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UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO)

Study on Waste Minimization and Management for the Volzhsky Region

UNIDO Project SI/RUS/95/801
UNIDO Contract No. 96/121
Vienna, Austria

December 31, 1996

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This project was conducted under the management of Mr. Valentin Ishchenko of the United Nations Industrial Development Organization (UNIDO), Industrial Sectors and Environment Division, located in Vienna, Austria. Technical consulting support and report preparation services were provided by ICF Kaiser, USA and ICF/EKO, Moscow, Russia. Additional technical consulting support was provided by Mr. Herbert Mascha, an independent consultant to UNIDO, in the preparation of Chapter 3 of this report, Waste Management. Additional background information was provided by Mr. Lukin of UNIDO and Mr. Verspeek, an independent consultant to UNIDO.

Lastly, we acknowledge that this project could not have been successfully completed without the assistance of the following individuals and organizations:

- Mr. F. Grishaev - Director of the Division Department of International Science and Technology Cooperation, the State Committee of Science and Technology of the Russian Federation
- Mr. V. Zheltobriukhov - Head of the Volgograd Regional Committee for Environmental Protection and Natural Resources
- Mr. L. Polianiov - First Deputy Head of the Volgograd Regional Committee for Environmental Protection and Natural Resources
- Mr. G. Gustomiasov - Head of the Volzhsky City Committee for Environmental Protection and Natural Resources
- Mrs. Zoya Nuzhdina - Chief Deputy of the Volzhsky City Committee for Environmental Protection and Natural Resources
- Volzhsky Plant for Tire Recycling and Repair
- Volzhsky Nitrogenous-Oxygenous Plant
- Volzhsky Orgsynthesis
- Volzhsky Abrasive Plant.

DISCLAIMER

This report was prepared for the United Nations Industrial Development Organization (UNIDO), Vienna, Austria by ICF Kaiser in fulfillment of Contract No. 96/121. The opinions, findings, conclusions, and recommendations expressed herein are those of the contractor and not necessarily those of UNIDO or other cooperating agencies. Mention of company or product names is not to be considered as an endorsement by UNIDO. Reasonable efforts have been made to report reliable data and information, but neither ICF Kaiser nor UNIDO can assume responsibility for the validity of the material provided by study facilities or technology vendors or for the consequences of their use.

ABSTRACT

The goal of this project was for the United Nations Industrial Development Organization (UNIDO) to develop a technologically feasible and economically viable strategy for the management and minimization of municipal and industrial solid wastes generated in Volzhsky. UNIDO undertook this project to transfer a general understanding to both the local environmental protection committees and individual enterprises located in the Volzhsky region that manufacturing companies need to minimize their costs and liabilities associated with managing hazardous and other industrial wastes generated by their operations, in order to: (1) remain economically competitive, (2) protect human health and the environment, and (3) comply with emerging regulatory requirements.

At the request of both the Volzhsky City Committee for Environment Protection and Natural Resources (VCCEP) and the Volgograd Regional Committee for Environment Protection and Natural Resources (VRCEP), UNIDO, through this project, conducted a systematic study to both identify and implement waste management and minimization techniques. This detailed study was limited to the following four industries which were predetermined to be both representative of industry in Volzhsky and willing to participate:

- Volzhsky Plant for Tire Recycling and Repair
- Volzhsky Nitrogenous-Oxygenous Plant
- Volzhsky Orgsynthesis
- Volzhsky Abrasive Plant.

This study and report were prepared after conducting the following tasks:

- Conducting an introductory workshop for presenting the framework of the waste minimization study;

- Reviewing the present technologies, conducting waste reduction audits for defining waste streams and existing problems, and formulating waste minimization/efficiency improvements at the four selected enterprises;

- Demonstrating through implementation of the most immediate measures in the selected industries that waste minimization is possible, and that it has financial and environmental advantages;

- Recommending policies to encourage eco-efficiency and competitiveness for the selected industries and for the region;

- Prepare a study on waste minimization and waste management strategy for the Volzhsky region;

It was the explicit goal of UNIDO, for this study to (1) demonstrate that waste minimization is both possible and practical at these facilities, and (2) provide the basis for developing and implementing an integrated approach to waste minimization and management that can be used by other cities throughout Russia.

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Project Introduction

1.1 Overview

The goal of this project was for the United Nations Industrial Development Organization (UNIDO) to develop a technologically feasible and economically viable strategy for the management and minimization of municipal and industrial solid wastes generated in Volzhsky. UNIDO undertook this project to transfer a general understanding to both the local environmental protection committees and individual enterprises located in the Volzhsky region that manufacturing companies need to minimize their costs and liabilities associated with managing hazardous and other industrial wastes generated by their operations, in order to: (1) remain economically competitive, (2) protect human health and the environment, and (3) comply with emerging regulatory requirements.

At the request of both the Volzhsky City Committee for Environment Protection and Natural Resources (VCCEP) and the Volgograd Regional Committee for Environment Protection and Natural Resources (VRCEP), UNIDO, through this project, conducted a systematic study to both identify and implement waste management and minimization techniques. Figure 1 presents a map of Volzhsky that shows the locations of most of the major industrial facilities. We note that this specific study was limited to the following four industries which were predetermined to be both representative of industry in Volzhsky and willing to participate:

- Volzhsky Plant for Tire Recycling and Repair
- Volzhsky Nitrogenous-Oxygenous Plant
- Volzhsky Orgsynthesis
- Volzhsky Abrasive Plant.

The information for this report is based on the results and perspectives of UNIDO's consultants, ICF Kaiser (USA) and ICF/EKO (Moscow), gained through their examination and conductance of pollution prevention opportunity assessments (P2OA) at the four Volzhsky enterprises. The P2OAs were carried out under UNIDO's guidance and methodology for preparing scientific reports. The actual P2OAs were overseen by Howard Finkel, P.E. of ICF Kaiser and conducted by the following ICF/EKO Russian team members:

- Dr. O.V. Padalko (team chief)
- Dr. V.N. Meshalkin (Orgsynthesis)
- Dr. A.P. Petrov (Volzhsky Abrasive Plant (VAP))
- Dr. V.V. Nechaev (energy consumption expert examiner — all enterprises)
- Dr. Ya. V. Nikitin (water consumption expert examiner — all enterprises)
- Dr. T.A. Kukushkina
- T.A. Vinogradova
- O. Yu. Kuzmin
- Dr. L.S. Pomogaeva
- V.I. Kiskin

City Coordinate System

Boundary of the Sanitary & Safety Zone of the Chemical Industrial Enterprise

100 Dwelling Blocks and Microregions

Air Pollution Inspection Post

Territories of the Enterprise

No.	Facilities
1	Volzhsky "Orgsynthesis"
2	The Enterprise #12 of the Industrial Association "RP-154"
3	The Volzhsky Plant for Tire Recycling and Repair
4	The Volzhsky Plant for Rubber Products "Latex"
5	The Volzhsky Pilot Industrial Plant
6	The Volzhsky Plant for Asbestos Industrial Products
7	The Heat and Electric Power Plant #1
8	The Plant for Synthetic Rubber
9	The Volzhsky Tire Plant
10	The Joint-Stock Company "Volzhskrezinotekhnika"
11	The Industrial Association "Khimvolokno"
12	The Volzhsky Mechanical Plant
13	The Volzhsky Nitrogen-and-Oxygen Plant
15	The Asphalt-and-Concrete Plant
16	The Heat and Electric Power Plant #2
18	The Brewery "Volzhsky"
19	The VolzhskyEnterprise for Petroleum Products Supply
20	The Volzhsky Plant for Tubes Production
21	The Volzhsky State Bearing Plant #15
24	The Meat-Packing Plant
27	The Volzhsky Milk and Cheese-Making Plant
29	The Volzhsky Bread-Making Plant
30	The Volzhsky Abrasive Industrial Association
34	The Steel Structure Plant
35	The Volzhsky Plant "Meteor": the industrial site #1 and #2
36	The Volzhsky Computer Plant
38	The Volzhsky Repair-and-Operational Fleet Base
40	The Industrial-and-Engineering Combine "Energokomplex, Volzhsky
42	The Road-and-Construction Management Department #6
	The Industrial Association "Stroyindustriya"
17	The Large-Panel House-Building Plant
22	The Wood Working Shop
25	The Reinforced Concrete Products Plant #2
31	The Building Structures Plant
32	The Ready Mix Plant
33	The Reinforced Concrete Products Plant
	The Volzhsky Energy and Manufacturing Plant
23	The Industrial Site #1
26	The Industrial Site #2
37	The Industrial Site #3
	The Plant for Electronic Computers Production
14	The Industrial Site #2
28	The Industrial Site #1
	The Trust "Yugmebel"
39	The Furniture Shop
41	The Timber-Handling Combine

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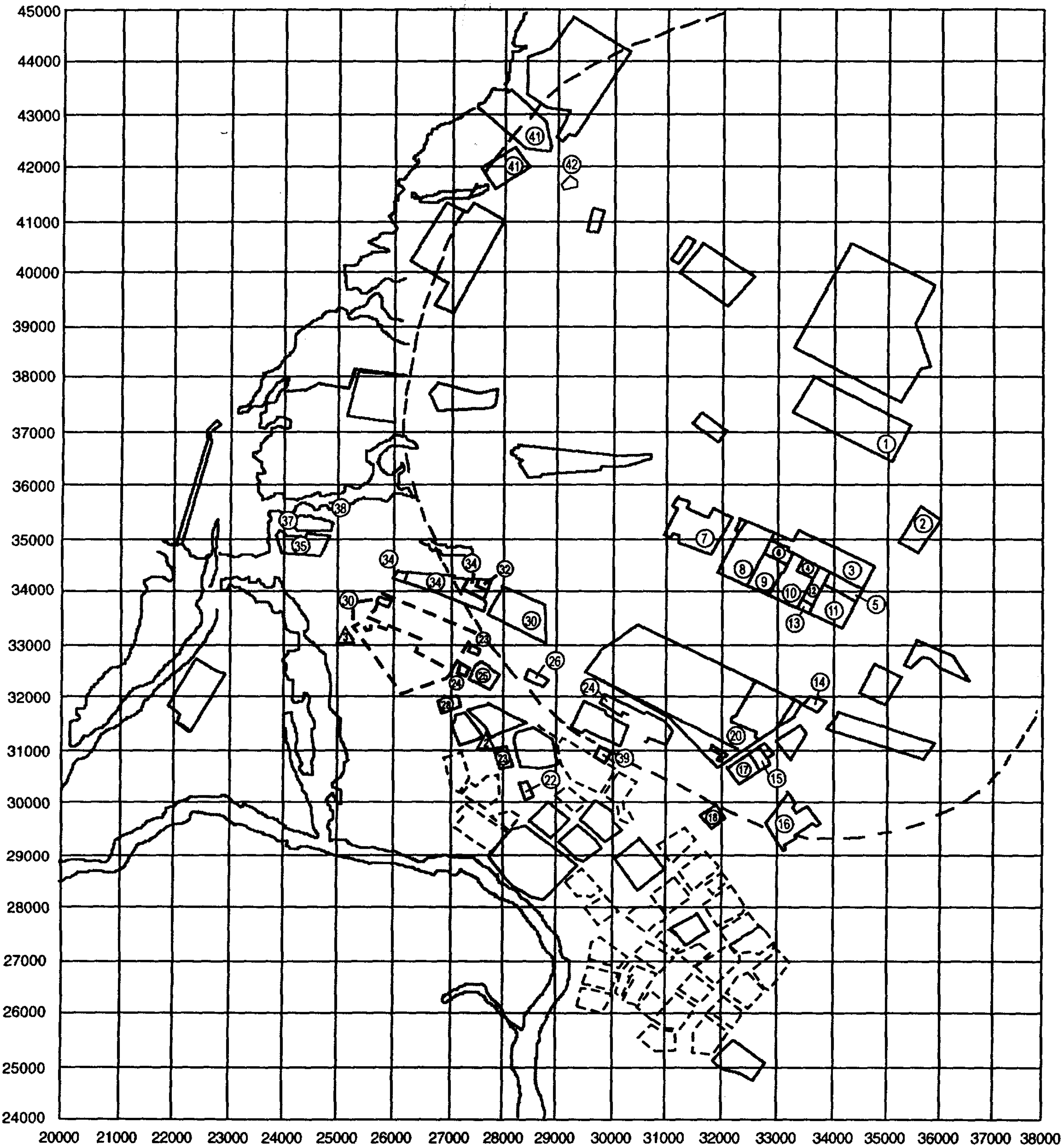

Exhibit 1-1

Major Industrial Facilities Located in Volzhsky, Russia

The remainder of this section provides an overview of the general economic and technical condition of the four enterprises, as well as the general conditions of the Volzhsky region. Section 2 discusses both pollution prevention and waste minimization and presents generic pollution prevention (P2) opportunities for preventing pollution and conserving raw materials. We also present in Section 2, the results of the P2OAs conducted at the Volzhsky Plant for Tire Recycling and Repair (VPTRR), the Volzhsky Abrasive Plant (VAP), Volzhsky Orgsynthesis (VO), and the Volzhsky Nitrogenous-Oxygenous Plant (VNOP). Section 2 also presents a summary of the recommended P2 and waste management opportunities by facility. Section 3 presents the results of UNIDO's independent consultant's waste management study, and Section 4 outlines the proposed policy for eco-efficiency, waste management, and competitiveness.

1.2 General Observations

During the week of September 22 through 26, 1996, ICF Kaiser and ICF/EKO (the "Team") conducted site visits at the following four enterprises located in Volzhsky, Russia:

- Volzhsky Plant for Tire Recycling and Repair
- Volzhsky Nitrogenous-Oxygenous Plant
- Volzhsky Orgsynthesis
- Volzhsky Abrasive Plant.

The purpose of these visits was to (1) observe the operations and waste management practices employed at each of the four enterprises and (2) collect process-specific waste generation information necessary for the Team to begin Task 3 - Pollution Prevention Opportunity Assessments (P2OA).

The visits were very interesting and informative, and allowed the Team to obtain insights into the operations at the four enterprises that were not readily apparent from our review of the literature provided in the solicitation. Specifically, even though the four enterprises were very different from one another (in size, complexity, and the number/type of issues faced), they all were afflicted by the problems associated with an uncertain economy, less than reliable source of raw materials, expensive (and sometimes unreliable) energy supply, and inadequate infrastructure. For instance:

- **Uncertain Economy** - the Volzhsky Abrasive Plant is operating at approximately 10 percent capacity because its customers cannot afford to purchase high quality abrasive products;

- **Raw Materials** - Volzhsky Orgsynthesis is unable to obtain liquid naphtha (a raw material) at sufficient product purity, which in turn causes an excessive generation of associated waste products;

- **Expensive (and/or unreliable) Energy** - the Volzhsky Plant for Tire Recycling and Repair must suspend operations during portions of the day due to rate restrictions for electricity; and,

- **Inadequate Infrastructure** - the Volzhsky Nitrogenous-Oxygenous Plant's wastewater treatment system (which, acts as a quasi-municipality, accepts liquid wastes from all of the enterprises located in Volzhsky) is both undersized and antiquated.

In addition, although each of the enterprises understood that proper waste management was necessary for both the protection of human health and the environment, none of the enterprises appeared to consider waste management a priority. Rather, the enterprises were more concerned with production and staying in business.

As a result of the current socio-economical and political climate in Russia, this project will be successful only if UNIDO can demonstrate that the implementation of pollution prevention and waste management techniques/practices can yield results that can be measured in terms of the conservation of raw materials, reductions in production and operating costs, increases in product quality, reduction in the quantity of wastes needing management, etc.

1.3 Overview of the Four Study Enterprises

The section provides a general overview of the technical and economical status of the four study facilities. A more through review and evaluation of the four study facilities is presented in Sections 3 through 6.

1.3.1 Volzhsky Plant for Tire Recycling and Repair (VPTRR)

The VPTRR is an employee-owned company involved in the recycling and repair of both passenger and truck tires. VPTRR has the capacity to repair/recycle 5,000,000 tires per year; however, the facility's equipment for handling passenger tires is temporarily out of order [efforts to correct this situation appear to be stalled due to the general lack of bias-ply tires]. VPTRR also processes non-recyclable tires and other rubber parts to produce up to 5,000 tons of coarse crumb rubber and rubber sheets per year [VPTRR processes the sheets to make rubber mats, gaskets, and other parts]. Lastly, VPTRR sells the textile portions of the remaining tire carcass for use as pipe insulation and well packing/grouting material.

<u>Technological Situation</u>

- VPTRR opened in 1961 and most of the current equipment was installed during the early 70's, with some newer investments in the late 80's.

- Production takes place mostly during the night because of the time-restricted electricity prices; the electricity is turned off between 9:00 a.m. and 11:00 a.m.

<u>Economic Situation</u>

- VPTRR is expected to operate at approximately 40 percent of its overall operating capacity due to reduced demand, relatively high operating costs (raw materials, electricity, water) and taxes, and dwindling supply of bias-ply (non-steel-belted tires).

1.3.2 Volzhsky Nitrogenous - Oxygenous Plant (VNOP)

VNOP has 815 employees and produces various grades of gaseous nitrogen and oxygen and plans to produce liquid nitrogen and oxygen in the near future. VNOP also serves as the distribution point for gas, steam, electricity, water (cold and hot) and telephone connections. Lastly, VNOP is the regional wastewater treatment facility with a capacity to treat 200,000 m^3/day. It is VNOP's wastewater treatment facility that is the subject of this project.

<u>Technological Situation</u>

- The wastewater treatment facility (WWTF) provides both mechanical and biological treatment of three types of wastewater: (1) 60,000 m^3/day of communal and industrial wastewater from the region; (2) 65,000 m^3/day of contaminated process waters; and (3) approximately 15,000 m^3/day of communal and small business wastewaters from Volzhsky City.
- "Conditionally pure" water also is sent to VNOP for biological treatment at the facility's 28 kilometer biohydrobotanic treatment area (a grassy area). Treated effluent from the biohydrobotanic area is sent back to the facilities for reuse.

<u>Economic Situation</u>

- VNOP collects fees for providing water and waste water treatment services; waste water treatment fees are supposedly based on the level of contamination.
- VNOP apparently does not incur charges for sludge disposal.

1.3.3 Volzhsky Orgsynthesis (VO)

VO is one of the largest chemical manufacturers in Russia and employs approximately 4,500 workers. VO operates 24 hours a day, 7 days a week and manufactures numerous products, including: rubber vulcanizers, isobutyl, potassium xanthates, carbon disulfide, diproxide, morpholine, aniline, phenasal, glutaric aldehyde, 2-naphthol. These products are used in agriculture, non-ferrous metallurgy, mining-extractive industry, rubber goods, tire production, cable-conductors, pharmaceuticals, and chemicals manufacturing.

<u>Technological Situation</u>

- VO manufactures most of its products using specific production lines. We were allowed to inspect and review information provided on the 2-naphthol process line.
- The 2-naphthol process line also is very old and has been in operation since 1974.
- Although VO stated that routine inspection and maintenance operations are either performed during the normal, one month/year plant turnaround, or during any temporary shut-down, it was clear during our inspections that routine maintenance is not a priority.

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- In the process area, leaky vessels, pipes, joints, flanges, and valves were observed as the norm, rather than the exception. Liquid and gaseous emissions were evidently long-term and persistent as evidenced by (1) liquids rising up through the concrete/brick floors when walking through the process areas, (2) worn cast-iron vessels and pipes, and (3) stained walls and floors.

Economic Situation

- VO, which is partially owned by Rhone-Poulenc (15%), is currently operating at 40 to 50 percent of capacity due to depressed market demands.

- VO projects better demand for 2-naphthol.

- VO also believes that if they can reduce operating costs (by improving process efficiency), they will be able reduce the cost of this product.

1.3.4 Volzhsky Abrasive Plant (VAP)

VAP, established in 1961, is the only producer of silicon carbide (SiC) materials in Russia. VAP is specialized in the production of abrasives and other products from black and green silicon carbide with grain sizes ranging from 14 microns to 1060 microns; metallurgical grades of silicon carbide with SiC content ranging from 60% to 95%; abrasive tools with ceramic bonded media made of green and black SiC; fused corundum materials; and SiC refractory and wear resistant products. Products are exported to the USA and other countries around the world.

Technological Situation

- The commercial production of silicon carbide is accomplished using large, batch-operated furnaces, known as Acheson furnaces. A high quality silica sand is first mixed with petroleum coke and CO_2 to form a charge which is built up around a central core of granular, conductive carbon material (i.e., graphite). The core is oriented horizontally, and the graphite electrodes are disposed through the end walls of the furnace to make electrical contact with the prepared core. The temperature in the core generally reaches about 2200 degrees C., and the flow of heat from the core to the surrounding charge causes the carbide formation reaction to take place. Significant quantities of off-gases are generated during this process.

- Both the production of SiC and SiC abrasive products are very energy intensive. VAP estimated that 50% of the costs associated with production are related to electricity.

- SiC material is processed by grinding and milling. VAP either sells SiC material to abrasive users such as manufacturers of sand paper, or uses them internally to make abrasive tools and fire bricks.

- The process line for handling SiC particles that are smaller than 60 microns in diameter is temporarily inoperable.

Economic Situation

- VAP is currently operating at between 10 to 20 percent of capacity due to depressed market demands.

- VAP believes that the demand for abrasives and abrasive products is high; however, many of their current customers can not afford to purchase abrasive materials.

- VAP also believes that if they can reduce operating costs (by improving process efficiency), they will be able reduce the cost of their products.

1.4 General Perspectives of Resource Conservation at the Four Study Facilities

As discussed above, each of the four enterprises are different by both industry and size/complexity. Nonetheless, these enterprises are characterized by a number of common features: general economic activity, resource utilization practices, and waste handling and management practices. Such a similarity is caused by the fact that all four of these enterprises were constructed and began operations during the same time period, i.e., the 1970's; use antiquated equipment and technology; operated under the conditions associated with a socialist economy; and are now struggling to adjust to and operate under a "transitional", free-market, economy. The following are general observations regarding the operation and condition of the four study facilities; these observations are explained in more detail below:

- operating at partial production capacities

- regardless of raw material expense, operation of inefficient production processes that squander raw materials

- lack of understanding of the importance of resource conservation as tool for improving environmental controls and financial positions

- absence of accounting system or inspection procedures for monitoring the facility's production costs and other expenses associated with raw materials use and waste generation and management

- absence of monitoring equipment and systems for measuring and tracking water and energy consumption

- unauthentic information concerning nomenclature, composition, properties of solid, liquid, and gaseous industrial waste.

We note that the general insolvency of the potential consumers within the domestic market is largely responsible for the facilities' operation at partial capacity (10-40% of the designed value). In addition, the ability for compensating domestic market losses through the exportation of products is very difficult for several reasons. First, the poor quality of the products and general lack of resources for advertising makes it very difficult for the companies to sell their products on the world market.

Second, the reduction in production volumes have not been accompanied by corresponding reductions in resource consumption, especially energy and water (or waste generation rates). Specifically, although production volumes have reduced by 60% to 90%, resource-consumption has only decreased by 5% to 30%. The reduction in production, without corresponding reductions in raw materials consumption (and waste generation) is also responsible for increase production costs and loss of competitiveness. As a result of this situation, any technical, organizational, economical, or other solution that leads to increase in production or decrease in raw material consumption must be considered simultaneously.

The operation of inefficient and outdated production processes and squandering of raw materials are connected with a number of factors.

As mentioned previously, the technological base of examined enterprises is outdated by 30-40 years. Since these enterprises started operation, none have updated their processes or equipment. As part of this project, the Project Team has formulated recommendations for process improvements and equipment modernization. These recommendations are presented in Section 2.

The second factor is the facilities' lack of understanding of the importance of resource conservation as tool for improving environmental controls and financial positions. Such an misunderstanding is caused by the lack of training and knowledge in the areas of pollution prevention, waste minimization, and waste management. This lack of understanding of pollution prevention and resource conservation is reflected by the fact that none of the examined enterprises have short-, medium-, or long-term plans/programs for conducting pollution prevention, resource conservation, or improved waste management. Without such plans or programs, it is unlikely for any of the enterprises to obtain investment and/or credit support from domestic and foreign financial organizations.

The third factor is the absence of accounting systems or inspection procedures for monitoring the facilities' production costs and other expenses associated with raw materials use and waste generation and management. While accounting systems and inspections procedures do exist and are implemented at most Russian enterprises, none of these systems account for the "true costs" associated with production, such as the costs of waste handling and waste management.

We note that based on our interviews with the management of the four enterprises, it was apparent that they generally believed that these expenses were "buried" as 1-2% of the product's prime cost. However, we note that the methodology recommended for application by both the United Nations Organization for the Commerce and Development (UNCAD) and the International Organization of the Attested Accountants (IOAA) includes specific procedures to account for all expenses, including those related to environmental control and resource consumption. Following UNCAD's methodology for cost accounting, we estimate that these "buried" costs actually account for up to 20-25% of the product's prime cost, which should be a serious stimulus for changing management's position concerning resource-conservation and environmental control.

During our site assessments, we noted the absence of modernized monitoring equipment and systems for measuring and tracking water and energy consumption.

Although the installation of such systems cannot be considered as the water- and energy-saving measures that will produce resource conservation, such systems are vitally important for establishing baselines of, and measuring resource consumption. Throughout the remainder of this report, we have presented examples of potential savings realized through resource conservation.

The absence of modernized measurement equipment for monitoring consumption of water, natural gas, electricity, and steam also makes it difficult for the enterprises to audit and control payments for the consumption of these resources.

Finally, the enterprises are unable to completely account for resource usage and waste generation because of their inability to collect accurate information regarding raw material use and waste generation. Such an inability to collect accurate data is evidenced by:

- the classification system for the various hazardous and industrial wastes that are ultimately discharged or disposed is too broad and both inappropriately groups wastestreams for treatment and makes it impossible to segregate wastestreams for specialized management (it also increases management costs because co-disposal of both hazardous and non-hazardous wastes increases the overall volume of waste needing more treatment);

- up to 20% of the different waste types produced by the enterprises are currently not characterized in the Russian regulations or disposal certificates;

- the mismanagement (co-management and co-disposal) of the different waste types (including those wastes not identified or categorized on the ecological certificates) not only makes it difficult to accurately account for the generation of specific wastes, but makes it difficult (if not impossible) for enforcing compliance with permit levels for volume and character of waste disposal;

- although not a data quality issue, the permits that control disposal of wastes specify volumes and concentrations based on levels obtainable using outdated technology. The reliance of outdated limits, which could be significantly lower if recalculated based on achievable levels obtained by newer technologies, inhibits the enterprises from reducing volumes and toxicities of their wastes because they do not have to meet more stringent levels.

Therefore, based on the above discussion (and as discussed later), we have formulated the following measures that all of the enterprises can institute (these measures can be enacted with or without the help of consultants):

1. Development of short-, medium- and long-term plans and programs for resource conservation and pollution prevention, waste management, instrumentation control, and measurement of water and energy consumption. The absence of such plans and programs will make it difficult for the enterprises to become more eco-efficient and competitive.

2. Performing training seminars for:

   - all employees to learn the general principles and practices for resource conservation (pollution prevention) and waste management;

   - accountants and economists to learn the modern principles and application of "full-cost" accounting to fully capture the costs associated with production, including those costs incurred through waste management and resource consumption.

3. Performing waste inventories (identification and certification) of all solid, liquid, and gaseous wastes generated at the enterprises using modern systems for "cadastre" accounting, certification, and classification of waste.

SECTION 2.0
Pollution Prevention and Waste Minimization

2.1 Introduction

Pollution prevention is the use of materials, processes, or practices that reduce or eliminate the creation of pollutants or wastes at the source. It includes practices that reduce the use of hazardous and non-hazardous materials, energy, water, or other resources as well as those that protect natural resources through conservation or more efficient use.

A pollution prevention program is an ongoing, comprehensive examination of the operations at a facility with the goal of minimizing all types of waste products. An effective pollution prevention program will:

- reduce the risk of criminal and civil liability
- reduce operating costs
- improve employee morale and participation
- enhance the company's image in the community
- protect human health and the environment.

The remainder of this section provides background information on pollution prevention and procedures for implementing a pollution prevention opportunity assessment (P2OA).

2.2 Benefits of a Pollution Prevention Program

In the case of pollution prevention, national environmental goals coincide with industry's economic interests. Business have strong incentives to reduce the toxicity and sheer volume of the waste they generate. A company with an effective, ongoing pollution prevention plan may well be the lowest-cost producer and have a significant competitive edge. The cost per unit produced will decrease as pollution prevention measures lower liability risk and operating costs. The company's public image will also be enhanced.

2.2.1 Reduced Risk of Liability

Companies will decrease their risk of both civil and criminal liability by reducing the volume and the potential toxicity of the vapor, liquid, and solid discharges they generate. Companies should look at all types of waste, not just those that are currently classified as hazardous or industrial wastes. Because toxicity definitions and regulations change, reducing the volume of wastes in all categories is a sound long-term management policy.

Environmental regulations at the national and regional levels require facilities to document and measure the types and volumes of wastes generated. Companies that produce excessive waste face increased management and disposal costs.

Civil liability is increased by generating hazardous waste and other potential pollutants. Waste handling affects public health and property values in the communities surrounding production and disposal sites. Even materials not currently covered by hazardous waste regulations may present a risk of civil litigation in the future. In addition, work-related injuries and medical costs also are directly related to the volume of hazardous materials produced.

2.2.2 Reduced Operating Costs

An effective pollution prevention program can yield cost savings that will more than offset program development and implementation costs. Cost reductions may be immediate savings that appear directly on the balance sheet or anticipated savings based on avoiding potential future costs. Cost savings are particularly noticeable when the costs resulting from treatment, storage, or disposal of wastes are allocated to the production unit, product, or service that produces the waste.

Materials cost can be reduced by adopting production and packaging procedures that consume fewer resources, thereby creating less waste. As wastes are reduced, the percentage of raw materials converted to finished products increases, with a proportional decrease in materials costs.

Waste management and disposal costs are an obvious and readily measured potential savings to be realized from pollution prevention. National and regional regulations mandate special handling procedures and specific treatment and disposal methods for hazardous or toxic wastes. The costs of complying with these requirements and reporting on waste disposition are direct costs to business. There are also indirect costs, such as higher taxes for such public services as landfill management. The current trend is for these costs to continue to increase at the same or higher rates. Other cost savings include:

- reduced manpower and equipment requirements for onsite pollution control and treatment
- less waste storage space, freeing more space for production
- less pretreatment or packaging prior to disposal
- smaller quantities handled and managed
- less need to transport wastes for disposal
- lower disposal costs
- reduced paperwork and record-keeping requirements.

Production costs can be reduced through a pollution prevention opportunity assessment (P2OA). When a multi-disciplinary group examines production processes from a fresh perspective, opportunities for increasing efficiency are likely to surface that might not otherwise have been noticed. Production scheduling, material handling, inventory control, and equipment maintenance are all areas that can be optimized to reduce the production of wastes of all types and also control the costs of production.

Energy costs will also decrease as pollution prevention measures are implemented in various production lines. In addition, energy used to operate the overall facility can be reduced by doing a thorough assessment of how various operations interact. Facility cleanup costs may result from a need to comply with future regulations or to prepare a production site for sale or when seeking foreign investment. These future costs can be minimized by acting now to reduce the amount of wastes of all types generated.

2.2.3 Improved Company Image

As the quality of the environment becomes an issue of greater importance to society, companies' policies and practices for controlling waste increasingly influence the attitudes of your employees and of the community at large. Employees are likely to feel more positive toward their company when they believe that management is committed to providing a safe work environment and is acting as a responsible member of the community. By participating in pollution prevention activities, employees can interact positively with each other and with management. Helping to implement and maintain a pollution prevention program should increase their sense of identity with company goals. This positive atmosphere helps to retain a competitive work force and to attract high-quality new employees.

Community attitudes will be more positive towards companies that operate and publicize a thorough pollution prevention program. Most communities in European and U.S. countries actively resist the siting of new waste disposal facilities in their areas (and we suspect that this will likewise become increasingly so in Russia). In addition, they are becoming more conscious of the monetary costs of treatment and disposal. Creating environmentally compatible products and avoiding excessive consumption and discharge of material and energy resources, rather than concentrating solely on treatment and disposal, will greatly enhance your company's image within your community and with potential customers (especially in countries that have adopted ISO 14000 environmental standards that exclude products that are not "environmentally friendly."

2.2.4 Protection of Human Health and the Environment

Reducing production wastes provides upstream benefits because it reduces ecological damage due to raw material extraction and refining operations. Subsequent benefits are the reduced risk of emissions during the production process and during recycling, treatment, and disposal operations.

2.3 The Environmental Management Hierarchy

In the United States and some European Countries, governments and agencies responsible for the protection of human health and the environment have developed and defined an environmental management hierarchy for the management of hazardous wastes. The highest priorities are assigned to preventing pollution through source reduction and reuse, or closed-loop recycling.

Preventing or recycling at the source eliminates the need for off-site recycling or treatment and disposal. Elimination of pollutants at or near the source is typically less expensive than collecting, treating, and disposing of wastes. It also presents much less risk to companies' workers, the community, and the environment. Examples of the types of activities by priority are presented below (from highest to lowest priority):

- Source Reduction
    - environmentally friendly design of new products
    - product changes
    - source elimination

- Recycling
  - reuse
  - reclamation

- Treatment
  - stabilization
  - neutralization
  - precipitation
  - evaporation
  - incineration
  - scrubbing

- Disposal
  - land disposal
  - underground injection
  - emissions to the air
  - discharges to water.

Examples of these types of activities include: modification of product to avoid solvent use; modification of product to extend coating life; solvent recycling, metal recovery, volatile organic recovery; thermal destruction of organic solvent; precipitation of heavy metals from plating baths; and land disposal, respectively.

2.4 What is Pollution Prevention?

Pollution prevention is the maximum feasible reduction of all wastes generated at production sites. It involves the judicious use of resources through source reduction, energy efficiency, reuse of input materials during production, and reduced water consumption. There are two general methods of source reduction that can be used in a pollution prevention program: product changes and process changes. They reduce the volume and toxicity of production wastes and of end-products during their life-cycle and at disposal.

Product changes in the composition or use of intermediate or end products are performed by the manufacturer with the purpose of reducing waste from manufacture, use, or ultimate disposal of the products. Process changes are concerned with how the product is made. They include input material changes, technology changes, and improved operating practices. All such changes reduce worker exposure to pollutants during the manufacturing process. Typically, improved operating practices can be implemented more quickly and at less expense than input material and technology changes. The following process changes are pollution prevention measures because they reduce the amount of waste created during production.

<u>Examples of Input Material Changes</u>

- stop using heavy metal pigments
- use a less hazardous or toxic solvent for cleaning or as coating
- purchase raw materials that are free of trace quantities of hazardous or toxic impurities

Examples of Technology Changes

- redesign equipment and piping to reduce the volume of material contained, cutting losses during batch cleaning or color changes or when equipment is drained for maintenance or cleaning
- change to mechanical stripping/cleaning devices to avoid solvent use
- change to powder coating systems
- use more efficient motors
- install speed controls on pump motors to reduce energy consumption

Examples of Improved Operating Practices

- train operators
- cover solvent tanks when not in use
- segregate waste streams to avoid cross-contaminating hazardous and non-hazardous materials (and to facilitate recovery)
- improve control of operating conditions (e.g., flow rate, temperature, pressure, residence time, stoichiometry)
- improve maintenance scheduling, record keeping, and efficiency
- stop leaks, drips, and spills
- turn off electrical equipment when not in use
- optimize purchasing and inventory control/maintenance methods for raw materials

2.5 What is Not Pollution Prevention?

There are a number of pollution control measures that are applied only after wastes are generated. They are, therefore, not correctly categorized as pollution prevention. Rather, they are categorized as waste minimization. Off-site recycling is vastly preferable to other forms of waste handling because it helps to preserve raw materials and reduces the amount of material that will require disposal. However, compared with closed-loop recycling (or reuse), performed at the production site, there is likely to be more residual waste that will require disposal. Furthermore, waste transportation and the recycling process itself carry the risks of worker exposure and of release into the environment.

Transferring of hazardous wastes to another environmental medium is not pollution prevention. Many waste management practices to date have simply collected pollutants and moved them from one environmental medium to another. For example, solvents can be removed from wastewater by means of activated carbon adsorbers. However, regenerating the carbon requires the use of another solvent or heating, which transfer the waste to the atmosphere. In some cases, transfer is a valid treatment option. However, too often the purpose has been to shift a pollutant to a less-tightly regulated medium. In either case, media transfers are not pollution prevention.

Waste treatment prior to disposal reduces the toxicity (and mobility) and/or disposal-site space requirements but does not eliminate all pollutant materials. This includes such processes as volume reduction, dilution, detoxification, incineration, decomposition, stabilization, and isolation measures such as encapsulation or embedding.

2.6 Conducting a Pollution Prevention Opportunity Assessment (P2OA)

The Team approached pollution prevention and waste reduction as a thought process in which manufacturing was viewed with objective function (i.e., each step should serve a specific purpose). We worked with all affected parties (including the R&D and Engineering staff) to provide a structure for changing the nature of the products and/or the manufacturing process to prevent or reduce wastes and to achieve a greater compatibility with the environment -- without adversely affecting product quality or market acceptance. We note that significant future progress in pollution prevention and waste reduction is attainable if planned for during initial product development.

We did not subscribe to the use of generic checklists. Rather, we prepared and followed a tailored, four-step process:

- Identify Chemicals & Wastes
- Determine Origin
- Identify and Develop Waste Reduction Alternatives
- Select Alternatives on the Basis of Life Cycle Analysis and Technical/Regulatory Feasibility

This process is commonly referred to as the "descriptive approach." As part of this approach, we used the information obtained from the four participants with information gathered during the site visits to develop a process flow chart to both represent the sequence of processes within a production operation, and clearly identify all inputs, products, by-products, and wastes. We then used these process flow charts to identify the source(s) of each material or energy loss and to serve as the foundation upon which ideas for reducing or eliminating the loss(es) were developed. We note that this focused approach is dynamic and can be used to describe any type of operation; it also eliminates the need to apply checklists.

2.6.1 Step 1: Identify Chemicals and Wastes

The purpose of this step was to develop an inventory of the chemicals used and waste streams generated by process (many facilities routinely track this information as part of their material inventory). This information was used to develop an understanding of the operations at hand and will serve as the foundation for completing the next steps.

We recognize that the availability and level of detail of process information will vary by facility. At some companies, this information was "sketchy" at best or only known by several individuals, while at other companies, detailed records were developed and managed by department. As part of the information gathering process, the Team:

- Met with the representatives of each site to assess the availability of process information

- Obtained and reviewed available records from various departments including: purchasing, operations, and waste management

- Interviewed key personnel. For example, at a metal finishing department, we would interview:

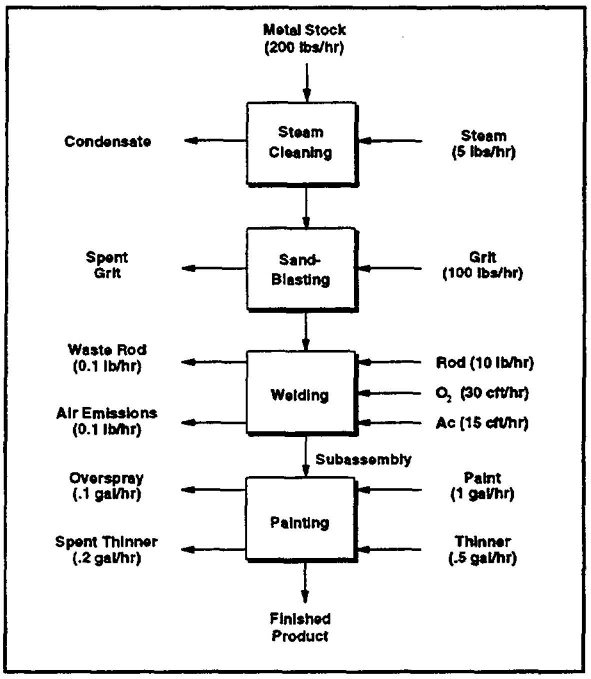
  - Department manager and line operators
  - Facilities engineer
  - Environmental engineer
  - Process engineer
  - Wastewater treatment supervisor

- Toured the facility and operations (material storage, production, and waste management)

2.6.2 Step 2: Determine Origin

Building from the information gathered in Step 1, we then reviewed information relating to material balances, process designs, waste management, raw materials/production, economics, and standard operating procedures, etc., to produce (or annotate existing) process flow charts.

The Team used the process flow charts to assist in the mass characterization.



Process flow charts help answer:

- What are the input materials?
- How much of a particular input enters the waste stream?
- How much of the material exits the process as a fugitive emission or waste?
- How efficient is the process?
- Are unnecessary wastes generated by mixing otherwise recyclable hazardous wastes with other process wastes?
- What types of housekeeping practices are used to limit the quantity of wastes generated?
- What types of process controls are used improve process efficiency?

2.6.3 Step 3: Identify and Develop Waste Reduction Alternatives

In this step, we used the process flow charts to identify and rank candidate waste streams for detailed evaluation of technical alternatives for pollution prevention. Specifically, we ranked the candidate waste streams by a number of factors that were tailored to the specific company and its philosophy, including:

- Waste quantity and frequency of generation
- Waste management costs

- Regulatory impact
- Safety and health risks
- Pollution prevention potential and ease of implementation
- Demonstrated effectiveness in other facilities within industry

The team relied on in-house information; data from trade associations, equipment vendors, literature, and environmental agencies (national and international); and facility personnel as resources for developing potential waste reduction alternatives.

We then identified appropriate waste reduction alternatives, including:

- Source Reduction
- Reclamation
- Input Material Changes
- Source Control
- Waste Exchanges
- Technology Changes
- Product Changes
- Use and Reuse
- Good Operating (Housekeeping) Practices

Although some of these waste reduction alternatives are more feasible than others, we have found these alternatives to be suitable in a wide range of industrial sectors, including the chemical manufacturing, rubber manufacturing, metal finishing, formulating, and utility sectors. Setting up a pollution prevention program does not require exotic or expensive technologies. Some of the most effective alternatives (or techniques) are simple and inexpensive. Exhibit 2-1 presents a listing of just a few of the more common, low-tech pollution prevention options. Exhibit 2-2 presents several pollution prevention techniques suitable for use in rubber manufacturing. Exhibit 2-3 presents an example checklist that facilities can use to help find potential pollution prevention alternatives.

2.6.4 Step 4: Select Alternatives on the Basis of Life Cycle Analysis and Technical/ Regulatory Feasibility

The purpose of this step was to perform a critical technical assessment of the waste reduction alternatives generated through completion of step 3. We considered the following six criteria to recommend the most suitable waste reduction techniques based on life cycle costs and technical/regulatory feasibility:

- **Quantifiable results** - Pollution prevention techniques must be economically justifiable.

- **Pollution prevention hierarchy** - Select pollution prevention techniques according to hierarchy which favors source reduction/recycling over treatment/land disposal..

- **Reduction of waste volume or disposal/treatment cost** - Costs to handle, treat, and dispose of waste streams is a key factor, and waste volume is directly proportional to cost.

- **Ease of implementation** - Low cost pollution prevention options that can be implemented quickly either through procedural changes or minor equipment modifications are given a higher priority.

EXHIBIT 2-1

POLLUTION PREVENTION ALTERNATIVES

Improved Operating Procedures

Good operating procedures rely not on changes in technology or materials, but on human adaptability. Small changes in personnel practices, housekeeping, inventory control, waste stream segregation, material handling and scheduling improvements, spill and leak prevention and preventive maintenance can mean big waste reductions: To reduce waste in chemical production:

- Reduce inventory of raw materials. Test materials first to determine whether or not they can be used in current manufacturing processes.
- Reduce excess and off-specification production. Produce only the amount requested or needed.
- Segregate waste to recover useful materials and cut disposal costs.
- Conserve water. Reuse rinse waters. If possible, clean process equipment with process fluids.
- Prevent contamination of stormwater runoff, thereby eliminating treatment of contaminated rainwater.
- Replace leaking valves, pumps, and seals.

Process Modifications

Rethinking an entire production or manufacturing process can be a very effective way of preventing pollution. Often the new process is more efficient and costs less to operate. Upgrading the system not only reduces waste, but can improve product quality, save money by reducing the need for maintenance, and increase control of raw materials used in production. Consider the following process modifications:

- Improve scheduling. Scheduling the production of chemicals that use the same production line can reduce cleaning requirements.
- Shift from batch manufacturing to continuous manufacturing. This can reduce evaporation loss.
- Maximize dedication of process equipment. This can reduce equipment cleaning frequency and waste generation.
- Clean equipment with small amounts of cleaning solution. If water is the cleaning agent, use sprays or jets of water to clean tanks or equipment; where possible, recycle concentrated waste as raw material.
- Use pumps and piping systems to transfer liquid materials. This can reduce spillage.
- Reformulate products. Prepare chemicals in pellet form instead of powder, to reduce dusting.
- Substitute less toxic or non-toxic materials as raw products.

Reuse/Recycling

With a little creative thought, a firm may be able to find a use for a material that has always been thought of as a waste. Alternatively, some companies recycle waste materials for reuse either at their own facility or off-site by others that do not require virgin materials. Examples include:

- Recovery of spent solvents using a batch distillation system.
- Recovery of metals from process wastewater using electrolytic recovery systems.
- Recovery of alkaline degreasing baths using an ultra-filtration system.
- Reconstitute and reuse spent baths.

EXHIBIT 2-2

POLLUTION PREVENTION TECHNIQUES SUITABLE FOR USE IN RUBBER MANUFACTURING

Pollution outputs from the rubber products industry occur at many stages of the manufacturing process. Most U.S. facilities are reducing these outputs by employing the many reasonable and effective pollution prevention options that exist.

Chemicals

The compounding and mixing area of a rubber products manufacturing facility, where dry chemicals are weighed, put into small containers, and loaded into the rubber mixer, can be a significant source of particulate emissions. Some mixing facilities have practically eliminated particulate emissions by purchasing their chemicals in small pre-weighed, sealed polyethylene bags. The sealed bags are put directly into the banbury mixer and the bag itself becomes part of the rubber matrix, thus eliminating this formerly dusty operation. For facilities not purchasing their chemicals in pre-weighed bags, a variety of other pollution prevention options exist. The following pollution prevention methods have been used by various facilities:

- **Careful Transportation Mechanisms** - Receiving chemicals in closed docks in sealed containers or in bulk rail or truck shipments with a minimal history of spills. Storing chemical piles inside the facility to ensure that any fugitive emissions can be contained within the facility.
- **Sealed Containers** - Providing sealed containers for all open materials. Sealed containers should have air space between the chemical and the container cover to minimize "puffing" losses when the container is opened. Similarly, placing secondary containment mechanisms around all storage containers provides further protection from spills and leaks.
- **Automatic Dispensing** - Utilizing automatic dispensing and weighing equipment whenever possible. Automatic dispensing minimizes waste due to spills from manual dispensing and provides quality control.
- **Reduced Toxic Chemical Usage** - Reducing the use of toxic chemicals via reformulation. For example, one manufacturer claims to have reduced zinc waste simply by reducing the amount of zinc added to the compound master batch. He kept reducing the amount of zinc added until the quality of the product suffered. The manufacturer then assumed that the last zinc level at which no decrease in product quality was discovered was the best "waste minimized" operating level.
- **Computer Inventories** - Providing computer inventory control methods to minimize the amount of stock purchased.
- **Spills and Sweeping Protocols** - Providing protocols for cleaning up spills and sweeping to ensure the proper segregation of waste.

Waste Water

Contaminated waste water is another pollution concern at many rubber product manufacturing facilities. In the U.S., all but the largest rubber product manufacturing facilities participate in waste water pretreatment programs with local publicly-owned treatment works (POTWs). Many plants meet pretreatment standards without treatment of their waste water. Some facilities, however, require solids settling, pH adjustment, or oil removal. To address the waste water issue, many facilities have implemented water reuse and recycling programs. Options for waste water reuse and recycling include installing a closed-loop water cooling or heating system or a closed-loop ethylene glycol system. Another problem is that waste water is often contaminated by oil and grease. To prevent the spilling and leaking of waste oil and grease which contaminates waste water, the following pollution prevention methods have been considered:

- Substituting lubricating grease for oil, especially for milling equipment. Grease has been shown to reduce substantially the amount of manifested waste.

- Performing preventive maintenance of processing, molding, and curing equipment. Such practices can further reduce the volume of manifested oil and grease waste by reducing waste from worn seals and gaskets.

- Removing oil from oily waste waters prior to disposal to reduce the volume of waste water disposal. For instance, oily waste waters collected from equipment engine pits could be routed through a centrally located oil/water separator prior to discharge.

Spent Solvents

Spent solvents known to contribute to ozone depletion are another pollution problem in rubber product manufacturing facilities. Many facilities have replaced solvent cleaning applications with high pressure water systems, used caustic cleaning solutions, and substituted old solvents with cleaner, citrus-based solvents. Many mold release compounds, coatings, and adhesives which formerly used ozone depleting chemicals as carriers were reformulated to eliminate the offending chemicals. Process changes and direct elimination of the chemicals of concern were also accomplished.

Disposal

A significant issue in the rubber product industry is the disposal of waste rubber. To prevent the improper disposal of scrap rubber, facilities can segregate and recycle rubber wastes. Properly segregating waste streams may be as simple as placing a screen over part of the molding equipment so that waste rubber stock produced during performing operations can be segregated from the oily waste waters and recycled back into the process. Other segregation processes may include separating cured from uncured rubber, and recycling the uncured portion back into the process.

Reclaiming and recycling cured, off-specification rubber is also a waste minimization option. Reprocessing rubber involves taking used rubber products and processing them in a manner that produces a form of rubber filler or an ingredient that can be incorporated into virgin rubber compounds. There are two general methods for producing reprocessed rubber. The first is a severing of cross-links by chemical or steam digestion to produce a product known as reclaiming. The second is a grinding of rubber compounds by ambient grinding, cryogenic grinding, or solution grinding in water. These processes are also applicable to the scrap rubber produced during finishing operations.

Scrap rubber which cannot be recycled within the manufacturing process is being addressed by some of the following methods:

- Adding it to coal and wood waste fuels for firing process boilers
- Making it into sheets and various shapes to use as athletic area surfaces and other floor coverings
- Making it into sheet gasket material
- Making it into loading dock bumpers.

EXHIBIT 2-3

Example Checklist of Potential Pollution Prevention Options for Consideration

Water Use/Reuse

- flow control valves?
- identifying water inflow and outflow from each unit process?
- evaluating reuse of clean or contaminated water?
- using timers or foot pedals to control water usage?
- using conductivity cells in plating rinse system?
- reactive rinsing?

Material Handling

- segregating raw and waste material containers?
- segregating different waste materials in separate containers?
- purchasing materials in bulk or larger containers?
- controlling inventory to reduce waste(e.g., "just-in-time" ordering system)?
- labelling all containers properly?
- labelling process tanks?
- centralized purchasing system?
- reagent chemicals ordered in exact amounts?
- is less hazardous raw material available?
- using rinsable/recyclable drums?

Raw Material & Product Storage

- SPCC plans in place?
- overflow alarms?
- loading and unloading procedures?
- secondary containment?
- document all spillage?
- floating roofs for VOC storage?
- vapor recovery systems?
- containers stacked properly?
- proper distance between incompatible chemicals?
- proper distance to prevent cross-contamination?
- drums and containers emptied thoroughly before cleaning or disposal?

Plating/Etching/Metal Finishing

- using low temperature baths to reduce evaporation?
- prolonging plating solution bath life through filtration, reducing drag-out, avoiding contamination, etc?
- using lower concentration plating bath?
- redesigning part racks to reduce drag-out before the rinse, possibly with air blow off?
- using trivalent chromium instead of hexavalent chromium?
- using noncyanide plating solution such as chloride or sulfate solutions?
- using in-line recovery techniques?
- regenerating spent bath solutions?
- segregating all waste streams?
- using spray or fog nozzle rinse to reduce drag-out?
- reusing rinse water?
- recovering chrome and plating solutions by an evaporation unit?

Water

- using multiple rinse tanks?
- using countercurrent rinsing?
- installing drainboards and tanks?
- installing racks above plating tanks to reduce drag-out?
- using fog nozzles and spray units?
- agitating rinse bath (air or solution agitation)?
- recycling and reusing spent rinse water through such metal recovery techniques as ion exchange, reverse osmosis, and electro-chemical recovery?
- segregating all waste streams?
- using an evaporator for material recovery from rinse tanks and reuse in plating bath?

Alkaline/Acid Cleaners

- removing sludge more frequently?
- avoiding cross-contamination of solvent?
- reusing cleaners by filtering and rejuvenating?

Application

- using equipment with high transfer efficiency such as electrostatic applicators?
- using high-solids coatings such as powder coatings?

Solvent Cleaners

- avoiding cross-contamination of solvent?
- avoiding water contamination of solvent?
- removing sludge continuously?
- using a tank cover or air knife to reduce surface evaporation?
- monitoring solvent composition?
- consolidating cold cleaning operations?
- recycling spent solvent?
- using cryogenic or plastic media blasting for paint stripping instead of solvent stripping?
- using nonchlorinated solvents instead of chlorinated solvents?
- installing on-site distillation units?
- evaluating work removal rate?
- regating all waste streams?
- using cheesecloth over filters to reduce spent filter generation?
- recycling over spray, for instance, from powder coatings?
- evaluating the use of different types of paint arrestors such as water wash and filters?
- arranging formal training for spray operators?
- optimizing spray conditions in terms of speed, distance, angle, pressure, etc.?
- using booth coatings for easy booth cleaning?
- inspecting all parts, such as racks, for cleanliness?
- using a charged screen with electrostatic system to reduce edge buildup and to capture and reuse over spray paint?
- using gun washer equipment for equipment cleanout?
- reducing the use of solvent-based and metal-based paints, where possible, by using water-based coatings?

Spills

- using seal-less pumps?
- installing spill basins on dikes?
- installing splash guards and drip boards?
- installing overflow control devices?
- maximizing use of welded pipe joints?

Sludge Dewatering

- using mechanical dewatering devices such as filter presses, centrifuges, vacuum filters, or compression filters
- keeping different metals sludges segregated?
- using filter bags?
- using sludge dryers?

Parts Washing

- covering all solvents cleaning units?
- using refrigerated freeboard on vapor degreaser units?
- improving parts draining before and after washing?

Oil/Water Separation

- using a centrifuge system to recover cutting fluids?
- chemical treatment?
- filtration?
- coolant regeneration?

- **Proven performance** - Pollution prevention techniques that have been successfully implemented at other firms are preferred.

- **Safety and health risks** - The potential effect on worker safety and health as a result of implementing a given pollution prevention option is considered.

The remainder of this section discusses the results of the P2OAs performed at each of the four study facilities.

> **Case Study: Quality Chemicals, Inc. (QCI)**
>
> A significant reduction in waste stream volumes was obtained through improved operations and disposal alternatives, which reduced purchase and disposal costs and generated revenues through the sale of recyclables. Examples of the waste minimization practices implemented include:
>
> - QCI once disposed of waste methanol at $1.25 per gallon. QCI now distills and reuses it in manufacturing and sells the excess to a manufacturer of windshield washer fluid. This reduced methanol purchases from 1,440 gallons to 600 gallons per batch.
> - Spent tetrahydrofuran, another chemical used in a production process, was disposed of previously as waste. QCI revised its technology to reuse it in the production process, eliminating it as a waste and reducing the purchase of new THF from 440 to 225 pounds per day.
> - Another process previously required diluting a caustic. QCI adjusted their technology to use a more concentrated caustic requiring less water, thereby reducing wastewater generation.
> - Used fiber drums, pallets, steel drums and scrap metal are recycled, saving costs from avoided disposal and generating revenue from the sale of materials.

2.7 Pollution Prevention and Waste Management Opportunity Assessment at the Volzhsky Plant for Tire Recycling and Repair (VPTRR)

2.7.1 Introduction

The Volzhsky plant for tire recycling and repair (VPTRR) operates two separate, but adjacent facilities to (1) retread used bias-ply truck and bias-ply passenger tires, and (2) process irreparable bias-ply tires to produce crumb rubber[1] that is either sold or subsequently processed to manufacture new (reclaimed) rubber products[2] (e.g., strips of rubber, rubber mats, rubber gaskets), respectively.

VPTRR's facilities were designed by the Moscow firm - "Rezinoproekt". In 1961, when the retread facility was built, the design production capacity was 280,000 tires/year. Over the years, VPTRR updated and expanded the retread facility using Russian, Italian, and Czech equipment and increased its annual production capacity to 500,000 retreads. However, due to the disrepair of some of the vulcanization equipment, the age of which ranges between 8 to 15 years old, the current annual production rate has fallen to approximately 300,000 retreads (a decrease of 40 percent).

In 1968, VPTRR began processing irreparable bias-ply tires (automotive, agricultural equipment, and truck) at its tire reclamation facility (TRF) to produce crumb and reclaimed rubber. VPTRR cannot process steel-belted tires. VPTRR reported that the TRF was designed

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[1] VPTRR's crumb rubber, as manufactured, meets Russian Technical Requirements nos. 3810853-89 for commercial use and sale.

[2] VPTRR's reclaim rubber, as manufactured, meets Russian Technical Requirements nos. 3810853-89 for thermomechanical reclaim rubber.

to process a maximum of 35,000 tons of irreparable bias-ply tires per year, with an annual design capacity of 17,300 tons and 5,300 tons of reclaimed rubber and rubber crumb, respectively. VPTRR also reported a waste generation rate of approximately 18%, which represents the non-useable portion of the irreparable tires.

We present a summary of VPTRR's overall economics and production for both facilities in Exhibit 2-4. As indicated in Exhibit 2-4, that while VPTRR's production costs have greatly increased, the output of products (retread tires and reclaimed rubber) has significantly decreased. (We note that we have not quantified the affects of inflation on production costs.) In addition, it also appears as though output of retread tire and reclaimed rubber in 1995 fell by approximately 95% and 60%, respectively, when compared with 1991's output of retread tire and reclaimed rubber, while the consumption of raw materials decreased by 30% in average. In such a situation, which is common to most enterprises in the region, any measures promoting the increase of production output automatically become the resource-saving ones. Clearly, the implementation of pollution prevention measures represents an important opportunity for increasing the efficiency and output of VPTRR's processes.

EXHIBIT 2-4

SUMMARY OF VPTRR'S OVERALL ECONOMICS AND PRODUCTION

Parameters	Units	1991	1995	% Change
General				
Value of Total Output of Products	Million Rubles	43	18,514	42,955
Production Costs	Million Rubles	33	11,453	34,606
Gross Profit	Million Rubles	10	5,340	53,300
Net Profit	Million Rubles	6	3,384	56,300
Profitability	Percent	23.3	28.8	5.5
The Output of Products in Real Terms				
Reclaimed Rubber	Tons	14,066	5,763	-59
Regenerated Tires	# of Tires	413,306	17,205	-95
Total No. of Employees	People	949	606	-36
Total No. of Non-Management Workers	People	807	574	-28
Energy-Output Ratio of the Product's Output	Million Rubles	3.2	3,925	122,556
Percentage of Production Costs Attributed to Energy	%	7.4	21.2	13.8
Water Consumption	Million Rubles	NA	NA	NA
Percentage of Production costs Attributed to Water	%	NA	NA	NA
Waste Water Discharges	1,000 m3/yr	NA	264	NA
Air Emissions	tons/yr	NA	32	NA
Solid Waste Discharges	tons/yr	NA	1,050	NA
Percentage of Production Costs Attributed to Waste Disposal	%	NA	NA	NA

NA - Not Available

We present a summary of the solid wastes generated by VPTRR in Exhibit 2-5.

EXHIBIT 2-5

WASTE GENERATION RATES (TONS)

Waste Stream	Design Generation Rate	Actual Generation Rate (1995)
Steel-Belted Tires	500	23
Bead Rings	2,818	446
Cord Fiber	2,188	580
Defective Tires after Roughing	230	3
Defective Tires after Vulcanization	5	1.6
Dust from Collection System	10	1.3
TOTAL:	5,751	1,054

As shown in Exhibit 2-5, VPTRR reportedly generated approximately 1,054 tons of solid, non-hazardous waste (Russian Class No. 4) in 1995. We note that the bead rings (which are currently stockpiled for future use) and the cord fiber (which is sold for use as insulation, well packing, and other uses) represent the majority of the solid waste (97.3%). Only a small fraction of VPTRR's wastes are actually disposed. However, as discussed later in this report, VPTRR will likely be able to utilize all of the tire's components, defective tires, and collected dust.

We present a summary of VPTRR's reported air emissions in Exhibit 2-6.

EXHIBIT 2-6

SUMMARY OF VPTRR'S REPORTED AIR EMISSIONS (TONS/YR)

Constituents	Amount Discharged	Permitted Discharges
Sulfurous Anhydride	1.33	6.84
Butadiene	0.657	2.85
Isoprene	0.657	2.85
Benzene	0.524	2.85
Xylene	1.05	4.56
Methyl styrene	2.67	12.5
Toluene	0.525	2.28
Ethyl benzene	1.58	6.84
Aliphatic Amines (C15 - C20)	0.001	0.013
Gasoline (nefras)	12.3	140
Hydrocarbons	4.91	19.9
Suspended Substances	3.8	15.5
Talc	1.39	4.26
TOTAL:	32.1	224

As shown in Exhibit 2-6, VPTRR's operations release a minimal amount of solid and gaseous materials to the atmosphere. We note that the ratio of the tons emitted to the atmosphere and the tons permitted by the enterprise's permit (approximately 7), is comparable to the ratio of the bead rings generated in 1995 and the design generation rate of bead rings (approximately 6.3). This suggests that VPTRR's air emissions are proportional to its current level of production.

The fourth and final type of waste generated by VPTRR's operations is wastewater, which includes cooling water (both contact and non-contact) and sewage. Estimates of both the quantities and nature of the wastewater generated by VPTRR were not made available to the team.

2.7.2 VPTRR's Tire Retread (Regeneration and Repair) Process

VPTRR uses the "hot" process, a traditional Russian process, to retread tires. The hot process involves the following steps:

- surface grinding (roughing) the used tire casing while reversing the rotation of the grinding tools during each successive pass
- wrapping the roughened tire casing with the hot retread rubber obtained directly from the extruder
- vulcanizing the wrapped tire casing in a specifically-sized tire-tread mold that is heated to 90 - 95°C using steam.

We present an illustration of the as-designed and the actual operating process for retreading tires in Figures 1 and 2, respectively. We note, that the high cost of the tire-tread molds restricts VPTRR's ability to change tire size and tread pattern beyond those characteristics represented by the molds that it currently has in-house. VPTRR must purchase additional tire-tread molds before it can retread tires characterized by the more modern and advanced tread design used elsewhere.

2.7.3 Potential Pollution Prevention Opportunities for Improving VPTRR's Retread Process

In this section we discuss the various changes that can be made to improve the efficiency of VPTRR's current retread process.

<u>Modification of the "Hot" Process</u>

Modification of the existing "hot" process, by using the universal device of the "ÀÏÏÂ 1180-380 èíä, 326.454" model (for both car and truck tires) could result in substantial savings obtained through both a reduction in energy use and an increase in productivity. Specifically, this device is equipped with a specially designed, cold feed extruder. When compared to the equipment currently used by VPTRR ("ÀÏÏÂ 800-280 èíä, 326.452" and

Fig.1. The designed scheme of the technological process for the automotive tires' regeneration

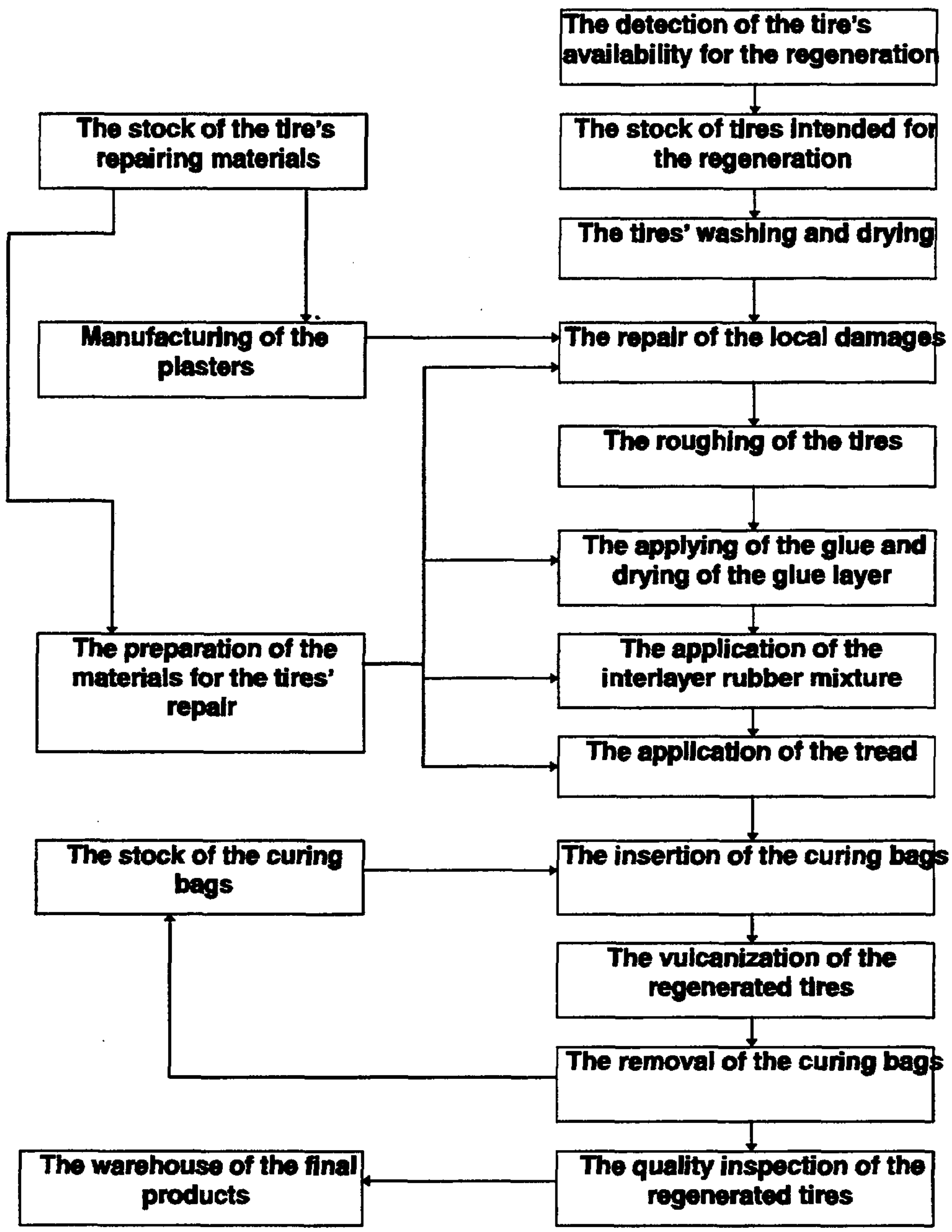
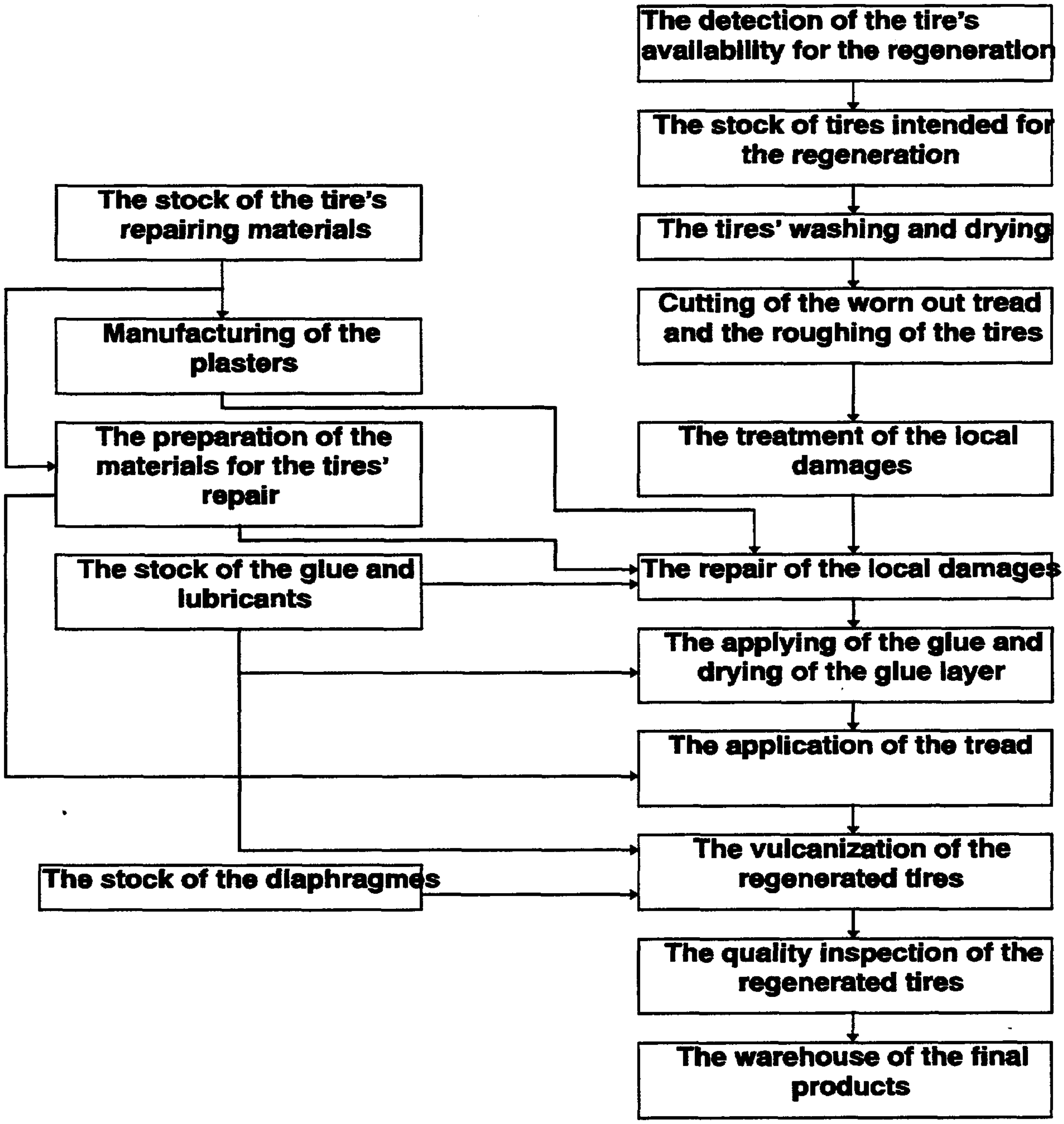


Fig.2. The effective scheme of the technological process for the automotive tires regeneration



"ÀÏÏÂ 1400-450 èíä, 326.453" models), this device consumes 13% less electricity, is 1.5 times more productive, and occupies 1.5 times less space. This piece of equipment is Russian made and costs approximately 55,000 US dollars (as of October 01, 1996).

Improvements to the Passenger Tire Line

Despite VPTRR's use of relatively modern retread technology, the volume of retread tires produced annually has fallen from 413,000 retread tires in 1991 to 17,500 retread tires in 1995. During our site visit to the plant, we noticed that the portion of the facility, which is engaged in the retread of automobile tires, was not operating. Specifically, while much of the equipment was in stand-by condition, the vulcanizers were partially dismantled because VPTRR was using them as a source of parts for the vulcanizers used to retread truck tires. VPTRR explained that it has shut-down the automobile retread operation because (1) VPTRR is unable to obtain a sufficient quantity of repairable tires for retreading, and (2) VPTRR is having problems selling retread tires for cars. VPTRR suggested that the dwindling supply of repairable tires is due to the low maintainability of the domestically-produced tires for cars (i.e., Russian-manufactured tires are generally not well-suited to regeneration). VPTRR also suggested that the majority of the tires are too worn to be retread because most automotive transportation enterprises do not have sufficient financial resources to allow them to replace their tires at the stage, when these tires are still suitable for the regeneration (i.e., the tires are used beyond their normal life, such that the tire is too worn to be reconditioned).

One potential method for improving VPTRR's position in the automotive retread business is based on the ability to retread used foreign-produced tires, which are existing on the market in great quantities. For example, we note that a small tire repair shop in the town Electrougly of the Moscow region, occupying an area of only 900 square meters, successfully retread and sold 23,000 foreign-produced tires in 1995. Based on information from users of these tires, the retread foreign-produced tires reportedly last as long as the retread Russian-produced tires.

VPTRR already has most of the equipment necessary to retread used foreign-produced car tires. VPTRR only needs to purchase the vulcanizing molds necessary to retread foreign tire sizes and tread patterns. The approximate cost of one foreign-produced mold ranges between 5,000 and 8,000 US dollars (as of October 01, 1996).

Rebuild Tire Sidewalls

To improve the quality of the retread tires, we suggest that VPTRR obtain the ability to rebuild tire sidewalls. We note that most tire retread operations outside of Russia already rebuild tire sidewalls when they retread tires. VPTRR's rebuilding of the sidewall should make its retread tires more competitive and allow VPTRR to return additional employees back to work.

In order to resume retreading of automobile tires and to begin rebuilding of the sidewalls, VPTRR should either:

- restore the device for the roughing of the side walls at the machine "Banny-2", or

- purchase a foreign-made roughening machine, which is equipped with a device for roughing tire sidewalls.

VPTRR should be able to off-set the costs of both rebuilding the passenger tire vulcanizers and regenerating the tire side walls by increasing the output of retread tires by 8 to 10 percent. This increase in output should be realized through VPTRR's ability to retread tires that were rejected in the past because of sidewall damage. The rebuilding of the tire sidewall should also improve both the quality and salability of the retread tires, and as a result, should make VPTRR more competitive.

Improvements to the Truck Tire Line

VPTRR can improve its output of retread truck tires by modifying its process to use the "cold" retread method (developed by "Bandag"). Use of this process would allow VPTRR to retread both Russian and foreign-produced bus/trolley tires. We note that the thickness of these types of tires are engineered with a larger safety factor than used with automobile tires, and therefore, are more suitable for retread operations.

We present the process diagram for the "cold" method in Figure 3.

Compared to the traditionally used "hot" method, the "cold" method for tire retreading has the following benefits:

- a single autoclave, which is used in the "cold" method, is designed to handle 22 truck tires - making it 10 times more productive than a vulcanizer used in the "hot" method;

- a single autoclave for use in the "cold" method cost the same amount as a vulcanizer used in the "hot" method;

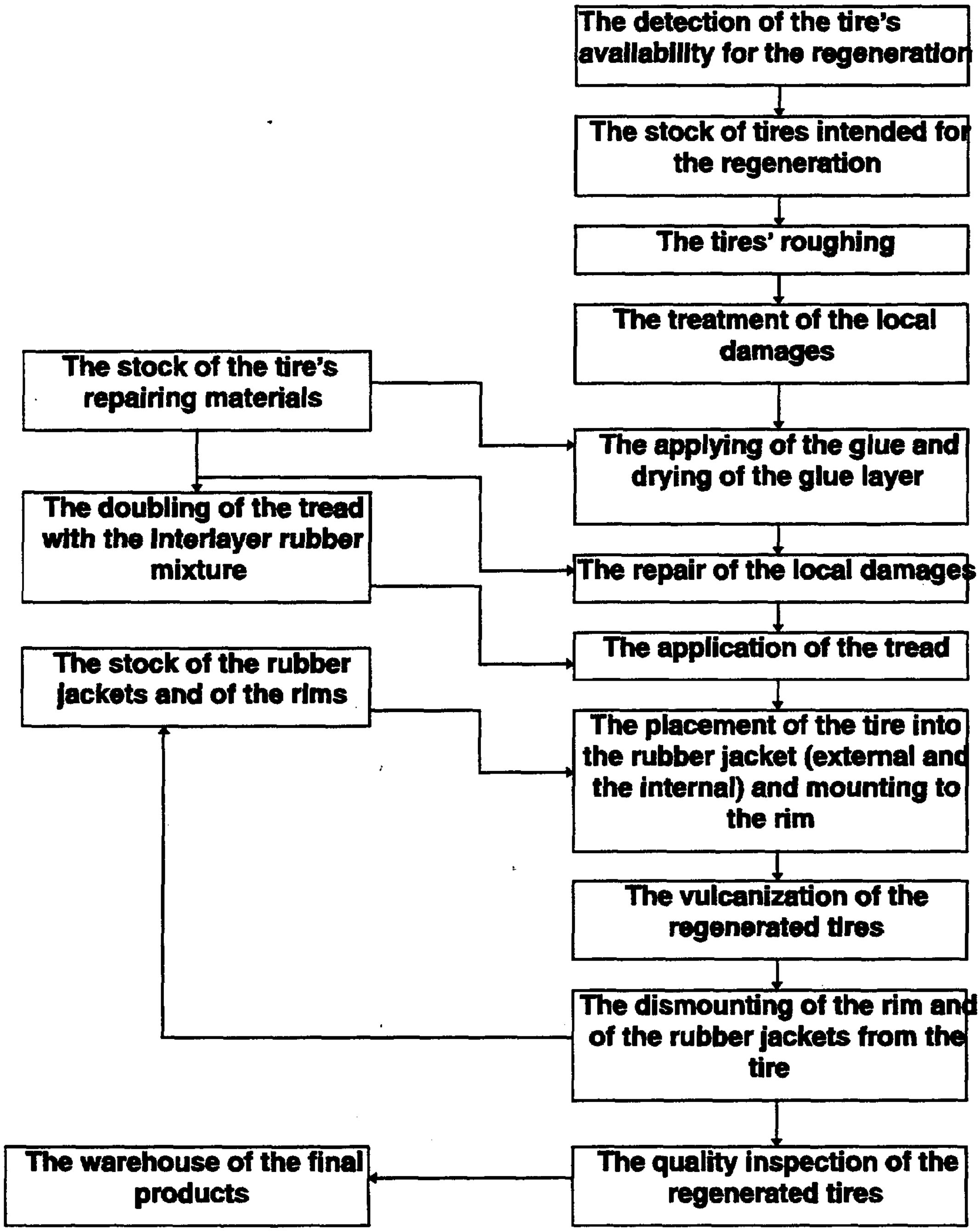
- results in a higher quality retread tire;

- allows for the ability to retread a wide range of tire sizes and tread designs without any extra costs for the expensive tread molds (the range in tire tread design is limited only by the range of the available treads, which are manufactured by their producers in hundreds of variants);

- uses substantially less electricity per retread tire than does the "hot" vulcanization method;

- allows for the output of 10,000 to 11,000 tires when operated in a single-shift mode due to the increased capacity of the autoclave (i.e., 22 truck tires).

Fig.3. The scheme of the technological process for the automotive tires' regeneration using the "cold" method



Implementation of the "cold" retread process for only the tread running surface of both domestically and foreign-produced tires with the tread design, should use approximately two-times less raw materials. This should help improve both VPTRR's profitability and competitiveness. The cost of the equipment required to implement the "cold" method is approximately 509,000 US dollars; however, VPTRR's profitability should increase by approximately 4 percent. The recoupment of the capital investments in the case of the single-shift operation should take about 1.75 years.

Manufacture Raw Materials In-house

VPTRR currently purchases tire repairing materials because it does not have the ability to manufacture them in-house. VPTRR's reliance on the open market for these materials has resulted in VPTRR having to pay increasingly more for these materials that often times do not meet requisite level of quality. VPTRR could control both the cost and quality of these raw materials by purchasing a rubber mixer, such as the PC-140 (or PC-90), and make these materials in-house. This also will allow VPTRR to return more workers to their jobs, increase the types of products produced, and allow for the direct reuse of waste rubber.

2.7.4 VPTRR's Reclaimed Rubber Process

In Figure 4, we present a schematic drawing of VPTRR's process for shredding and grinding of irreparable bias-ply tires to produce crumb rubber and other products. VPTRR's current process presents the following problems:

- impossibility of processing steel-belted radial tires
- impossibility of processing and using the steel bead rings
- production of large-sized rubber crumb, which has narrow applications, is difficult to sell within Russia and nearly impossible to sell on the world market.

The above-mentioned problems are easily solved by modernizing VPTRR's process by purchasing updated tire recycling equipment. We discuss these various pieces of equipment and selected options below.

2.7.5 Pollution Prevention Opportunities

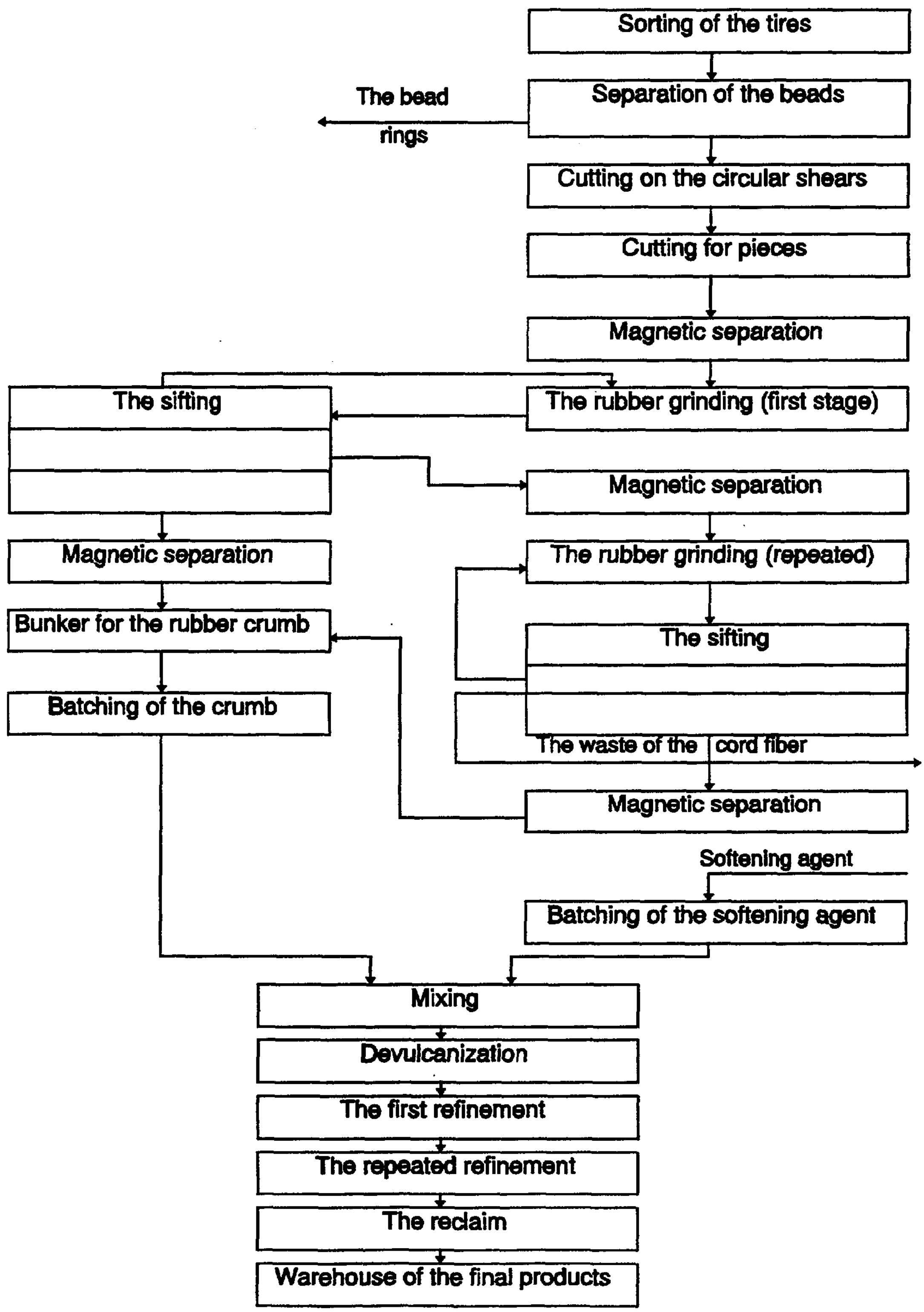
Purchase a Tire Debeader

VPTRR should purchase a tire debeader that is capable of removing the bead wire from the tire. This machine costs approximately 40,000 roubles and will allow VPTRR to both recover more rubber for recycling and sell rubber-free steel for recycling.

Purchase of Updated Tire Processing Equipment Capable of Grinding and Sorting Rubber and Steel

VPTRR should purchase and install a primary chopping/grinding machine that is capable of processing steel-belted radial tires. At VPTRR's option, they can also purchase a

Fig. 4. The schematical presentation of the operative technological process for the reclaim production



new tire debeader which will optimize the separation of the steel bead wire from the tire (removes only the bead wire and not the tire's rubber sidewall) and reduce some of the wear and tear on the primary grinder' blades. These machines are produced by both Russian and foreign firms. For example, one such domestically produced machine, the "ÄÍÂ-2-400 P", is well suited to processing steel-belts and costs approximately 100,000 US dollars (as of October 01, 1996).

This machine can process 2.5 tons per hour and uses 110 kW of electricity. The chopper/grinder reduces steel-belted radials (having the sizes up to 1300 mm) in to 100 x 100 mm pieces of rubber. This machine does not require water for cooling of its moving parts, and therefore, does not generated any contaminated wastewater.

VPTRR should then purchase and install a two-roll knife-type grinder, such as the "ÄÍÂ-2-310 ÝÌ" brand, to perform secondary size reduction. This machine uses 55 kW of electricity and costs approximately 100,000 US dollars. The secondary grinder reduces the 100 x 100 mm pieces of rubber and rubber/steel to 30 x 30 and 20 x 20 mm pieces or rubber and steel. We note that this fine of processing optimizes the separation of the metallic cord from the rubber. Neither air or water are required in this step.

VPTRR should purchase and install a drum-type magnetic separator, such as the "ÏÁÑÐ-60/50" brand to remove the fine pieces of steel from the rubber. This type of magnetic processing uses 1.5 kW of electricity. The separated steel fines should have very little rubber (less than 5-7 percent) and can be sold to any local steel smelting operation.

We illustrate this revised process in Figure 5.

We believe that this modernization will allow VPTRR to greatly increase the source of raw materials (i.e., tires) available for processing. As a side-benefit, VPTRR will be able to assist the region by offering an alternative to the current land filling (and illegal dumping) of a large number of steel-belted tires.

Purchase of Rotary Dispersion Machines

The rotary dispersion machines are a new type of equipment that are intended for grinding a wide range of the polymeric materials and rubber, as well as polymeric composites of rubber, textile, and metallic cord. An example of this technology, the "ÐÎÑÒ-150Á" model, is presented in Figure 6. This piece of equipment has the following specifications:

- average particle size - 150 - 800 µm (for the rubber)
- productivity - 20 - 60 kg/hour
- electric drive power - 20 - 60 kW
- cooling water consumption - 1.5 m3/hour
- size (in mm): 1800 (L) x 2500 (W) x 1700 (H)
- weight - 1600 kg.

This equipment is now being designed to have a productivity of up to 2 t/hour.

Fig. 5. The scheme of the technological process, involving the grinding of the tires with the metallic cord and the modernization of the starting stage of the operative production

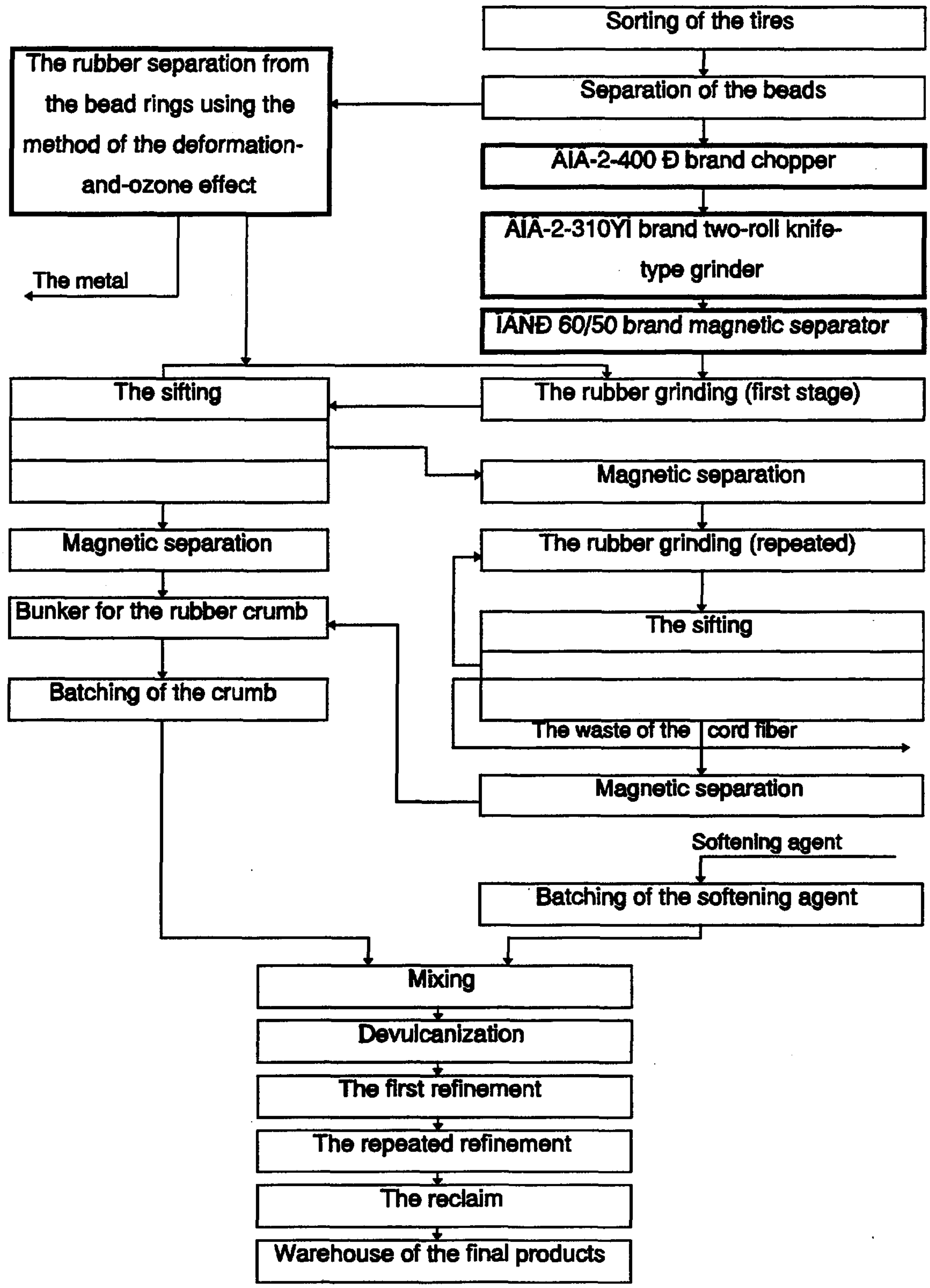
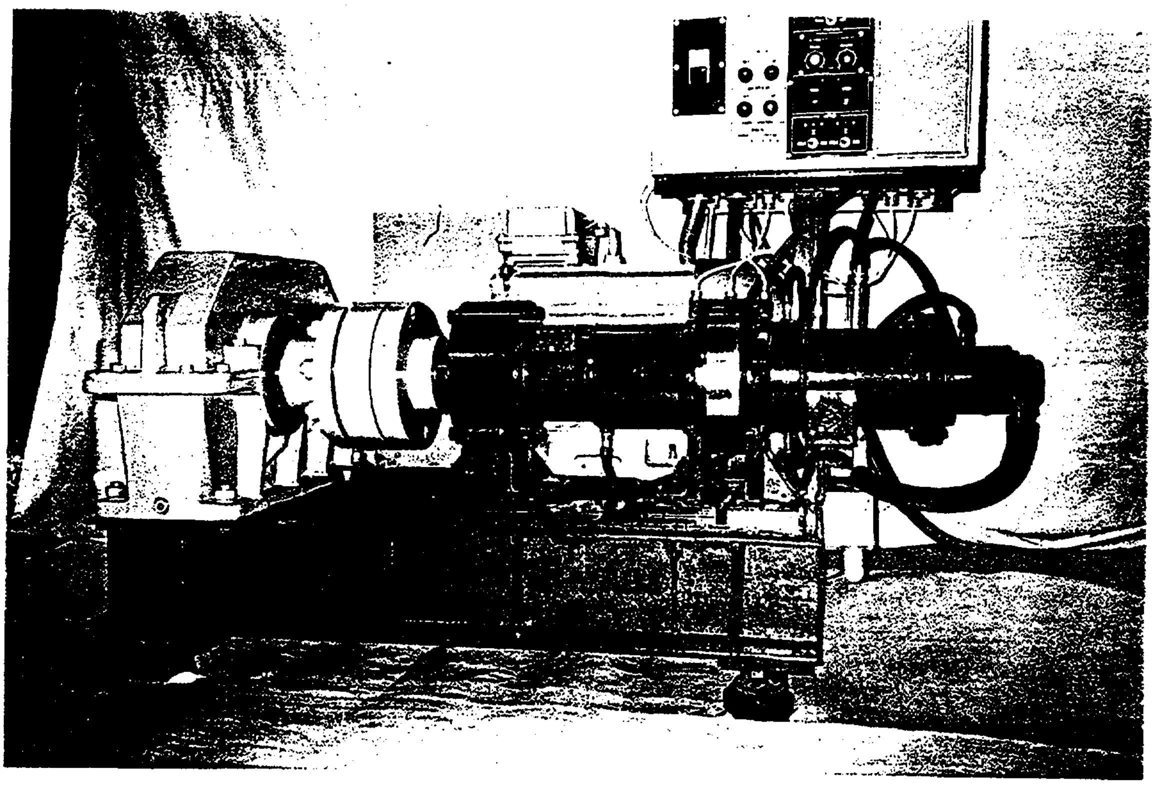


FIGURE 6



Unlike the roller grinders currently used to produce rubber crumb, the purchase and installation of two rotary dispersion machines will make it possible to produce between 100 and 140 kg of powder rubber per hour, with an average particle size of 400 to 600 μm and the specific surface area of 0.5 m2/g. This modification will allow VPTRR to produce nearly 800 tons of crumb rubber per year (which is equivalent to the 1995-96 output). An added benefit will be the decrease consumption of electricity and water (approximately 200 kW/hour/t and 40 m3/t of product, respectively).

Powder rubber from this process is sold on the world market at prices ranging from 400 US dollars per ton (without any advertisement) to 2,000 US dollars per ton (with advertisement). This material can be used either as a component for the production of the raw rubber products (while being introduced in the quantities of 50 - 75 % by mass), ingredients for polymeric composites, or as sorbents for spilled oil or oil products from water and soil.

The dispersion machines require about 20 m2 of space and cost approximately 95,000 US dollars. We note that the efficiency of the separation of the cord fiber from the rubber can be improved, as necessary, by the installation of an air vibrating separator. These separators can process up to 50 kg/hour, use an additional 7 kW of electricity, and require 15 m2 of space. The separators cost approximately 13,000 US dollars.

The turn-key commissioning of the entire production line will require approximately 8 months starting from the beginning of the financing.

If VPTRR was to pursue the above option, we would also suggest that VPTRR further modify the line to allow for the processing of steel-belted tires by installing the following additional equipment:

- cutter for cutting of the tires (without the bead rings) into two parts along the external circle
- roller shears for the receiving of the pieces with the sizes of 20 x 20 mm
- rotary dispersion machines
- magnetic separator
- air vibrating separator.

With this configuration, VPTRR would be able to produce 500 kg of high quality powder rubber/hour. This equipment would require an area of 120 m2, use 900 - 1000 kW/hour of electricity per ton, and use 30 m3 of water/t. This project would cost approximately 350,000 US dollars and require 9 months to install, starting from the beginning of the financing.

The "rotary" powders, similar to the powders currently produced by VPTRR, can be sold as a final product, or used as an intermediate product that is subsequently devulcanized. We note that VPTRR should change-out the existing devulcanizers (5 units that use a total of 2500 kW/hr) and replace them with a Russian-made unit, capable of processing up to 1500 kg/hour. This new devulcanizer would be operated in line with two rotary dispersion machines (described above) and would required only 12 kW/hr and 15 m2 of space. The devulcanizer costs approximately 75,000 US dollars.

The Deformation-and-Ozone Effect (DOE) Process for Processing Tire Bead Rings

Although VPTRR has a theoretical output of 2,188 tons of tire bead rings per year, we estimate that, as of 1995, VPTRR has actually accumulated approximately 446 tons. This reduction is directly related to significantly decreased operations at the plant. If VPTRR did not purchase chopping/grinding equipment sufficient to process the steel tire bead rings, VPTRR could employ the deformation-and-ozone effect (DOE) process to separate the rubber from the metal.

The DOE process uses both mechanical loading and ozone-containing gas to physically and chemically separate the steel and rubber components (as well as any remaining textile cord). The process needs only a small amount of ozone and approximately 100 kW hours/t of electricity. The steel can be sold to a steel smelting facility and the rubber can be put back into the existing process. Although the DOE process is currently only being used on the pilot-scale level, it could be used for processing either the tire bead rings or the entire steel-belted tires.

Utilization of Textile Fiber

As of 1995, VPTRR produced approximately 579 tons of textile fiber (from the tire sidewalls). This material can be used to manufacture heat and sound insulating materials and panels. The fiber also can be used in manufacturing roofing roll materials (a mixture of reclaimed rubber and textile). Both of these technologies are currently available in Russia. (It is not clear as to whether VPTRR is selling this material to others or if it is being land disposed.) In order to manufacture these insulation and roofing materials on-site, VPTRR will need to obtain mixers, such as the "PC-90" brand, a three-roll calender (with 1250 x 550 x 550 mm rollers) and a barrel-type vulcanizer (of the "Buzuluk" brand).

Other Potential Options for Further Study and Consideration

VPTRR could investigate the purchase and installation of a gas-explosive crushing system that is capable of processing any type of tire. The technological scheme of this device is presented on Figure 7.

In this process, the tire is cooled to below -100°C, the temperature at which the rubber's bond with the cord and bead ring is weakened and the rubber becomes brittle. The cooled tire then is subjected to the impulsive impact loading, caused by the detonation of the gaseous mixture. As a result of the impact, virtually all of the rubber separates from the steel to produce particles ranging from 5 to 20 mm; the textile, steel belt, and bead ring remain undamaged and can easily be separated from the rubber particles. This process uses approximately 20 to 50 kW/t of electricity.

This process can either use a mixture of hydrogen and oxygen (at a starting pressure of 0.2 - 0.5 Pa), which is the most acceptable mixture from the basis of environmental control, or a lower priced mixture of gaseous hydrocarbon fuels (methane, propane, acetylene and others) with air or oxygen. This process is relatively safe (no more dangerous than a conventional internal combustion engine) and could produce up to 950 kg/hour or 2,500 tons of the rubber per year (single shift operation). The rubber crumb product can be directly used in the devulcanizers without the need for an initial air vibrating separation step.

We estimate that such equipment will require 500 kW of electricity, 200 m2 of space, cost approximately 1 million US dollars, and take at least one year to install and bring on line. We note that this process is currently only operating on a pilot-scale level with a productivity of 100 kg/hour.

A second potential option for VPTRR to investigate at a later date, is the installation of a thermal destruction unit that uses overheated steam to break down the worn tires. We present a simplified-schematic drawing of this process in Figure 8.

As shown in Figure 8, worn tires are cut into two (along the diameter) or four parts, and then fed into the reactor by conveyor. Overheated steam from the steam generator also is fed into the reactor. The steam, while passing through the reactor, heats and melts the sectioned tires.

The mixture of the gaseous decomposition products and steam enters a refrigeration unit, where the non-condensed gas is either pumped into the gas holder or is pumped back to the steam generator furnace. The steam condensate also is returned back to the steam generator. The liquid fraction is removed and pumped to the storage tank. The remaining carbon-containing residue is separated from the metallic cord and stockpiled. The metallic cord (steel belts and bead wire) is pressed into the briquets.

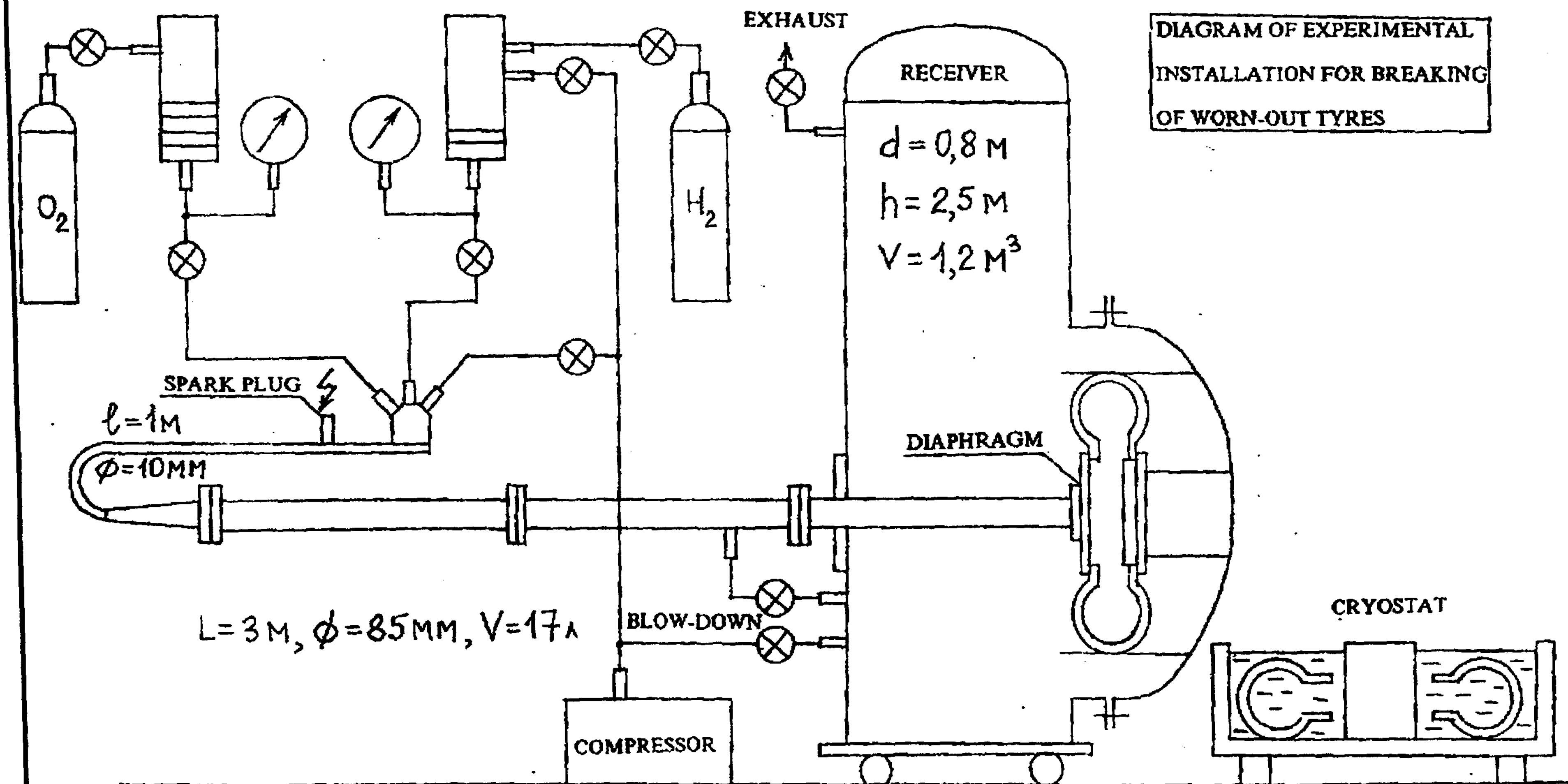
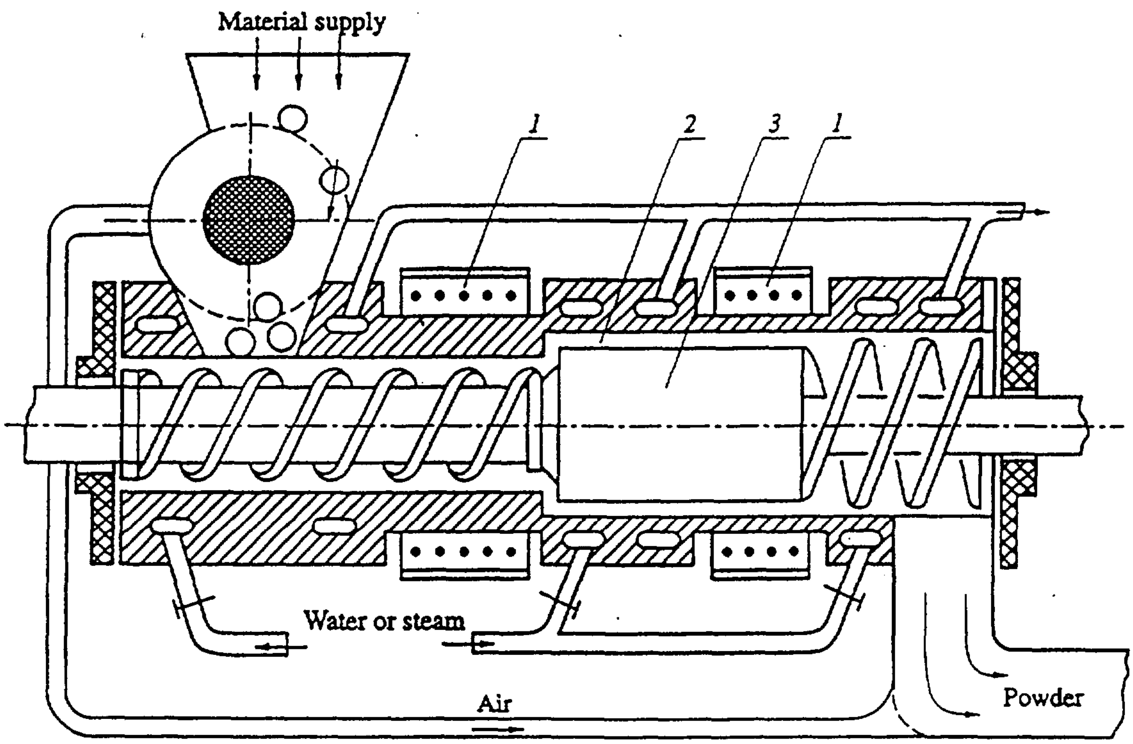


DIAGRAM OF EXPERIMENTAL INSTALLATION FOR BREAKING OF WORN-OUT TYRES
EXHAUST
RECEIVER
d = 0,8 м
h = 2,5 м
V = 1,2 м³
O_2
H_2
SPARK PLUG
ℓ = 1м
ϕ = 10мм
DIAPHRAGM
L = 3 м, ϕ = 85мм, V = 17 л
BLOW-DOWN
COMPRESSOR
CRYOSTAT

FIGURE 7

Figure 8



The main energy-carrier in this device is the overheated vapor, the consumption of which is one ton per one ton of raw material. The liquid fraction is used as the fuel for heating the steam (approximately 25 - 30 percent of the liquid product); diesel fuel is required for startup.

As a result of this process, the following products are produced:

- a mixture of the liquid hydrocarbons (40 - 45% of the volume of the non-metallic part of the charge), which exhibits characteristics similar to the fuel mazoute of the M40 grade (meeting Russian standard GOST 10585). This material can also be used as a raw material in the production of D-limonene for the production of either synthetic rubber or asphalt;

- the solid residue (40 - 45% of the charge's volume) is 90% carbon and the remaining 10% is the mineral components of the tire's rubber. This residue can be briquetted for fuel or transformed into powder, which is either returned to the tire's production, used as a powder component in liquid fuel, or is processed for use in activated carbon production;

- gaseous hydrocarbons (10% of the volume of the non-metallic part of the charge), which can be used as fuel for the steam generator;

- metal scrap;

- secondary heat in the quantity of 300 Gcal/1000 t of the raw materials.

The approximate cost for the construction of the device, which produces both the mazut and all of the other products, having a productivity of 1 t/hour (6,000 - 7,000 t/year) is 1.5 million US dollars. The approximate cost for the construction of the device, which produces both D-limonene and all the other products, is 2 - 2.5 million US dollars. The total returns from the sale of the commodity products is:

- 700,000 US dollars - from selling the liquid fraction as mazoute
- 1,500,000 US dollars - from selling the D-limonene.

The thermal destruction of tires using overheated steam, as well as the potential option of gas-explosive crushing, solves the problem of the processing of the tires with the metallic cord, as well as the problem of the bead rings' utilization. The important advantage of this option, however, is that the thermal destruction method provides for complete autonomy as far as heat supply is concerned. However, this option is not without any risks because this device has only been operated on a pilot-scale, having a productivity of approximately 200 kg/hour.

We believe that VPTRR's most favorable option at this point in time, is the installation of updated equipment capable of both processing steel belts and bead wire and separating the steel from the rubber. In the future, VPTRR may wish to diversify its line of products by investigating the use of a combination of mechanochemical processing and thermochemical destruction.

2.7.6 Conservation of Infrastructure Resources

Along with the resource-saving measures discussed above in Sections 2 and 3, an additional, yet substantial reduction in resource use/cost can be achieved through implementation of water and energy-conservation measures.

Water Conservation

VPTRR can reduce its consumption of water by doing the following:

- recycle the spent cooling water and purge water from the reclaimed rubber operations for washing the tires in the tire retread operations. This option will require the installation of a small tank, pump, and associated piping, but should save approximately 15,000 m3 of water per year.

- recycle steam condensate from the vulcanizers in the tire repairing shop for use as makeup water in the plant's circulating water cooling system in the reclaimed rubber line and for cooling the equipment in the tire retread shop. This option will require the purchase and installation of a tank to collect the condensate, associated plumbing, and pump, but should save approximately 50,000 m3 of water per year.

- collect rain water runoff for washing tires, floors, and/or watering trees on the facility's property. If the rain water could be collected separately from the ground runoff, this water could be used as makeup water for the plant's cooling system. This option would require the purchase and installation of a collection tank and associated plumbing. This option could save approximately 45,000 m3 of water/year.

Energy Conservation

In addition to the specific measures discussed in the separate energy report, VPTRR can reduce its consumption of energy by implementing the following measures:

(1) Insulating all steam pipes inside the premises to reduce energy losses. The energy savings should be equivalent to approximately 800 Gcal/year. This project will cost approximately 370 US dollars and save approximately 18,000 US dollars.

(2) Performance of routine and preventive maintenance to eliminate vapor losses caused by leaks. The energy savings should be equivalent to approximately 20 Gcal/year. This project will not require any capital expenses and will save approximately 500 US dollars.

(3) Recovery of the heat energy from the clarified water, which is heated in the calenders and rollers at the retread shop, as well as of the first cycle industrial water from the rubber reclaim shop. The total volume of water is 400,000 m3/year; the heat energy losses are estimated to be 6,300 Gcal/year. Although the complete utilization of this energy is not likely due to (1) the absence of a constant user of this low-potential heat, and (2) the need for removing impurities from the clarified water, the heated water could be used for heat during the heating season. In this case, 3,100 Gcal of heat energy could be recovered, which could result in a cost savings of nearly 87,000 US

dollars. We note, however, that it is presently impossible to estimate the required capital investments for the purification and for the heat-exchange equipment.

(4) The construction of an onsite boiler, which could burn wastes generated by both VPTRR's facilities as well as other facilities in the area.

The boiler could burn both textile wastes and discarded rubber wastes produced at the Industrial Rubber Products plant (IRP). In 1995, a total of 5,763 tons of reclaim was produced, which would suggest that approximately 1,900 tons of textile waste was generated. If the heating capacity of the textile waste is estimated as 5,000 kcal/kg and the efficiency of the waste-burning device is 80%, than we can calculate, a potential energy production of 7,600 Gcal. To purchase this amount of heat, VPTRR would spend approximately 934 million rubles (at the current prices). However, if VPTRR was to sell the textile waste (at the price of 70,000 rubles/t), VPTRR could collect 133 million rubles. VPTRR, therefore, could realize a net difference of nearly 801 million rubles (or ~148,000 US dollars) by burning this material onsite for energy recovery.

In addition, the boiler could also burn industrial rubber production waste. Specifically, several enterprises of the industrial zone currently have rubber waste. In 1994, more than 2,200 tons per year have been transported to the dump.

While calculating the potential energy saving, the Team used the following data waste production in the VPTRR:

- designed waste production is approximately 5,000 tons (recalculated data for the rubber);
- actual production of waste in 1995 was approximately 800 tons (recalculated data for rubber).

In this particular case, the actual data of waste transported to the dump in 1994 was simply added to the date of the designed (**variant P**) and of the actual (**variant F**) waste production in 1995 by VPTRR.

While accepting the rubber's caloricity at 6,000 kcal/kg and the boiler-utilizer's efficiency of 60% (the efficiency of the boiler itself is 70%, minus 10%, which are connected with the energy consumption for the gases purification after the boiler device), the heat potential can be calculated as follows:

- **variant P** - (2200 + 5000) t/year * 1000 kg/t * 6000 kcal/kg * 60% = **25,920 Gcal/year**, which is equal (current prices of 122,906 roubles/Gcal) to **3.186 billion roubles/year;**
- **variant F** - (2200 + 800) t/year * 1000 kg/t * 6000 kcal/kg * 60% = **10,800 Gcal/year**, which is equal (current prices of 122,906 roubles/Gcal) to **1.327 billion roubles/year;**

However, it is impossible at the present time to estimate the economic expediency of such a solution, because the domestically-produced serial boiler-utilizer for burning industrial rubber is unknown.

In order to carry out the estimating calculations, the boiler-utilizer for solid household garbage of the PKCM-25/1,4-10 brand (25t/hour of vapor under the pressure of 1.4 MPa, productivity for garbage utilization is 10 t/hour), with a cost of 5 billion roubles, can be used as the "prototype." The calculated heating capacity of solid household waste is near 2,000 kcal/kg..

The required device must burn the rubber waste with a heating capacity of 6,000 kcal/kg and a volume of 7,200 tons annually (**variant P**) or 3,000 tons annually (**variant F**).

The Team accepts the hours of operation for both devices at 4,000 hours annually. As far as the waste is concerned, the required productivity of rubber-burning devices will be 1,800 kg/hour (**variant P**) or 750 kg/hour (**variant F**).

The heat "loads" of the devices differ by:

- **variant P** (2,000 kcal/hour * 10,000 kg/hour)/(6,000 kcal/kg * 1,800 kg/hour) = 1.85 times;

- **variant F** - (2,000 kcal/hour * 10,000 kg/hour)/(6,000 kcal/kg * 750 kg/hour) = 4.44 times;

The threefold difference in heating capacity must be taken into consideration. The Team believes that the higher the heating capacity of rubber waste, the specific expenses for boiler construction for burning these rubber wastes will be approximately 1.4-1.5 times lower than the expenses of boiler, in which household garbage is used.

Thus, the correcting coefficients will be as follows:

- **variant P** - 1.85 * 1.4 = 2.59
- **variant F** - 4.44 * 1.4 = 6.22.

The cost of the required boilers will be as follows:

- **variant P** - 5 billion roubles/2.59 = 1.93 billion roubles
- **variant F** - 5 billion roubles/6.22 = 0.8 billion roubles.

The assembling cost is equal to the boiler equipment, while the design works cost is equal to 10% of the object's cost in general, i.e., the total expenses can be estimated as the cost of the boiler multiplied by a factor of 2.2. The total **expenses for the construction of the required boilers** will be:

- **variant P - 1.93 billion roubles * 2.2=4.25 billion roubles**

- **variant F - 0,8 billion roubles * 2.2=1.76 billion roubles.**

The term of recoupment is the same for the both variants and is equal to:
- **4.25 billion roubles/3.186 billion roubles/year (= 1.76 billion roubles/1.327 billion roubles/year) = 1.33 years or 16 months.**

It must be noted, that this calculation is approximate and in case it will be used, the financial calculations must be precise.

We note that additional revenue may be realized if VPTRR were to sell this energy to off-site consumers. Other important aspects of constructing and operating a waste-burning boiler also should be considered, such as:

- waste from the other plants, which are transported to the dump at the present time, could also be used as fuel. VPTRR could charge these plants for taking their wastes and could also charge the consumers of the waste-derived energy;
- the municipal industrial waste landfills are not equipped with the engineering supply lines (for water, gas, electricity), which are necessary for the operation of such a boiler. VPTRR has all the necessary engineering supply lines and space for the construction of a boiler and for stockpiling of raw materials;
- the heat communications of the industrial zone permit without any substantial reworking to realize the heat supply of the nearby enterprises using the waste-burning boiler located on the VPTRR's territory;
- VPTRR could meet all of its internal energy requirements - even when operating at full capacity.

(5) The creation of an accounting system for the heat carriers in the regenerating shop. The existence of such a system will permit VPTRR to reduce its heat consumption by 800 Gcal/year, electricity consumption by 450 MW.hour, and annual expenses for purchasing the energy carriers by 33,000 US dollars. The capital investments for the creation of such a system are estimated to be approximately 100,000 US dollars.

2.7.7 Potential Administrative-Based Resource-Saving Measures to be Instituted by the Regional and Local Governments

VPTRR, unlike most enterprises in the area, is mainly involved in the processing and recovery of secondary resources, and as such, actively fulfills the environmental control work for the region. We note, that in other industrialized nations, such companies, and specifically tire recycling companies, receive some form of comprehensive administrative, legal and economical support from the federal, regional and local authorities. In the US, such support is granted via state programs (i.e., 48 states have programs). These programs envisage:

- Requiring permits for tire piles over a certain size and requiring fire lanes in large tire piles. Funds may also be used to provide grants or loans to entrepreneurs who are recycling tires or incinerating them for energy recovery. 33 states impose a disposal/recycling fee on tires, including OR, WI, UT, and OK which have developed rebate systems for scrap tires in which users of scrap tires are paid rebates of one cent per pound or more for recycling tires or burning them for energy recovery.

- The U.S. government is working to identify and implement pollution prevention strategies to decrease the number of scrap tires and the economic and environmental problems that accompany scrap tire disposal. On November 17, 1989, EPA promoted the use of retread tires by government agencies and other government-funded entities by promulgating procurement guidelines for retread tires.

  The purpose of retread guidelines is to assist procuring agencies in complying with the requirements of §6002 of RCRA, as amended, 42 U.S.C. 6962, as that section applies to procurement of tires. By May 8, 1986, Federal agencies were required to eliminate from their specifications any exclusion of retread tires and any requirement that tires be manufactured from virgin materials unless there is a technical basis for such exclusion or requirement. The current guideline requires each procuring agency to assure that its specifications require the use of retread tires to the maximum extent possible without jeopardizing the intended end use of these items.

- **The Intermodal Surface Transportation Act of 1991.** The purpose of the Intermodal Surface Transportation Act is to increase the use of ground tire rubber in asphalt materials which are purchased with Federal funds for use in highway construction and maintenance. Ground tire rubber is produced by recycling used automotive and truck tires that would ordinarily by disposed of by placement in landfills or by other disposal procedures. Increased use of tires in asphalt materials should help to remove tires from the solid waste stream. At the same time, such use will assist in conserving both energy and natural resources used in constructing and maintaining pavement systems.

  The Act mandates that starting in 1991, a "minimum utilization" of five percent of all asphalt pavement financed in whole or in part by the Federal government be asphalt rubber. This minimum is to increase annually by five percent until 1997, when the minimum utilization will have risen to 20 percent. More than 500 tires are consumed to produce asphalt for a one-lane, one-mile stretch of road. By encouraging the use of ground tire rubber, the guideline should result in a decrease in the number of tires going to landfills or to tire stockpiles. In addition, the increased use of rubber in asphalt materials will result in reduced generation of solid wastes, air pollutants, and water pollutants generated during the production of asphalt and the aggregates used in asphalt concrete pavements.

- Increased tipping fees incurred for the disposal of used tires in landfills.

- Preferential tax status for firms involved in the processing of waste materials (as well as the consumers of such products).

- The training and retaining of staff for the tire processing enterprises.

- Providing information and consultative assistance.

- Retreaded passenger car tires are manufactured according to Federal Safety Standards developed by the U.S. Department of Transportation.

An additional important stimulus for the development of the tire recycling business is that worn tires are accepted for sale/purchase as a commodity on the Chicago Commodity Exchange (the largest commodity exchange in the world).

As the result of the stimulation of the tire recycling industry in the US, the following points can be made:

- Of the 253 million tires, 55.4% were reused or recycled. The majority of the tires (~101 million) were used for fuel. 29 cement kilns are using tires as fuel, an additional 14 kilns are testing tire burning, and 12 other facilities are investigating the possibility of using tires as fuel.

- 16 industrial plants use tire-derived fuel in their boilers.

- 115 resource recovery facilities (waste to energy facilities) burn between 2 and 5 percent tire fuels. Two dedicated tires-to-energy plants burn about 15 million scrap tires a year.

- There is over 240 million pounds of size-reduced rubber (crumb rubber) on the market. 67% of this material comes from tire buffings (a by-product of the tire retreading industry. The remainder comes from whole tire processing.

- Of the 240 million pounds, 42% goes into rubber-modified asphalt. 139 million pounds goes into markets such as molded products, rubber/plastic products, friction brakes, bound product, tires, and athletic and recreational surfaces.

- Punched, cut, or stamped products made from scrap tires include muffler hangers, welcome mates, traffic cone weights, dock bumpers, etc., and account for the use of approximately 8 million scrap tires per year.

- Civil engineering applications currently consume 12 to 15 million scrap tires per year in uses such as lightweight fill and road construction; as an aggregate substitute in leachate collection systems; for landfill cover; and for reef and breakwater construction.

- Pyrolysis accounts for the use of less than 500,000 tires per year.

- 575 million pounds of tread rubber was used to make 5.3 million retreated passenger car tires, 7.2 million retreaded light truck tires, 15.9 million retreaded medium and heavy truck tires, and 868,000 other retreaded tires (aircraft, off-road vehicles, motorcycles, farm equipment, etc.).

Based on the above discussion, we recommend that both the Volzhsky City Committee and to Volzhsky Regional Committee for the Environmental Control initiate the development of a tire recycling program for Volzhsky and for the Volzhsky region.

2.8 Pollution Prevention and Waste Management Opportunity Assessment at the Volzhsky Abrasive Plant (VAP)

2.8.1 Introduction

Volzhsky was chosen for construction of the abrasive plant because of the convenient geographical location, nearby position of raw materials and electric energy sources, and availability of proper transportation roads. The decision concerning the start of the construction was accepted on March 20, 1958 and the first products were produced in 1961. In 1963, the plant produced a range of granular grinding materials. In 1966, the plant started to produce SiC micropowders. In 1967, output of abrading tools with the ceramic post was mastered. In 1968, the plant started SiC products production. In 1991, output of dolls and toys from plastisol was mastered. The plant is currently set up to produce abrading tools with bakelite tools.

The general designer of the Volzhsky abrasive plant is the former USSR State Institute for the Designing of the Enterprises for Machine-Building and Tool Industry ("GIPROSTANOK", Saint Petersburg). The designed capacity for SiC production, the main product produced by the plant, was 50,300 tons/year (of that amount, 17,700 tons/year of black SiC was produced and 32,600 tons/year was produced of the green SiC). In 1970, the plant terminated the output of green SiC, the production of which in the former USSR was concentrated in Zaporozhye. The plant acquired production capabilities for producing black SiC and its output in 1987 and produced as much as 76,700 tons that year. At the present time, the plant's potential production of black SiC is 83,000 tons/year. Simultaneously with SiC production, the plant works directed to increase output of SiC-based products were also fulfilled to capacity. The abrading tools output increased in 1987 up to 45,700 tons/year and the micropowders' output increased up to 1,600 tons/year that same year.

The current maximum designed production output capacity for the main types of products is:

- black SiC, received in the Electric Smelting Shop = 83,000 tons. The actual output in 1995 was 45,600 tons.

- SiC abrasive granules and abrasive dust ranging in particle size from 2,000 - 1,600 µm to 80 - 63 µm = 67,125 tons. 1995 = 42,100 tons.

- abrading tool = 45,700 tons (1995 = 3,891 tons).

- silicone carbide plates = 4,500 tons (1995 = 1,655 tons).

- special types arenaceous quartz = 175,000 tons (1995: concentrated sand = 69,720 tons, and molding sand = 23.240 tons).

In 1990, output of SiC micropowders was terminated because of product sale difficulties. The termination of SiC micropowders' production promoted certain improvement of the ecological situation in the plant because the production of these materials included the acidic and alkaline treatment of the powders.

In general, the quality level of the produced products corresponds to the designed quality level of SiC and of SiC-based products. In accordance with the 1961 maximum production output design, the staff level was 2,000 people. The current staff level is 1,700 people.

The total area of the plant including treatment facilities, is 72.11 hectares (without the treatment facilities, 65.65 hectares). The productive floor space is 267,400 m^2. The positional layout that determines the plant's location on the territory of the Volzhsky industrial zone, is presented in Figure 1 of Section 1. The average age of the plant equipment is 25 years.

The main shops of the Volzhsky Abrasive plant are:

1. Sand mining and concentration shop (SMCS).
2. Electric smelting shop (ESS).
3. Crushing-and- sieving shop (CSS).
4. Carborundum products shop (CPS).
5. Abrading tools shop (ATS).
6. Auxiliary shops, treatment facilities.

2.8.2 Waste Generation and Handling

In 1966, the following maximum permissible volume of detrimental discharges (MPD) into the air was determined for the plant (for the existing production output capacity):

1. CO - 28,465 t/year (78 t/day) - 22,772,000 m^3.
2. NO_x - 521.71 t/year (1.4 t/day) - 264,467 m^3.
3. SO_2 - 1975.6 t/year (5.4 t/day) - 674,000 m^3.
4. H_2S - 216.9 t/year (0.6 t/day) - 140,000 m^3.
5. Hydrocarbons - 0.00041 t/year.
6. Acetic acid - 0.000006 t/year.
7. Acetone - 0.16 t/year.
8. Formaldehyde - 0.062 t/year.
9. Phenol - 0.06 t/year.
10. Ethyl alcohol - 0.015 t/year.
11. HF - 0.0005 t/year.
12. Aerosols of H_2SO_4 - 0.022 t/year.
13. Silicon compounds - 0.0008 t/year.
14. Carbon black - 3.96 t/year.
15. Lead aerosols - 0.00037 t/year.
16. Suspended substances - 3.44 t/year.
17. Manganese - 0.021 t/year.
18. Abrasive dusts - 0.04 t/year.
19. Readily-soluble inorganic fluorides - 0.0024 t/year.
20. Inorganic dust containing SiO_2 > 70% - 47.5 t/year.
21. Inorganic dust containing SiO_2 in the range from 20 to 70% - 657 t/year.
22. Kerosene - 0.078 t/year.
23. White spirit - 0.87 t/year.

At the designed maximum capacity of the equipment, specifically during the silicon carbide's synthesis, the discharges of the detrimental substances (mainly CO, NO_x, SO_2, H_2S, and the dusts) are doubled. The measurements of CO discharges level, which have been taken by the Volzhsky Environmental Control Committee, have shown the doubled increase of discharges compared with the MPD, even at the existing level of production output.

In 1995, the following types of liquid and solid waste have been produced in the Volzhsky Abrasive Plant:

1. Used oil = 70 t/year.

2. Fluorescent lamps = 0.300 t/year (mercury = 0.015 - 0.02 t/year, the heat-resistant glass, metals).

3. Waste of charge for the carbidizing treatment = 1,500 t/year (SiC = 15 - 20%, C = 25 - 35%, SiO_2 = 45 - 60%, calcium oxides, the aluminum oxides, the iron oxides, and others = 2 - 3%).

4. Abrasive dust, which is produced during treatment of the abrading tool = 300 t/year (Al_2O_3 = 79.35%, MgO = 0.6%, Fe_2O_3 = 9.0%, SiC = 5.0%, SiO_2 = the rest).

5. Metal scrap = 1,023 t/year.

6. Domestic garbage (solid) = 2522 m^3/year.

7. Worked out accumulators = 3.4 t/year.

8. Worn out tires = 5 t/year.

9. Incandescent lamps = 0.200 t/year.

10. Electrodes = 0.50 t/year.

11. Slime, produced during truck washing = 20 t/year (sand = 63%, charge = 30%, water = 7%).

12. Construction waste (solid one, incombustible) = 50 t/year.

13. Industrial garbage = 157 t/year (sand = 74%, leaves = 10%, rag = 3%, petroleum products = 10%).

14. Rejects of abrasive disks = 236 t/year (abrasive granules = 60%, post = 20%, sodium silicate = 7%).

15. Waste paper = 0.98 t/year.

16. Breakage of refractory bricks = 131.5 t/year.

17. Wood waste (saw-dust, cuttings) = 7,000 m^3/year.

18. Graphite electrodes' waste = 367 t /year (carbon = 97.7%).

19. Non-ferrous metals waste (copper) = 1.5 t/year.

20. Petroleum slimes = 6 t/year (petroleum products = 30%, abrasive dust = 70%).

The main part of the wastes (the wastes of charge for the carbidizing treatment) are transported to the dump, which is an open sand pit in the region. Cooperation of the abrasive plant with other enterprises is necessary for the effective processing of these wastes, because quantity is too small for cost-effective and efficient processing at the individual enterprise.

The adjusted settlers' system for sewage water purification is operating effectively in the plant. Its effectiveness is illustrated by the data presented in Exhibit 2-7, concerning the concentration of detrimental impurities in the liquids, which are entering from the treatment facilities, and by the corresponding values of the maximum permissible concentration (MPC):

EXHIBIT 2-7

Parameters	After Treatment	MPC
pH	7.0	6.5 - 8.5
Suspended substances	19.2 mg/dm^3	20 mg/dm^3
Density of the liquid	1,560 mg/dm^3	2,000 mg/dm^3
Aluminum	0.2 mg/dm^3	0.3 mg/dm^3
Iron	0.3 mg/dm^3	0.5 mg/dm^3
Petroleum products	0.2 mg/dm^3	2.0 mg/dm^3

The wastes, which are caught in the treatment facilities, are dumped onto the earth after drying and then are sold to the Cherepovec Metallurgical Combine. In the dumped piles of earth, the material content is not homogeneous, and we could not receive any information about it. While practicing this method of storage, up to 5% of the secondary raw materials are lost.

In general, the real situation concerning the nomenclature, the volume, and the level of toxicity of the wastes being produced by the Volzhsky Abrasive Plant, corresponds to the data of the ecological certificate (except for the discharges of CO).

The technological schemes, illustrating the production of the main types of the products in the Volzhsky Abrasive Plant, are presented on Figures 9 - 13. Compared with the designed schemes, the currently effective schemes remained almost unchanged. Only change of obsolete and broken equipment has been done. In the above-mentioned schemes, only the irrevocable losses (the abbreviation "i.l." is used) are specified. The main part of the solid dust-type waste, which are produced in the plant, are collected and returned to the

FIGURE 9. **The scheme of the technological process for concentrated sand production**

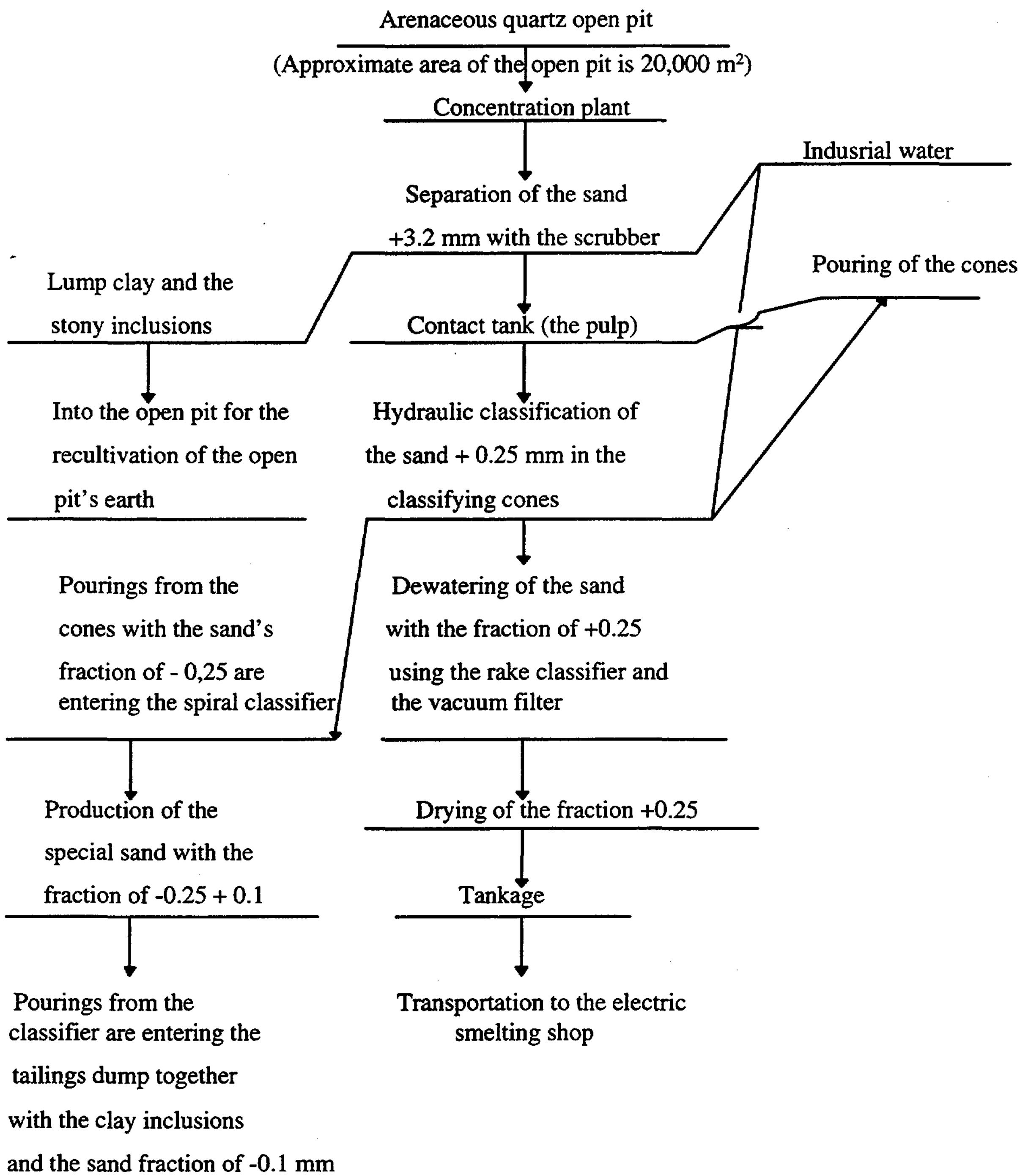


FIGURE 10. **The technological process scheme for silicon carbide production in the electric smelting shop**

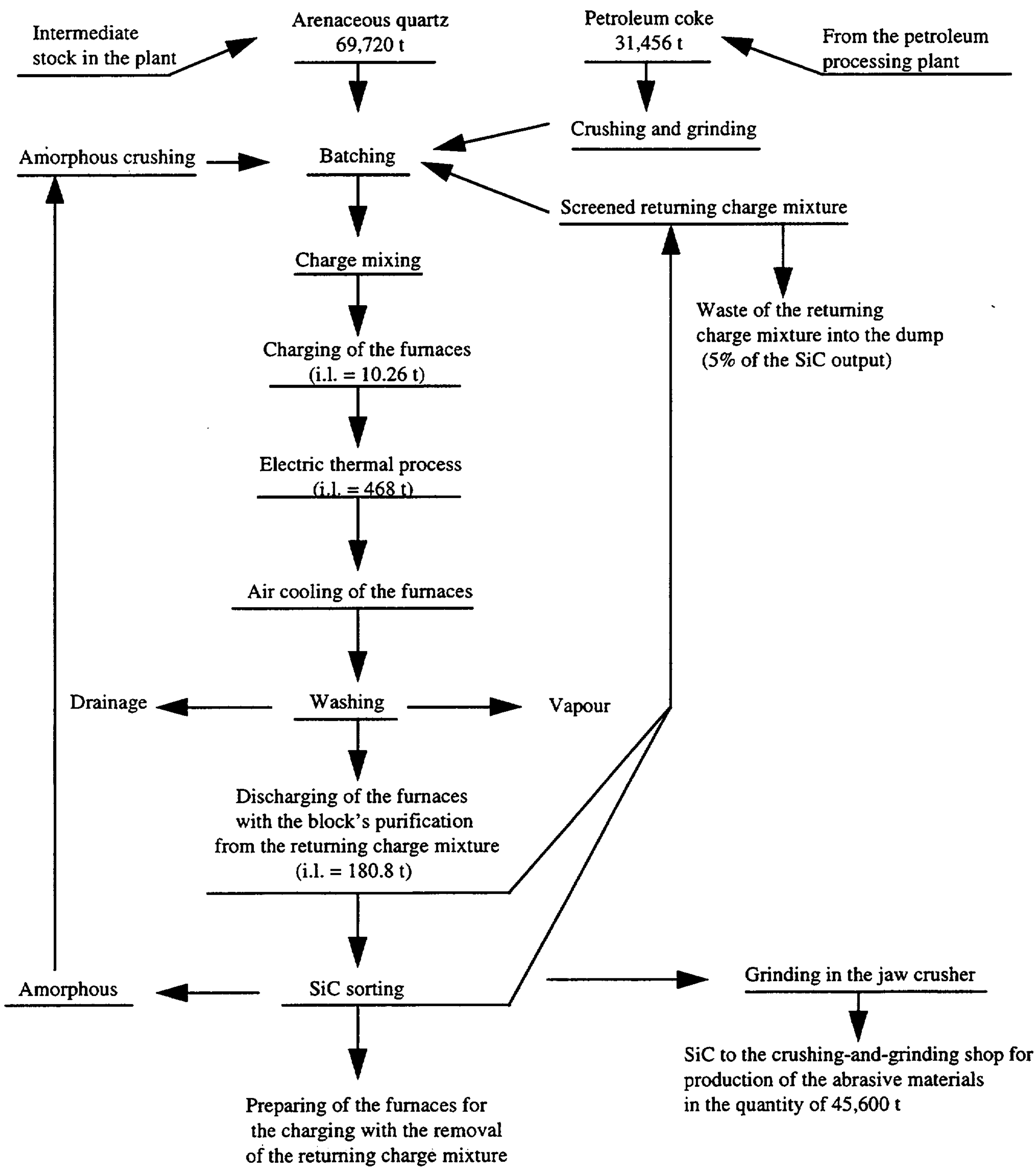


FIGURE 11. The scheme of the abrasive materials production technological process

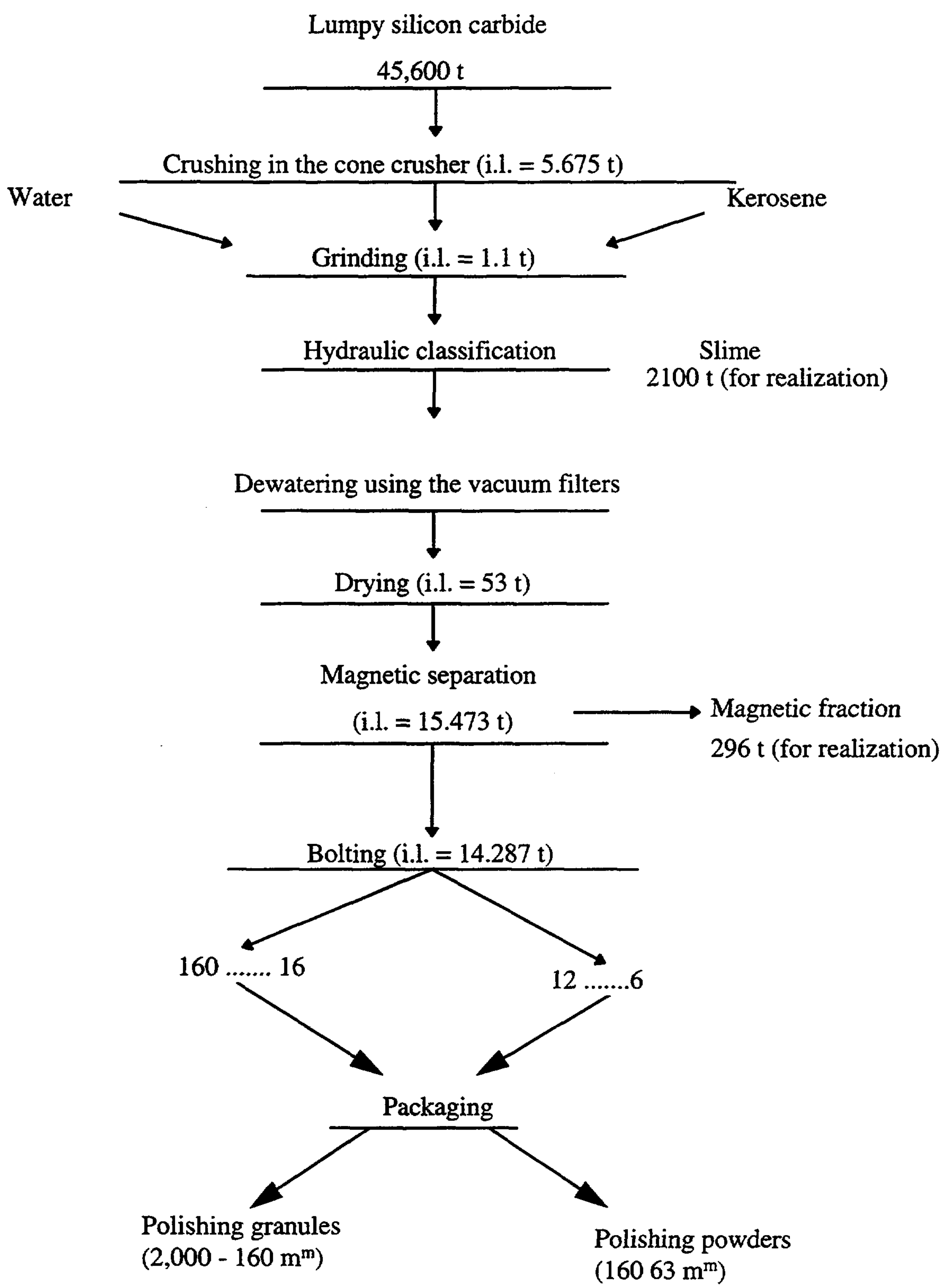


FIGURE 12. The technological scheme for the production of silicon carbide's plates

Transportation of raw materials

↓

Black SiC	Clay	Lignosulfonate	Gypsum
1000 kg/t	30.7 kg/t	87.2 kg/t	4.5 kg/t

↓

Batching of the components
(i.l. = 4.3 t)

↓

Preparing of the molding mixture
(i.l. = 3.6 t)

↓

Transportation of the molding mixture

↓

Plates' formation

↓

Plates' drying

↓

Charging to the kiln cars

↓

Plates' roasting

↓

Discharging and procurement of the plates

↓

Inspection of the plates for compliance to requirements

↓

Transportation of the final products to the warehouse

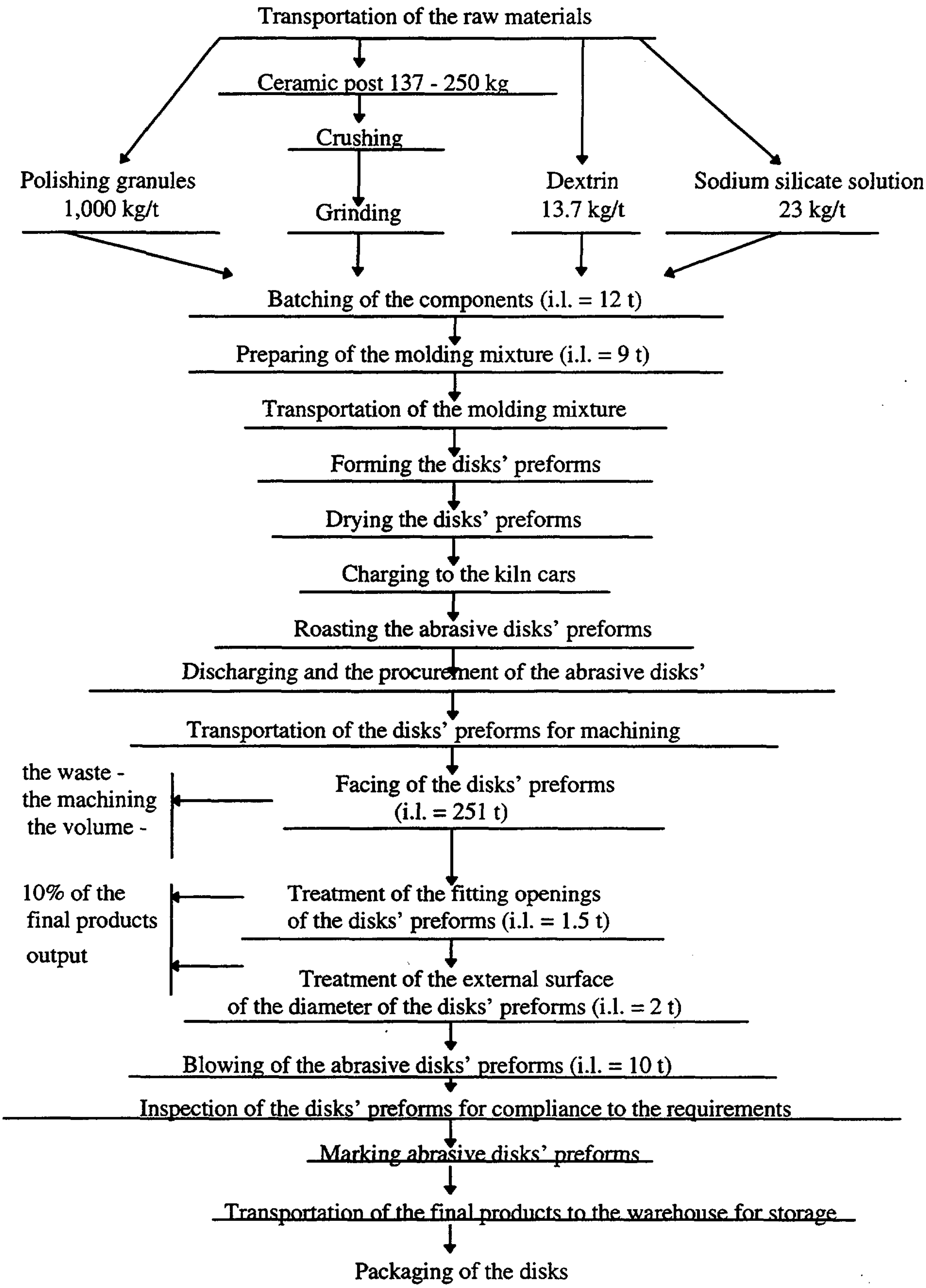
↓

Storage of the final products

↓

Packaging of the plates

FIGURE 13. The technological scheme of abrading tool production



production cycle. The exact quantitative information concerning these wastes is absent and are not reflected in the schemes.

Sand transportation from the open pit to the abrasive plant is done using "KAMAZ" trucks without the tarpauline cover, which leads to sand loss of approximately 5% because of dust formation. It was envisaged in the open pit's design to carry out its recultivation in the middle of 1990. After the additional estimation of sand reserves in the open pit, it was decided to continue the open pit's operation for 20 more years and only after that for recultivation of the earth.

The wastes that are produced during the output in accordance with the effective technological scheme can be divided into four groups:

1. Recoverable wastes, which are used directly by the Volzhsky Abrasive Plant in the technological processes of SiC production and of SiC-based products output. Such wastes are represented by the wastes being produced in the electric smelting shop (amorphous siloxicon, unreacted charge mixtures, and others), dust-type and lumpy waste of SiC, abrasive dust and others. These wastes almost don't pollute the environment, however they substantially reduce economic performance, decrease finished product output, while increasing the specific products' resource capacity by 15 to 20%.

2. These wastes are collected in the plant and then sold to customers, first of all to the metallurgical enterprises. These wastes are represented by slimes, rejected abrading tools, magnetic fraction after the magnetic separation of the SiC powder, and others. Environmental pollution by these wastes is also very small.

3. These wastes that contain carbon of ≥ 10% are transported to the dump. These wastes are polluting the environment during transportation to the burial place (25 km away from the Volzhsky Abrasive Plant) because of dust carriage. This carriage is reaching 5 - 7% of the transported wastes' mass. Waste burial is connected with the estrangement of the earth despite that the wastes are used for recultivation of the open sand pit. At the present time, those wastes that contain small quantities of valuable product (SiC) are transported and processing such wastes seems to be technically difficult and not profitable for the plant. On the other hand, the wastes, that had been transported to the dump earlier, contained much more SiC, and in the burial place, with an area of 300,000 m^2, vast quantities of conditional SiC are contained. The enterprise must consider the problem of processing of the waste from burial, even if manual sorting of silicon carbide lumps is necessary.

4. The wastes are discharged into the air and pollute the environment. These wastes are represented by dusty and gaseous discharges (see Exhibit 2-7).

2.8.3 Sic Production Process

Two main methods of SiC production are currently used in the world: (1) α-SiC is produced in core furnaces using technology that is similar to the technology being used in the Volzhsky Abrasive Plant; (2) β-SiC is produced using the method of carbon-thermal synthesis at relatively low temperatures (1400 - 1600°C).

The industrial and the technological processes, which are used by the Volzhsky Abrasive Plant for α-SiC production are almost the same as Acheson's method. Acheson's method is traditionally used in many countries for production of the refractory carbide compounds. The main drawbacks of this method are low output level of the quality finished products, substantial energy consumption, and environmental pollution from carbon oxide and sulfurous gases produced using this method.

The central rod (the core), made of current-conducting lumpy carbon-graphite material, is used as the heater in the Acheson-type furnaces. The charge mixture that is composed of arenaceous quartz, unreacted charge mixture from the previous process, intermediate products (amorphous siloxicon), and petroleum coke is placed around this heater. As the core is heated and after it reaches the definite temperature, the process of reducing the silicon dioxide begins in the charge mixture, that is adjacent to the core's surface, as well as in formation and growth of silicone carbide crystals. The layer of crystals gradually accumulates and the reaction moves from the zones that are adjacent to the core, to the zones located near the external surface of the charge mixture (or the furnace). After accumulation of the definite layer of SiC, the furnace is switched off. After cooling, it is discharged so that the contents of the furnace are separated for the following products, located in the furnace as concentric layers (these products are specified below in order of the furnace's discharge, i.e. starting from the external layers):

1. Unreacted charge mixture;

2. Siloxicon - the intermediate product, that sharply differs from the unreacted charge mixture by its light-green color.

3. Amorphous substance - the finely crystalline SiC, which contains components of the charge mixture in substantial quantities.

4. SiC - the product, which is the purpose of the synthesis.

5. Graphite - the product, which is produced as a result of SiC decomposition at high temperatures.

6. Reacted core material.

Two types of α-SiC are known: the black one and the green one. In general, the technologies of their production are similar. The main difference is that while producing green SiC, which contains less carbon than black SiC, the sodium chloride is added into the charge mixture and the energy consumption for its production is increased by approximately 15%.

Other Russian enterprises don't produce α-SiC. In other countries of the former USSR, the substantial quantities of α-SiC are produced in Uzbekistan and in the Ukraine. Especially large quantities of green α-SiC were produced at the abrasive plant in Zaporozhye. At the present time, this enterprise has almost terminated its operation because of the high price of green SiC and the lack of customers.

As far as the world SiC production is concerned, Chinese enterprises are very promising, since these are bringing to the world market low-priced products with satisfactory quality. The situation in China is very similar to the one in the USSR just before 1990. SiC is produced by large enterprises where the cost of labor and energy is low, and there is a lack of care towards environmental control. This explains why Chinese SiC price in the world market is lower than competitors'price. In western countries, because of high energy expenses and strict environmental control, α-SiC is mainly produced by small enterprises, which must spend a lot of money for the utilization of the exhaust gases, especially carbon oxide. The most efficient method of environmental control is the use of expensive platinum catalyzers. Some enterprises, which have not acquired equipment for exhaust gases utilization, are obliged to pay large penalties (this information was received from a consultant from ICF Kaiser International, Inc., Mr. Howard Finkel).

It is possible to use the Fe-, Cu- and Mn-based catalyzers, as well as change the design of the furnaces for the synthesis, which permits reduction of carbon oxide environmental pollution.

The basic solution of the problem, connected to the reduction of CO exhaust into the air, is the use of carbon -thermal synthesis for SiC production. This is carried out in the vacuum furnaces or in the inert atmosphere at temperatures of 1400 - 1600°C. In this case β-SiC is produced, energy consumption is reduced substantially, output of the quality finished products is increased, and the discharges of the detrimental impurities into the environment are mostly eliminated. Several variations of carbon-thermal synthesis of β-SiC have been developed that differ from each other by equipment used in these processes, by the quality of the SiC produced, and by energy consumption [1 - 3]. The most favorable method of β-SiC production is the "fluidized bed" method, which was developed in the USA [4] and in Western Europe [5]. Using the "fluidized bed" method, one can produce the quality powder of silicon carbide while also producing a high output of finished products. However, using this method as well as any other of the above-mentioned methods, only β-SiC powders with an average size of not more than 30 - 50 μm can be produced. These methods have been developed mainly for the production of finely dispersed powders of SiC, which are used for manufacturing structural products. The SiC dispersed powders are also used for manufacturing of refractories as well as of micropowders for polishing. The production of abrasive granules with an average size of more than 50 μm using the method of carbon-thermal synthesis at the temperatures of 1500 - 1600°C is impossible. If it becomes necessary, technical advisors and consultants are ready to present detailed information concerning the methods of production of β-SiC, including analysis of output regimes and characteristic features of the finished products.

The specialists of the company "Superior Graphite Co." (USA) have developed the technology for production of the more coarse granulated powders of α-SiC, in which the finely dispersed powders of β-SiC are subjected to long-term (24 hours), high-temperature heating for sintering. However, energy consumption for this technology is higher and as a consequence, the cost of silicon carbide powder is higher as well. Also the possibility of SiC powders used as abrasive material is doubtful because the strength and hardness of α-SiC, which has been produced from β-SiC at relatively low temperatures must be substantially lower compared with the similar properties of SiC which was produced using the Acheson's method.

Variations of technical re-equipment of the Electric Smelting Shop (ESS) are suggested:

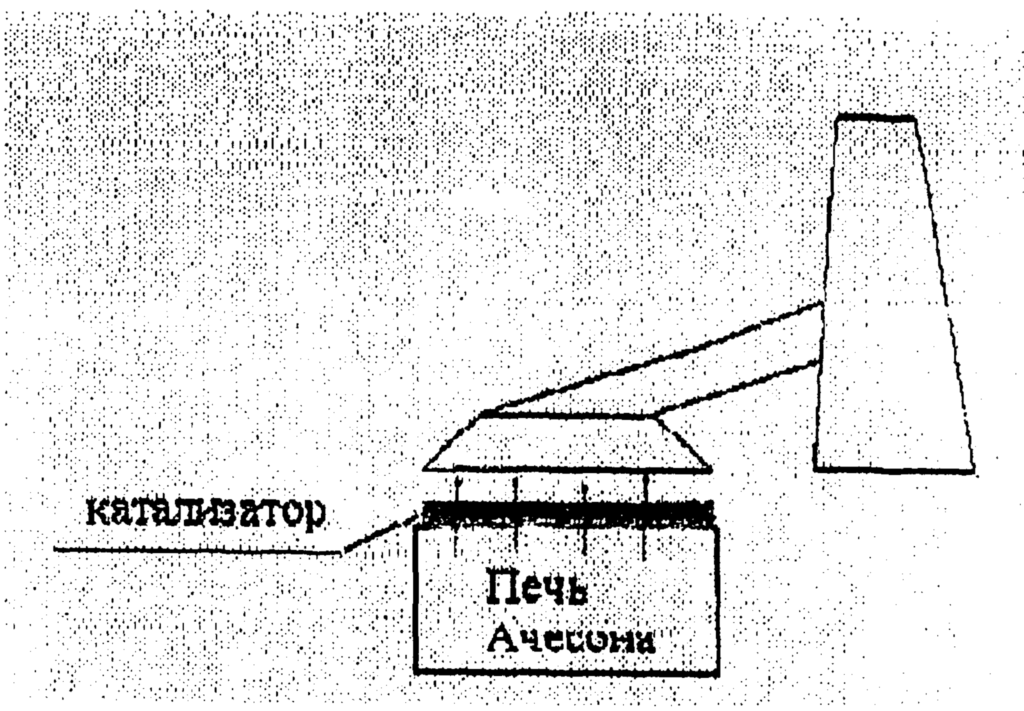
- Creation of a system for catalytic burning of CO using domestically-produced catalyzers, in which the carriers are the natural zeolites and the catalyzers themselves are the low-price compounds of Fe and/or Cu. Having analyzed the data characterizing the gaseous emissions from the synthesis furnaces, it appears as though the catalytic destruction using catalysts consisting of honeycomb blocs with low pressure losses (not over several mm of water pressure). This would alleviate the necessity for installing additional drafting equipment. The suggested catalyst does not contain any rare or precious metals and is fire resistant. The catalyst should be place immediately above the loading surface on a metal grid in the 350°C - 450°C temperature zone. A similar catalyst was installed and tested at the Abrasive Materials Plant in Zaporozhie (Ukraine).

  As part of the first stage of changes, one catalytic unit should be installed on one of the Acheson furnaces. The device will require approximately 10 tons of catalyst and can be produced by the designer. Figure 14 presents a schematic drawing of the positioning of the catalyst bed. A decision regarding whether or not the gaseous emissions from all the furnaces can be made after the completion of this test phase. The estimated cost of implementing the catalytic system (including design, equipment, and catalyst) for one Acheson furnace is approximately $180,000 USD.

- Create the vacuum-type device on the base of an existing furnace for SiC synthesis. The design of the furnace car and the method of the furnace's charging with the charge mixture materials are practically the same as in the case of the furnace of the Volzhsky Abrasive Plant. The furnace size also remain unchanged, however the lantern pinion is used for the drive instead of the geared one. Using this drive, the furnace car, being loaded with the charged materials, is rolled into the cylindrical vacuum chamber. One side of this chamber is dead and equipped with the fixed-ring of the electric holder, that is in contact with water-cooled copper cheeks, that are being supplied with hydraulic pressing casings. The opposite side of the vacuum chamber is equipped with the cover that rolls aside in when the vacuum is removed and in which the hydraulic drive of the ring of the electric holder as well as the hermetically-installed conduction from the buses of the furnace's transformer network are mounted. The vacuum chamber is welded from the sheet steel and is equipped with the water-cooled casing. The conduction to the furnace's core is also hermetically installed on the side of the dead, hermetically-closed cover. The internal space of the chamber is lined with high-duty fireclay brick. The furnace's car is moved along the rails of the chamber. The silicon carbide production process is carried out at the pressure of 30 - 50 mm of the mercury column. In order to reach such a pressure, three mechanical pumps of the "ÂÂÍ-50" brand are installed. The vacuum tubings are assembled in such a way, that the operation of the pumps can be switched from the parallel mode to the serial mode. At the first stage of the process, the pumps are operating in the parallel mode, while at the end of the process, when more vacuum is required, the pumps are switched to the serial mode of operation. The electric furnace is equipped with some special units, such as the anti-explosive devices, and the gauges for the temperature measurements in the vacuum chamber. The average duration of the process is reduced by 20%, while the energy consumption

FIGURE 14

Schematic Drawing of Catalytic Bed Installation



is reduced in average by 1450 kW·hour/t. In order to carry out the exact calculations of the economical and ecological effectiveness of the use of such vacuum furnaces for silicon carbide production, additional experiments are necessary. The experiments in the pilot furnace for the carbidizing treatment include:

- Change the synthesis of the part (8,000 - 10,000 t) of SiC that is carried out in the core kilns, for the synthesis in the domestically-produced vacuum chamber furnaces with the heat insulation of the "carbon - carbon" type. Such a transfer will provide the production of SiC with the quality that correspond to world standards, which will guarantee its sales in Russia and abroad. This will permit to prove experimentally the energy and raw-materials' advantages of this synthesis method. The expenses will amount to ... billion roubles. The term of recoupment ~ 2 years.

- Treat the problem concerning the development of the technical proposal for the creation of the special, large-scale vacuum furnaces for SiC synthesis, keeping in mind the possibility of the complete transfer of the ESS for the new synthesis method.

Implementation of the expert team's design might be complicated by a possible breakdown through a rarefied medium under 260-400 V that leads to the furnace base. The team based its design on the furnace used at the Volzhsky Plant of Abrasive Materials and has to decide on the body's 5 m diameter. A furnace of this size presents a technological problem while its use involves certain technological and economic hazards because the experimental design was tested on smaller furnaces.

There are other alternatives such as:

- Installation of carbothermal silica reduction vacuum technology. This requires vacuum furnaces capable of creating pressure of 0.1 mm of mercury column that would rise together with temperatures reaching 8-100 mm m.c. This vacuum system should be a combination of liquid-ring and mechanical vacuum pumps supplied with corresponding dust filters. The value of residual pressure indicates that the reactions are completed. It can be also interpreted as an indirect quality indicator even when the mixture compositions change. This allows improvement of SiC identity qualities.

- Installation of vacuum furnaces with its heating source placed outside the charge which is put into a container. The entire charge is heated to 2100°C. When reaction is completed, the charge is expected to have identical properties that exclude manual grading.

- Use of carbon composite materials in heaters, conductors, containers, and for insulation. There is ample experience of their use in designing, manufacturing, and using vacuum furnaces.

- The furnace's design allows equal heat distribution in the charge that creates identity of SiC qualities. The same is also ensured by high accuracy of temperature control which is done with the help of microprocessor regulators, including those produced in Russia.

- Vacuum furnaces are ecologically pure. They are free of fire and explosion hazards; do not require design, manufacturing, and exploitation of ventilation systems; and an absence of heat and gas exhausts in shops create comfortable conditions for personnel.

Exhibit 2-8 shows the basic characteristics of vacuum electric furnaces, including model 16/22 that is currently manufactured. It allows experimental testing of various heating technological regimes. A larger model 128/21 furnace is designed for better grades of products, such as silico-carbide heaters. The team also suggests a discussion of designing and manufacturing a model 1500/21 furnace to produce a still higher grade of SiC powder.

Exhibit 2-9 cites goal descriptions of silicon carbide production. Figure 15 offers an outline of how the main elements of furnace model 1500/21 should be placed.

For the purpose of comparison, the team suggested the variant of charging in bulk (= $1kg/dc^3$) and preliminary stamping ($2kg/dc^3$). This will increase the furnace's productivity and, correspondingly, decrease current consumption. The yield is determined by the possible quantity of produced SiC.

Despite its good technical and economic descriptions, the suggested variant of using a batch chamber vacuum furnace has a flaw. To produce the designed quantity of SiC, about 100 furnaces are needed. The amount of SiC produced in 1996 requires about 50 furnaces. To increase productivity, SiO_2 and the black mixture should be briquetted. On the other hand, finer grades of SiC should be obtained in the batch chamber vacuum furnace. This will allow the plant to extend the product application and find new buyers.

2.8.4 Technological Efficiency at VAP

There is no doubt about the skills and knowledge of workers and the administration. Yet an obviously inadequate technological efficiency that fails to meet current requirements exist. This inefficiency is caused by numerous outdated equipment and the 1960's technology of obtaining silicon carbide and its products.

EXHIBIT 2-8

Basic Characteristics of Batch Chamber Vacuum Electric Furnaces for Silicon Carbide Production

Parameters	Model 16/22 (measured)	Model 16/22 (produced)	Model 128/21 (designed)	Model 128/21 (offered)	Model 1500/21 (designed)	Model 1500/21 (offered)
Net space:						
length (m)	0.4	0.4	0.8	0.8	2.4	2.4
width (m)	0.2	0.2	0.4	0.4	0.8	0.8
height (m)	0.2	0.2	0.4	0.4	0.8	0.8
Net volume (m^3)	0.016	0.016	0.13	0.13	1.5	1.5
Maximal charge mass incl. container (kg)	18	35	150	300	1700	3500
Temp. C	2200	2200	2100	2100	2100	2100
Power, kWh include.						
net kWh	3.4	6.8	18	36	213	425
loss kWh	15.6	15.6	63	63	314	314
Accum. Heat kWh	3	3	17	17	52	52
Vacuum System kWh	1	1	7	7	118	118
Vacuum Ult. (mm)	0.1	0.1	0.1	0.1	0.1	0.1
Accept. Inc. Pressure (mm)	20	20	50	50	50	50
Consumption of cooling water m^3/h	1	1	10	10	40	45
Overall dimension (m)						
length	1.9	1.9	4	4	7	7
width	1.5	1.5	3	3	6	6
height	1.85	1.85	3.5	3.5	4	4
Area (m^2)	3	3	12	12	42	42
Mass (t)	0.95	0.95	40	40	120	120

EXHIBIT 2-9

Goal Descriptions of Silicon Carbide Production

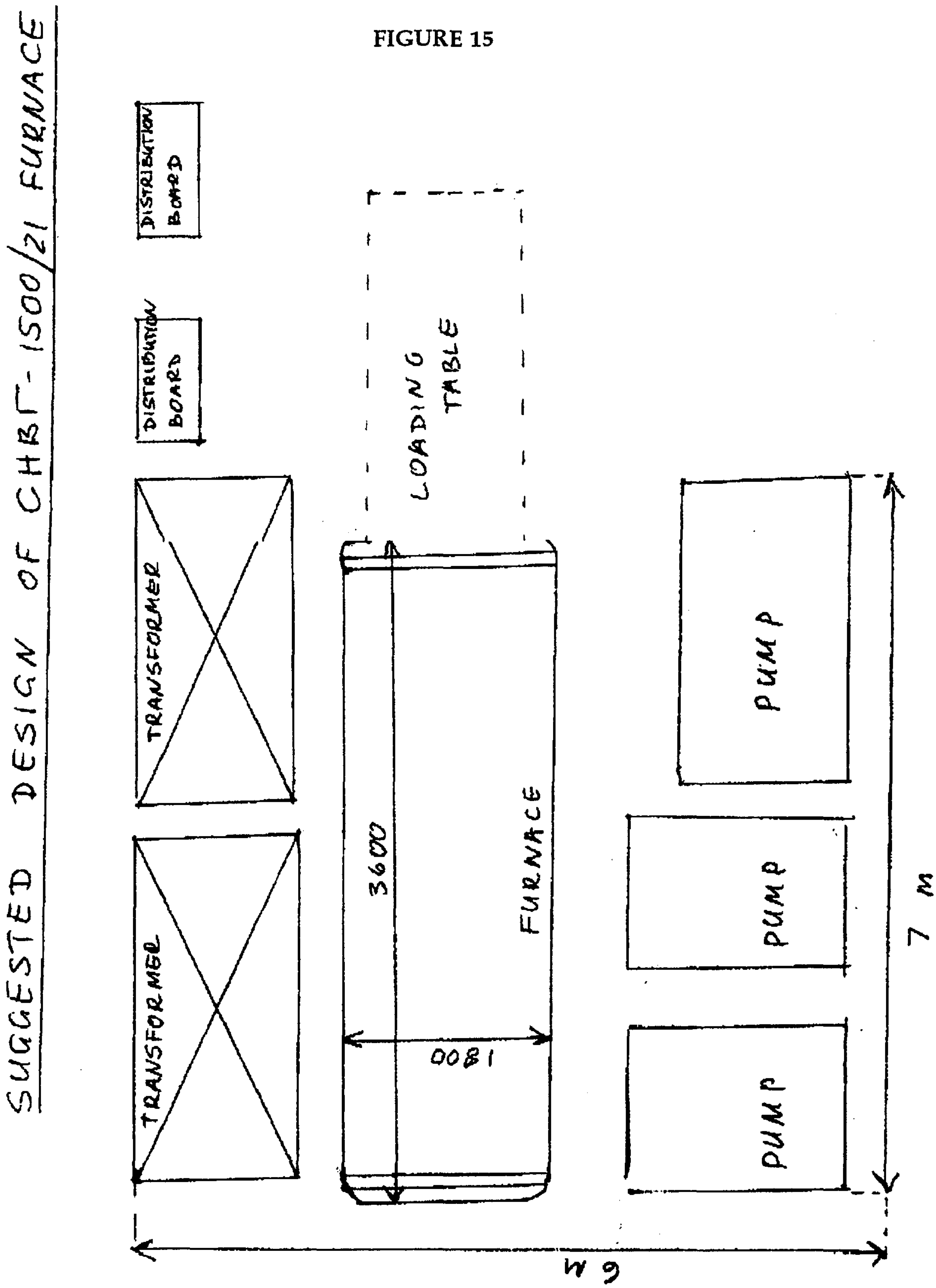
Parameters	Model 16/22 (measured)	Model 16/22 (produced)	Model 128/21 (designed)	Model 128/21 (offered)	Model 1500/21 (designed)	Model 1500/21 (offered)
Total charge mass kg	16	32	130	260	1500	3000
Process						
Time (h)	5	5	10	10	13	15
Heating to 2100°C (h)	2	2	3	3	4	4
Stand under 2100°C (h)	0.5	0.5	2	2	2	2
Cooling, incl. forced (h)	2	2	4.5	4.5	6	8
Loading/unloading (h)	0.5	0.5	0.5	0.5	1	1
Productivity tons/y						
in mass of charge t/y	192	38.4	78	156	692	1200
in mass of finished product t/y	12.8	25.6	52	104	461	800
Power consumption kWh includ.:						
Net heat	3.4	6.8	54	108	862	1700
losses	39	39	220	220	1258	1258
accum. heat	7.5	7.5	51	51	208	208
vacuum system	2.5	2.5	35	35	480	480
Specific power consumption kWh/t						
on mass of charge	3750	2030	2920	1654	2000	1270
on mass of prod.	5630	3050	4380	2480	3003	1907

EXHIBIT 2-9 (Continued)

Parameters	Model 16/22 (measured)	Model 16/22 (produced)	Model 128/21 (designed)	Model 128/21 (offered)	Model 1500/21 (designed)	Model 1500/21 (offered)
Life time of the heating bloc elements (years)						
heater	2	2	2	2	1	1
leads	2	2	2	2	2	2
container	2	2	2	2	2	2
heat insulation	3	3	3	3	2	2
bedplate	3	3	3	3	3	3
fasteners	1.5	1.5	1.5	1.5	1	1
Tentative furnace price (VAT excl) mln November 1996 roub	200	200	1080	1080	2200	2200
designing and manufacture (mln)	180	180	1000	1000	2000	2000
participation in commissioning (mln)	20	20	20	80	200	200
Terms of delivery (year)	0.5	0.5	1	1	1.5	1.5
designing and manufacture (year)	0.4	0.4	0.8	0.8	1.4	1.4
Participation in commissioning (year)	0.1	0.1	0.2	0.2	0.3	0.3

Main purpose: technological regimes high grade Serial-products, products incl. of higher CiS quality, depending on material heaters.

FIGURE 15


SUGGESTED DESIGN OF CHBГ-1500/21 FURNACE
DISTRIBUTION BOARD
DISTRIBUTION BOARD
TRANSFORMER
TRANSFORMER
LOADING TABLE
FURNACE
3600
1800
PUMP
PUMP
PUMP
7 M
6 M

One of the most glaring examples of this is the silicon carbide vacuum drum drier. Located in the breaking and screening shop, it creates a large amount of dust that settles to the floor in a several centimeter-thick layer. This is caused by the faulty design of a part in drier. It loses a considerable part of the SiC product and greatly worsens labor conditions. A similar situation can be observed in the abrasive instruments shop where quartz is broken.

In addition, based on our observations, we believe that the crushing, grinding, and mixing operations are the week links in the process lines in electro-melting, crushing-and-seeving, and carborundum shops. We recommend that VAP change the existing crushers, grinders, and some other installations for the technological lines on the basis of more modern and effective vibrating machines of Russian design, as shown in Figure 16. Installation of these more modern machines should result in a three-fold decrease in energy consumption with a simultaneous 20% increase in productivity through the decreasing of overgrinding. The capital cost and employee will be also decreased by the factor of two comparatively the existing level.

Based on the existing process lines and availability of industrial space at VAP, we believe that it is possible for VAP to pursue the production of building materials and building parts using both the wastes generated in the region and raw materials (sand, etc.) that are unique to the (found in) Volzhsky Industrial area and Volgograd. Preliminary information suggests that it is possible to produce up to 200,000 tons of building materials and parts and to attract up to 100,000 tons of industrial waste for their production. This new product line should become self-supporting in about one-half year due to low capital expenditures and high market demand for building materials within the region.

2.8.5 Potential Opportunities for Pollution Prevention and Waste Management

The following is a summary of the potential opportunities for pollution prevention and waste management:

- Considerable loss of valuable components and noticeable environmental pollution are caused by a backwards dust collection system in all shops.
- The dumps contain a large amount of electric melting shop refuse that contains a considerable amount of silicon carbide. The refuse could be processed to extract standard silicon carbide but it has not been done yet.
- Heat from waste gas and water steam formed in the spraying process in the electrical melting shop is not utilized.
- Some capacities for producing silicon carbide micropowder are idle. Upon reconstruction, they can be used to produce fine silicon carbide dispersive powders of high chemical purity that are in great demand in the structural products industry. The electrical melting shop is under using power in silicon carbide production.

FIGURE 16

1 - The electric vibrating feeder;

2 - The breaker of the ВЩД 200x1400 brand;

3 - The breaker of the КИД-450 brand;

4 - The vibrating transporter Ø 500;

5 - The bolter of the 450Э brand;

6 - The pneumatic separator of the CB-1000 brand;

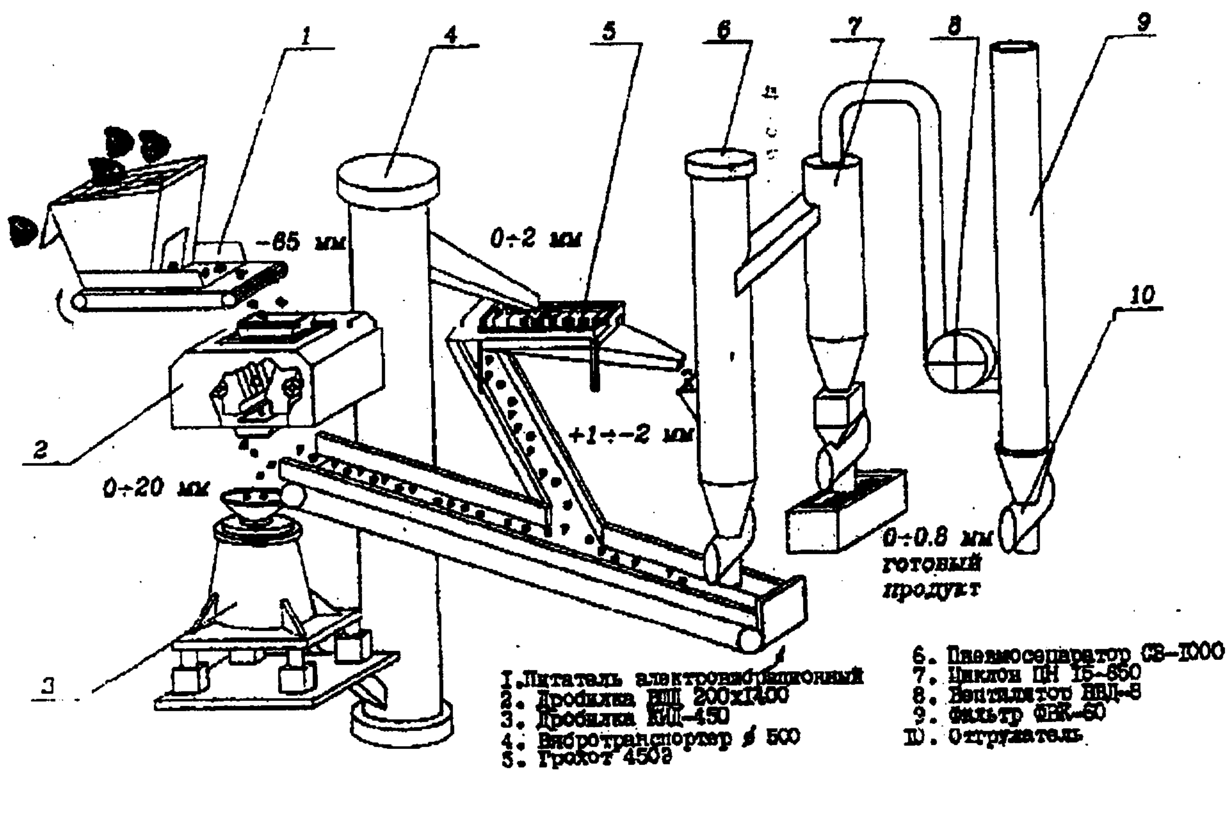
7 - The cyclone of the ЦН 15-650 brand;

8 - The fan of the ВВД-8 brand;

9 - The filter of the ФВК-60 brand;

10 - The unloading device;

Готовый продукт - the final product



To remedy the faults the following measures are suggested:

- Obsolete dust collectors should be replaced with modern, more efficient equipment widely used by the abrasive industry such as scrubbers, centripetal cyclones, and impact-inertia type dust collectors. Equipment that the abrasive industry uses recently that remove dust particles smaller than 5 mkm can also be used. In such cases, a system of machines is needed that makes use of a turbulent washer, known as a Venturi tube, to coagulate fine dust. To improve gas purity, the process should take place in sets of various types of machines such as cyclones combined with electric filters or scrubbers with Venturi tubes.

- Obviously, such adjustments require money but they should be done. This measure will decrease atmospheric pollution and, hence, fines; improve labor conditions; and should increase additional yield of finely dispersed silicon carbide powder. This is a valuable product in which further processing may change it into source material for structural elements.

- Silicon carbide can be extracted from dump waste. Additional efforts are needed to assess the general content of silicon carbide in the dump and to select the best method to extract it. However, considering the large amount of waste (about 100,000m^3) and the large chunks of silicone carbide (over several kilograms) that can be seen on the surface, question the practicability of such a project. It might be advisable to collect silicon carbide pieces by hand once the dump is stripped.

- The acquisition of capabilities for producing silicon carbide micropowders can be used as a basis for a shop that can produce high grade, fine dispersion powder. Today, none of the CIS countries produce silicon carbide powders with an average particle size of 0.5 mkm and with impurities not over 1.5% that could be used for perspective ceramics production. Stark, a FRG firm, produces powders with the above descriptions charges as much as $300 per kg. Their technological chain includes several breaking stages of silicon carbide powder produced by the Acheson method, its liquid and gaseous classification, its annealing in the air to remove excessive carbon, and removing impurities by acids and alkalis washing. The plant has the major part of the equipment needed to produce fine dispersive silicon carbide power and also has extensive experience working with SiC micropowders. The high price on SiC used for fine ceramics and an absence of its production in Russia makes it reasonable research economic effects of introducing such production.

2.8.6 Recommendations for Energy Conservation

Heat Energy

Highly qualified energetics specialists work at the enterprise. The enterprise discarded all external sources of heat energy (the centrally-heated water) and decided to heat the enterprise by its boiler shop. The boiler shop is finished at the present time and the enterprise specialists are about to approve pipelines' reconstruction. It is not quite clear how the heat supply will be conducted. That is why the starting (basic) data for the comparison are absent and the recommendations for "improvement" of the heat energy use effectiveness are also not available.

The current purchase of transportable gas analyzers for monitoring the boiler fuel burning effectiveness in the boiler shop can improve energy use effectiveness. In accordance with information from enterprise staff, the current monitoring control is performed visually by the torch. Use of the gas analyzer at the boilers' operating regimes and during current operation would allow savings of up to 3% of the natural gas, which is burnt in the enterprise's boiler shop. Let's accept heat consumption for the enterprise's centrally-heated water at a constant level of 15,450 Gcal (in 1995). Let's also recalculate it for natural gas with the gas heating capacity accepted as 8,000 kcal/m^3 and the boilers' efficiency is 90%. The estimating value of the gas consumption is:

$$V=\frac{1540Gcal}{(800,kcal/m^3x0,9,\%)}x10^6=2.145.833m^3$$

of natural gas per year.

The savings of 3% will produce:

- RUB = 2,145,833 m^3 x 287,174 roubles/m^3 = about 18,500,000 roubles/year or about $3,400 US /year.
- The cost of one FYRITE-4 brand instrument is $2,500 US. The term of recoupment will be 2,500/3,400 * 12 = about 9 months.

Electrical Power Conservation

The enterprise (apart of the other examined enterprises) has a system for receiving information about electric power consumption from individual, large structural departments. That is why the comprehensive analysis of electric consumption must be done at the next stage. At the present stage, the work was not scheduled.

Steam Conservation

The enterprise equipment for with the heat flows control system (expansion of the existing electric power consumption analysis system) is not practical at the present stage because the layout of the heating supply lines will be changed.

2.8.7 Recommendations for Water Conservation

See our report discussing water supply, treatment, and conservation prepared for the Volzhsky Nitrogenous and Oxygenous Plant.

2.9 Pollution Prevention and Waste Management Opportunity Assessment at the Volzhsky Orgsynthesis (VO)

2.9.1 Introduction

The Joint-Stock Company, Volzhsky Orgsynthesis (VO) produces numerous organic chemicals, including 2-naphthol, which is one of the basic organic intermediate products and has numerous applications. For example, 2-naphthol is used as a raw material for the production of many of the organic dyes and pigments (and their intermediates); antioxidants for the caoutchouc, pharmaceuticals, and aromatic organic compounds; and is used in the non-ferrous metallurgy to assist in the separation of chromium from zinc.

The known production capacity for 2-naphthol is as follows (in thousand tons):

- Russia - 16,000
- Ukraine - 12,000
- Italy - 20,000
- Germany - 12,000
- China - 20,000
- Japan - 5,000
- India - 8,000.

VO began operations in 1970 and is the only manufacturer of 2-naphthol in Russia. The facility has a designed capacity of 16,000 t/year, and was designed by the branch of Giproorgchim in Rubezhansk. The design of VO's process is based on the design used by Industrial Association "Krasitel" (located in Rubezhnoye (Ukraine)). The process/facility has not been enlarged or reconstructed since initial construction.

2.9.2 Overview of the Process for 2-Naphthol Production

Exhibit 2-10 presents a complete schematic diagram that details the flow of raw materials; the formation and flow of the intermediate products, reaction materials; and flow of wastes generated through the production of 2-naphthol below. As shown in Exhibit 2-10, the process begins with the sulfonation of naphthalene dissolved in concentrated sulfuric acid. The sulfonated material is diluted with water and the naphthalene, which has formed after hydrolysis, is removed along with the water vapor. The naphthalene is separated from the water layer and is returned back to the process with the help of the sulfite-sulfate solution. The remaining water layer is discharged to the plant's sewer system for chemically polluted water.

The sulfonated material is neutralized with a solution of Na_2SO_3 and is heated until it boils in order to facilitate the removal of sulfur dioxide. The isolated sodium salt of the 2-sulfonic acid of the naphthalene is filtered via centrifuging and is rinsed with water. The mother liquor and spent rinse water are partly directed to the previous stage, while the rest is discharged to the plant's sewer system for chemically polluted water.

The schematic technological diagram, reflecting the production of the 2-naphthol

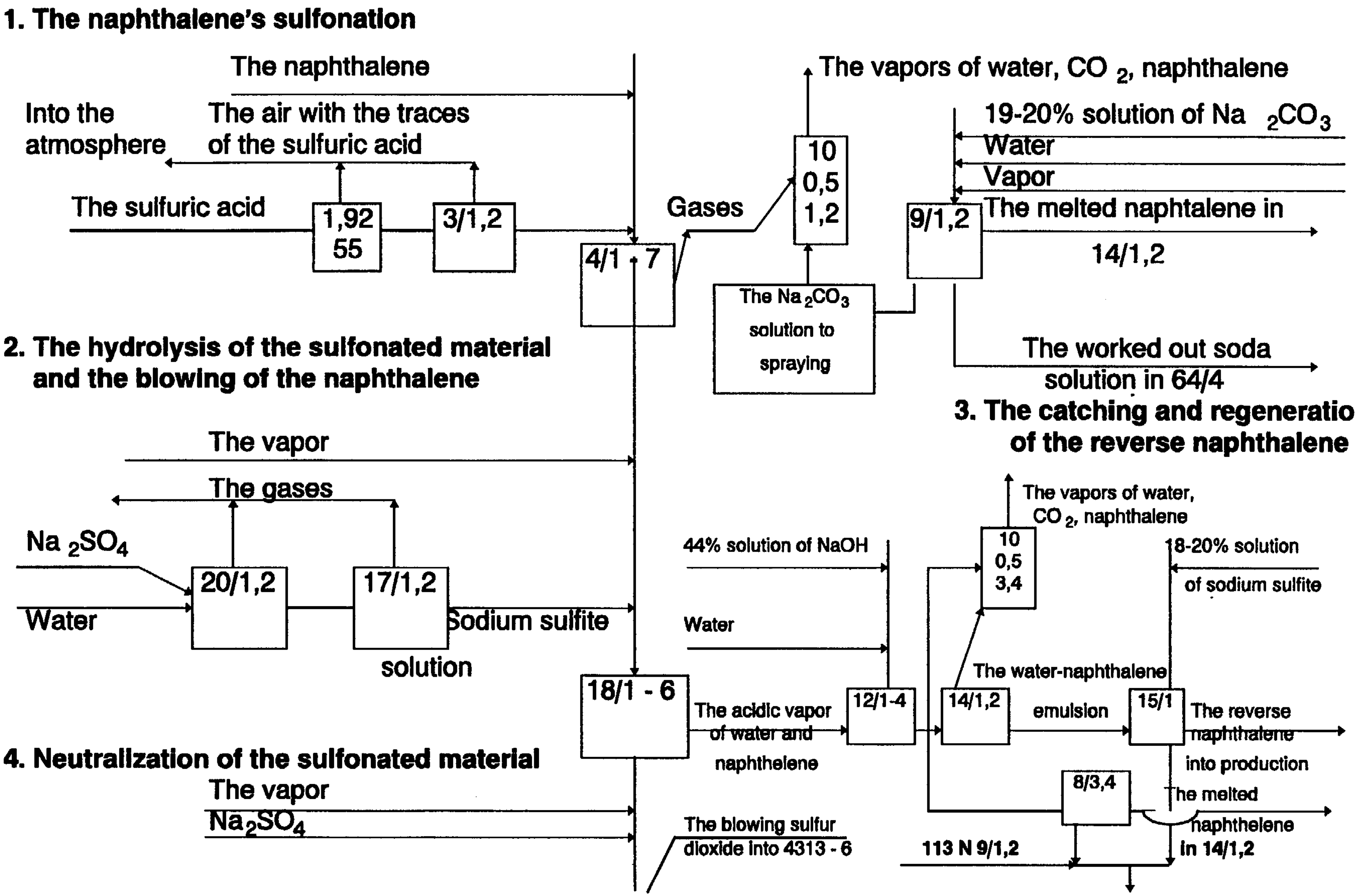


EXHIBIT 2-10: Schematic Diagram of VO's 2-Naphthol Production Process

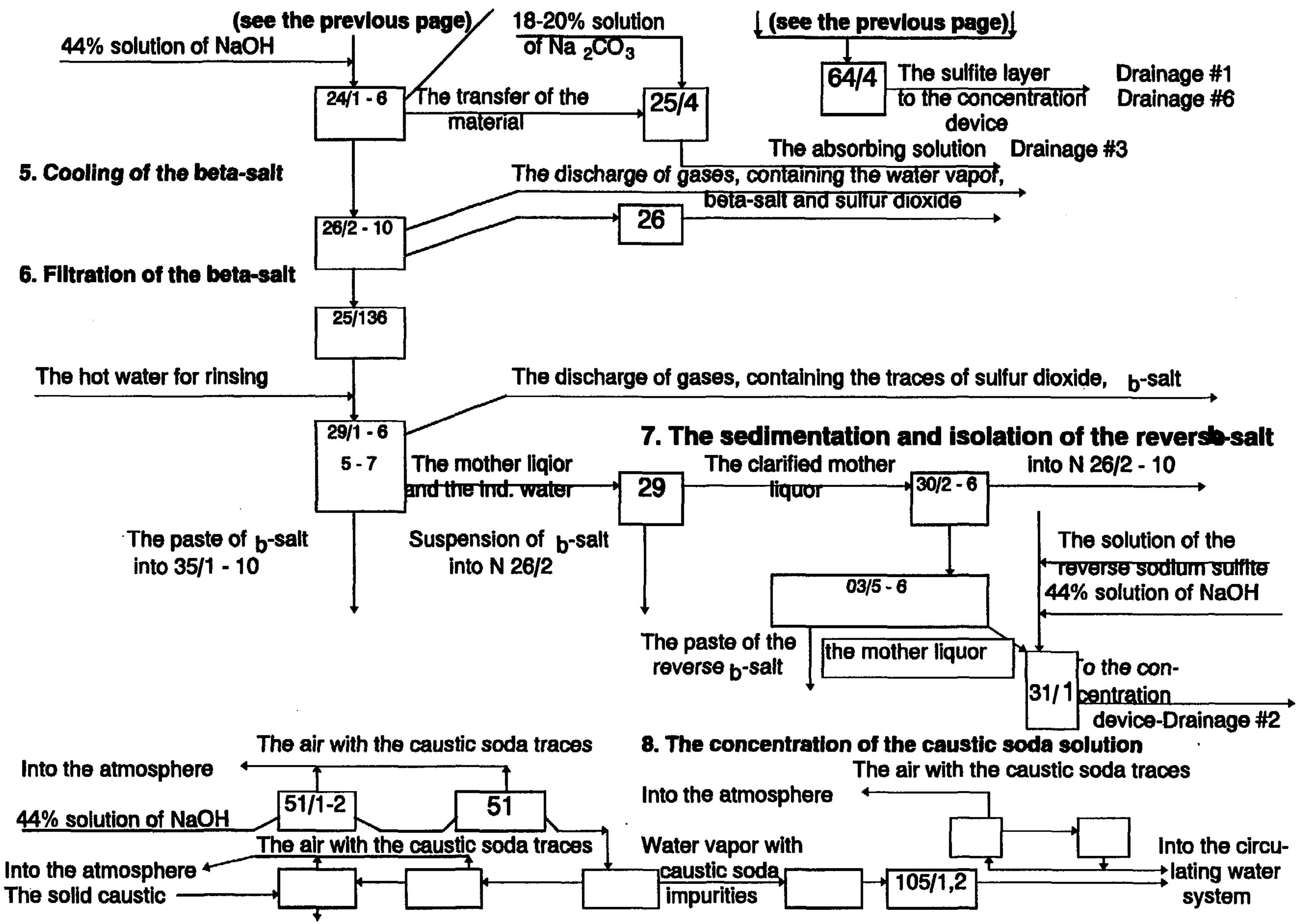


EXHIBIT 2-10 (Continued)

(see the previous page)

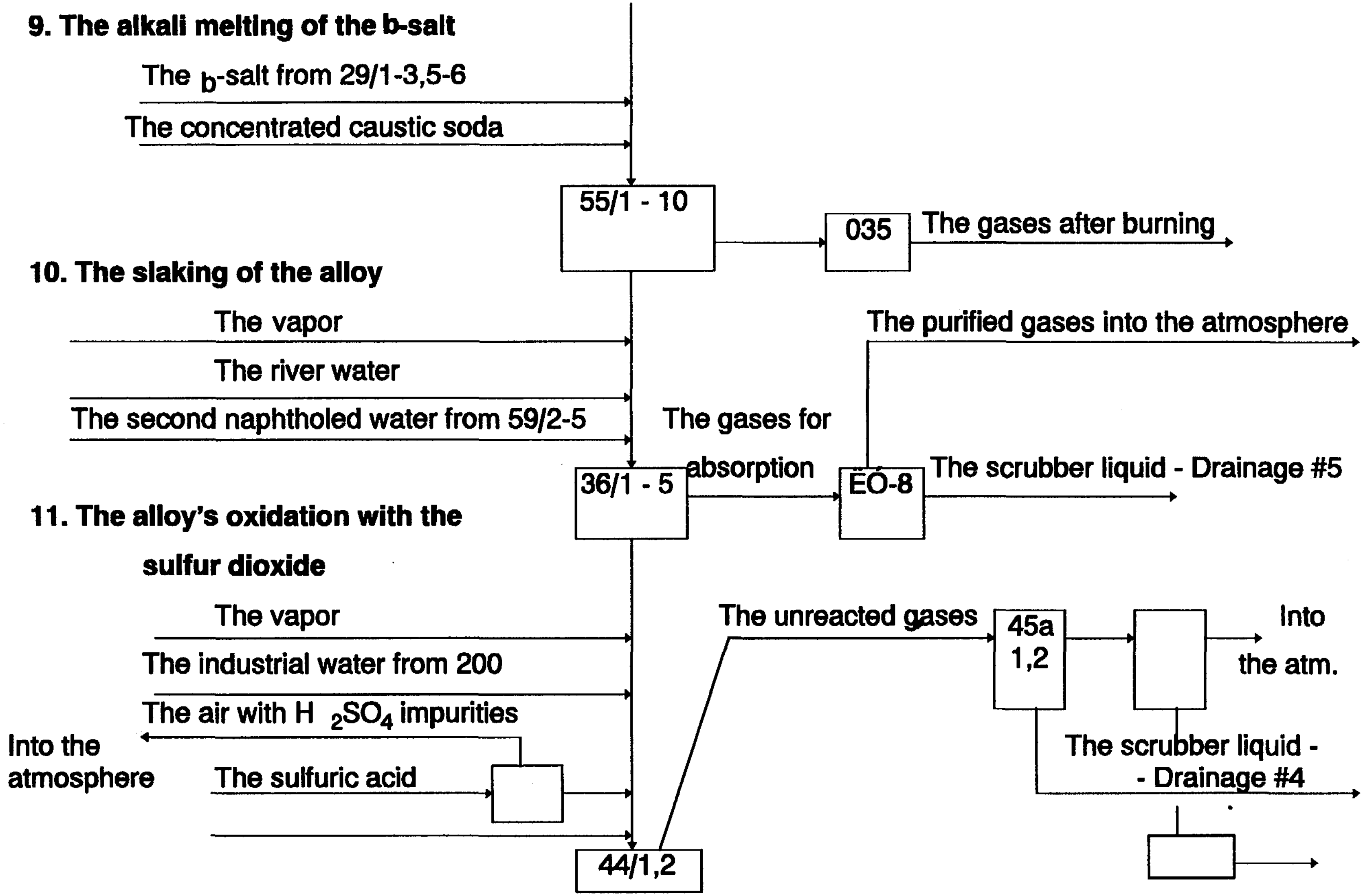


EXHIBIT 2-10 (Continued)

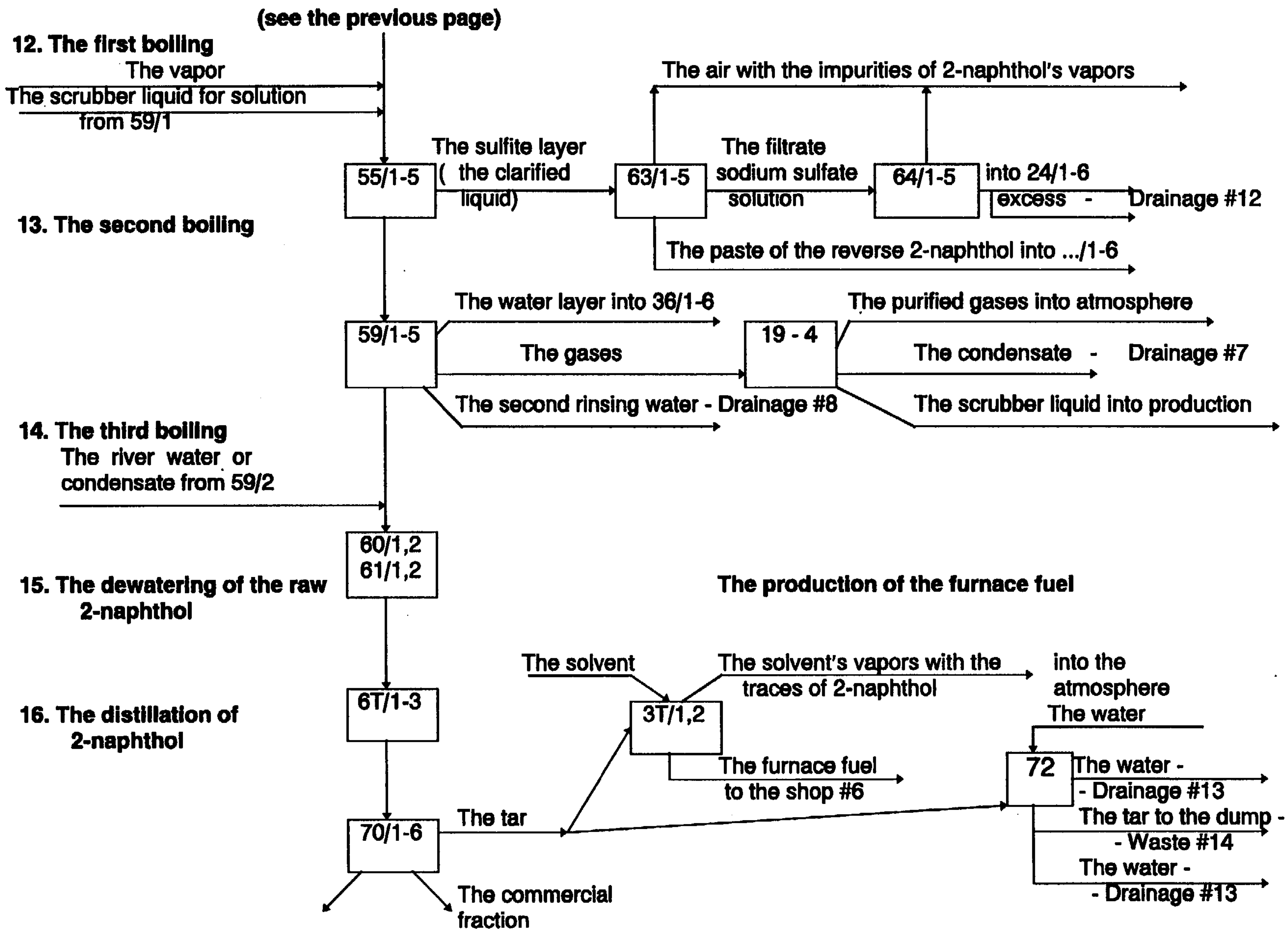


EXHIBIT 2-10 (Continued)

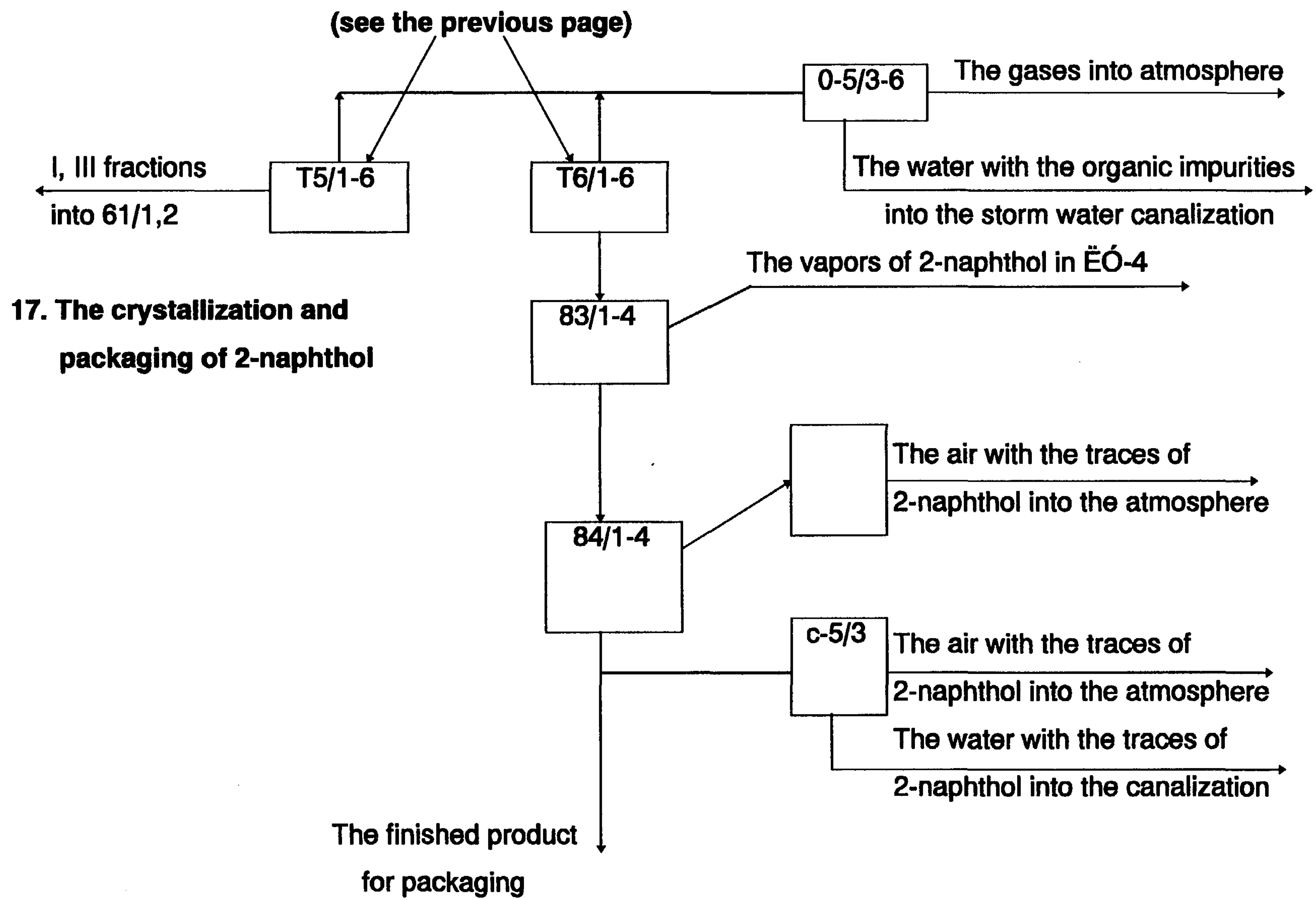


EXHIBIT 2-10 (Continued)

The resulting paste (the sodium salt of the 2-sulfonic acid of the naphthalene) is charged to the melting boilers, where the alkali, is concentrated to a concentration of 90%. After the completion of the alkaline melting step, the material is diluted with water and is oxidized with the sulfur dioxide, which is liberated during the neutralization of the sulfonated material. The resulting dissolved 2-naphthol is rinsed three times with water. The first rinsate (which now contains a solution of Na_2SO_3) is used in the neutralization of the sulfonated material and the excess is discharged to the plant's sewer system for chemically polluted water. VO uses the rinse water from the third rinse step as the rinse water used in the second rinse step. The spent rinse water from the second rinse step is used in the dilution of the material after alkaline melting.

After the third rinse step, the cleaned 2-naphthol is heated for dewatering and then purified via distillation. The products are produced in the form of flakes. The vat residue remaining after the granulation is transported to the dump for disposal and the water is sent to the plant's sewer system for chemically polluted wastes.

In summary, VO's process is represented by the following schemes:

1. During the sulfonation step, both β- (the principal reaction) and α- (the secondary reaction) sulfonic acids of naphthalene are formed.

2. In order to remove the α-sulfonic acid, the reaction mixture is hydrolyzed with the water, which begins the decomposition of the α-acid to form the starting products.

3. The neutralization of the sulfonated material with the formation of the Na-salt of the β-sulfonic acid is carried out using the sodium sulfite, which partly transforms to form sodium bisulfite in the presence of sulfuric acid:

$$H_2SO_3 \rightarrow SO_2\uparrow + H_2O$$

4. The alkaline dissolution of the β-salt.

5. The resulting β-naphtholate is oxidized with the sulfur dioxide to form the desired product - β-naphthol (2-naphthol).

2.9.3 Summary of Wastes Generated From the Production of 2-Naphthol

We present below the waste characteristics in accordance with the effective technological regulation of the 2-naphthol production, dated March 30, 1990 and calculated for 1 ton of finished product in Exhibit 2-11.

EXHIBIT 2-11

	Wastes	Waste Generation Rate (kg/t)	Composition (weight %)	Discharge Point
1	Liquid layer after the separation of the naphthalene, being received at the stage of hydrolysis	5,350	naphthalene - 0.1 β-salt - 0.25 Na_2SO_4-0.53 Na_2SO_3-9.37 mineral impurities - 0.5 tars - 0.49 water - rest	To the concentration device or to the plants chemical waste sewer
2	Mother liquor after the filtration of the sodium salt of 2-naphthalenesulfonic acid (the β-salts)	7,400	naphthalene - 0.04 β-salt - 0.7 Na_2SO_4-6.8 Na_2SO_3-5.1 NaOH-0.16 mineral impurities - 0.9 tars -1.6 water - rest	To the concentration device or to the plants chemical waste sewer
3	Scrubber liquid from the collector 25/4 at the stage of the sulfonated material's neutralization	33	Na_2CO_3-1.0 Na_2SO_3-12.9 water - rest	""
4	Scrubber liquid from collector 45a/1,2 at the stage of the oxidation of the floating with the sulfur dioxide	40	Na_2CO_3-3.2 Na_2SO_3-16.5 water - rest	""
5	Scrubber liquid from the local purification system of the ËÓ-8 brand at the stage of the floating's slaking	410	The exact content of the sewage is not available, the sewage is the multi-component one, containing the tar, naphthalene, 2-sodium naphthalate	""
6	Spent alkali solution from position 9/1,2 (the system for the absorption of the acidic vapors at the stage of the naphthalene's sulfonation)	180	Na_2CO_3-0.; Na_2SO_3-; naphthalene - 0.5 - 1.0	""
7	Condensate from the local purification system of the ËÓ-4 brand at the stage of the raw 2-naphthol's rinsing	10	contains the traces of 2-naphthol	""

EXHIBIT 5-2 (continued)

	Wastes	Waste Generation Rate (kg/t)	Composition (weight %)	Discharge Point
8	Spent rinsate from the second rinse step after the second boiling and sedimentation of the raw 2-naphthol	238. (0.2 m^3/t)	[in g/l] 2-naphthol -26.; β-salt-110.; Na_2SO_3-23.4 mineral impurities - 9.6 tars - 220.7 water - rest	""
9	Water from the vacuum pumps of position 0-5/13 with the traces of 2-naphthol	1,500	--	storage tank for chemically polluted wastes
10	Spent equipment wash water	1,000	--	storage tank for chemically polluted wastes
11	Cleaning wastes resulting from washing floors containing organic impurities	1,000	--	storage tank for chemically polluted wastes
12	Spent rinse water from the first rinsing stage (after filtration against the passage of the 2-naphthol) - the raw 2-naphthol - Drainage #2	In accordance with the data of the shop 1904 (1.6 m^3/t)	2-naphthol - 0.03 Na_2SO_3 - 15-16 Na_2SO_4 - 3 $NaHSO_3$-1.5 water-rest	To the concentration device or to the plants chemical waste sewer
13	Water after the tar's granulation from the stage of the 2-naphthol's rectification - Drainage #4	In accordance with the data of the shop 1000 (1.0 m^3/t)	The sewage contains 2-naphthol - 0.3 - 1	""
14	Distillation bottoms from the 2-naphthol's distillation process	50	2-naphthol - 4.6 mineral impurities - 2.8 tars - 65.4 water - 25.4	Landfill

In accordance with Russian regulations, we estimate that total discharge of process wastewaters to the plant's chemical sewer system to be nearly 13,423 kg/t of 2-naphthol produced, and that the total quantity of wastewater, including wastewater generated from the washing of equipment, floors and pumps, is approximately 16,923 kg/t. However, when considering three additional wastestreams (waste nos. 12-14 above) not currently accounted for by the Russian technology regulations, the actual total quantity of generated wastes are approximately 19,827 kg/t of 2-naphthol produced.

2.9.4 Waste Handling

Wastes from the production of 2-naphthol contain a wide range of organic compounds, which are characterized by the following toxicity factors:

- **MPC (maximum permissible concentration) in water(mg/l):**

  - naphthalene - 0.05
  - 2-naphthol - 0.4

- **MPC in the worker's air (mg/m^3):**

  - naphthalene - 20.0
  - 2-naphthol - 0.1

- naphthalene sulfonic acid has an LD_{50} of 13 g/kg (for the rats).

In the past the process wastewaters have been processed following two methods:

- concentration, which results in the production of dry sulfite-sulfate salts

- biological purification.

At the present time, VO use an underground injection well to dispose of all the chemically polluted process waters. Gaseous discharges are partly caught by the traps or scrubbers and then vented to the atmosphere.

2.9.5 Comparison of VO's Process and Quality of Product to Practices and Products Produced by Europe and World

VO's process for preparing 2-naphthol is the same process used by chemical companies around the world. VO's process, however, uses slightly different proportions and concentrations of certain reagents at specific stages of the production process. In particular, at the sulfonation stage in the Italian technology, a more concentrated sulfuric acid (99%) is used. In addition, hydrolysis of 2-naphthalenesulfonic acid does not occur as a separate step, which makes VO's process more simple - but also slightly increases raw material consumption. A more important observation, however, is the fact that VO's production process is out dated in respect to the age and condition of the equipment/instrumentation and control/management systems.

Despite these short-fallings, the quality of VO's 2-naphthol generally meets and even exceeds the specifications of 2-naphthol produced in Europe and the rest of the world.

2.9.6 Identification of Resource Losses and Waste Generation In Connection to VO's Production Technology

During our review of VO's process information and flow diagrams, and based on our observations made during our site visit to the plant, we have (1) identified the following areas where VO is wasting resources, (2) highlighted the overall affect of such practices, and (3) made specific recommendations for correcting the observation.

Observation #1

The usage of the technical-grade naphthalene of the ÒÀ, ÒÁ, ÒÓ 14-7-97-89 brands (the Russian standard ÃÎÑÒ 16106-82), characterized by the crystallization temperature of 78.6 - 79°C and by the increased content of the sulfur impurities [thionaphthalene - (up to 2.3%), β-methy-l-naphthalene (up to 0.3%), indole (up to 0.1%)], instead of the purified one, characterized by the crystallization temperature of 79.6°C.

Direct Effect of Observation #1

VO has increased its consumption of naphthalene (in the technical weight) to 1.48 t for 1 t of the 2-naphthol from 1.23 t (when using a higher quality naphthalene). As a result, an intensive frothing occurs during the neutralization of the sulfonated materials. This froth is removed via a skimming system, and contaminates the scrubber liquid (held in tank 25/4) and of the air ducts' tank (the tank 25/5) with a finely dispersed β-salt. Because of the intensive frothing at the stage of the sulfonated materials' neutralization and of the β-salt's isolation (separation) from the mother liquor, the wastewater, which is directed to the drainage #2, is contaminated with a substantial quantity of finely dispersed β-salt and subsequently enters the plants chemical sewer system. The contamination of the wastewater, directed to the drainage #2, occurs as a direct result of sulfonated impurities in the technical-grade naphthalene.

Recommendations for Improvement

(1) VO should install a separate unit to purify the technical-grade naphthalene to obtain a crystallization temperature of not less than 79.6°C. The unit should have a minimum capacity of 6,000 t/year and, if possible, should have a maximum capacity of 10,000 t/yr (to be able to meet increased demands). The approximate cost of designing and building such a unit, is approximately 5 billion roubles.

(2) Alternatively, VO could purchase pure naphthalene in the domestic or world market at the price of 550 USD/t.

Observation #2

The incomplete recuperation of both the sodium sulfite and the mixture of sodium sulfite/sodium sulfate from the process wastewater.

Direct Effect of Observation #2

VO loses an estimated 850 kg per 1 t of 2-naphtholsodium sulfite (containing 5 - 15% of sodium sulfate as the impurity). VO also loses an estimated 1300 kg of a sulfite-and-sulfate salt mixture (equal ratio) per 1 t of the 2-naphthol produced.

Recommendations for Improvement

(1) In accordance with the design, fulfilled by the Scientific Center of the Private Joint-Stock Company "Orgsynthesis" in cooperation with the shop for the 2-naphthol production, we suggest that VO change the naphthalene/water emulsion separation that occurs either at the deposition of the β-salt's mother liquor, or at the excess sodium sulfite solution from the stage of the 2-naphtholate oxidation, by using a specially designed crystallizer to crystallize the emulsion to separate the crystallized naphthalene from the water layer. The overall affect of this change would be to (1) reduce the volume of wastewater generated at the hydrolysis step, and (2) improve the quality of the product.

The cost of the works - in accordance with the schedule of expenses, was calculated by the specialists of the Private Joint-Stock Company "Orgsynthesis".

(2) The excess solutions of the sulfite-sulfate salts mixture and sodium sulfite can be processed to produce the following commercial products or intermediates:

- from the mixture of the sulfite-sulfate salts, a crystal sodium sulfite can be obtained from the preliminary purification of the organic solutions
- the crystal sodium sulfite can be used for the production of the cellulose, sodium thiosulfate, and crystal sodium sulfite ($Na_2SO_3 \cdot 7H_2O$).

The estimated costs for the development of the technology for the salt's utilization, including the production of the pilot lots and their testings by the consumer, is approximately 2 billion roubles, and has an expected pay-back period of 2 - 3 years.

(3) The recuperation of SO_2, following the closed cycle for SO_2 during the production of the 2-naphthol, can be realized via the development and introduction of a method for isolating the commercial crystal sodium sulfite from the slaked floatings (position 36/1-6). The estimated cost for the development of this technology, including the production of the pilot lots and their testings by the consumer, is approximately 1 billion roubles, and has an expected pay-back period of 1 year.

Observation #3

The equipment used for the alkali melting of the β-salt, including the stage of preparing of the sodium hydroxide's concentrated solution, is obsolete.

Direct Effect of Observation #2

The overheating of the smelting boilers with fuel gases heats the walls up to 700°C, while the temperature of the material is 300 - 350°C. This overheating causes the tarring of the material and subsequent blocking of the gas pipelines with tars. This tarring of the gas pipeline must be removed by hand. The tar is transported to the dump for disposal (the classification for this waste is not specified in the Russian regulations).

The process line for burning the exhaust gases is not yet in operation because the exhaust gas monitoring equipment is not assembled (the project, designed by "Giprosynthesis", is available).

Recommendations for Improvement

(1) Update the obsolete equipment by selecting new boilers used in similar processes throughout Russia and the rest of the world. These boilers, can either burn a high heating value fuel or rely on induction heating and should be constructed out of nickel alloy. Two boilers, with a volume of 8 cubic meters, can be obtained for approximately 1 billion roubles.

Observation #4

The distillation tower fittings are too worn to prevent air infiltration to the tower during the 2-naphthol distillation process.

Direct Effect of Observation #4

The infiltration of air into the high temperature environment of the distillation tower promotes additional tarring. This tarring prevents the efficient distillation of the 2-naphthol and causes up to 6% of the 2-naphthol to be left in the distillation bottoms. This is a direct loss of 2-naphthol; i.e., product is left in the distillation bottoms which, in turn, further contaminates the process wastes generated during the granulation of the bottoms.

Recommendations for Improvement

(1) Purchase gasketless fittings made of stainless steel (12X18H10T) - 48 units D_y80.

(2) Burn the bottoms from the 2-naphthol's distillation (the granulated tar) in either an existing furnace (reconstructed) or in a new circulating fluidized bed furnace.

2.9.7 Suggested R&D to Improve the Production Process and to Reduce Resource Consumption

Based on our review and evaluation of VO's process for producing 2-naphthol, VO should consider the following research and development (R&D) projects to increase the efficiency of its process:

1. The Scientific Center of the Private Joint-Stock Company "Orgsynthesis" should try to optimize the isolation of the β-salt's from the sulfonated materials via the creation of the pH monitoring system in the isolators (extractors) (position 24/1 - 6).

2. Develop improved instrumentation and equipment for the following stages: filtration of the β-salt's suspensions, filtration of the sulfite waters from the stage of the raw 2-naphthol's rinsing with the removing of the 2-naphthol, and rinsing of the raw 2-naphthol.

This project can be conducted by the specialists of the Scientific Center of the Private Joint-Stock Company "Orgsynthesis" in cooperation with the specialists of the State Scientific Center of the Russian Federation NIOPIK, as well as consultation with other specialized organizations and enterprises. The approximate cost of the research and development project is 1 - 1.5 billion roubles.

3. Due to the decreased demand for 2-naphthol experienced in 1996 (now about 4,000 t/year), VO should concentrate on updating the technology and efficiency of only one line within the existing shop to meet the current/expected demand of 2-naphthol.

2.9.8 Estimated Opportunities for Resource-Saving Using Low-Expense Alternatives (Housekeeping Changes)

The overall condition of VO's facility and equipment used to produce 2-naphthol is extremely poor as evidenced by the:

- numerous equipment leaks that have caused large volumes of gaseous emission to occur, which in turn has greatly contaminated the surrounding workspace atmosphere; and

- numerous leaks and pools of liquid on the floor and equipment surfaces, and so on.

All of these troubles are the result not of the insufficient production level or low staff's qualification, but of the extremely worn out state of the equipment, fittings, pipelines, ventilation systems, and of the other elements, which have operated for two or more amortization periods. Clearly, we recommend that VO change several hundred fittings, gaskets, and seals as a way to further resource conservation and improve the condition and safety of the workspace. However, these changes will likely be fruitless if VO also does not update and repair existing primary equipment and pipelines, as well as improving the overall technology of its process (as suggested in this report).

2.9.9 Opportunities for Energy Conservation

We present a summary of VO's consumption of energy in Exhibit 2-12. This summary is based on our review of information provided by VO.

EXHIBIT 2-12

Energy Resources	Units of Measurement	Consumption	
		1991	1995
Natural Gas			
- as a raw material	Thousands of nm^3	44,801	36,683
- as a fuel		68,023	62,760
Total Usage:		112,284	99,443
Electricity	Thousands of kW*hour	165,115	132,156
Steam	Gcal	1,074,789	723,385
Hot Water	Gcal	73,750	35,114

As we have noted in our review of the other enterprises, VO does not appear to understand the importance of energy conservation. For example, as shown in the above exhibit, while during the period of 1991 - 1995 the overall volume of VO's production has fallen by more than four times, VO's consumption of (1) electricity has fallen by only 20%, (2) steam has fallen by 33%, and (3) natural gas has been reduced by 12%. These data show that, although a substantial share of VO's energy consumption is relatively "constant", a significant portion of VO's energy consumption appears to have been incurred as unproductive losses. We suggest that VO's upper management pay greater attention to this problem.

Examples of low-cost measures for improving energy conservation at the facility include the following:

- The development and implementation of an energy-conservation policy must become one of the major priorities at VO. If VO's energy consumption continues to increase while production decreases, the share of the energy component in the structure of the product's price will increase to a point where the price of the product becomes too expensive and reaches a "critical" value. We note that the existing practice of the secondary and subordinate role of the energy base relative to primary production must be eliminated. The times of the product's output "at all costs" are in the past; VO must concentrate on resolving issues of quality and price competitiveness. VO needs to act quickly, as it takes time to solve problems associated with energy consumption and conservation. In addition, we note that it is difficult to solve all of these problems at once; rather, it is necessary to solve these problems systematically by implementing and following an energy-saving policy/plan.
- The technical manager of the enterprise needs to be given the appropriate authority and priority to obtain the financial resources necessary to develop and implement an energy conservation program.

- Based on our interviews with the specialists of the chief power engineering department, it appears as though insufficient resources are being allocated to energetics. This situation, in which money is being saved at the expense of improving the energy systems is unwise (especially at such an energy intensive facility), because it can bring about a sharp reduction in both the effectiveness and reliability of the operation of the energy-consuming equipment and of the facility in general.

- The management structure should be revised to transfer the responsibility for inspecting the power systems from the shop's level to the plant's level.

- In order to be able to estimate the potential savings realized through energy conservation, VO needs to develop and implement a system for measuring and monitoring energy consumption throughout the entire facility.

- We note that VO may need to increase its staff of qualified energy technicians and engineers in order to effectively and systematically improve the facility's energy supply system.

We were unable to review complete and comprehensive energy consumption records; therefore, for the purposes of this study, we have estimated the value of the potential energy savings, which could be realized through the implementation of the measures discussed above. We present a summary of these potential savings below in Exhibit 2-13.

EXHIBIT 2-13

Energy Category	Potential Savings	Quantity	Value - Roubles	Value - US$
Steam and Hot Water	up to 30%	200,000 Gcal/yr	24.6 billion/yr	5,550,000
Electricity	up to 20%	25,000 MW*hour	4.5 billion/yr	850,000
Natural Gas	up to 10%	10,000,000 nm^3/yr	2.9 billion/yr	532,000

The estimation of the effectiveness of the individual measures is presented in Exhibit 2-14.

EXHIBIT 2-14

	Observation #1 The Lack of Condensate Removers	Observation #2 The Lack of Centralized Tracking System for Energy Consumption
Estimated Energy Losses/yr	15,000 Gcal	6,600 MW*hour - Electricity 76,000 Gcal - Heat
Cost of Energy Loss - Million Roubles	1,844	1,211 - Electricity 9,341 - Heat
Cost of Energy Loss - Thousand US$	341.4	224.3 - Electricity 1,729.8 - Heat
Estimated Capital for Improvement - Million Roubles	108	3,412
Estimated Capital for Improvement - Thousand US$	20	631.8
Projected Term of Recoupment	3 weeks	<4 months
Comments	The installation of the condensate removers can be done in-house	Electricity savings is 5 percent Heat savings is 10 percent

2.9.10 Potential Opportunities for Waste Conservation

See our report discussing waste supply, treatment, and conservation prepared for the Volzhsky Nitrogenous and Oxygenous Plant.

2.10 Pollution Prevention and Waste Management Opportunity Assessment at the Volzhsky Nitrogenous-Oxygenous Plant (VNOP)

2.10.1 Introduction

The Rostov Department of the Soyuzvodokanalproekt has designed the scheme of water supply, water disposal, and purification of wastes (based on the research done by the VNIIVODGEO) to be implemented in the town of Volzhsky, Volgograd Region.

The town's industrial complex that was regarded as a single chemical agglomeration is now comprised of individual enterprises such as organic synthesis, synthetic rubber, synthetic fibers, retreading and repair of tires, nitrogen-oxygen plants and some other independent production facilities. In the town itself, there are machine and radio engineering plants that dispose of their wastes together with municipal wastes.

The entire flow of industrial and municipal wastes are grouped into three flows:

(1) industrial wastes from water cooling installations at rubber production and its semi-finished items and also storm (rainfall) runs-offs from all plants;

(2) domestic run-off from the plants and the town, and also wastes from the plants situated in the town;

(3) chemically polluted run-off from the organic synthesis and synthetic rubber plants.

The first run-off is polluted primarily with mechanical impurities. The project suggests their hydro-biological purification is done in a 28 Km long canal with a sand-gravel bed and planted cane. Then it flows through mesh, frame-filled and disinfecting filters. Replenished with fresh water, the run-off is supposed to flow back to be used for industrial needs. At construction, the system was not completely commissioned.

Today, the wastes are purified hydro-botanically and clarified in horizontal settling basins (at clarification stations) with simultaneous processing with aluminum polychloride. The residue is not removed from the system: from time to time it is discharged and flow away with clarified water.

The wastes of the second flow are clarified in a regime that differs from the original project. The local industrial enterprises are under utilized so both the industrial and domestic wastes have decreased. This allowed the water purification installations to build up capacity reserves, put some of the equipment out of circulation, do repairs, alter earlier decisions, and decrease exploitation costs.

The third flow, diluted with domestic flows from the chemical plant, is completely treated biologically and are channeled for accumulation and evaporation to Bolshoi Liman. A natural depression closed with a dam was used as a water accumulator. It is 40 km^2 with a capacity of 160 mln m^3. The system was expected to totally exclude waste out-flow to the Volga: all wastes are either recycled to production facilities or sent to the zone of complete purification (ZCP) and Bolshoi Liman.

A year ago, part of the especially toxic wastes flow was channeled for burial underground 1 m. The buried wastes are monitored through checking water from periphery holes. The industrial water supply and water disposal was designed and commissioned in the late fifties-mid-sixties. The solutions were based on the then current water wasteful technologies.

The design of the Volzhsky industrial complex made wide use of dividing the flows and recycling the purified industrial wastes into basic technological lines. Other solutions were tested: purification of cooling water of heating pollutants, disinfection with ozone, etc.

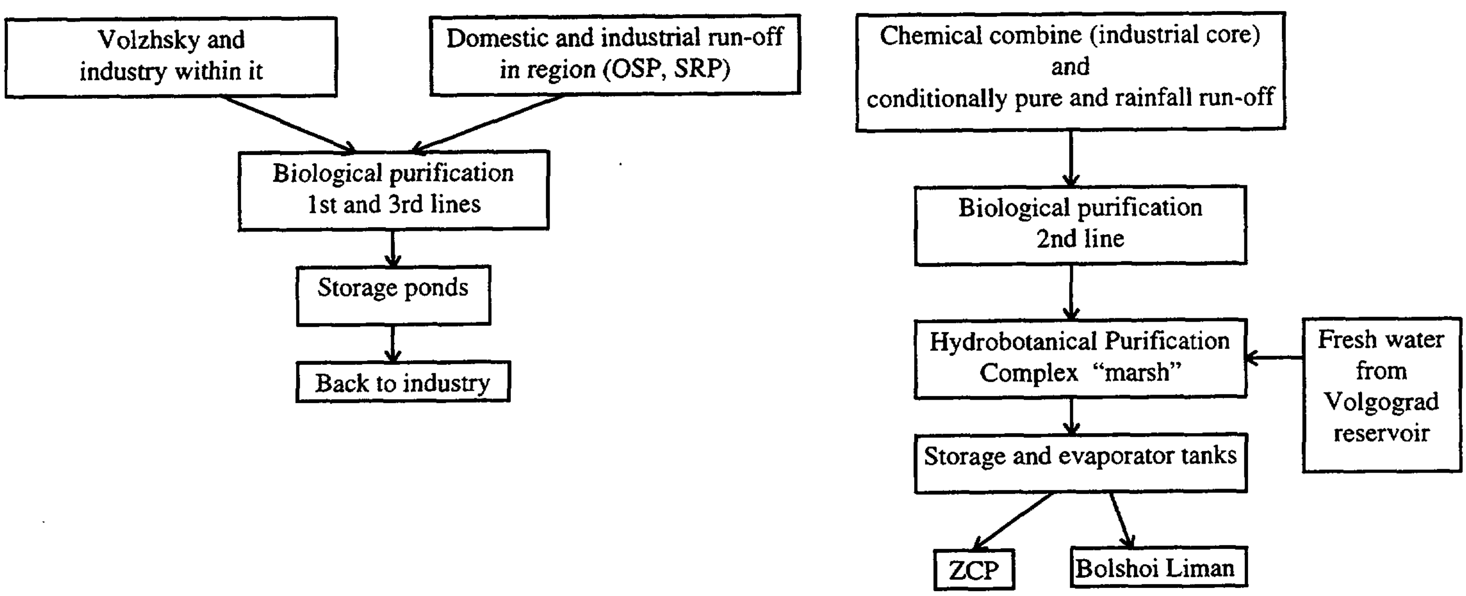
Certain changes have been introduced because of additional technological elements and the changing situation in industry obvious in the last 4 or 5 years.

Still, the current requirements of environmental protection bodies impose on the enterprises the task of creating closed water circuit or even a zero discharge water supply system. Its basic prerequisites have been already set up at the Volzhsky enterprises.

2.10.2 Wastewater Generation and Handling

Industrial and Municipal Waste Flows

We present below a schematic illustration of the industrial and municipal wastewater treatment process.



Simultaneous concepts of water-saving technologies were formed together with ideas of setting up complex water supply and water disposal systems. The goal of water treatment for recycling purposes should be set up to replace the present purification installations' functions.

Today, industrial water supply makes use of purified industrial and domestic wastes aimed at:

- cutting down water intake from the water supply system by switching to a new and improved technology of finished and semi-finished products that substitute water-intensive processes for those using less water or using no water; and also producing little or no run-off (TEF-technology). They can be, and should be, designed for this industrial complex, provided better technologies are used in the main production facilities;

- use of the already existing and designing of new purification methods of local run-offs to fit the already existing standards of water quality and to obtain some by-products;

- final purification on purification facilities outside plants to meet the same standards for industrial water and its recycling into the production process.

Various levels of contaminated run-off generated by the numerous enterprises reach common purification installations outside them and are sent back in various volumes to be used for technological purposes. Because of this situation, it is hard to establish how the run-off of each of the plants affect the total flow and level of contamination. In our case, the industrial complex has not been contemplated as an individual entity. This requires a system analysis which is theoretically possible only with a detailed discussion of its component parts. Yet, one can say that many of the plants would wish to maintain the collective system of purification of conditionally pure and rainfall run-off. The plants' wastes are less polluted than the recycled water they get; and the owners of the water purification facilities established rigid limits on run-off and imposed sanctions for violations that are not always justified.

A closer inspection of two production facilities at the Organic Synthesis plant and one at the Synthetic Rubber Plant (SRP) has demonstrated a possibility of completely or in part liberating from dependence on the VNOP or cut dramatically the amount of equalized industrial water at the least. This can be done by a more efficient use of their own local water purification installations (biological purification at the Organic Synthesis plant and a cartridge filter at SRB) and existing balancing reservoirs that allow to recycle the water with fresh water added. Recycling may increase if the already existing cooling towers are used, more cooling towers are added, and if the cooled water is more fully used in the basic technological cycle.

<u>Biological Purification Installations At VNOP</u>

VNOP Ltd. is using biological purification installations of the entire complex organized in three lines:

- 1st and 3rd lines that purify domestic wastes of Volzhsky and the town's industrial enterprises;

- 2nd line dealing with chemically polluted waters of industrial enterprises (mainly from OSP and SRP) of the Volzhsky chemical complex and domestic wastes from the same enterprises.

The designed and actual (as of 10-06-96) amount of purified wastes are as follows:

Category	Amount of wastes in thousand m^3/day		
	1st line	2nd line	3rd line
Domestic	60.0	33.2	68
Chemical	65.0	15.0	--

The 1st and 3rd lines appear to be efficient, that is they produce the required treatment (the levels of treatment are stipulated in an outdated permit, i.e., the levels are not representative of treatment obtained using modernized treatment equipment). Each of them has sand traps, primary settling basins, mixer aerotanks, and secondary settling basins; but no disinfection for purified wastes. They are channeled to storage Nos. 1 and 2. Currently, VNOP Ltd. is facing a problem of how dispose of the water. The owners of the territory formerly used as agricultural irrigated fields refused to use the water.

The sediments from the primary settling basins and surplus activated sludge are fermented in methane tanks and sent to the sludge sites that have been in use since 1968. The original design did not stipulate sludge removal or its utilization.

The 2nd line gets four flows:

- chemically-polluted water of OSP (1)
- chemically-polluted water of SRP (2)
- latex wastes (3)
- domestic run-off of the chemical complex' industrial enterprises (4).

Each of the flows goes through mechanical purification separately; the chains include: sand traps and primary settling basins. The first two flows go through a balancing reservoir that differentiate the wastes flows (after the sand traps). The primary sludge of the first three flows go to slam accumulators. The primary sludge of the first flow together with surplus activated sludge of the aerotanks of the 2nd line are fermented in methane tanks, like the similar sludge of the 1st and 2nd lines.

When mechanical purification of all flows is completed, they are mixed in two mixers and go to 7 sections of corridor mixer aerotanks. The sludge is separated in the radial secondary settling basins. The purified wastes are channeled to the accumulating-evaporating reservoir Stary Liman.

To recreate the working conditions under the full load, the team turned to the materials concerning the purification facilities of the 2nd line for 1987-1990. The information was borrowed from the work journals of the chemical laboratory of the plant's purification facilities.

The exhibits below illustrate the treatment efficiency of the 2nd line worked under full loading (Exhibits 2-15 - 2-17).

A comparison of the incoming wastes run-off (Exhibit 2-15) shows that in the chemically polluted wastes, some pollutants had higher than admissible concentrations. Biological purification of the 2nd line was less efficient than designed (Exhibits 2-16 and 2-17), with over polluted run-offs as one of the reasons for this (Exhibit 2-17). The purification efficiency for such specific pollutants as DMD, SPAM, aniline, oil products was very low (Exhibit 2-16). In 1990, biological purification was obviously working even worse.

Visual inspection of the aerotanks and the secondary settling basins of the 2nd line demonstrated:

- part of the constructions, especially the places where they contact water, crumbled mainly because of the aggressive wastes and because the construction materials used were lower than acceptable quality;

- in the primary and secondary settling basins, the height of water discharges and the lower edges of the collecting and distributing facilities are placed incorrectly that interferes with the hydrodynamic regime and lowers the effect of water clarification;

- aeration system in the aerotanks is partly damaged that interferes with the aeration regime, lowers the aerotanks oxidizing capacity and causes sludging.

EXHIBIT 2-15

Average Annual Figures for Specific Pollutants of the 1st and 2nd Lines

Constituents	Concentration mg/l		
	SR	OS	Designed
SPAM	0.54	32.3	-
CH_2O	559.7	1.96	2.5
CH_3OH	164.4	5.2	1.5
Dimethyldioxane	18.1	-	1.2
Toluene	0.7	-	0.27
Oil products	1.63	0.24	0.52
CN	-	0.31	-
CS_2	-	0.01	-
Aniline	-	17.1	2.24
Sulfides	-	0.89	1.0

EXHIBIT 2-16

Reduction in Constituent Concentrations Through Treatment (%)

Constituents	1987	1990	Designed
Methanol	75.0	44.7	99.2
Formaldehyde	77.8	56.0	78.6
DMD	15.7	95.7	
Toluene	45.0	59.9	46.7
SPAM	33.5	23.8	81.3
Oil products	89.0	36.0	87.5
Aniline	58.2	50.0	84.0
Hydrogen Sulfide	50.8	40.0	70.0
Caprolactone	81.8	59.9	20.8
COD	62.5		70.1

EXHIBIT 2-17
Biological Purification Stage

	Concentrations (mg/l)			
	1987		Designed	
Constituents	**Before Aerotank**	**After 2nd Basin**	**Before Aerotank**	**After 2nd Basin**
Methanol	8.6	2.15	1.3	0.01
Formaldehyde	30.8	6.8	1.4	0.3
Toluene	0.82	0.45	0.15	0.08
DMD	1.52	1.01	0.7	0.03
Oil products	4.6	0.5	0.8	0.1
CÅÇé	2.9	1.95	1.6	0.32
Aniline	13.9	5.8	1.25	0.2
Caprolactone	32.0	5.8	12.0	9.5
CN	0.88	0.43	--	--
CS_2	0.007	0.004	--	--
Sulfides	0.52	0.26	0.4	0.12
COD	938.0	51.0	790.0	165.0

2.10.3 Pollution Prevention Alternatives

The team believes the following measures should be taken in relation of the 1st and 3rd lines of the biological purification installations:

- utilize biogas from the methane tanks using a known technologies;
- search for technologies that would discontinue accumulation of fermented sludge on the sludge sites and use dried sludge that has already been accumulated;
- look at a possibility of recycling purified water for industrial water supply.

The team already pointed out that biological purification of the mixed wastes (domestic and industrial) at the VNOP purification facilities produce purified wastes and sediments, including sediments from primary settling basins and surplus activated sludge. In the past, the wastes were channeled to agricultural irrigated fields (ZCP) where industrial crops were grown. In today's market conditions, the new landowners are no longer willing to grow technical crops. So they do not need the water and sediments as fertilizers. The water polluted with heavy metal salts and harmful chemicals cannot be used to grow other crops: they need different water and different fertilizers. On the other hand, the water's high quality allows its industrial utilization. This will probably require disinfection. The water may be channeled to the places where no personnel contact is possible. In this case, no ozone or chlorine treatment is needed. The team believes that chlorine should be avoided because an increased recycled water supply coefficient will increase the chlorine content and may exceed the norms for chlorine ions in industrial water.

In connection with the above and also taking into account that dehydration and accumulation in the storage facilities are not the best solutions, the team proposes two ways of treating fresh sediments.

1. The sediment should be treated with the oxygen of the air in an alkaline environment to transfer the organic part into the salts of huminian acids and the inorganic into construction material. The method is patented. This facility uses pumps to send sludge suspension into the dosators from which the suspension is sent into the hydrolysis installation by pressed air. Under high pressure and high temperature, the sludge is processed and is then alkalized and oxidized. The resultant suspension on the filter-press (öÅÇèî, for example) is dehydrated and sent to be processed into construction materials. The filtrate is thickened, packed, and used as an agricultural preparation ÇâÉÄèÄÉ. The content of the heavy metal salts is lower than the EC standards while treatment of one ton of the dry sludge substance is not more than US $190.

2. Under another Russian patent, sludge suspension (5-30 g/l) is introduced into the technological cycle at production of sulphur-free organic fuel. Surplus-activated sludge (SAS) undergoes hydrolysis in an alkaline medium. Freed from part of suspended matter, the biomass is sent to the evaporator plant to be compacted. Compacted to 75-80%, the hydrolysate becomes a sulphur-free fuel with high heat and physical descriptions. It is sent to be burnt in a sodium regeneration boiler (SRB) where high-pressure steam is produced. It feeds evaporation plants and heating systems. In this way, biological wastes treatment becomes both regulated and self-paying. The sediment is sulphur-free fuel and brings profit in the form of heat and sodium recovered from the SRB. There is even more profit because the wastes are not stored and there is no need to pay for it. The designers calculated that this technology brings in US $50-70 per 1 ton of SAS, while the traditional utilization methods required over US $400 to be spent. The new technology has other advantages over currently used methods: it does not produce toxic smoke which deprives these methods of any perspective. The current technologies of burning substances which contain chlorine under the temperature of below 1000°C produce ecologically hazardous polychlorine dibenzodioxines (dioxans) and furans. Even if burned in a furnace under 900°C (e.g., with suspended sediment layer), the burnt substance should remain in the flame for no less than 2 sec which is practically

impossible to observe in the existing systems. The suggested technology burns the hydrolysis products (sulphur-free fuel) in a SRB under 1000-2000°C with over 2 sec in the flame in a highly alkaline medium. The conditions observed reduce the toxin effluents (after electrical filters) to the rigid European standards for incinerators. For example, the dioxane content in off-gas is not over 100 pkg/m^3 in normal conditions.

As for the 2nd line of biological purification installments, the team believes that maintenance and reconstruction are overdue. The data for the waste that reach the 1st, 2nd, and 3rd lines testify that the 1st line is under-loaded and can treat the wastes of the 2nd line. The amount of chemically-polluted wastes is not large.

The following urgent points should be done for the maintenance and reconstruction of the 2nd line:

- complete restoration of all ruined constructions with the help of high-grade concrete and anti-corrosion insulation;
- replacement of smooth water discharge edges of the collecting equipment with clogged water discharges; height correction of the central cylinders' lower edges;
- reconstruction of the aeration system in aerotanks. Cloth aerators can be recommended;
- installation of latest monitoring and measuring devices to be connected with the central dispatcher office.

The above analysis allows the team to believe that the most urgent measures will revive the 2nd line installations to their primary (designed) state, but will not increase their efficiency to reach their designed state. This can be done through two sets of measures:

- reconstruction of the water utilization and water discharge systems at OSP and SRP that would decrease their wastes pollution that go to purification:
- technological improvement where purification directly at the 2nd line of purification installations is concerned.

Section 2.9 describes the measures at VO that ignores possible technological changes in the main production process. Nonetheless, the main water user among the chemical plants, the Synthetic Rubber Plant, was not included as a part of this specific study.

The measures for improving the purification technology should aim at deeper microbiological oxidation of the specific biological pollution of wastes. The biological impurities in the chemically-polluted wastes have different oxidation specific speeds by mg BOD_{comp} per 1 g of dry matter of activated sludge. The figure for Caprolactone is 22, acetone 28, methanol 23; for aniline and toluene, correspondingly, the figures are 9 and 8. This makes two-stage biological purification feasible. There are two possible variants. Under the first of them, the earlier part (as the water flows) of mixer-aerotanks is transformed into biotanks by introducing filling. No separation of the sludge mixture after the 1st stage of aerotanks is needed. Under the second variant, after the 1st stage of aerotanks (without fillings), the sludge mixture is divided by pressurized flotation (to replace the traditional settling). This will improve the quality of primary sludge, because it will no longer depress activated sludge in anaerobic conditions of settling. It increase the sludge quantity in aerotanks of the 1st stage to 10-15 mg/l. The volume correlation of the 1st and 2nd stages under the first and second variants should also be determined.

More technical and economic studies are needed to select the best variant. It will be useful to set up an automated management system for the BWP complex.

2.10.4 P2 Opportunities for Wastewater Effluents Generated at the Other Three Study Facilities

2.10.4.1 Volzhsky Plant for Tire Recycling and Repair (VPTRR)

The VPTRR includes two basic productions:

- recycling in buildings P10 and P15
- retreading in building P47.

The retreading production issues reclaimed thermomechanical rubber (TY 38108053-89) and rubber crumb from vulcanization waste. With the designed capacity of 17.3 thousand tons per year of reclaimed rubber and 5.3 thousand tons of crumb a year the plant produces correspondingly 5.75 thousand tons and 0.734 thousand tons a year. The plant was commissioned in 1968. During inspection, the plant was working at night to cut electricity costs.

The production is based on the thermomechanical method where retreading is intensified through activators. The tires are not washed although there is a bay for refuse washing and drying. Dispersion can be used as an alternative.

The tire repair facility produces retreaded pneumatic car tires and tubeless tires. With a designed capacity of 283 thousand units/year in 1995, actual output dropped to 17.5 thousand units. The facility has been functioning since 1961.

Before the expert team reached Volzhsky, they could not determine from the provided information how much water the facility consumed and discharged. Accordingly, it was hard to guess the plant's water consumption and discharge needs.

A visit to the plant produced materials that outlined the general situation. The materials have to be verified because of the lack of consistent figures for the same quantity among different documents. The qualitative descriptions of run-in and run-off should be specified.

One can surmise that the plant receives technical water from VNOP as purified recycled water that corresponds to the Specs. According to table-specification No. 2 of the technical water quality sent by VNOP Ltd., the water should have the following qualities:

pH--6.5-8.5
alkalinity--1.0-3.0 mg-eq/l

hardness--2.0-7.0 mg-eq/l
sulfates--150-500 mg/l
chlorides--100-350 mg/l
iron--0.1-1.0 mg/l
oxidability--10-15 mg/l
suspended matter--50 mg/l
temperature--14°C.

The plant's laboratory discovered deviations such as:

suspended matter--55.5 mg/l
temperature--26°C
residue density--880 mg/l (sometimes contained large suspended matter.

The plant also receives steam without returning condensate and drinking water for domestic use. Water is used for the following purposes:

- in the retreading shop recycling cooling system;
- for equipment cooling in the repair shop;
- for tire washing in the repair shop;
- in the washing cars recycling system (This was not mentioned in the materials transferred to the team).

The plant installed a mesh filter to remedy the divergence from the quality of turbidity-free recycled water required by the Specs. Higher temperature (26°C versus the required 14°C) interferes with the repair shop's recycling system functions. Something should be urgently done to cool it. So far, there is no solution to the problem.

The water used for tire washing is sent to local purification and information about it could not be obtained.

The conditionally pure wastes sewage system receive:

purging waste water of the recycling cooling system of the retreading shop--57 thousand m^3/year;
cooling wastes of tire repair shop
tire washing wastes in the repair shop
steam condensate--52 thousand m^3/year
storm run-off--47 thousand m^3/year.

The wastes quality (without storm run-off):

ph--6.5-7.5
suspended matter--15-36 mg/l
oil products--2-4.5 mg/l
dense residue--250-350 mg/l/

How to overhaul the existing water consumption scheme without interference into the basic technology.

1st stage

Switch to the use of the cooling waters and purging retreading shop recycling cooling system wastewater. This requires an additional reservoir to collect waster, another pipeline, and a pump to move the wastewater from the retreading shop to the repair shop.

2nd stage

1. Collect steam condensate, cool it, and use in the retreading shop recycling cooling system and for cooling repair shop equipment. This will require another reservoir, a pipeline system, a pump plant, and cooling towers.

2. Collect and purify rain run-off for the same purpose stated in #1. This will require a rain net and a purification plant. Surplus of reclaimed rain water can be used to irrigate the territory and plantings during dry seasons.

3. Install monitors at all water consumption lines to create a balanced consumption-discharge.

The above suggestions should be supported with ecological and economic calculations when more specific information about the quality and quantity of the water consumed and discharged is received. This should be combined with the plant's general layout where inputs, outputs, and purification installations are shown. The suggestions do not account for a possible change in the technology's water intensity suggested by the team.

2.10.4.2 Volzhsky Orgsynthesis (VO)

The plant produces a wide range of important chemicals that ensure uninterrupted functioning of many, including neighboring, plants. We have contemplated information about water consumption by the plant's two production units (Shops 2 and 5). The plant has four water recycling systems and two make-up systems using river water and the reclaimed water from the central clarification of wastes that serves the entire plant.

River water is channeled to the plant where it is divided into two flows: one is chlorinated and channeled for domestic use, another, upon purification, is sent for industrial needs to produce b-naphthol and methionine. Today, production is decreasing and the plant's administration plans to close down, or at least, cut b-naphthol production to 4,000 t/year. The plant is currently looking into altering some of the basic technologies to decrease water consumption and discharge.

The wastes of methionine production are sent to the local biological purification station, they are then ozonized and discharged into a 1.8000 mln m^3 pond. A portion of especially polluted wastes from other productions are sent to storage reservoirs to be pumped underground 1 km. Every day, 4.3 thousand m^3 are disposed this way. The conditionally pure wastes (rain run-off and cooling wastes) are also sent to the same pond (1.8 mln m^3).

This solution to the problem of how to dispose highly concentrated sulphide-sulphate wastes is open to doubt. The impossibility of their emergence either on land or into the Volga is not guaranteed. It would be advisable to resume selling these wastes to the nearest pulp-and-paper factories in Astrakhan and the Mari republic. One ton of methionine combined with 2 tons of sodium sulphate is eagerly bought by other enterprises. It seems that sodium sulphate, a by-product of b-naphthol production, will find a market after more processing.

According to the plant's reports, the present overall plant river water consumption reaches an average of 30.127 thousand m^3/day. Irrevocable water consumption is 13.012 thousand m^3/day, or 43.2%. We believe that is it necessary to revise all gas exhausts, identify the pure steam exhausts, condense them, and recycle them back into production. Even if half of the irrevocably used water is re-used as industrial water, no less than 20% of the total water consumption will be saved.

The slime should be separated and the water recycled for its transportation if 4.3 thousand m^3 of slime water is discharged per day (total water discharge being 19.0 thousand m^3/day). The evaporation and draining losses taken into account, over 10% of the total water consumption will be saved.

The conditionally-pure and domestic and black wastes can be recycled for recycling system content material. Naturally, some water will be lost through evaporation and drainage into the pond's bed. Still, the remaining water will be enough for the system.

This can be done after ozone disinfection, for example, at standard purification installations for domestic and black wastes, and also after mechanical purification of the conditionally clean wastes. The plant has experience with ozone purification. Purified and disinfected domestic and black wastes should be sent, along with conditionally-clean wastes from the production zone to the settling pond (V= 1.8 mln m^3). The pond's inlet and outlet should be moved further apart to let the wastes remain longer thereby increase the pond's purification potential. It is suggested to build a dam or other barrier to remove the zones of stagnation and extend the time. Natural aeration and removal of suspended matter will be more efficient; the same will be probably true of pathogenic microbes.

To increase purification efficiency, surface aerators at inlet and even at outlets can be used which will make the pond an aerated pond. Sprinkling systems can be used for hot periods to ease water evaporation and cooling. If the bed is covered with concrete, or even without this, the reservoir in front of idling pump station No. 230 for pumping rain run-off can be used. It can serve as a primary settling reservoir. This will allow complete biological purification of the domestic and black wastes with an average BOD_5 of about 40 mg/l (the maximal figure being 107 mg/l) and pH = 6.5-9.0. Upon ozone treatment the water can be channeled for any industrial purposes.

Measuring and monitoring equipment installed at the OSP and at other industrial enterprises will cut total water consumption by 5-10%. It should be installed at the inlets and outlets and also in the main production units and large pieces of equipment. It is feasible to mathematically simulate the material and water flows at the OSP and other plants. This will allow monitoring of the volume and content of the plant's industrial water and correct the situation as needed.

2.10.4.3 Volzhsky Abrasive Plant (VAP)

After study of the plant's main production shops 1995 water consumption and water discharge balance, the team concluded that no solutions and suggestions could be made on the data's strength. The balance does not show inflow of all water types (1268m^3/day or 437.46 thousand m^3/year) and their discharge (548m^3/day or 189.06 thousand m^3/year).

Information about water used by four main production units (electrical melting, crushing and screening, abrasive instruments and silicon-carbide abrasive tools) allow no conclusions since they utilize only 8.9% of drinking water, 22.9% of industrial water, and 26.2% of hot industrial water. The rest is used by other shops or sold to other consumers.

2.10.5 Conclusion

The preliminary expert conclusion on water consumption, water discharge, and purification of wastes looked at the systems of water consumption, water discharge, and treatment of wastes at the enterprises of the Volzhsky industrial agglomerate. The Volzhsky Tire Retreading and Repair Plant, the Plant of Organic Synthesis and the Plant of Abrasive and Grinding Instruments were used as examples. The team also studied the biological purification installations of the Volzhsky Nitrogen and Oxygen Plant used by all industries in the agglomeration for mechanical and biological treatment of domestic and industrial wastes.

Suggestions were made on how to improve water consumption, water discharge, and local wastes treatment that did not account for possible alterations in the currently used technologies. There are suggestions on how to improve the scheme of mechanical and biological purification. Technological changes will inevitably change water consumption and wastes discharge. There are alternative solutions for processing and utilization of wastes sediments.

2.11 Summary of Recommendations for all Four Study Facilities

2.11.1 All Facilities

Medium-Cost Measures

(1) Re-training of personnel at seminars, or in any other way, on the following subjects:

- modern methods of industrial waste management: local and regional aspects. Cost: about R50 mln;

- modern methods of calculating costs of waste formation, irrational use of resources and environmental pollution. Cost: about R100 mln.

(2) Short-, medium- and long-term waste management programs created jointly with the experts and the Volzhsky and Volgograd environmental committees (more rational use of resources). Cost: about R50 mln per an enterprise.

(3) Coordinating the ecological passports with the real content of emission, discharges and wastes; their volumes and hazard class using the independent experts' experience. Cost: about R50 mln per a passport; efficient efforts will identify 20 to 50% of unregistered pollution sources on top of those registered in the passports.

<u>High-Cost Measures</u>

(1) Centralized telemetric systems at each enterprise to collect and process information on in-going power streams and liquid waste and structuralized power and water balance based on this information. Average cost: R1500 mln for each of the systems; net efficiency (technological measures excluded): 5 to 15% less power resources and 10% less water used (see also suggestion on individual enterprises).

(2) Elaborate or adapt the existing mathematical models of the water and power stream to create an ACS for these streams. Cost: from R50 to 250 mln for each stream for one enterprise; average ACS cost R1 bln for each group and each enterprises; net efficiency 10 to 20% less power and water resources used (on top of 1.2.1).

2.11.2 Recommendations for Volzhsky Plant for Tire Recycling & Repair (VPTRR)

<u>Low-Cost Measures</u>

(1) Purchase a tire debeader that will facilitate the removal of bead wire for subsequent sale. Cost: R40,000.

(2) Stop oil leakages (at the repair roller bay), spills of rubble crumble and auxiliary materials (at the RTI bay).

(3) Use waste of the shop's cooling system to wash tires; it involves no investment and saves up to 100 thous m^3 a year of technical water.

(4) Conduct feasibility study to use steam condensate and/or rain water to make-up the cooling system in the tire repair and recycling productions; excess of rain water can be used to water the plant's territory during the dry season. Cost of the feasibility study: about R50 mln.

(5) Insulate the steam pipes inside the plant. Cost: about R2 mln; this will save 800 Gcal/year of heat, or about R100 mln/year.

(6) Stop steam leakages in the tire repair shop; no costs involved; this will save 20 Gcal/year of heat, or about R2.5 mln/year.

(7) Conduct feasibility study on partial use of heat energy used to cool water clearing plant in the tire repair shop and technical water of the 1st cycle of the tire recycling

shop to heat the plant in winter. Feasibility study cost: R50 mln; potential efficiency, 5000 Gcal/year of heat, R600 mln/year.

(8) Start its own production of tire repair materials in two new internal mixers PC-140 (PC-90) that costs about R30 mln each. This will decrease the share of materials in the products' cost by 10 to 15%.

(9) Start removing metal wire from bead rings with the help of an American device that should be bought and used. Cost: R35 mln. With the production facility loaded to capacity this will produce additionally 1400 t of steel scrape metal and 1400 t of rubber waste to be sent for recycling.

(10) Conduct feasibility study (business plan) for production of construction materials based on cordage fibre waste. Business plan will cost about R50 mln; loaded to full capacity the production will process 2200 t/year of cordage fibre waste; products will be sold.

(11) Create a program and/or norms of economic incentives for VPTRR, together with the Volzhsky and Volgograd environmental committees, the administration of both cities. It should take account of international practices and encourage the plant's nature-protecting and resource-saving role in the region and the Lower Volga area.

Medium-Cost Measures

(1) Replace the now used universal device for cutting car and truck treads with AìÅé1180-380 ¿¡ñ. 326.454 that costs about R300 mln. This will raise labor productivity by 1.5 times and lower power consumption by 13%.

(2) Start retreading foreign-made tires for which vulcanizing molds to be mounted on the existing equipment should be bought. Cost: R50 mln each; this will allow to increase production load by 10 to 20%, depending on the type range.

(3) Start remolding side walls of tires by repairing üÇìiê-2 or buying similar new equipment. Cost: R120 mln; this will increase the volume of production by 8-10%.

(4) Set up a tire shredder äìé-2-400, produced in Russia, for primary shredding metal corded tires, a crusher äìé-2-310 ¥î, a magnetic separator ÅüæÉ-60/50. Cost: R1.2 bln; efficiency being determined by the quantity of metal corded tires reprocessed.

(5) The now used roll crushers should be replaced with rotor powder dispensers of 100-140 kg/h productivity. Cost: R280 mln per a unit, the quantity needed should be determined by the initial material supply. They crush shredded textile and metal corded waste. This will save up to 200 kWh/t, 40 m^3/t of cooling water and will allow to produce a new type of product: finely divided rubber powders that enjoy unlimited demand both inside and outside the country.

High-Cost Measures

(1) Rotor dispensers should be used as a basis for a complete line of recycling textile and metal corded tires. Cost: about R2 bln, efficiency being determined by the material supply.

(2) Set up a system of heat-transfer agents control. Cost: R560 mln. It will save 800 Gcal/year of heat and 450 MWh/year of electric power.

Potential Measures[3]

(1) Creation and mastering of a deformation-ozone breakdown of bead rings or/and tires as a whole. Costs are being specified.

(2) Creation and mastering of cryogenic-gas explosive breaking down of tires before they are powdered. This will be the first device in a line similar to that suggested in point 2.3.1. Additional cost: R2.5-3.5 bln, depending on the material supply.

(3) Creation and mastering of a tire thermal destruction installation using superheated vapor. The production volume of 6-7 thous t/year will involve spending R6-7.5 bln depending on the processing depth.

(4) Setting up own boiler plant to use some of the waste types that are not being used now. This includes industrial waste disposed at landfills. This will ensure the plant's independence in some types of fuel and lower their share in the products' costs. Depending on the boiler plant's productivity it may cost from R2 to 5 bln.

2.11.3 Recommendations for Volzhsky Abrasive Plant (VAP)

Low-Cost Measures

(1) Revise the balance between water supply and water discharge to eliminate inconsistencies identified by the experts and described in the present report.

(2) Set up portable gas analyzers FYRITE-4 to control fuel burning efficiency in the boiler plant and to optimize the boilers' operation charts and their exploitation. Cost: R13.5 mln per a set, that will save 3% of natural gas and R19 bln/year.

(3) Prevent scattering of raw material on the way from the quarry to the plant and dust pollution of the environment when dust waste is taken to a landfill. In this way 2 to 5% of raw material is saved.

(4) Conduct feasibility study or a business plan to partially switch the production of SiC powders to a synthesis on furnaces with a quasi liquid layer and master production of highly dispersed pure SiC powders for structural ceramics, including the use of the now closed down facilities. Cost of a business plan: about R50 mln.

[3] Potential processes that should be investigated in the future.

Medium-Cost Measures

(1) Organize processing of industrial products that were, and are, disposed to a landfill on the sand quarry's territory. Cost: about R150 mln, potential sales of waste processed into road-building material R250 mln/year.

(2) Identify all sources of dust pollution and elaborate a business plan of supplying them with modern means of dust suppression and selective dust separation. Cost: about R150 mln, about 1000 t/year of selectively collected dust waste can be sold as products.

(3) Conduct feasibility study or create a business plan of an investment project on partial or complete stage by stage switch to produce lump SiC by synthesis in chamber vacuum furnaces of batch operation recommended in the present report. Cost of a business plan: about 100 mln; transition to the vacuum technology will potentially decrease power consumption by 2 times, water resources (on the operations of producing lump Sic) by 10 times, increase the yield up to 90%, completely eliminate gas emission and improve the product's quality.

High-Cost Measures

(1) Set up a system of catalytic reburning of CO on one of the air paths of a furnace of CiO synthesis based on catalysts produced in Russia. The test results will decide whether it is expedient to do the same on the four other air paths. One turn-key system costs about R1.2 bln, efficiency is determined by a possible decrease of CO emission by 70%.

(2) Replace the now used crushing-grinding-grading equipment with modern technological lines based on vibrators of the latest generation produced in Russia. Cost: about R500 mln; this will decrease specific power consumption by 3 times while increasing power productivity by 20%, cut the serving staff by 50% and current expenses by 50%.

2.11.4 Recommendations for Volzhsky Orgsynthesis (VO)

Low-Cost Measures

(1) Study the discharges into the air, separate pure vapor discharges to condense it and recycle into the technological process. Cost: about R20 mln, this will save 20% of the general use of fresh water.

(2) Reuse of water separated from sludge streams, volume about 4 thous m^3/day, to transport sludge. Cost: about 15 mln; 10% of the total use of fresh water will be saved.

(3) Coordinate the technological regulations and the ecological passport and the real production process where the real volume and range of chemically polluted waste water and solid wastes of alkaline melting of double salt are concerned.

(4) Supply production facilities with stainless steel stuffing boxes. Cost: about R50 mln; there will be up to 6% more 2-naphthol and less toxic liquid wastes produced by vat residue granulation.

(5) Conduct feasibility study or elaborate a business plan for a technological line in the existing 2-naphthol shop that would accumulate new technological and organizational solutions, including those made within the UNIDO project, and take out of exploitation outdated equipment and technologies.

Medium-Cost Measures

(1) Improve water purification in the settling pond by ozone treatment, extending natural aeration or using artificial aeration by electric or wind-driven aerators made in Russia. Cost: R100-200 mln depending on the chosen variant; efficiency for the entire enterprise is determined by a possibility to use the entire pond (that contains 1.8 mln m^3) for production needs.

(2) Alter the structure of managing the plant's power supply: maintenance of the relevant equipment should be entrusted to the office of the chief power engineer; saving power should be described as the plant's priority task; hire more skilled technicians and qualified engineers to serve the power supply complex; restore the shops' power supply systems to the norm. Cost: about R500 mln, this will save about R300 bln/year for the plant as a whole.

(3) Set up steam traps on steam using devices. Cost: about R100 mln; that will save 15,000 Gcal/year of heat and R1.8 bln a year.

High-Cost Measures

(1) Set up a centralized telemetric system to collect and process information on the power streams. Cost: about R3.5 bln; this will save 6600 MWh/year of electric power and 76,000 Gcal/year of heat, R10.5 bln/year.

(2) Set up a purification plant for technical naphthalene before it put into production process. Cost: about R5 bln, consumption of naphthalene will drop by 20%, the volume of liquid waste by 20%, the waste itself becoming much less toxic. As an alternative purified naphthalene can be bought; its price is R3.1 mln/t.

(3) Replace the process of separation water from naphthalene with a process of crystallization of the emulsion in a special device. Work out a technology of processing the resultant waste into saleable products. The costs and the efficiency were determined by the Orgsyntez plant, that had developed the process.

(4) Replace the old smelters with modern ones. Cost: about R1 bln for 2 smelters; this will remove tar-waste and make maintenance cheaper.

(5) Rebuilt the obtaining furnace to make it usable to burn vat residue or replace it with a furnace using circulating quasi liquid layer made in Russia. Cost: about R1.5 bln, no vat residue which today reaches 800 t/year.

Potential Measures

(1) Conduct R&D to optimize separation of double salt out of sulfated material by setting up a pH control system in separators. The costs and efficiency were determined by Orgsynthesis plant that had elaborated it.

(2) Together with the Research Institute for Organic Intermediate Products and Dyes design modern equipment for the filtration stages of double salt suspensions, sulfated waste from the stage of washing out 2 naphthol from raw 2 naphthol. R&D will cost about R1.5 bln.

2.11.5 Recommendations for Volzhsky Nitrogen-Oxygen Plant (VNOP)

Low-Cost Measures

(1) Set up a new, or use the existing, facility as a surge tank to level down steam pulsations at the entrance to the purifying facilities. Cost: about R50 mln; this will prevent badly purified waste from being sent to the recycling system of industrial water supply.

(2) Conduct feasibility study or create two variants of a business plan of processing the accumulated and accumulating sludge. This should be based on the processes known in Russia and using hydrolysis of the sludge's organic parts. The result is salable products made both of the organic and mineral parts. Business plans will cost about R50 mln each. It is expected that the new technologies will save R200-300 thous/t of sludge and will prevent environmental pollution caused by sludge disposal in the industrial zone.

(3) Conduct feasibility study or create a business plan to upgrade purification of chemically polluted waste through deep microbiological oxidation of specific organic pollutants. Cost: R30-50 mln.

(4) Conduct feasibility study or create a business plan for measures to use sewage gas from the methane tanks according to one of the known technologies. Cost: about R50 mln.

Medium-Cost Measures

(1) Repair and reconstruct the 2nd line of purification facilities, restore the crumbled constructive elements, optimize the geometry and location of the overflow rims, aeration system of the aerotanks and placing control and measuring instruments. Cost: about R500, this will restore the designed quality level of the 2nd line.

(2) Set up a centralized telemetric system to collect and process information on power streams on the purification facilities. Cost: R450 mln., this will save 1500 mWh/year of electric power and R275 a year.

High-Cost Measures

(1) Set up production facilities to process the accumulated and accumulating sludge. Costs and efficiency are yet to be determined.

(2) Complete the existing purification installations with a complex of tertiary treatment of chemically polluted liquid waste by deep microbiological oxidation of specific organic pollutants. The costs and efficiency are yet to be determined.

(3) Set up a system of utilization of sewage gas from the methane tanks. The costs and efficiency are yet to be determined.

SECTION 3.0

WASTE MANAGEMENT STUDY

As part of the UNIDO project for hazardous and solid waste management and waste minimization for the region of the City of Volzhsky, we prepared a basic study to devise a waste management concept for the region.

As the first part of this study, a field trip and fact finding mission was conducted in both Moscow and the City of Volzhsky during week 47, November , 1995. After this mission, additional information was submitted to the consultant.

A second mission to the City of Volzhsky took place during week 44, October/November 1996. During that mission, additional information was collected and a concept for the implementation of a control system for municipal and industrial waste was presented to the Volzhsky City Committee for Environment Protection and Natural Resources (VCCEP). The concept was discussed and immediate and future activities were outlined.

3.1 Objectives of this Section

There are two objectives of this report:

⇒ analyze the present situation of waste management in the City of Volzhsky and outline activities to achieve a waste management system, which meets current standards.

⇒ analyze the current waste management situation in the City of Volzhsky regarding it as a model for similar situations in other cities or regions of Russia and outline an approach to improve the situation there.

3.2 Meetings and Sources of Information

Meetings and discussions during both missions were held with the following persons:

Name	Institution, Company
Mrs. Olga Varlamova	ICF/EKO
Mr. Oleg Padalko	ICF/EKO
Mr.Gennadiy Gustomiasov	Volzhsky City Committee for Environment Protection and Natural Resources (VCCEP) Head of Committee
Mrs. Zinaida Nuzshdina	VCCEP, Deputy Head
Mr. Oleg Markov	VCCEP, waste management specialist

The following sites were visited:

Site	Company
Waste Water Treatment plant	City of Volzhsky
Landfill No. 1	Volzhsky Bearing Plant-15
Landfill No. 3	Cooperative Aljians
Landfill No. 5	Volzhsky Orgsynthesis
Landfill No. 8	?
"Big Estuary"	?

3.3 Description of the Current Situation of Waste Management in the City of Volzhsky

The description of the present situation is made on the basis of the received information and on the information collected during the field trips to the City of Volzhsky.

3.3.1 Legal Situation, Regional and Local Regulations, Specifications, Standards and Guidelines

In the Russian Federation there are no specific laws for the protection of water or for waste management. The basis is the environmental law.

3.3.2 Licensing of Companies for Waste Collection, Transport, Treatment and Disposal

There is a requirement for companies, which collect, transport, treat or dispose waste to have a licence. The licence is granted by the Regional Committees for Environmental Protection. At present there are no general outlines for the Russian Federation for the requirements for the companies to obtain such a licence or for the regional committees on how to grant the licence. Therefore , the regional committees have to develop their own criteria.

For the Region of Volgograd, the specification of the requirements will be finished in 1997.

3.3.3 Structure of the Committee for Environmental Protection in the City of Volzhsky (VCCEP)

The VCCEP is headed by Mr.Gennadiy Gustomiasov; the vice head is Mrs. Zinàida Nuzshdina.

In the VCCEP, there are 5 groups of inspectors:

- air pollution (2 inspectors)
- water protection (2 inspectors)
- waste management (1 inspector, Mr. Oleg Markov)

- moving polluters (1 inspector)
- collection of environmental fees (1 inspector)

Staff for administration is not included.

3.3.4 Environmental Laboratory

There is also a laboratory for environmental analyses in the City of Volzhsky. The laboratory is funded from the environmental fund of the City of Volzhsky. The head of the VCCEP advises the head of the laboratory. But the laboratory is not part of the structure of the VCCEP. Budget and administration also are separate.

In the laboratory, there are 4 groups:

- water (2 employees)
- air (10 employees)
- mobile laboratory and data collection (3 employees)
- chromatography (2 employees)

Staff for administration is not included.

3.4 Waste Management in the City of Volzhsky

3.4.1 Municipal Solid Waste (MSW)

The amount of MSW, which is collected in the area of the City of Volzhsky is 400,000 m^3 per year. But this figure is based on a theoretic calculation of the VCCEP assuming an amount of waste of 1 m^3 per year per person. Data, which are based on the actual generation of waste do not exist. There are also no data regarding the composition of MSW. The existing data were collected in the era of the USSR. Due to the changes of the political and economical situation and due to the changes of consumer habits these data cannot be used anymore.

The MSW is collected by a municipal company - Municipal Specialised Transport Enterprise (MSTE). It is disposed at the landfill, which is also operated by MSTE.

There are no specific fees collected from the residents of the City of Volzhsky for the collection of MSW. The costs for waste collection and disposal are included in the rent of the apartments. In other towns like Volgograd there are fees for the collection of MSW collected together with the fees for the apartments.

As MSTE is no independent structure, it is financed from the city budget. Therefore, there is no money transferred from the City of Volzhsky to MSTE for the collection and disposal of the MSW.

3.4.2 Municipal Solid Waste from the Industrial Companies

For MSW, which is produced by the local industry at their territories, MSTE has contracts with the specific companies for collection and disposal. There is a fee of US$ 1.60[1] per m^3 charged.

At MSTE, costs for the collection, transport and disposal at the landfill of US$ 1.36 per m^3 are incurred. But there were no figures and information available on how much MSW from industrial companies is collected and disposed by MSTE and how the costs were calculated.

MSTE has 198 employees, of which 64 are involved in collection, transport and disposal of the MSW. MSTE operates 28 trucks for the collection and transport of MSW and at the landfill, the operate one scraper and 3 bulldozers. At present , MSTE has no licence for its activities due to the fact that there exist no licensing procedure. When the requirements for licensing are specified by the Regional Committee for Environmental Protection for the Region of Volgograd in 1997, a licence will be issued to MSTE.

3.4.3 Industrial and Hazardous Waste

The data on the waste production of the local industry, which were forwarded to the consultant, are based upon information from the companies. An independent data base for amount and composition of waste does not exist.

All except one landfill are operated by industrial companies. At these landfills, the waste of the specific companies and from other companies, which do not own a landfill, are disposed. There are licenses, which specify the type and the condition of waste, which may be disposed on the specific landfill. These licences are authorised by the VCCEP. After licensing, the landfills are not controlled anymore.

All landfills, except the landfill of the "Volzhsky Tube Plant" (No. 2), are unlined and do not have monitoring wells or other modern features (such as leachate collection systems). The landfill of the "Volzhsky Tube Plant" is constructed with a bottom layer of clay. There are monitoring wells and a fence around the landfill.

One landfill is operated by the private company "Aljans" - landfill (Nr. 3). The company receives waste, recovers materials (which can be reused) by sorting, disposes the residuals at the landfill, and covers the landfill. The company is licensed to dispose rubber and waste containing asbestos, oily carbon black, slime from purification plants for laundries and refuse from street cleaning. The company collects a fee of US$ 11.10/t independent from the type of waste.

The VCCEP collects a fee from the companies, where the waste is generated. This fee depends on the classification and the quantity of the disposed waste. Each year the companies gain permission for the disposal of a specific amount of waste of a specific category. For this

[1] All fees are quoted in US$ using an exchange rate of 5,400 Roubels for 1 US$ from October/November 1996.

specified waste, they receive "coupons" from the VCCEP. The coupons are collected at the entrance of the landfills. If a company disposes more waste as there are coupons, the company has to buy additional coupons for five times the cost of the first ones.

The coupons include the following information:

- name of the company
- number of order
- name of waste (description)
- quantity [t]
- main components of waste [%]
- physical and chemical characteristics
- state of aggregation
- class of hazard
- required safety measures for handling of waste
- transport conditions

The coupons are approved and signed by the following persons:

- chief of the enterprise where the waste is generated
- person who is responsible for the transport of the waste
- person who is responsible for receiving the waste
- City of Volzhsky Center for the Sanitary and Epidemic Inspection
- City of Volzhsky Committee for Environmental Protection and Natural Resources

At present the following fees are collected for the disposal of industrial waste:

Category of hazard	US$/t
IV	8.44
III	16.89
II	25.33

The categories of hazard are specified according to the Russian classification system for hazardous waste. I is the most hazardous category and IV the least hazardous category. The classification system is discussed below.

For waste, which is classified as category I, there is no fee collected by the VCCEP, because this waste has to be treated and is not disposed at the landfills.

Liquid hazardous waste is burned in most cases at the companies where it is generated. Other liquid wastes, like acids are neutralized or are diluted with water and then disposed along with waste water. The liquid hazardous waste (or part of it) from Volzhsky Orgsynthesis is disposed by deep well injection at a depth of 1,000m.

3.4.4 Organization of Waste Management

Presently, there are no plans for establishing any institutional organizations to work on the issues of waste management. Ideas to involve private companies for collection and treatment of municipal waste have not been discussed.

3.4.5 Hospital Waste

There are no facilities for the safe treatment and disposal of waste generated by hospitals located in either the City of Volzhsky or Volgograd. The amount of specific waste from the hospitals is not known at present.

3.4.6 Facilities for Treatment and Disposal of Waste

Besides the landfills, there are only the treatment plant for used luminescent tubes and a company, which processes waste oil. There are no other facilities for treatment of waste in the region.

The luminescent tubes are treated at the Volzhsky Plant for Chemical Fibres Production. A technology using evaporation and adsorption of mercury on activated carbon is applied. There are no figures available about the capacity of the plant and the amount of tubes treated per year.

Used oils are returned to Volzhsky Oil Base. Volzhsky Oil Base is an oil distributor. Part of the used oil is used as fuel and distributed to other users.

3.4.7 Concepts and Projects for Facilities for Treatment and/or Disposal of Waste

There are no detailed projects besides the VCCEP for the construction of a new landfill. There is a rough concept for the construction of an incineration plant for MSW and industrial waste, but without any details. The construction of a new landfill has been identified as a very important issue because of the limited capacities of the existing landfills.

In a study conducted by ICF/EKO in 1993/94, several general concepts for waste management strategies and for treatment and disposal facilities were developed.

The industries have no plans for building either new landfills or other facilities for waste treatment or disposal.

3.5 General Aspects of the Environmental Situation in the City of Volzhsky

3.5.1 Environmental Action Plan of the City of Volzhsky

The VCCEP elaborated an environmental action plan for the year 1996. The plan includes activities, which are carried out by the companies and activities of the City of Volzhsky.

The activities focus on the reduction of air pollution and the treatment of waste water at the industrial plants to reduce the chemical load at the sewage treatment plant. The activities of the of the City of Volzhsky focus on the improvement of the sewage treatment plant. Projects for the measures to protect the industrial plants from the rising groundwater level are also part of the plan.

There is also the construction of a garbage processing plant included in the plan. But there is no detailed information about the project. For one industrial company - VPZ-15- the reconstruction of the landfill for the industrial waste is included in the plan.

The budget for these activities totals to US$ 4.433 Mio. The budget for the activities of the industrial companies totals to about US$ 4.316 Mio.

3.5.2 Contaminated Sites

All the existing landfills - except the landfill of the "Volzhsky Tube Plant" - can be referred to as contaminated sites without waiting for the results of a detailed investigation. In all landfills materials, which can cause contamination of groundwater - although they may be classified as non hazardous - are disposed. No landfill has any form of a basic liner system and it can be assumed, that part of the disposed materials is beneath the groundwater level. Some of the old landfills are used by the local population for agriculture and small gardening.

Some landfills, such as landfill No.3, are flooded regularly. In the case of landfill No. 3, infiltration of water from the "Big Estuary" into the upper geological layers is responsible for causing the flooding.

Up to now, there has not been any investigations of contamination of the surrounding areas or the groundwater, which is caused by the landfills or the industrial sites, carried out. Therefore, there are also no plans or projects for the remediation of the sites, for groundwater remediation or measures for protection of the surrounding areas and the groundwater.

3.5.3 Wastewater Treatment

Although the treatment of wastewater is not the main issue of this project, the aspect of wastewater treatment has to be considered. As a result of the treatment of communal and industrial wastewater ,sludge is produced. In the past, this sludge was dumped at an area between the landfill for MSW and the wastewater treatment plant. The area is 19 ha and approximately 100,000 t of sludge are disposed there (landfill No. 8). The landfill is partly on fire as evidenced by the presence of smoke and steam.

Results of a chemical analyses of dried sludge from the wastewater treatment plant and from the landfill show, that the sludge is contaminated with metals (zinc, cadmium, lead, mercury, chromium) and that there is a high concentration of petroleum products.

Therefore, the concept of the collection of wastewater has to reconsidered with respect to the separate collection of industrial and communal waste water or with respect to an efficient pre-treatment of industrial waste water before releasing into the collecting sewers.

The treatment and disposal of sludge has to be considered when a waste management concept is elaborated. At present, the use of sludge as fertilizer cannot be considered because of the chemicals present in the sludge.

3.5.4 Groundwater Situation and Monitoring

There are monitoring wells at the landfill of "Volzhsky Tube Plant" and "Volzhsky Orgsynthesis". However, information for only the monitoring wells at "Volzhsky Orgsynthesis" have been made available, and these data indicate that a "considerable" amount of aniline has been discovered.

Data from the analyses of groundwater, water from the "Big Estuary" and the Akhtuba River where presented to the consultant. The data were from the year 1994 and older. These data, however, were not sufficient to describe and evaluate the situation of groundwater contamination in the area.

At present, the groundwater situation is not clear. The hydrogeological description also is not clear. There are two aquifers. The first aquifer is close to the surface. The source of this aquifer is surface water and possibly the Volga River reservoir. This aquifer is contaminated by the infiltration from "Big Estuary", by leakage from the landfills and from the industrial sites. It can be assumed that this aquifer draines into the Akhtuba River.

The second aquifer is beneath the Atelian loams and is artesian. Due to the construction of the Volga River Reservoir and due to unknown constructions, the covering layer of this aquifer was penetrated and water from this aquifer infiltrated the first aquifer and caused (and still causes) flooding of part of the area of the City of Volzhsky and the industrial territory. A study, which was the basis for measures for prevention of the flooding, was elaborated by Expert-Engineering Centre for Ecology of Underground Hydrosphere (EPOS) in 1991/93. This work included only a quantitative analyses and did not take contamination and pollutant transport into consideration.

3.5.5 Drinking Water Supply

The City of Volzhsky is supplied with drinking water from the Volga River reservoir. The water is treated before use. There is no use of groundwater from any aquifer for drinking water. Some industrial plant use groundwater for their water supply.

Some of the local population uses water from the "Big Estuary" as drinking water.

3.5.6 The Akhtuba River

In the report of the "Big Estuary", the danger of the contamination of the water of the Akhtuba River is indicated. Due to the situation of the groundwater in the area of City of Volzhsky it is also possible that contamination from the landfills or other contaminated sites is transported to the Akhtuba River and could cause a contamination of the river water.

The water of the Akhtuba River is monitored on a regularly basis by local organization. There are doubts that the necessary parameters, which would be an indication of a contamination, are being analysed.

The water of the Akhtuba River downstream of the City of Volzhsky is used for irrigation and for drinking water for all settlements along the Akhtuba River.

3.6 Conclusions

3.6.1 General Environmental Situation

The situation at the City of Volzhsky is very complex. The City of Volzhsky was founded about 40 years ago. Since then, all the wastes, which were generated in the area (waste water, municipal solid waste, industrial waste), were disposed in close vicinity of the town (landfills, "Big Estuary"). Therefore, over that period an enormous amount of contaminated materials has accumulated.

The consequences of this disposal can only be assumed at the moment. The available information of the groundwater situation indicates, that an infiltration from the "Big Estuary", from the landfills and from the industrial sites is drained to the Akhtubar River. If this assumption is right, it means that the contamination is brought to the lower part of the Volga River, to the delta of the Volga and further to the Caspian Sea. The population of that area depends on the rivers (Akhtuba River, Volga River) as drinking water supply and as a major fishing area.

An other aspect, which has to mentioned in this context, is the use of water from the "Big Estuary" for irrigation. At this point it cannot be excluded that with irrigation contaminants - especially heavy metals - from insufficient treated industrial waste water or from the contaminated sludge at the bottom of the "Big Estuary" are contaminating the agricultural products.

None of the landfills - licensed or not - meet the technical standards, that are required for the disposal of waste of the present composition (MSW and industrial). The situation of groundwater in the area adds another problem to the already difficult situation.

When the problem of waste management is put forward for solution, the aspects of the contaminated areas and the treatment of sludge from the waste water treatment plant have to be considered as well.

Without a detailed investigation, it can be assumed that the remediation of the whole area is far from being able to be financed. Therefore, all the activities have to focus on the protection of the population and of the environment from contamination from this area. Only the most hazardous sites have to be considered for immediate remediation. These remediation projects have to be included in the future environmental action plan and waste management concept.

A detailed investigation of the contamination of groundwater and soil and of the composition of the disposed waste has to be carried out as a basis for an environmental protection and action plan.

3.6.2 Waste Management

From the information which was collected at the City of Volzhsky, and from the discussions with the VCCEP, it can be seen that a basic control system for the existing waste streams is established. This system relies on theoretical assumptions (MSW) and on the data of the companies, where the waste is generated.

With the establishment of the VCCEP, there is an institution present to take care of the responsibilities of permitting treatment and disposal of waste.

The fact that the environmental laboratory is not part of the structure of the VCCEP causes problems of co-ordination and efficient use of the economic resources and infrastructure.

3.6.3 Facilities of the Waste Management Concept

As there are no facilities for treatment or disposal of municipal solid waste and industrial waste in the City of Volzhsky, the basic infrastructure for the realization of a waste management concept, which fulfils the requirement of the present environmental standards, has to be established.

The basic components of such a system depend on a waste management strategy and on basic decisions as the construction of an incineration plant for MSW. This system also depends on the future development of the local industry including, the results of the waste minimization project for the local industry (which is also taking place at this time).

In general, the situation for the construction of landfills for industrial or municipal waste in the area of the City of Volzhsky is very complicated. Due to the already available information on the groundwater situation it can be assumed that the groundwater level in the area is between 1 and 2m below surface or even higher. Therefore, a construction of a landfill below surface does not meet technical standards. If at all, only above-surface constructions can be constructed.

The construction of an incineration plant for MSW can be identified as a realistic solution. As indicated by the VCCEP there is a demand for additional heat supply in the City of Volzhsky, which could be generated by the incineration plant. According to the information there is an amount of 400,000 m^3 or 120,000 t MSW per year. Experiences with incineration plants show, that the lower level for an economic operation is at least 250,000 to 300,000 t per year. Therefore it is suggested to evaluate the demand for incineration capacity for the area of Volgograd and the City of Volzhsky. To avoid high transportation costs, the MSW can be brought to transfer stations after collection. At the transfer stations, the waste is compacted and transported to the incineration plant(s).

3.7 Formulation of the Goals of the Waste Management System of the City of Volzhsky

Before the activities, projects and investments, which are needed to achieve an environmentally sound waste management system in the City of Volzhsky are described and discussed, the overall goals of waste management in City of Volzhsky have to be formulated.

3.7.1 General Goals

The waste management system has to make sure that:

⇒ that there are no negative impacts on the environment by handling, storing, treating and disposing of waste
⇒ that resources and energy are preserved
⇒ that the part of waste which is disposed in landfills is reduced to a minimum
⇒ that only such waste is disposed in landfills, which is no danger to future generations
⇒ that the quantities of waste are reduced as much as possible
⇒ that waste is reused or recycled if it is ecologically acceptable, technically possible and economically feasible
⇒ that waste, which cannot be reused or recycled, has to be treated biologically, thermally, chemically or physically in such way, that the reactivity of the residuals is minimised
⇒ that a sustainable development is achieved

These goals apply to the goals for waste management, which are formulated by European countries and the European Union.

3.7.2 Specific Requirements of the City of Volzhsky

In addition to the general goals, specific requirements considering the situation and the future plans of the City of Volzhsky are formulated:

⇒ consideration of the economic situation of the City of Volzhsky and in the region
⇒ attraction of private business
⇒ attraction of national and international investors
⇒ attraction of national and international financing institutions
⇒ maximization of use of available national and international grants and loans
⇒ production of first results as soon as possible to improve the motivation of the population, the industry and the local government authorities

3.8 Realization of the Formulated Goals

For the realization of the specified goals, a long period of time and the input of a great amount of capital will be needed. It is not realistic to assume that in the City of Volzhsky a status of waste management can be achieved within a few years, which took other countries like the European Union 15 to 20 years to develop. For the realization of the waste management concept, it also is very important to consider the local economic situation. At present, it is not realistic to assume that the industry as well as the residents of the City of Volzhsky are able to pay fees as they are collected in the European Union or the USA for the collection and disposal of waste.

3.8.1 Action Plan for the Implementation of a Waste Management Concept in the City of Volzhsky

Considering the goals and requirement specified above, the following action plan is formulated. The planned activities are realized step-by-step. The step-by-step approach makes sure that there is a sustainable development achieved and that especially at the beginning, the financial means, which are needed are rather small. There also is special emphasis put on activities, which can be carried out by the VCCEP.

The action plan is shown in the Figure 18.

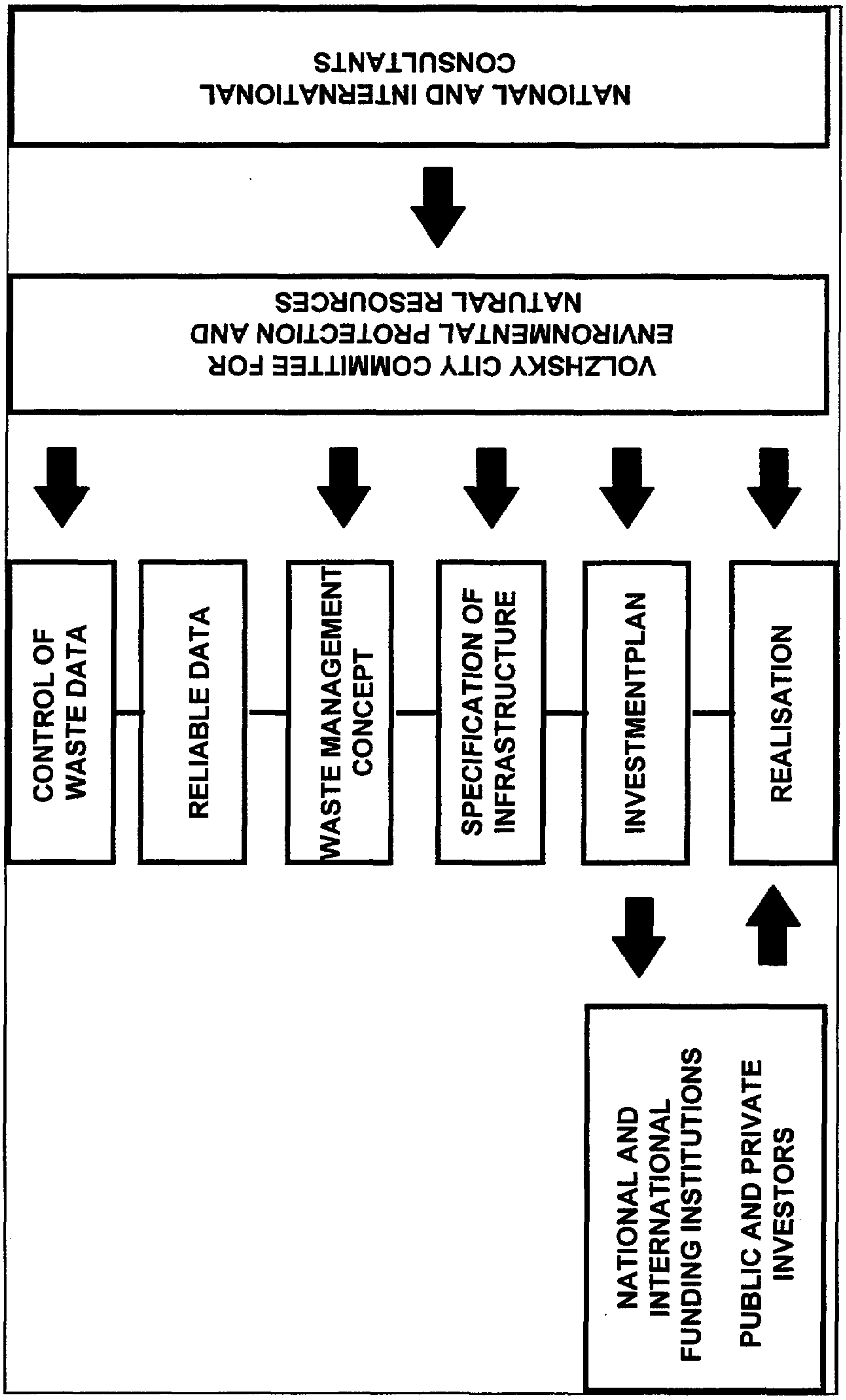
3.8.2 Control of Waste Data

This first step of the realization is very important - probably the most important of all steps. The collection of reliable data, which make it possible to describe and analyze the present situation of waste generation, is the basis for all future steps. It is not possible to develop the waste management concept, to specify the required infrastructure, and to elaborate a plan of investments without reliable and realistic data.

The most important aspect of the collection of reliable data is, that it is not possible to attract national or international funding or financing institutions or investors without a detailed and reliable analysis of the present situation.

The collection and the control of the waste data is the basis for checking the results of activities for waste reduction. It is also the basis for financing the VCCEP and its activities, because the fees are collected according to the amount of waste generated and not recycled or reused by the industry.

FIGURE 18
Action Plan for the Iplementation of a Waste Management Concept



3.8.3 Waste Management Concept

On the basis of the data, which are collected, the present situation can be described and analyzed. Specific waste streams can be identified. The waste management concept will include the following results:

⇒ specify the existing types of waste
⇒ identify waste streams
⇒ specify potentials for waste reduction
⇒ specify potentials for reuse and recycling of waste
⇒ specify required treatment facilities
⇒ specify required disposal facilities
⇒ analyse present and future amount of wastes and specify required capacity of the facilities
⇒ specify, which types of waste will be treated or disposed in the City of Volzhsky
⇒ specify, which types of wastes will be treated at facilities in or outside the region of Volgograd
⇒ specify, which types of waste will be brought to the City of Volzhsky for treatment or disposal to make an economically sound operation of the facilities possible
⇒ elaborate public awareness and information programs
⇒ specify programs for the industry for reduction of amounts of waste and of hazard of waste
⇒ specify priorities

3.8.4 Plan of Investments

On the basis of the waste management concept, the plan of investments is elaborated. The plan is elaborated according to the priorities, which were specified in the waste management concept.

The plan of investments is the basis for approaching national or international funding institutions (e.g., World Bank, TACIS Program of the European Union) and national or international investors. For all these sources of financing, it is extremely important to have a clear plan for the required investments and a clear and detailed concept for the realization.

A detailed plan shows that there are clear concepts for the region and that an investor and a financing institution can rely on the realization of the concepts, which are the basis for their investments.

3.9 Realization

The waste management concept is realized according to the priorities, which were specified, and to the available financial resouces, which are brought in by investors, by loans and grants and money from the budget of the City of Volzhsky.

3.9.1 Implementation of First Steps

As outlined in the prior chapters, the realization can only be done on a step-by-step basis. At the beginning it is important to set small steps, which require little capital. It also is important to start these activities as soon as possible to increase the motivation of the members of the VCCEP.

3.9.2 Establishment of an Effective Control System for Municipal and Industrial Waste

At present, a control system for the industrial waste based on a coupon system exists. For the MSW, neither from the City of Volzhsky nor from the industrial companies a control system exists.

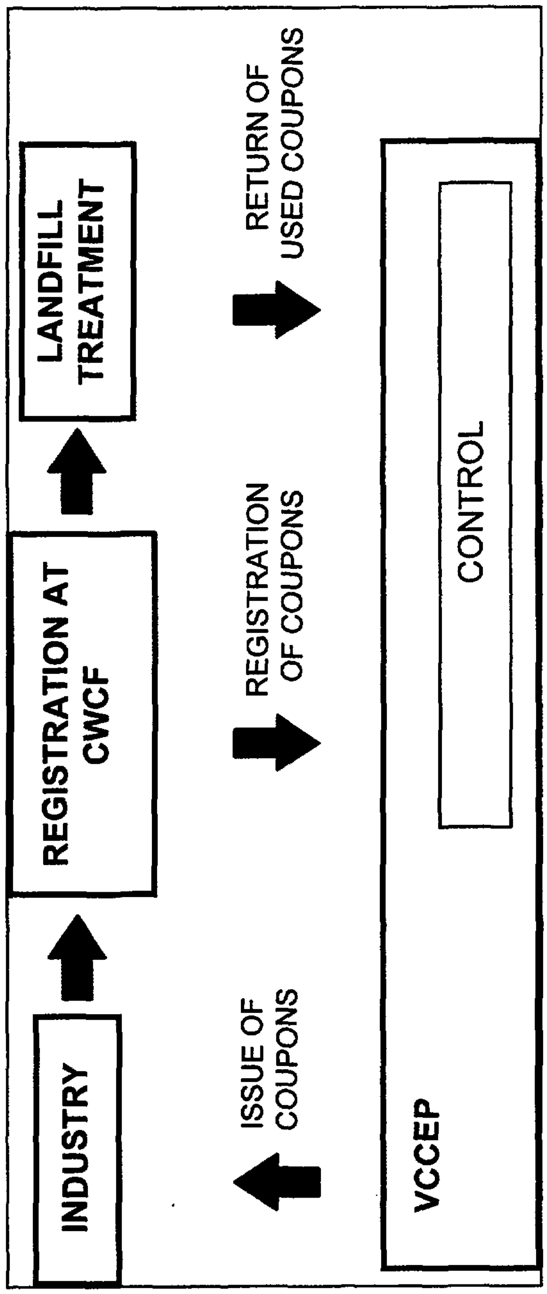
The implementation of an effective control system for all types of waste has to be considered to be the basis for all future activities and projects in the field of waste management in the City of Volzhsky. An effective control system does not only deliver reliable data but is also an important tool for the implementation of waste management strategies (e.g., separate collection of MSW). Public and private, national and international Investors are attracted easier once a control system is established and proves to be effective.

The control system shall deliver the following results:

⇒ deliver reliable data of waste generated in the City of Volzhsky
⇒ provide control that no waste is disposed without paying fees
⇒ provide that no waste is collected, treated or disposed by companies without regular licences
⇒ provide that waste is delivered from the industrial plants complying with the concepts of waste minimisation and separation (no mixing of different types of waste)
⇒ monitor the results of waste minimisation strategies applied by the industry and the City of Volzhsky

The control system can be based on the existing system. The introduction of the administration of the coupons and the data with computers can be started as one of the next steps. In Figure 19, the concept of the control system is shown.

FIGURE 19
Control System for Industrial Waste



3.9.3 Central Waste Control Facility (CWCF)

The situation of the City of Volzhsky and the industrial zone are quite different from the situation as it is found in central Europe or the USA. All industrial companies and the landfills, where at present all waste except waste which is treated by incineration is disposed, are within the range of few kilometres. According to information from the VCCEP the distance is on average 6 km from the industrial plant to the landfill.

According to modern standards for landfill operation, each landfill should be equipped with a weighting station and a trained person for control should be present when the landfill is open. At present, this would require about 8 weighting stations and 8 people.

Therefore,it is suggested to establish one central waste control facility (CWCF). The CWCF can be situated at a location, which is central to all (or most) industrial plants. The investments can be kept to a minimum, because there is only one facility to establish.

The scheme of the disposal of waste at present is shown in Figure 20. The concept of operation of the CWCF is shown in Figure 21.

FIGURE 20
Scheme of Waste Disposal - Present Situtation

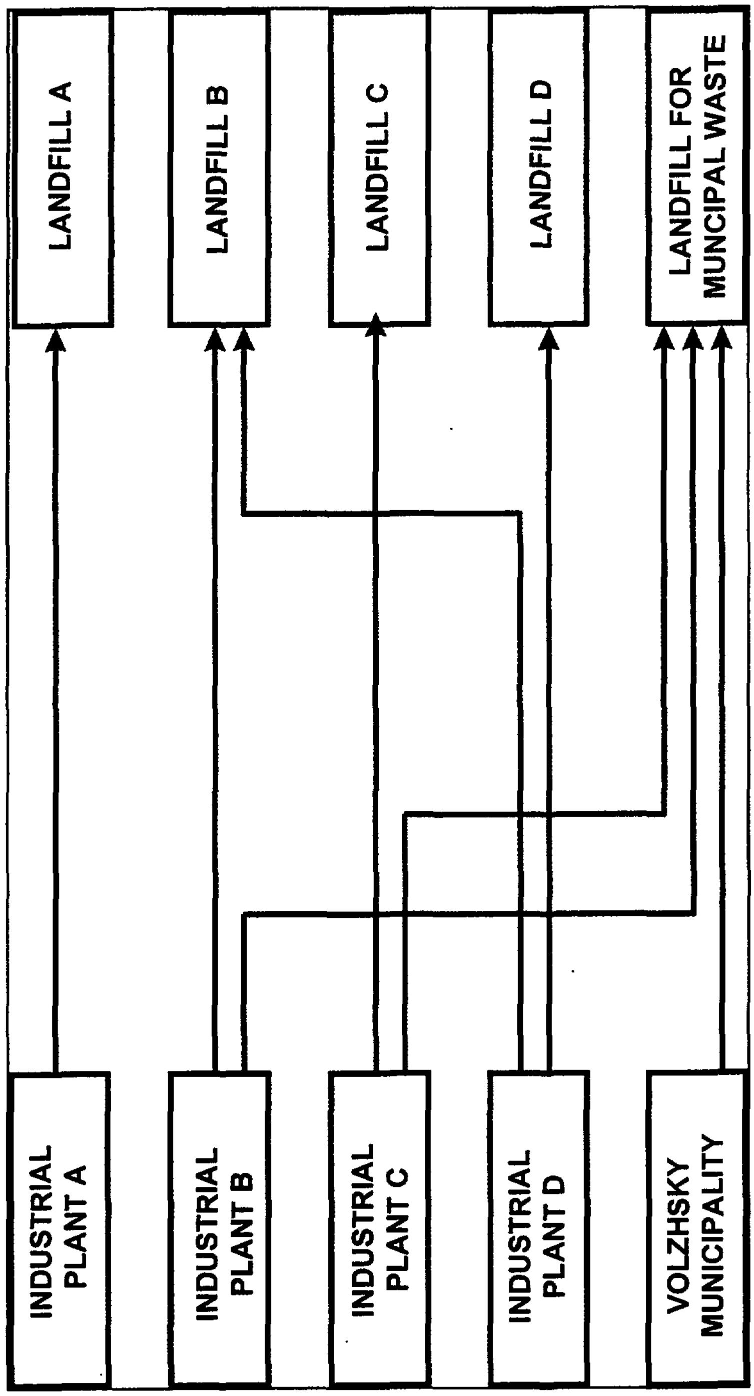
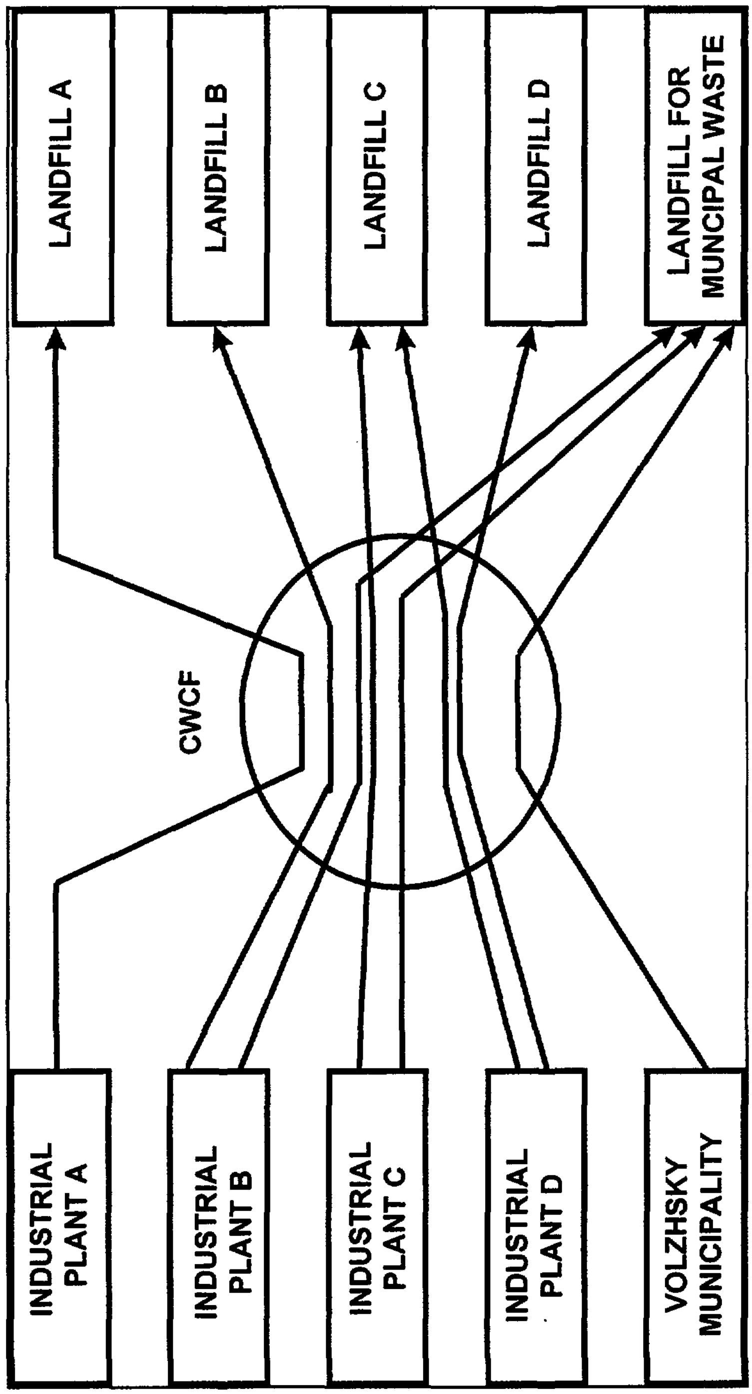


FIGURE 21
Scheme of Waste Disposal - After Implementation of CWCF



At present, all waste from the industry is transported directly to the landfills. At some landfills there are persons who collect the coupons, and at other landfills there is no personnel present. Therefore , it cannot be ruled out that waste without coupons is disposed at the landfills. A control of the classification of the waste is also not possible.

The concept of the CWCF requires that all types of waste are transported via the CWCF and are registered there. At the CWCF a trained person is present, who registers the coupons, controls the classification and registers the weight of the waste. All the municipal waste from the City of Volzhsky and from the industry must also be registered at the CWCF.

The following data will be collected at the CWCF:

- date and time
- origin of the waste (name of company)
- name of the facility where it will be treated or of the landfill, where it will be disposed
- number of coupon
- licence number of the truck
- name of the driver
- name of the company, which does the transport if it is not the company, where the waste is generated
- classification of the waste
- weight or volume when liquid

The requirements for the infrastructure of the CWCF are very small compared to the effect, which is produced by the implementation.

The required infrastructure is the following:

STEP 1:

- scales
- office container, which is situated above the scales for control of the waste, which is delivered by the trucks
- computer for data administration (can be established at Step 2)

STEP 2:

- laboratory facilities for control of composition of waste
  (it is also possible to use the existing infrastructure of the environmental laboratory, see chapter 6.2.3)
- establish computer based accounting system for fee collection

3.9.4 Institutional Requirements

Besides the establishment of the required infrastructure, there are also institutional requirements which have to be considered for the establishment of an effective waste control system.

At present, there is one inspector responsible for all aspects of waste management and disposal. If the concept is established and the control system is supposed to be effective, there is need for additional personnel. In the beginning, one more person for the operation of the CWCF will be sufficient.

The personnel will have the following duties:

<u>head of the waste control group</u>
- management of CWCF
- control at industrial plants, treatment facilities and landfills
- reporting

<u>inspector at CWCF</u>
- registration of waste
- control of waste
- reporting

The decision as to whether it is either necessary to add additional personnel to the existing staff of the VCCEP or , if possible, to use the existing staff belongs to VCCEP.

The issue of the structure of the VCCEP and the environmental laboratory will be discussed below in the Institutional and Administrative Actions section.

3.9.5 Cost of the Central Waste Control Facility

The costs, which are stated here are actually not only the costs for the CWCF but the costs for the operation of the waste control system.

STEP 1: Basic investment costs (prices in US$)

scales and office container	50,000.—
computer	5,000.—
additional expanses	5,000.—
	60,000.—

yearly costs based of a pay back period for the investments of 5 years:

personnel	5,000.—
investments (incl. interest)	15,000.—
additional expanses	5,000.—
(gasoline, electricity for container etc.)	
	25,000.—

Considering an amount of industrial waste of approximately 100,000 t per year, this means an increase of fees of US$ 0.25 per t or 2.9 to 1% of the present fees for the industry. If it is possible to also ncrease the fees for the municipal waste, then the required increase in fees borne by industry can be reduced.

3.9.6 Trainee Program for Members of the VCCEP

The operation of a waste control system according to up to date standards is new for the members of the VCCEP. To improve the motivation and the understanding of the importance of such a system, it is suggested to implement a trainee program for the members of the VCCEP, who participate in the operation of the waste control system.

The trainee program should consists of two parts. The first part is training and instruction at waste treatment and disposal facilities and relevant government agencies out side the Russian Federation. A duration of 4-6 weeks for this part should be sufficient.

The second part is "on-the-job-training". Once the CWCF is established, an experienced person (experienced with the identification and classification of waste) will stay in the City of Volzhsky for 6-8 weeks to train the personnel and advise in the operation of the CWCF and the control of waste disposal.

For the financing of such a trainee program, institutions as the UNIDO or country-to-country exchange and support programs, can be addressed.

In the future, the trainee program can be extended by organizing workshops for the exchange of experiences between government agencies and operators of waste treatment and disposal facilities from other countries and their counterparts in the City of Volzhsky.

3.10 Institutional and Administrative Actions

3.10.1 Environmental Laboratory

The issue of the environmental laboratory is very important. According to the information, which was received during the visits to the City of Volzhsky, there exists the basic infrastructure at the environmental laboratory which is needed to do the analyses that are required for groundwater quality and air quality control and which can also be used for the analyses of waste.

The environmental laboratory is financed by, the ecological fund of the City of Volzhsky and not from the budget of the VCCEP. This causes administrative problems and also budgeting problems at the VCCEP.

An environmental laboratory is a very important part of the structure of an environmental control agency as the VCCEP. The experiences with other administrations and the experiences in the City of Volzhsky show, that a separate administration is not effective at all. Usually, there is a lack of information between the organizations and money is spent for double administration.

As the VCCEP is the agency which is responsible for the calculation and the collection of environmental fees (not only for waste disposal), the environmental laboratory should be included into the structure of the VCCEP. In this case, the VCCEP would be able to make a budget according to the fees which are collected. Having only one administration for the VCCEP and the environmental laboratory will save money and will make the administration more effective.

3.10.2 Calculation and Collection of Fees for Waste Disposal

Compared to international standards, the fees charged for the disposal of waste are small. Once the waste management concept, which will include new infrastructure, is realized it will be necessary to collect fees, which are high enough to finance the system.

Although this will not happen in the very near future it is suggested to start to raise the fees step-by-step. This makes it easier for the industry to adjust to the raising fees. For example a raise of 15% per year doubles the fees within a period of 5 years.

There should also be more emphasis put on the collection of the fees - fees for waste disposal and all other environmental fees. It is clear that at present, some companies are not able to pay the fees because of their economic situation. But it should not be accepted, that the companies pay only part of their fees or not at all. If a company has economic problems, the company should apply for a temporary reduction of the fees or ask for an agreement to pay the fees later. This application should be forwarded to the VCCEP and be granted (or not) in accordance with the city council.

3.10.3 Municipal Specialized Transport Enterprise (MSTE)

The MSTE is at present a part of the structure of the City of Volzhsky. There is no independent budget and there is no income from the activities, which are carried out for the municipality as the collection and disposal of MSW from the residential areas. Therefore, it is not possible to make any assumptions if the fees, which are collected by MSTE from the industry and what is included in the rent of the apartments for the collection of the MSW, is covering the expenses.

It is suggested to take the MSTE out of the structure of the City of Volzhsky and to establish MSTE as an independent company. The company may be owned by the City of Volzhsky or also privatization could be considered. The establishment of MSTE as an independent company will be the basis for a realistic cost analysis. As an independent company, MSTE will be forced to work as efficiently as possible to cover their expenses and to be profitable.

3.10.4 Privatization

Once a waste management system is established, it will become possible to attract private business. Private business can be attracted at two levels. The first level is the attraction of small private enterprises at local level. This is already begining to happen. One landfill is operated by a private company ("Aljans"). This could be extended in the near future. Possible activities for small private business are the collection and transport of waste, recycling of waste (e.g., construction debris) and others. The establishment of MSTE as independent company could also be used for the attraction of private business.

The second level is the attraction of private investors. The chances that private investors are attracted at this point are relatively small. It will become possible to find investors when a plan of investments is elaborated and when private business started to be part of the waste management system.

A form of private investment could be a modeled as Built-Operate-and Trade (BOT). In this case, a private investor, who is selected by a tendering procedure, builds a plant (e.g., incineration plant), operates it for a certain period of time (usually 20-25 years) and after this period turns the plant over to the city.

3.10.5 Public Awareness and Information Programs

As an additional activity, which focuses on the reduction of municipal solid waste, public information programs and public awareness programs should be started. As a basis for the implementation of separation of MSW at the source, public information is necessary. Public awareness and information programs are needed to improve the acceptance of the population for activities concerning waste management and are also the basis for the acceptance of higher fees.

A detailed program should be part of the waste management concept. An information program could be started almost immediately.

3.11 Waste Classification System

The classification system for waste is such an important issue, that it was not discussed along with the problems of the City of Volzhsky. It has to be discussed separately, because the classification system can not be changed only in the City of Volzhsky. Such changes have to be carried out at least on the level of the region, but better on the level of the Russian Federation to avoid chaotic situations with different, non consistent classification systems.

The classification system, which is used in Russia at present, has 4 categories. Category I is the most hazardous and category IV is the least hazardous. The waste is classified by the following criteria:

⇒ chemical content
⇒ chemicals, which can be released into the surrounding air
⇒ toxicity (LD_{50})

The category of hazard is calculated by using principles of probability, hygienic regimentation rules and toxicological parameters and the toxicity parameters of the chemical compound of the waste (Temporary Classifier for Toxic Industrial Waste and Methodological

Recommendations regarding Class of Waste Toxicity Calculation, 1987). According to this procedure the types of waste are classified.

In difference to other waste classification systems (European Union, EPA) there is no parameter used, which is based on the potential of groundwater contamination of a specific waste.

Therefore, the disposal of waste on landfills causes in reality many more problems as the category may indicate. Especially in an area as the City of Volzhsky, where the situation of the groundwater is already severe, the underestimation of the risk of groundwater contamination by disposed waste increases the problems.

According to the information from the Russian experts, the Institute of Standardization of the Russian Federation is working on a new classification system. At this point it is not possible to tell, which criteria will be used in the future.

As a basis for the implementation of an effective waste management system, it is definitely necessary to change the existing classification system. Although the classification system should be changed as soon as possible it is not suggested to change the system for the project in the City of Volzhsky before at least there is more information about the new classification system for the Russian Federation is released.

The problems of the existing classification system are illustrated with the following examples. There are types of waste taken from the list of the types of wastes generated in the City of Volzhsky. The classification is compared with the classification according to the guidelines of the European Union for the classification of waste.

Specification of waste (Russian Federation)	category of hazard	Specification of waste (European Union)	classification
Sludge from car-wash settling tanks	III-IV	sludge from oil separators	hazardous
Sludge from local refineries	III	oil sludge	hazardous
sludge from oil regeneration	III	residue form oil regeneration	hazardous

These examples show that according to the existing classification the hazard of the waste in many cases is underestimated. Especially, since the hazard of waste to the groundwater quality is not considered as it should be. This is also the case for MSW. According to the existing classification, it is classified as non-toxic. But, MSW has to be considered to present a high level of hazard to the groundwater because of the high content of organic substances.

Therefore, the issue of waste classification system is an extremely important issue. If this issue is not solved it is impossible to make sure that waste - industrial and municipal - is treated or disposed according to the requirements of the environment.

The issue has to be discussed and solved on the level of the Russian Federation, but at least on the level of the region.

3.12 Licensing

When privatization is discussed, the issue of licensing and the control of the companies is very important. Without strong requirements for licensing and a strong control after licensing, the environmentallysound operation of the waste management system can be doubted.

Therefore, it is strongly recommended to develop licensing procedures for companies and the individuals, who are managing these companies, according to standards of the European Union or USA.

It is also strongly recommended that the issue of licensing is not solved at the level of the regions. Specification of the licensing requirements at the level of the regions will lead to different level of requirements. In the future this will cause the transfer of waste - especially industrial and hazardous waste - from regions with strong requirements to regions with lower requirements and therefore cheaper costs for treatment and disposal.

The transfer of waste is not the goal of any waste management system and it is not in the sense of an environmentally sound waste management system. The waste transfer, which is caused by different standards, will cause additional environmental problems in the future.

3.13 Conclusions for Similar Projects in the Russian Federation

According to the experience of the consultant and to information from Russian experts, the problems of the City of Volzhsky can be considered as rather typical for industrial towns in the Russian Federation. The institutional structure in the different regions can also be assumed to be at least similar if not the same. Due to the large distances in the Russian Federation and due to the small costs of disposal of waste in the region close to an industrial plant, there is hardly any waste transported across the country for disposal. One possible exception is radioactive wastes, which are generated at weapon production facilities. But these types of wastes have to be considered under different programs, rather than in either the industrial or municipal waste programs.

The problems, which are faced also in other regions and industrial towns can be specified as follows:

⇒ more or less unidentified waste streams
⇒ insufficient capacities for waste treatment and disposal
⇒ facilities not built to up to date technical standards
⇒ insufficient control systems
⇒ lack of information at the local authorities about waste management and waste control systems
⇒ environmental problems with old industrial sites and landfills
⇒ lack of financial means for investments
⇒ lack of know how for the operation of waste treatment and disposal facilities
⇒ institutional problems

These problems are not different from the problems, which were identified and outlined by the VCCEP in the City of Volzhsky. There will be differences due to the local situation, number, size and type of industrial plants. The systematic approach to the solution of the problems with waste management has to be same as it is outlined for the City of Volzhsky (see Figure 18).

The basis for all concepts and projects is the collection of reliable data and the control of the waste streams. In some cities or regions also the concept of the Central Waste Control Facility (CWCF) could be applied, if the industrial plants and the landfills are located in concentrated areas as in the City of Volzhsky.

The issues of the classification of waste and the licensing of companies, which collect, treat or dispose waste, have been discussed above. The problems arising from these issues will be the same in other regions of the Russian Federation.

3.13.1 Trainee Programs

As it was outlined above, trainee programs can be considered as extremely helpful in implenting the first steps towards environmental sound practices in waste management. By the implementation of trainee programs it is possible to transfer basic knowledge and understanding of the problems concerning waste management.

Individuals, who participate in such trainee programs, are able to use the gained knowledge to set first steps such as the implementation of control systems. As the next step, these individuals can also transfer their knowledge to others from other regions. The motivation, which arises from the participation in trainee programs, is also very important to be considered.

Trainee programs can be implemented with relatively small budgets. They are also the basis for a sustainable development, because the new concepts are implemented and understood by the relevant local individuals and not only by national or international institutions or consultants.

If there are participants of such trainee programs at a region it will be much more easier - and therefore much more efficient - for representatives of national and international institutions or for the consultants working for them to identify the specific problems of the region and to elaborate efficient solutions.

3.13.2 Workshops

As an additional tool for the transfer of knowledge and to increase the understanding of the problems of waste management, the realization of workshops can be considered to be very useful.

Participants of such workshops should be members of the regional and local authorities (e.g., VCCEP), industry and companies and organizations involved in waste management from the Russian Federation and from other countries (Europe, USA). The goal of these workshops is to serve as an institution for informal knowlege transfer and to establish contacts between the participants for future exchange of experiences.

Such workshops can also be realized with relatively small budgets. The workshops are also a basis for a sustainable development.

3.13.3 Consultants Suggestions for Future Activities

As outlined in this section, the problems in other cities or regions as the City of Volzhsky can be assumed to be quite similar without being to general. The experience, which was gained during this project, can therefore be used as a basis for future activities.

A main problem during the project was to establish a common view of the problems between the local representatives and the Russian and international consultants. As a result, the collection and transfer of information was not efficient. When it was explained that the suggested procedures are common for the solution of similar problems in other countries, the dialogue became more fruitful.

As further steps, it is therefore suggested to organize workshops. These workshops should be held at regional centers such a Volgograd. This seems to be more efficient than to organize workshops in Moscow, because the access for the local participants is easier.

The participants at these workshops should be representatives of the regional and local authorities, representatives of the local industry, representatives of local waste treatment or disposal plants, representatives of similar institutions from other countries including other countries from the former "Eastern Block", representatives from international institutions as UNIDO, World Bank and national and international experts.

As a result of such a workshops, the Russian participants are able to establish contacts, learn about experiences in other countries. After this process they will be able to identify and specify their problems more clearly. Future programs such as expert missions can be carried out much more efficient.

First steps as the improvement of the institutional situation, the implementation of efficient control systems, the collection of data and formulation of goals can be carried out by the participants with relatively small support from national and international consultants.

Such workshops can be realised with a relatively small budget. The result to the invested financial means is small compared to the result, which can be achieved.

Further steps can be identified according to the real demand when the experiences of the first workshops are analysed.

SECTION 4.0
Proposed Policy for Eco-Efficiency, Waste Management, and Competitiveness

4.1 Introduction

UNIDO, with the assistance of both the ICF Kaiser team and Mr. H. Mascha, consultant, has worked to develop a policy that will encourage eco-efficiency and competitiveness, as well as the improvement of waste management practices at both the four study enterprises and all the other enterprises within the region.

4.2 Facility-Level

We believe that any successful policy will require consideration of the following five basic principles:

- Improving Competitiveness
- Enhancing Consumer Acceptance
- Reducing Environmental Impacts
- Improving Working Conditions
- Enhancing Community Relations

Accordingly, we have developed a proposed policy based on the above principles to enable the four study enterprises to:

- cost-effectively reduce waste
- minimize worker exposure to toxic materials
- optimize use of raw materials
- improve a product's competitiveness in local and world markets
- enhance the company's image of responsibility to the surrounding community
- protect human health and the environment.

As discussed earlier in this report, the four study enterprises are (as, we suspect, are the majority of enterprises in the region) commonly afflicted by the problems associated with an uncertain economy, less than reliable source of raw materials, expensive (and sometimes unreliable) energy supply, and inadequate infrastructure. Furthermore, although everyone understands that proper waste management is necessary for both the protection of human health and the environment, none of the enterprises we visited appeared to consider waste management a priority. Rather, the enterprises were more concerned with production and staying in business.

Therefore, as a result of the current socio-economical and political climate in Russia, we have purposely drafted this policy to be as basic as possible. We believe that by keeping this policy as simple as possible, the four study enterprises (as well as the other enterprises located in the region) should easily be able to adopt and follow the proposed policy. Enterprises that successfully implement and follow the proposed policy can increase the sophistication of this proposed policy at a later date (and at their own speed). But, we believe any facility that adheres to at least a portion of the policy discussed below will make strides towards becoming more competitive and eco-efficient.

We propose the following policy for enabling the enterprises to become more competitive and eco-efficient:

4.2.1 Improve Competitiveness

Facilities can lower operating costs, increase product quality, and meet ISO 14000 standards if they develop a pollution prevention and waste minimization program that incorporates the following measures:

- Review Facility Operations

- Identify Raw Materials Used and Wastes Generated by Process Area

- Assign Real Costs to both Raw Materials and Wastes

- Identify and Develop Waste Reduction Alternatives (including):
  - source reduction
  - technology changes
  - reclamation
  - product changes
  - input material changes
  - use and reuse
  - source controls
  - good operating practices
  - waste exchanges

- Select Alternatives on the Basis of Life Cycle Analysis and Technical Feasibility using the following criteria:
  - quantifiable results
  - follow pollution prevention hierarchy
  - reduction in waste volume or disposal/ treatment costs
  - ease of implementation
  - proven performance
  - safety and health risks

- Implement the Basic Foundations of the ISO 14000 Standards (see below).

4.2.2 Enhance Consumer Acceptance

Facilities can enhance consumer's acceptance of their products by advertising that they use recycled components (i.e., their product is a "green" product). This is particularly useful in Europe where consumers are basing purchasing decisions on whether the product is a "green" product.

4.2.3 Reduce Environmental Impacts

Facilities need to adhere to the following Environmental Management Hierarchy for handling all wastes generated:

- Prevention
- Recycling
- Treatment
- Disposal

Wastes that ultimately must be disposed of, need to be disposed of in an environmentally safe manner. A centralized waste treatment facility or regionalized waste treatment facility should be constructed and users should be charged with the real costs of disposal (e.g., incineration).

4.2.4 Improve Working Conditions

Facilities need to control both the usage of raw materials and emissions of raw materials/waste products during the production process to reduce worker exposure to toxic materials. (Significant improvements in working conditions can be achieved through implementation of 4.2.1 above.)

4.2.5 Enhance Community Relations

Facilities need to capitalize on their successes in reducing emissions to the environment by publicizing their pollution prevention success stories. (Consumers are more likely to accept higher prices for products when they know that a product is generated in an environmentally safe manner.)

4.3 Elements of a Successful Pollution Prevention and Minimization Program

Although the following steps are presented in a specific order, the actual progression of the program will vary from company to company depending upon the internal structure of the company and what part of the company the original idea for a program originated. This is true for all three steps.

4.3.1 Step I -- Start Up

<u>Overview of Waste Generation and Need for a Program</u> -- Get a handle on your facility's waste generation and waste management practices.

(1) Determine whether your facility has potential waste minimization and prevention opportunities.

(2) Collect basic information regarding the waste(s) generated at your facility, including approximate amounts, current disposal practices and effected media (e.g., air, land, surface water, ground water), and disposal costs.

(3) Can you identify likely benefits resulting from a successful waste minimization and prevention program? Specific benefits include:

- Reduced operating costs;
- Higher product yields;
- Improved customer satisfaction;
- Reduced waste generation rates;
- Reduced waste disposal costs;
- Enhanced corporate image;
- Reduced exposure to future liability costs;
- Increased environmental awareness by plant personnel; and
- Reduced environmental compliance costs.

(4) Identify on-going facility programs on which a waste minimization and prevention program could either be incorporated with or modeled after. Pay particular attention to established programs with compatible goals and objectives (like worker safety programs), management support, approved budget, and organized staff.

(5) Prepare "draft" Program Goals and Objectives (something to shoot for).

Obtain Top Management Support -- Convince your management that your facility could benefit from a successful waste minimization and prevention program.

(1) Use information regarding waste generation, potential benefits, and other facility programs (developed above) to support your case for establishing a waste minimization and prevention program. Highlight other waste minimization and prevention success stories.

(2) Stress likely economic savings and reductions in future liability.

(3) Present "draft" Program Goals and Objectives.

(4) Inform Management of other existing programs on which a waste minimization and prevention program could "piggy-back" thus, potentially reducing start-up costs and initial resistance.

(5) Don't forget to point out previous waste minimization and prevention steps already taken at the facility or at one of the company's other facilities. Highlight other success stories.

(6) Obtain facility approval for continued work in developing, implementing, and managing a successful waste minimization and prevention program.

Establish Program Goals and Objectives -- Aim for obtainable Program Goals and Objectives.

(1) Firm up Program Goals and Objectives and develop written format for all employees to see and understand. If applicable, set specific goals for each department (e.g., maintenance, production, shipping).

(2) Goals can be qualitative or quantitative.

(3) Provide examples of waste minimization and prevention activities already undertaken by the facility or company.

Select a Program Leader and Team -- Organize.

(1) Pick a Program Leader -- a "champion" -- to oversee the development, implementation, and management of a successful waste minimization and prevention program.

(2) Select a team of individuals (perhaps one from each department) to assist in the development and implementation of a successful waste minimization and prevention program.

Announce Program to all Employees -- Inform the employees and rally troop support.

(1) Set up employee incentive programs to spark waste minimization and prevention behavior on the "lines". Consider contests for the best slogans, reward ideas for increased waste minimization and prevention, and reward the department obtaining the highest reduction in waste generation or any department meeting Program Goals and Objectives.

(2) Organize seminars on waste minimization and prevention procedures to educate personnel.

(3) Use publicity and broad communication to promote information transfer between departments and facilities (Technology Transfer).

4.3.2 Step II -- Conducting Waste Minimization Assessments

Characterize Waste Generation -- Dig deep and investigate opportunities.

(1) Organize team to collect detailed information on waste sources, waste generation rates, waste characteristics, current waste management practices, and disposal costs by department or process/operation. Develop a checklist or interview guide to assist team in collecting comprehensive and consistent information.

Prioritize Waste Streams -- Select a waste stream.

(1) Rank all waste streams by any one or more of the following: volume, toxicity, disposal costs, potential for waste minimization and prevention opportunities, ease of implementing waste minimization and prevention techniques, current regulatory status (e.g., is the waste stream likely to be affected by the land disposal restrictions).

On-site Review of Priority Waste Streams -- Perform a site-visit.

(1) Review the waste generating process and perform a site-visit to inspect the process (this step is often referred to as a waste minimization "assessment"). Meet with the

workers and familiarize the waste minimization and prevention team. Set up procedures for exchanging information concerning: data collection, potential ideas for specific waste minimization and prevention options, etc.

Evaluate Fully Loaded Waste Management Costs -- What's the real cost for waste management?

(1) Define your baseline costs, including waste management, liability, regulatory compliance and other costs. This information is vital to later assess the feasibility of a particular waste minimization or prevention option.

(2) Be honest and consider all costs encountered during the full "life-cycle" of the project.

Identify Applicable Waste Minimization and Prevention Techniques -- Identify your options.

(1) Based on all your research on the quantity of waste generated, physical and chemical properties of the waste, and current production and management processes, identify all of the applicable waste minimization and prevention technologies/techniques. Use outside vendors, in-house experts, literature searches, local and State Agencies, or contact the Environmental Protection Agency to assist in the identification of applicable technologies/techniques.

(2) Define savings or reductions in waste volume/toxicity.

(3) Define cost of each option.

Evaluate Feasibility of Each Waste Minimization and Prevention Techniques - Pick the waste minimization or prevention technology/technique which best helps you meet your Program Goals and Objectives.

(1) Perform technical, regulatory, and economic feasibility analyses. Consider costs of implementing technology/technique.

(2) Consider ease of installation and costs associated with installation of specific equipment.

(3) Will the selected technology/technique affect product quality or composition, production down-time, etc.

Obtain Permission and Funding for Selected Waste Minimization or Prevention Technology/Technique -- Clear the way for implementation.

(1) Pitch the best waste minimization or prevention technology/technique to management.

(2) Secure commitments for funding.

4.3.3 Step III -- Implement Program

Implement Selected Waste Minimization or Prevention Option -- Do it.

(1) Get bids from vendors for equipment and installation.

(2) Contract out for equipment and installation (if using in-house personnel, contact appropriate department and arrange for their time).

(3) Obtain any necessary permits.

(4) Schedule for installation and identify production down-time, start-up, verification of correct installation.

(5) Install, train the workers, go on-line, and workout any bugs.

Document Results -- Only time will tell.

(1) Record reductions in the amount of waste generated, reductions in costs, raw materials, etc. Also record any problems encountered and steps taken to remedy problems.

Program Evaluation -- Grade the performance of the selected waste minimization or prevention option.

(2) How well is the selected waste minimization or prevention technology/technique working? Is the selected technology/technique working as well as projected?

(3) Use project success to justify additional projects.

Expand Program by Building on Successes -- Don't stop now...you've got momentum.

(1) Expand your program to other wastestreams, processes within your facility or other facilities within your company. Start with the next highest "priority" wastestream (previously identified).

4.4 ISO 14000 Environmental Management Standards

The International Organization for Standardization (ISO) 14000 Environmental Management Standards are designed to enable companies to systematize their environmental management efforts, and demonstrate to existing and potential customers and governments worldwide a commitment to integrating these concerns as a standard business practice. Moreover, these standards provide an international framework for both business and environmental improvement. The standards developed or under development include environmental management systems, environmental auditing, environmental performance evaluation, ecolabeling, and life cycle assessment.

ISO 14001 is the environmental management systems specification standard developed under the ISO 14000 effort. Over 40 countries have participated in the development of the standard, which represents an international consensus of governments and industry concerning the basic elements of an environmental management system applicable in any sized organization, in any industry, in any region of the world. Developed over three years of deliberation, the 14001 specification defines five major elements of an environmental management system (EMS). These EMS elements include the following:

- Policy
- Plan
  - Environmental aspects
  - Legal and other requirements
  - Objectives and targets
  - Environmental management plan

- Implementation and Operations
  - Structure and responsibility
  - Training, competence and awareness
  - Communications
  - Documentation
  - Document Control
  - Control procedures for routine operations
  - Emergency preparedness and response

- Checking and Corrective Action
  - Monitoring and Measurement
  - Non-conformance and corrective and preventive action
  - Records
  - EMS Audit

- Management review

The ISO 14001 standard is organized on the basis of a total quality management (TQM) system, and bears a number of similarities with the ISO 9001-3 series Quality Management System specifications.

The ISO 14001 specification presents those aspects of an EMS which can be objectively audited for purposes of registration. Therefore, it is designed for use by organizations who wish to be audited against the standard and auditors who have been authorized to perform the auditing by a registration body. The standard does not present specific, quantitative performance requirements which must be met. Instead, the specification requires several commitments from organizations, including the following:

- Commitment to compliance with legal and other requirements
- Commitment to prevention of pollution
- Commitment to continual improvement of the environmental management system.

The EMS is the vehicle for reaching these commitments. Through the EMS, the environmental performance of the organization will improve.

Organizations around the world are evaluating whether and when they need to conform to ISO 14001, and if so, the extent to which their EMS conforms to the requirements of the ISO 14001 specification document. Even if the organization determines it does not need to immediately register to the standard, it may wish to adopt a position of "ISO readiness" adapting many of the requirements of the standard, so that it can rapidly move toward registration if necessary.

4.4.1 EMS for VPTRR and Other Russian Enterprises

We selected the Volzhsky Plant for Tire Recycling and Repair (VPTRR) as a case study for implementation of an environmental management system. VPTRR (and the other enterprises) should consider elements in the ISO 14001 standard as it develops it own EMS. Its EMS should respond to the current regulatory, trade, economic and public relations situations the plant faces. It can build an EMS which will permit it to meet the ISO EMS standard when that is required, but registration to the standard is probably not immediately necessary.

It must be recognized that an EMS approach does not absolutely require immediate investment in specific pollution control technologies or meeting national or international regulations or performance standards. As its basis, ISO is a commitment to compliance with laws, and prevention of pollution within a continual improvement framework. There is no performance requirement for entry into ISO beyond the commitments above and the establishment of an EMS with the required elements.

In fact, the existing VPTRR EMS contains some elements required by ISO 14000, including the following:

VPTRR EMS Element	ISO 14001 EMS Requirement
Internal meetings to discuss environmental, among other problems	Communications
Chief Engineer as responsible for environmental performance	Responsibilities and authority
Waste minimization program, production to waste generation metrics	Addresses elements of environmental management plan, objectives and targets, and operational controls

An appropriate EMS could be built around these existing elements. Priorities for action include the following:

1. Perform a simple gap analysis to compare the current EMS to the ISO requirements. Use the ICF Kaiser 14000 Workstation to accomplish this. Our gap analysis program also permits development of plans to close the gaps in the areas indicated.

2. Conduct an assessment of significant impacts to address the major environmental impacts associated with the facility. Prioritize activities on the basis of impacts and identify objectives and targets for management.

3. Develop an environmental policy statement which can meet the ISO EMS and which can be distributed to plant personnel and the public, if appropriate.

4. For priority areas, develop operational controls for routine and emergency operations, training programs, and written documentation, as necessary.

5. Use monitoring and measurement, including auditing of procedures and performance and apply corrective actions if performance does not meet objectives and targets.

6. As the program is successfully implemented, go back to Step I above to update the gap analysis and Step II, to identify the activities which generate the next most significant environmental impacts.

4.4.2 Value to VPTRR and Other Russian Enterprises of EMS Approach

There are considerable benefits to VPTRR from adopting this approach. The facility will get a head start in implementing the standard, which may become a requirement in the future. The facility can use this incremental approach to improve environmental performance in a cost-effective manner.

4.5 Local and Regional Measures

During the Team's inspection and evaluation of the four study enterprises, it became apparent that several important institutional changes needed to be made to promote pollution prevention and environmentally-sound waste management at both the study enterprises and within the region. These institutional changes include the following:

- In light of the infeasibility of constructing an environmentally sound land disposal facility (i.e., the presence of a saturated zone within 1 to 2 meters of the surface), the practicality of designing and constructing of both a centralized waste transfer facility inside Volzhsky and a secure disposal unit at an environmentally sound location (where there is sufficient separation between the bottom of the disposal unit and the top of the seasonally high water table) should be investigated.

- The feasibility of constructing and operating a waste-to-energy facility should be investigated. The operation of a boiler that can burn the region's solid wastes to generate both process steam and electricity could solve several problems (i.e., solid waste disposal and cost-effective and reliable energy supply).

- Development and implementation of an improved charge-back system that will allow VNOP to recover costs associated with providing complete treatment. This system could force local enterprises to institute on-site source reduction measures such as water conservation and reuse, and pre-treatment. Such measures could reduce both the volume and toxicity of the various effluents sent to VNOP for treatment.

- Development and implementation of an improved charge-back system that will allow the operator of the centralized waste disposal facility to recover costs associated with providing secure disposal. This system could force local enterprises to institute on-site source reduction measures such as pollution prevention, pre-treatment, and volume reduction. Such measures could reduce both the volume and mobility of the various solid wastes sent to the disposal unit.

- An enhanced tire recycling incentive program could be proposed for adoption by the local government. The program could be modeled after any one of the many successful tire recycling programs operated here in the U.S. and/or abroad. Such a program could both increase the supply of tires available for recycling/repair and off-set the costs associated with transporting the tires to VPTRR.

- Development and implementation of grant programs or other incentive-based programs to foster pollution prevention and waste minimization.

These and other potential institutional changes were more thoroughly discussed in Section 3 of this report, which presents the results of a separate, but concurrent study conducted by UNIDO's consultant, Mr. Mascha.

APPENDIX 1

Company / Equipment Type	Cost	Description	Shred Width	Comments
Shredders				
Allegheny Paper Shredders				
TR-36 Auto Tire Shredder	$85,000	300-400 tires/hour	2"	
TR-50 Truck/Auto Tire Shredder	$168,000	400-500 tires/hour	2 1/8"	
American Pulverizer Company				
TRS-35X35	$86,500		2 - 3"	
Key Machine Inc.				
K150 Tire Shredder	$168, 385			
Alan Ross Machinery Corp.				
Used Margardshammer Shredder	$95,000		2 - 4"	
Used SSI Shear Shredder	$150,000		4"	Infeed Hopper Included
Used Carthage Tire Shredder	$65,000	700-1000 tires/hour		Infeed and Discharge Conveyors Included
Used Shred-Tech Shear Shredder	$59,950		1 - 1/2"	Conveyor and drum classifier
De-beaders				
Tire Recycling Consultants				
Bead Pro 4000	$29,900	200 tires/hour		
MM 1000 Tire Sidewall Remover	$3,495 - $4,295	150 tires/hour		
Tire Cutter	$7,995		13"	
TSI / SSG				
TC-600 Bead Loosener	$2,800			
TC-610 Tire Bead Breaker	$420			
Different Tire Cutters				

Company / Equipment Type	Cost	Description	Shred Width	Comments
Continental Turf Systems				
Truck Tire De-Beader	$18,000	75 tires/hour		All truck tires including 11 R 24.5 Bias & Steel Belted
Passenger Tire De-Beader	$15,000	250 - 300 tires/hour		
International Tire Equipment Co. Inc.				
Tire De-Beader	$15,000	135 tires/hour		
Alan Ross Machinery Corp.				
Tire De-Beader New 1992	$6,995			
Tire De-Beader New 1992	$7,500			
Key Machine Equipment				
Tire Bead Wire Puller	N/A			
Magnetic Separators				
Dings Magnetic Group				
Overhead Magnets	~$2,200 - $50,000			
Magnetic Deep Draw Drums	~$8,000 - $80,000			
Perma Drum	~$1,800 - $15,000			
Complete Recycling Systems				
Continental Turf Systems				
Whole Tire Granulating System	$450,000			Includes De-beader, Conveyor Belts, Shredder, Granulator, Mag. Separator, Dust Removal, etc.
Recycling Concepts Int'l Group, Inc.				
RCI 2001	$700,000	100 tires/hour		Pulvarizes and Separates 1" and 2" tire chips to 3mm to 100 mesh

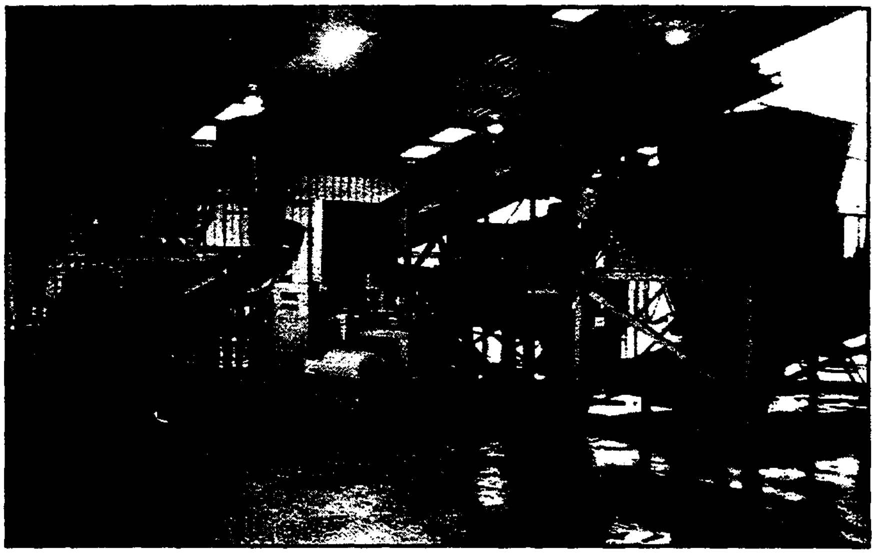
Company / Equipment Type	Cost	Description	Shred Width	Comments
Garbalizer Machinery Corporation				
S52-11 (Single Shaft)	$850,000	12 tons/hour		This price includes shredder, granulator, debeader, and conveyors
Chip Classifiers				
Key Machine Inc.				
Stand-alone	N/A	500 tires/hour	2"	More production, conveyor belt
Wrap Around Shredder	N/A	250 tires/hour	2"	Surrounds shredder, eliminate conveyor belts

TECHNOLOGY UPDATE

NEW! PRODUCTION UPDATE!

Texas Tire Recycler Reaches New Heights in Production, Efficiency

Shredder performance, new maintenance approaches, take production as high as 836,000 tires per month.



Gibson's Saturn 60-44HT primary shreds material — including truck tires — and passes it along for secondary shredding in the Saturn 62-40HT.

The scenario at Gibson Recycling just keeps getting better. The firm, situated on 44-acres in Atlanta, Texas, had recently seen its production rates rise from about 25,000 tires/day (three eight-hour shifts) to better than 30,000 tires/day. The latest word from company officials put that figure at a four-month average of more than 38,000 tires/day with a single month's output as high as 42,000 tires/day. In operation for about two years, the company uses Saturn shredders as part of its overall shredding capability. Company representatives say the shredders, coupled with new approaches taken to streamline the operation, have made the difference.

Seeking Improvement

A good portion of Gibson Recycling's tire stream is truck tires — company officials put the figure at about 45% by weight. In the past, Gibson Recycling successfully used a dual unit processing system consisting of two Saturn 62-40HT shredders — the most widely used shredder in North America for scrap tire applications. However, according to plant manager [illegible] Swanson, as the number of truck tires [illegible] grow, it was felt that an [illegible] processing capability was needed.

"We [illegible] turn about our needs. [illegible] ut 25,000 tires per day, in [illegible] n. While we were [illegible] felt that, [illegible] o better."

Up [illegible]

[illegible] ith Gibson [illegible] subsequent [illegible] der, the 300hp, [illegible] er. Designed [illegible] ons like truck tire p[illegible] ding to Swanson, has dram[illegible] the site's productivity.

"Prior to installation of the 60-44HT, we were processing about 25,000 tires/day. Today, we are regularly doing 38,000 tires/day and, in a single month's period, have averaged more than 42,000 per day. We have also gone to great lengths to ensure that interruption of production for blade changeovers is minimized. Through careful planning and preparation, we have reduced time needed for blade changeovers from 12 hours to about one hour 45 minutes. Those two factors alone — the performance of the shredders and the level of efficiency — have made a tremendous impact on production."

System Overview

In Gibson Recycling's system, the new Saturn 60-44HT acts as the primary shredder which then feeds material directly to a Saturn 62-40HT for secondary processing.

"Our market needs dictate that we take the material down to a TDF-sized chip. Truck tires and all, this system does that quickly and easily," says Swanson.

He adds that retrofitting the processing line to accommodate the new shredder was a simple procedure. "The addition of one electrical line to power the third motor was all that was needed. It was basically remove one unit and drop in the new one."

An Eye on Mobility

Company president Bud Gibson says that, while they have an ample supply of tires coming in from throughout the area, there is also a large volume of scrap tires to be processed offsite.

"We have plans to eventually go to existing area tire piles. Those plans include taking our Saturn 62-40HT Shredder mobile and shredding the tires on location. Doing so will reduce volumes by about a 4:1 ratio, and dramatically reduce transportation costs."

Gibson says issues like Saturn's eagerness to address his problems do not go unnoticed.

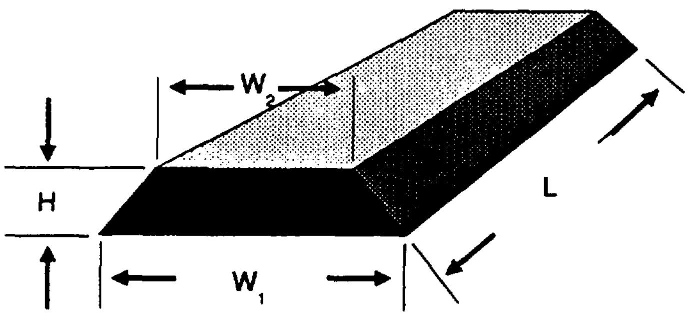
"It's what I like about dealing with MAC/Saturn: their response to our questions and willingness to meet our demands. As a result of their efforts, we now have the region's best truck tire-processing capability. They have played an important role in helping us become a full-service operation."

MAC CORPORATION / Saturn Shredders
201 East Shady Grove Road
Grand Prairie, Texas 75050
Phone 214-790-7800 Fax 214-790-8733

SATURN SHREDDERS

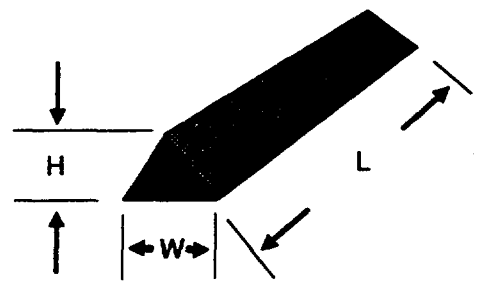
ESTIMATING NUMBER OF TIRES IN A TIRE PILE

(RANDOMLY STACKED)



FORMULA FOR TRAPEZOIDAL SHAPED TIRE PILE

$$V = (1/2\,[W_1 + W_2] \times H \times L)$$



FORMULA FOR TRIANGULAR SHAPED TIRE PILE

$$V = 1/2\,(W \times H \times L)$$

PROCEDURE:

1. First sketch and record the general dimensions of the tire pile.
2. Estimate the percentage of Passenger or Truck Tires.
3. Select and apply either the Trapezoidal or Triangular formula.

NOTE: The bulk density or number of tires per cubic yard will vary based on age, tire pile depth, method of stacking, and compaction. For highly compacted, older piles, use 12 passenger or 4 truck tires per cubic yard. For very loose piles use 8.5 passenger or 3 truck tires per cubic yard.

EXAMPLES USING THE TRAPEZOIDAL SHAPED TIRE PILE

Tire Pile Measurements: W_1 = 75 Feet, W_2 = 100 Feet, H = 10 Feet, L = 220 Feet

Case I: 100% Passenger Tires

$$V = \frac{(1/2\,[\,75 + 100\,] \times 10 \times 220)}{27 \text{ cubic feet per cubic yard}} = 7{,}130 \text{ cubic yards of scrap tires}$$

Number of Scrap Tires in Pile = 7,130 x 10 = 71,300 Tires

Case II: 80% Passenger Tires and 20% Truck Tires

V = 7,130 cubic yards (same as Case I)

Number of Scrap Tires in Pile = (7,130 x 0.80 x 10) + (7,130 x 0.20 x 3.5)
= 57,040 Passenger Tires + 4,991 Truck Tires
= 62,031 Total Number of Tires

Courtesy of Rouse Rubber Industries, Inc., Vicksburg, MS

STOCKPILE ABATEMENT PROGRESS REPORT

The following states provided updated stockpile abatement information for 1994. It should be noted that many states are currently in the process of conducting inventories of the stockpiled tires in their states while others have completed inventories and are developing remediation plans.

Overall, stockpile remediation in the states is currently handled in one of two ways - either through a formal, state-established policy which usually includes an environmental priority ranking of the sites and a funding program to help carry out the cleanups. The other most commonly used approach is enforcement. In the majority of cases, however, enforcement actions have not yet resulted in cleanup or remediation of the piles due to the inability to recover costs from site owners or operators. Scrap tire recyclers and others interested in participating in stockpile cleanups should consult the list of states (p. 69) which fund stockpile abatement through their state scrap tire programs.

For more detailed information regarding stockpiles, including lists of state-identified accumulations, bid dates and requirements, please refer to the listings of state agencies beginning on page 139 of this directory. State waste management or environmental protection officials generally handle stockpile information. Questions should be directed to those agencies.

In addition to the information presented here, you may also wish to obtain a copy of **State Scrap Tire Management Programs - 1994 Legislative, Regulatory and Market Development Review**. To order a copy call *Scrap Tire News* (703) 280-9112.

Florida

Annual generation: 17 million scrap PTE's (Passenger Tire Equivalents).

Stockpiled - approximately 8.6 million scrap tires in known sites.

Status

• The Florida Department of Environmental Protection (DEP) reports approximately 3.5 million tires have been abated under contracts issued by DEP since the program began in 1990. Total cost of these cleanups was $2,903,117.

• Five counties have cleaned up 835,000 tires using waste tire grant funds.

• Approximately 3.1 million tires have been cleaned up by owners /operators without using waste tire account funds.

• In total, twenty waste tire sites have been cleaned up through state funded contracts and county projects, and private clean-ups accounting for a total of over 6 million scrap tires.

• Two piles have been stabilized accounting for approximately 5 million scrap tires.

• Ten sites are now under consent or enforcement orders accounting for 9 million scrap tires.

Georgia

Annual generation: 6 million scrap tires

Stockpiled - 3.4 million in known sites

Status

• 90 percent of piles are under consent or administative order.

• State has developed a priority environmental ranking system for stockpiles to expedite cleanups.

• Approximately 60,000 scrap tires were cleaned up from sites in the state in 1994.

Idaho

Annual generation: 1.3 million scrap tires

Stockpiled - approximately 850,000 scrap tires in known sites.

Status

• In 1994, the Department of Environmental Quality disbursed $1.5 million to counties from the State Waste Tire Grant Account to pay for cleanup of illegal stockpiles and fund other scrap tire management activities.

STOCKPILE ABATEMENT PROGRESS REPORT

Iowa
Annual generation: 1.3 million scrap tires

Stockpiled - approximately 850,000 scrap tires in known sites.

Status
- No formal program for abatement has been established.

Maine
Annual generation: 2.8 million scrap tires

Stockpiled - 2.6 million scrap tires in 43 known legal and illegal stockpiles.

Status
- The Department of Environmental Protection (DEP) is exploring the potential for developing a program to abate some of the state's largest stockpiles by in-state processing of the tires to produce tdf for supplemental fuel use at pulp and paper mills in the state. (Four mills are currently burning tdf). In 1994 the state met jointly with end-users, processors, haulers and others to discuss the merits of such a program.

- DEP made improvements including interior and perimeter fire roads, firebreaks and construction of an onsite fire pond to a site containing several million tires to reduce fire hazards and make the site passable for equipment.

Maryland
Annual generation: 4.5 million scrap tires

Stockpiled - approximately 5 million scrap tires in 34 known sites.

Status
- Maryland Environmental Service (MES) has initiated the first stockpile cleanup of approximately 45,000 scrap tires and has submitted cleanup plans for additional stockpiles containing about 400,000 scrap tires.

- Cleanup funds /grants are disbursed through the Used Tire Cleanup and Recycling Fund.

Massachusetts
Annual generation: 4 million scrap tires
Stockpiled - approx. 20 million scrap tires in 20 known sites.

Status
- The Massachusetts Environmental Strike Force has prosecuted several illegal storage and disposal sites resulting in the incarceration of two owners.

- Cleanup plans have been initiated at two of the state's largest sites located in the western part of the state.

Minnesota
Annual generation: 4 million scrap tires

Status
- The Minnesota Pollution Control Agency (MPCA) finished cleanup of 13.6 million scrap tires from the state's 292 tire dumps June 10, 1994. These 292 sites comprise all tire dumps originally identified in 1985 as eligible for cleanup.

- 200,000 scrap tires at 20 tire dumps are currently under contract and cleanup is expected to be completed by June 30, 1995. These stockpiles were identified and reported in the last six months.

- No tire stockpile cleanups are being proposed beginning July 1, 1995.

Mississippi
Annual generation: 2 - 2.3 million scrap tires

Stockpiled - approximately 2.3 million scrap tires in known piles.

Status
- State is reviewing disbursement of Waste Tire Grant funds to address stockpile abatement.

Nebraska
Annual generation - 1.6 million scrap tires
Stockpiled - approximately 1.5 million scrap tires in known piles.

Status
- Scrap Tire Reduction and Recycling Incentive Fund makes grants available for abatement of existing scrap tire piles.

Nevada
Annual generation: 1 million scrap tires
Stockpiled - 376,000 scrap tires in known piles.

Status
- One cleanup project completed in state. 30,000 tires were baled and used by in-state businesses for fencing

New Hampshire
Annual generation: 1 million scrap tires
Stockpiled - 185,000 scrap tires in known sites

Status
- A scrap tire pile containing approx. 200,000 tires in Seabrook, NH was cleaned up in 1994.

- In 1991, the state's largest pile (Danville) containing approx. one million scrap tires was remediated at a cost of $1,342,350.

STOCKPILE ABATEMENT PROGRESS REPORT

New Jersey

Annual generation: 9.7 million scrap tires
Stockpiled: approx. 5.5 million scrap tires in 8 known sites

Status

• 260 tons of whole tires and 126 tons of charred tires were removed from the site of Roebling & Sons Steel as part of a Superfund remediation. Total cost of the cleanup and removal was $94,740.

• Illegal pile containing 2,493 tons of scrap tires was cleaned up as part of a wetlands mitigation for new highway construction. Total cost was $700,000. Site owner is jailed for other violations and no cost recovery is expected.

• Another site containing nearly 1 million tires was cleaned up by the owner when advised of the potential fines and penalties he was facing.

• The New Jersey Department of Environmental Protection and Energy is working with the New Jersey Department of Corrections and one of the state's major utilities to develop a scrap tire remediation and processing program that would involve cleaning up the state's scrap tire stockpiles using inmate labor to collect, process and transport tdf to the utility's power plants for supplemental fuel.

Oregon

Status

• The Oregon Department of Environmental Quality financed cleanup of 64 scrap tire sites totalling 3,538,370 scrap tires at a cost of $3,732,101 over the life of the Oregon Waste Tire Program enacted in 1988 and ended as of June, 1993.

• $1.5 million remaining in the state tire recycling account will be disbursed in grants and loans to counties in 1995.

• $150,000 has been earmarked for municipalities on a bid basis to fund cleanup and amnesty days in 1995.

Rhode Island

Annual generation: 1 million scrap tires
Stockpiled - approx. 7-9 million scrap tires in known piles.
Status

• The Division of Waste Management (DWM) is currently addressing remediation of four small intermediate size piles with a combination of initiatives including development of a long-term remediation strategy through owner proposed plans and consent agreements.

• In 1994, the state and tire dump owner William Davis agreed to abatement terms for the state's largest pile containing an estimated 8 million scrap tires. The agreement sets out a scheduled removal plan to begin no later than March 1, 1995 with completion set for 1997.

South Dakota

Annual generation: 700,000 scrap tires

Stockpiled - approx. 2 million scrap tires in known piles.

Status

• Two stockpiles containing a combined total of approximately 600,000 tires are being cleaned up in projects that began in June 1994.

Utah

Annual generation: 1.7 million scrap tires

Stockpiled - 1,925,000 scrap tires in known piles.

Status

• State does not have a formal abatement plan in place.

Virginia

Annual generation: 5.5 - 6 million scrap tires

Stockpiled - 17.8 million scrap tires in 731 known tire piles.

Status

• Estimated cleanup cost for all state tire piles is $32.4 million

• Department of Waste Management has initiated a four year plan for scrap tire management which includes selected stockpile cleanups- $1.5 million has been allocated for this use.

• In 1994, Ring George County officials negotiated a cleanup settlement for one of the state's largest piles containing 6-8 million scrap tires. The county will secure and prepare the site as its part of the cleanup using a $750,000 state grant. The remainders of the cleanup will be conducted by a private contractor in conjunction with the company's recently awarded management and operation contract for a new county landfill scheduled to open in 1995.

Washington

Status

• Three major scrap tire piles totalling more than one million tires were cleaned up in 1994. Approximately $4 million was disbursed from the waste tire fund for these cleanups.

• To date, 22 of the 25 largest piles have been cleaned up accounting for approximately 3 million waste tires being removed from the waste stream. Remaining three piles (approximately 3 million tires) are under contract and expected to be cleaned up by the end of 1995. When complete, the state will have cleaned up 6 million stockpiled tires over the life of its waste tire program which began in 1989 and expired December 31, 1994.

West Virginia
Annual generation: 1.9 million scrap tires
Stockpiled - more than 5 million scrap tires in known piles.
Status
• In 1994 state funded and initiated cleanup of two major stockpiles. The total number of tires in both piles account for nearly 4 million waste tires.

Wisconsin
Status
• As of January 1995, 80 waste tire stockpiles cleanups have been completed and more than two-thirds of all tires stockpiled in the state have been cleaned up at a total cost of $11 million. Responsible parties (site owners and operators) have cleaned up an additional 200 stockpiles.

• In total 85% of all waste tires stockpiled in the state have been cleaned up. It is expected that by the end of 1996 all stockpiled tires will be cleaned up.

Other Stockpile facts

• Cleanup grants are available through Michigan's Scrap Tire Regulatory Program. In 1994 Michigan cities requested $460,000 from the fund to collect, remove and dispose of illegally dumped tires.

• In fiscal year 1994 approximately $498,643 was disbursed in scrap tire management grants to Kansas counties. Nearly half of that amount was used for stockpile abatement by the counties. In FY1995 Kansas expects to disburse $1,698,200 from the Waste Tire Recycling Fund in abatement grants to eleven counties.

States With Available Funding For Scrap Tire Projects

Arizona	Maryland	Oregon
Arkansas	Michigan	Pennsylvania
California	Minnesota	Rhode Island
Colorado	Mississippi	South Carolina
Florida	Missouri	South Dakota
Georgia	Nebraska	Tennessee
Idaho	Nevada	Texas
Illinois	New Jersey	Utah
Indiana	New Mexico	Vermont
Iowa	New York	Virginia
Kansas	North Carolina	Wisconsin
Kentucky	North Dakota	Wyoming
Louisiana	Ohio	
Maine	Oklahoma	

Note: The majority of states disburse grants and loans to counties for projects. Counties may contract with private firms.

Scrap Tire Landfill Restrictions

The following states ban whole tires from landfill. Cut or shredded tires can be landfilled except in states noted with **. Those states ban all tires.

Arizona*	Louisiana	Oklahoma
Arkansas*	Maryland**	Oregon
California	Massachusetts	Rhode Island
Florida	Minnesota**	South Carolina
Georgia	Mississippi	Tennessee
Hawaii**	Missouri	Texas
Idaho**	Nebraska (9/1/95)	Utah
Illinois	Nevada	Vermont
Indiana (** 7/95)	New Hampshire	Virginia
Iowa	New York	West Virginia (** 6/95)
Kansas	North Carolina	Wisconsin**
Kentucky	Ohio**	

LEGEND
* monofills allowed for shredded and/or whole tires

** bans all tires in any form

FIRE SUPPRESSANT PRODUCTS & SERVICES

FSI Inc. Fuel Buster
256 Commerce Dr., Suite 475
Peachtree, GA 30269
TEL: (404) 487-2969 FAX: (404) 487-5474
CONTACT: Douglas Cobb

FSI offers a fire suppressant for extinguishing tire fires.

Monsanto Chemical Company
810 E. Main St., Ontario, CA 91761
TEL: (714) 983-0772 24 hr. TEL: (714) 946-7371
FAX: (714) 984-4770
CONTACT: Mike Mertens, George Roby, Karen Powell

Mosanto's Phos-Chek[R] Class A foam is unique in its ability to extinguish tire fires, reduce smoke, improve fire fighter safety and reduce costs. Monsanto's Wildfire division manufactures chemical retardants and Class A foam fire suppressants, provides necessary equipment and services to Wildland fire management officials and to the general fire fighting industry.

Mr. Waddell Hill
Tacoma, WA
TEL: (206) 596-2732
Mr. Hill is a consultant / instructor in the management and prevention of tire fires tactics training; site and process fire prevention methods training; code and preventive methodology training for governmental agencies; fire fighting tactics for tire pile fires; and health-environment impact methodology training.

Arnold Enterprises
P.O. Box 270657, Corpus Christi, TX 78427
TEL: (512) 850-7794 (voice and fax)
Market a chemical liquid concentrate that mixes with water, in a 3 to 6% ratio, which is sprayed on tire and oil fires and works by encapsulating the oil molecules, and disolving them, while cooling down the tire core, according to company. The mixture is non-toxic and biodegradable, according to Arnold Enterprises.

MARKET SURVEY

AVERAGE MARKET PRICES FOR TIRE-DERIVED MATERIALS

Crumb Rubber

Size	Average Price	Range
1/4"	$.09 /lb. $205 /ton	$.02 - $.15 /lb. $200 - $220 /ton
3/8"	$.08.6 /lb. $205 /ton	$.04 - $.13 /lb. $200 - $210 /ton
10 mesh	$.12 /lb. $225 /ton	$.06 - $.17 /lb. $120 - $340 /ton
20 mesh	$.15 /lb. $300 /ton	$.07 - $.20 /lb. $150 - $380 /ton
30 mesh	$.17 /lb. $365 /ton	$.12 - $.21 /lb. $260 - $420 /ton
40 mesh	$.23 /lb. $460 /ton	$.16 - $.25 /lb. $320 - $500 /ton
80 mesh	$.45 /lb. $600 /ton	$.30 - $.65 /lb.

Note: See definition of "mesh" on page 36

Tire-Derived-Fuel

Size	Average Price	Range
1" minus	$28.20 /ton	$13.50 - $50 /ton
2" nominal	$28.75 /ton	$5.00 - $45 /ton

Buffings

Size	Average Price	Range
raw	$98.57 /ton	$20 - $150 /ton
processed	$240 /ton	

SOURCE: 1994 Price & Market Survey conducted by Recycling Research Institute

CRUMB RUBBER MARKETS

Asphalt: 91 million lbs. per year or 37% of tires being consumed annually.*

Tires: 40 million lbs. per year or 16% of tires being consumed annually.* Manufacturers limit use to 2% per tire but could use up to 5% per tire. Good potential for growth in this market.

Molded /Extruded: 12 million lbs. per year or 5% of tires being consumed annually.* More R & D needed. Slow growth market.

Rubber /Plastic: 11 million lbs. or 4% of tires being consumed annually.* Products include truck bed liners, golf cart fenders, bumpers, and similar products.

Bound Rubber: 54 million lbs. per year or 22% of tires being consumed annually.* Products include mats, tiles, padding, sheet goods and similar products.

Athletic /Recreation Surfaces: 32 million lbs. per year or 13% of tires being consumed.* Rapidly growing market.

Friction Materials: 8 million lbs. per year or 3% of tires being consumed annually.* Mature market that has been stable for the last ten years.

* Percentage of the 15 to 20 million scrap tires currently being consumed in crumb rubber markets annually in the U.S.

SOURCE: Baker Rubber, Inc.

TIRE-DERIVED-FUEL MARKETS

- 80 million being consumed as fuel (1994)
- 26 cement kilns burn TDF (only 2 in 1990)
- 14 kilns are testing (Capacity: approx. 3 million tires/kiln/year)
- 15 paper mills burn TDF (8 are testing TDF) Capacity: 750,000 - 3 million tires/mill/year
- 16 industrial plants including utilities burn TDF
- 2 whole tires-to-energy plants (annual combined capacity is 15 million tires)

SOURCE: Scrap Tire Management Council

Scrap Tire Processing

SSI Tire Shredding Systems set the industry standard for high volume, cost effective scrap tire processing and recycling. Our complete line of stationary and portable shredders are designed to process up to 20 tons per hour of truck or passenger tires into chips suitable for tire derived fuel (TDF) and crumb rubber applications.

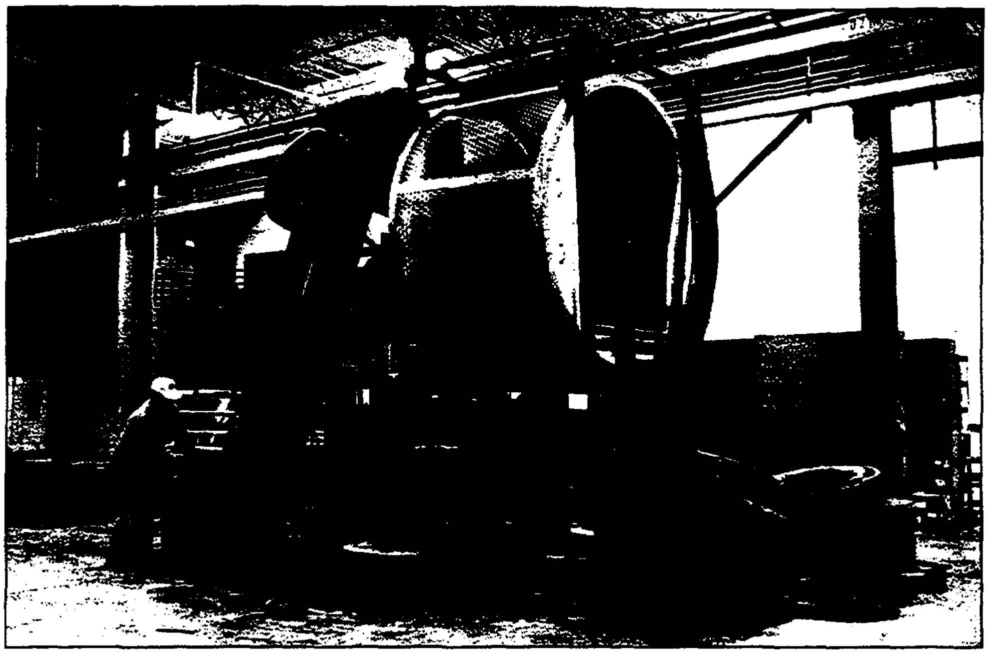
From high volume TDF processing facilities to lower volume, tire reduction operations, SSI has established a reputation for **RELIABLE, PRODUCTIVE** and **EASY TO OPERATE** tire shredding systems:

- TDF Systems
- Rough Shred Systems
- Crumb Rubber Pre-Processing Systems
- Portable and Stationary Units
- New and Used Equipment
- Replacement Parts and Service for All Major Shredder Lines

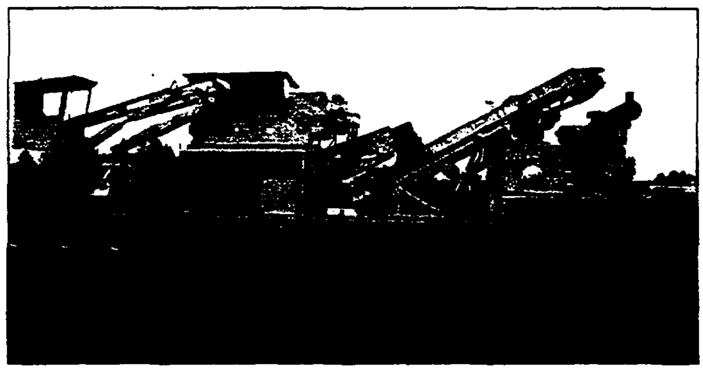
For proven equipment performance, reduced operating costs and reliable replacement parts delivery for your tire processing operation, call SSI today.

SSI

SSI Shredding Systems, Inc.
9760 S.W. Freeman Drive
Wilsonville, Oregon 97070-9286
Phone: (503) 682-3633
Fax: (503) 682-1704



***Above:** SSI's Model 2400 Tire Derived Fuel System processes up to five (5) tons per hour of truck tires producing a 2" or 1" nominal chip.*



***Right:** SSI's portable tire shredding systems cut whole tires, even steel belted radials, in one step with no debeading and are completely mobile for transport from site to site.*

***Left:** SSI's tire reduction systems are ideal for processing off road, truck, heavy equipment, and aircraft tires.*

***Above:** The Model 2400 TDF System features easily interchangeable 1" and 2" classification screens depending on particle size requirements.*

COMPLETELY SELF CONTAINED, THE REDUCTION TECHNOLOGY 5040 MOBILE SHREDDER REDUCES TRUCK TIRES TO 2" SHREDS OR 1" OR 2" CHIPS

4 MINUTE SETUP

From parking the 70,000 lb 5040 to operation is less than four minutes with two workers. No additional equipment is needed, it is completely self contained. A simple 4 step procedure is followed:

1. The diesel generator is started.
2. The 450 HP main diesel is started.
3. The discharge conveyor is hydraulically raised into position and the stay pins are inserted.
4. The infeed conveyor is lowered to the ground and pushed into position. Now the 5040 is ready to shred tires.

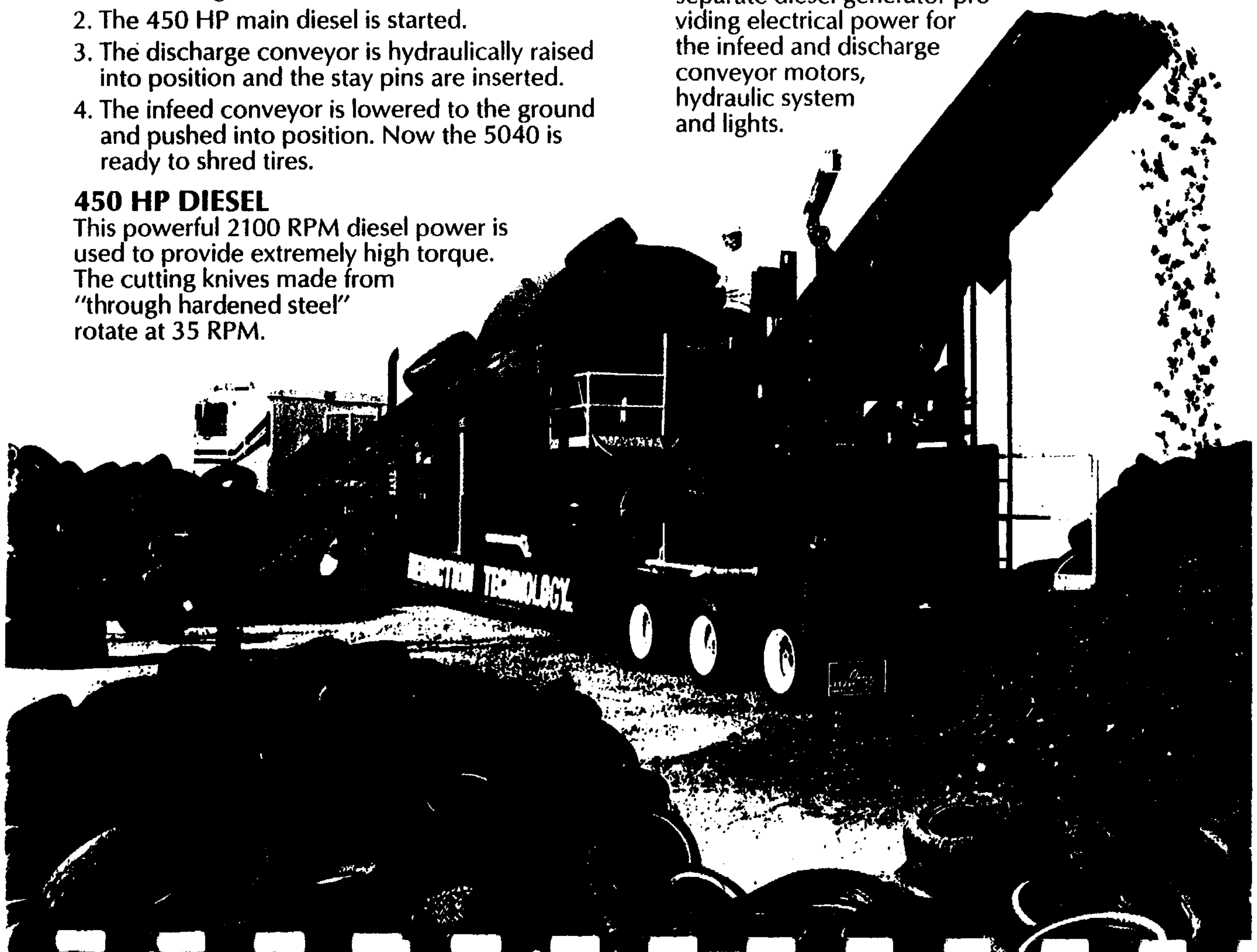
450 HP DIESEL

This powerful 2100 RPM diesel power is used to provide extremely high torque. The cutting knives made from "through hardened steel" rotate at 35 RPM.

The hook shear knives easily process 4 ft. diameter truck tires. All the power from the main diesel is directed to the cutting chamber.

INDEPENDENT DIESEL GENERATOR

Electrical power for the 5040 is produced by a separate diesel generator providing electrical power for the infeed and discharge conveyor motors, hydraulic system and lights.



EASY CHANGE FROM STRIPS TO CHIPS

The proven design of the nine foot diameter classifier allows an easy change over from processing shreds to either 1" or 2" chips. Each of the eight screens has only 2 nuts to remove and replace with different size screens. To produce rough shreds when the classifier is set for 1" or 2" chips is simple and fast. Stop the classifier and remove one panel under the cutting chamber and the 2" shreds fall directly to the discharge conveyor.

BUILT STRONGER AND HEAVIER

Built on a tri-axle low boy trailer with twelve wheels for proper weight distribution and stability. Each of the two 18" longitudinal "I" beams weigh 50 lbs per ft. The low profile reduces operator fatigue and measures less than 13'6" to adhere to highway safety regulations.

PROVEN IN SERVICE

Since 1975 over fifty of our stationary and mobile tire shredding units have demonstrated unmatched dependability and ease of maintenance, meeting customer expectations at a competitive price. Our services include experienced supervisory personnel at each installation start-up.

Please contact us so we may identify your processing requirements and respond with a proposal that meets your needs.

If you produce it, we can reduce it.

REDUCTION TECHNOLOGY INC.

OEM Successor to Mitts and Merrill Reduction Equipment and Carthage Tire Shredder Systems

206 Ashville Road, P.O. Box 297, Leeds, AL 35094-0297

Entire Environmental Systems, Incorporated (EES)
1219 Abrams Road, Suite 112
Richardson, TX 75081
TEL: (800) 859-7700 / (214) 690-4571
FAX: (214) 690-4572
CONTACT: Mary Lou Acton

EES is a multi-national technology development company. Designs, engineers and manufactures tire baling equipment for distribution.

Eriez Magnetics
Asbury Road at Airport
P.O. Box 10608
Erie, PA 16514
TEL: (800) 345-4946
FAX: (814) 838-4960
CONTACT: K.W. Jones

Eriez manufactures magnetic separators to remove bead wire and other ferrous, vibrating pan feeders and round screeners to convey and size rubber, metal detectors for final quality control, and other related equipment. Eriez has a Tech Center to test customer products on numerous equipment to recommend the best solutions for process problems.

Forsbergs, Inc.
P.O. Box 510
Thief River Falls, MN 56701
TEL: (218) 681-1927
FAX: (218) 681-2037
CONTACT: Denny Bakke

Forsbergs, Inc. manufactures dry granular separation machinery including screeners, gravity tables, destoners, aspirators, conveyors and fans.

Global Equipment Marketing Inc
P.O. Box 810483
Boca Raton, FL 33481-0483
TEL: (407) 750-8662
FAX: (407) 750-9507
CONTACT: Marshall Gralnick

North American distributor of "Mastermag" line of magnets. Offer the Mastermag type "K" permanent magnetic overband separators for tire shredding and aggregate crushing plants. Unit is used for removing steel from shredded tires to produce cleaner product and more saleable scrap.

Graves Body Crusher
P.O. Box 68
Spencerville, IN 46788
TEL: (219) 238-4858

Company offers tire balers.

Griffin Environmental Co., Inc.
7066 Interstate Island Road
Syracuse, NY 13209
TEL: (315) 451-5300
FAX: (315) 451-2338
CONTACT: Sam Stenger

Griffin Environmental manufactures dust control systems and equipment.

Hallco Manufacturing Co., Inc.
P.O. Box 505
Tillamook, OR 97141
TEL: (800) 542-5526
FAX: (503) 842-8499
OR
#2 Azalea
Texarkana, TX 75504
PHONE: (903) 832-5185
FAX: (903) 838-8907
CONTACT: Charles Russell

Hallco manufactures tire conveyors/conveyor systems. Transfer systems for tire handling. Trademark "Live Floor" stationary and mobile units. Makes floors for semi-trailers and shredded tire feeders. Also manufactures horizontal moving slat conveyors.
See ad opposite Introduction page

Hustler Conveyor Company
4985 Fyler Ave.
St. Louis, MO 63139
TEL: (314) 352-6000
FAX: (314) 352-0355
CONTACT: Paul Griesedieck

Hustler manufactures heavy-duty flat belt conveyors, oscillators, sorters/separators, stackers etc. for scrap recycling operations.

Keith Manufacturing Company
P.O. Box 1
Madras, OR 97741
TEL: (800) 547-6161 /(503) 475-3802
FAX: (503) 475-2169
CONTACT: Keith Foster

Keith Mfg. designs and manufactures conveyor / unloading systems to haul and handle tires. Trademark "Walking Floor, Running Floor, and Keith Lite" Systems are available in mobile and stationary design.

LaBounty Manufacturing, Inc.
100 State Road 2
Two Harbors, MN 55616
TEL: (218) 834-2123
FAX: (218) 834-3879
CONTACT: Kathy Dover

LaBounty manufactures a complete line of waste handling and processing hydraulic attachments for the scrap recycling, demolition, construction and waste industries.

Logemann Brothers Company
3150 West Burleigh St.
Milwaukee, WI 53210
TEL: (414) 445-3005
FAX: (414) 445-1460
CONTACT: Robert Plichta
Logemann Brothers manufactures metal balers and two-ram, automatic-tie balers for baling solid wastes including scrap tires.

Western Rubber Products Ltd.
721 Alford Avenue
Delta, B.C.
CANADA V3M 5P5
TEL: (604) 524-5263
FAX: (604) 524-1241
CONTACT: Grant McIntosh, Mike Roberge

Formed in 1989, Western Rubber Products Ltd. operates from two facilities near Vancouver, B.C.. WRP accepts/picks up and processes scrap passenger, truck and OTR tires into crumb rubber and has grown steadily into the largest crumb rubber producer in Western Canada. The company produces and sells different grades of crumb rubber to various markets. Product available in all black or black and white. Sizes include 3/8" minus, 1/4" minus and 1/8" minus. All product is free of steel and available with or without fiber. Packaged in 50 lb. bags, one ton bulk bags or shipped in bulk according to customer needs. Currently producing in excess of 1 million lbs. per month, Western Rubber has the capacity to process 2.5 million PTE's annually.

RESEARCH & TESTING

Ontario Center For Materials Research
15 Burnwood Rd.
Etobicoke, Ontario
CANADA M9B 2W4
TEL: (416) 626-3922
FAX: (416) 978-5638
CONTACT: Harvey Pellegrini

Pyrovac International Inc. / McDermott Marketing Services
1560, avenue du Parc Beauvoir
Sillery, Quebec
CANADA G1T 2M4
TEL: (418) 656-7406 /(703) 870-5424
FAX: (418) 656-2091 /(703) 870-5574
CONTACT: C. Roy (Canada), S. Whitcomb (Virginia)

Pyrovac Int'l Inc. develops a vacuum pyrolysis process which converts scrap tires into value products such as oils, carbon black and steel. A licensing agreement has been signed with McDermott Mkt. Services Inc. for use of the technology in the U.S.

Science Council of B.C.
Suite 800 - 4710 Kingsway
Burnaby, B. C.
CANADA V5H 4M2
TEL: (604) 438-2752
FAX: (604) 438-6564
CONTACT: Bernadette Mah

The Science Council of British Columbia provides funding for product and technology development in many sectors including environmental technology. A research funding program is also available for recycled tire crumb rubber. Funding is only available to B.C. companies.

Universite Laval
Dept. of Chemical Engineering
Pavillon Adrien-Pouliot
Sainte-Foy, Quebec
CANADA G1K 7P4
TEL: (418) 656-7406
FAX: (418) 656-5993
CONTACT: Dr. Christian Roy

The research team conducts a fundamental research program since 1985 for the industrial development of the vacuum pyrolysis process. The process turns old tires into oils and carbon black at low temperature (415oC) and pressure (0.1 atm absolute). The program involves heat transfer studies, reaction kinetics and material characterization, purification and upgrading. Work is done in close collaboration with Pyrovac Institute, Inc. (Sillery, Quebec).

Summary of Scrap Tire Management Programs in Canada

Province	Financing Tool	Economic Incentive
British Columbia	$3 adf*	Recycling: up to $1.50/tire Energy Recovery: $0.90/tire Transportation: average of $0.50/tire R & D: grants
Alberta	$4 adf	Recycling: negotiated (one recycler receives $250/ton) Energy Recovery: negotiated (one kiln receives $2.15/tire) Market Development: grants up to $5,000 for small recyclers Small Scale Recycling Association: $20,000 start-up grant R & D: grants
Manitoba	$3 adf	Recycling: up to $2.50/tire Energy Recovery: up to $2.50/tire Municipalities: $0.50/tire taken from municipal landfills
Ontario	General Revenue	Demonstration Projects: grants Recyclers: grants
Prince Edward Island	$2 adf *advance disposal fee	Transportation: $1/tire Shredding: $1.05/tire (shreds used by government for road base) **SOURCE: Apogee Research Int'l Ltd. / TireTech Marketing**

COLUMBUS McKINNON CORPORATION
SHREDDER / WASTE MANAGEMENT DIVISION
1920 WHITFIELD AVENUE
SARASOTA, FLORIDA 34243
941/755-2621

CM

November 4, 1996

Carmen Gueirreco
ICS Kaiser Inc.
9300 Lee Hwy.
Fairfax, VA 22031-1207

Dear Mr. Gueirreco:

*Thank you for your continued interest in the **CM Tire Shredding System.** Pursuant to our conversation below please find pricing for mobile and stationary systems that we discussed:*

QUOTATION: Stationary Tire Shredder

We are pleased to quote you a price of $512,925 (U.S.) F.O.B. Sarasota, FL for a complete stationary tire shredding system, with a 1 X 1 inch classifier, as described in our brochure, excluding the lowboy trailer and diesel generator set which is standard equipment for our portable unit.

QUOTATION: Portable Tire Shredder

We are pleased to quote you a price of $625,275 (U.S.) F.O.B. Sarasota, FL for a complete portable tire shredding system with a 1 X 1 inch classifier as described in our brochure.

A qualified CM technician will make two trips to the shredder location. The first trip will be to train operators on the set-up, tear down, operation and maintenance of the system. The second trip will be made at the time of your first knife change in order to train your technician on this procedure. At this time we will once again review all maintenance requirements.

Delivery for the tire shredder (stationary or portable) would be 6 to 8 weeks after receipt of a signed formal contract and a twenty percent (20%) down payment.

Thank you for the opportunity to quote you on these items.

Sincerely,

Charles G. Astafan

Charles G. Astafan
General Manager ks
Sarasota Operations

COLUMBUS McKINNON CORPORATION
SARASOTA OPERATIONS
1920 WHITFIELD AVENUE
SARASOTA, FLORIDA 34243
PHONE 941/755-2621 FAX 941/753-2308

CM INTRODUCES MULTIPLE SIZE CLASSIFICATION SYSTEMS

MATERIAL SIZE - NORMALLY DEFINED AS A NOMINAL SIZE 2 X 2 INCH, 3 X 3 INCH, ETC. HAS CREATED PROBLEMS IN THE PAST FOR POTENTIAL END USERS OF T.D.F. (TIRE DERIVED FUEL).

CM, IN ITS CONTINUING ENDEAVORS TO SATISFY THE INDUSTRIES NEEDS HAS TAKEN ITS ORIGINAL PATENTED 2 X 2 INCH CLASSIFIER CONCEPT, AND APPLIED IT TO A NUMBER OF DESIRED END PRODUCT SIZES.

ALL EXISTING CM TIRE SHREDDERS CAN EASILY BE RETROFITTED WITH ANY ONE OF OUR NEW CLASSIFIERS. WITH THE INTRODUCTION OF THIS CONCEPT, THE CM TIRE SHREDDER CAN NOW PRODUCE THE FOLLOWING PRODUCT SIZE:

1.	SINGLE SHRED 2 X 12 INCH STRIP	22 - 24 TONS/HOUR
2.	3 X 3 INCH NOMINAL CHIPS	10 - 14 TONS/HOUR
3.	2 X 2 INCH NOMINAL CHIPS	8 - 12 TONS/HOUR
4.	1-5/8 X 1-5/8 INCH NOMINAL CHIPS	7 - 9 TONS/HOUR
5.	1-1/2 X 1-1/2 INCH NOMINAL CHIPS	6 - 8 TONS/HOUR
6.	1 X 1 INCH NOMINAL CHIPS	4 - 5 TONS/HOUR

PLEASE NOTE ALL PRODUCT SIZES CAN RANGE SLIGHTLY AND GREAT CARE SHOULD BE TAKEN WHEN CONSIDERING A CLASSIFIER FOR YOUR APPLICATION.

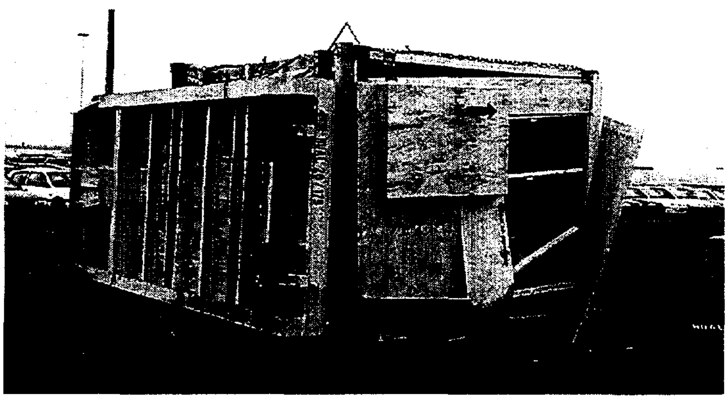
SAMPLES OF CHIPS CAN BE SUPPLIED UPON REQUEST.

Scrap Tire NEWS
Covering The News And Developments In The Scrap Tire Recycling Industry
Reprint from Vol. 8, No. 9 **September 1994**

Tire Shredder Durability "Put to the Test"

Just how durable is your tire shredder?

That's a question the Columbus McKinnon Corporation (CM) got the unexpected opportunity to answer earlier this year when the first tire shredder it was delivering in Europe tipped over at the port of Amsterdam. The machine, which had been placed on a trailer that was too light for its 30 ton weight, landed on its gearbox when the trailer's rear wheel and wheel support collapsed, according to CM sales manager Charlie Astafan. Because the gearbox is located in one of the strongest and heaviest areas of the machine, only the guards around the recirculation drum were damaged in the fall, Astafan said. "Absolutely no damage was done to the machine to effect its operational functions," Astafan said. "Not even the sight glass on the gear box cover was damaged ... and the seal wasn't ruptured", he said.

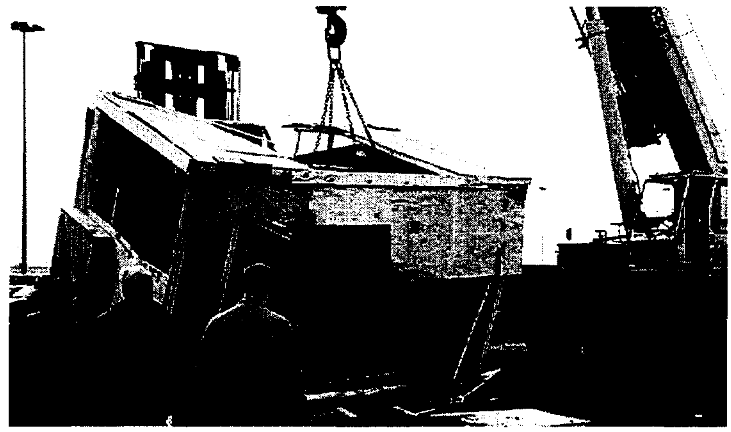


Manufacturer's nightmare - this overturned trailer holds a CM tire shredder headed for delivery to an Amsterdam rubber processor.

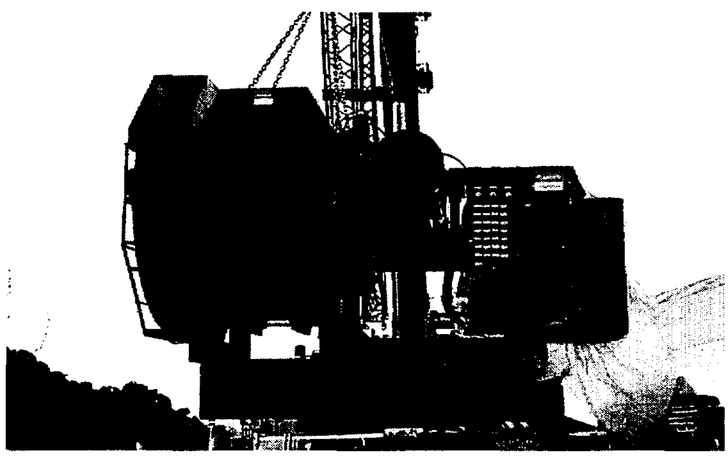
Within 48 hours of dispatching service technicians from CM's manufacturing plant in Sarasota, FL, to Amsterdam, the shredder was set upright, delivered and operating at the crumb rubber plant of its owner Granuband, B.V., in Amsterdam. Granuband purchased the CM machine in December, 1993 with the primary goal of increasing its crumb rubber production capacity. Granuband uses the CM Shredder to process whole passenger and truck tires into nominal one inch chips which are then used as feed material for its crumb rubber plant.

Since installing the machine, Granuband has also been able to expand its market base to include tdf markets for the one-inch chip. In addition, the machine gave Granuband the capability to add truck tires to its scrap tire collection and become more competitive in that market.

To meet European electrical requirements (380 volts, 50 hertz power), CM equipped the machine with special motors and electronic controls. CM also supplied a special soft start electronic controller to reduce the inrush current of the motor on start-up, Astafan said. "These features were specially designed to help our customer operate at maximum levels of energy efficiency," Astafan said. With the high cost of energy in Europe, this was a critical component for Granuband, he noted. Once CM's technicians repaired the guards and inspected and tested shredder operations, CM reinstated its full warranty, Astafan said. Granuband reports the machine has been fully operational since then.



Within twenty four hours, CM personnel were at the Port of Amsterdam getting the shredder "back on its feet."



The virtually undamaged "CM warhorse" being installed at Granuband.

In addition to the Granuband machine, CM has installed shredders in several other off-shore locations including Germany, Belgium, Taiwan, Hawaii and Puerto Rico - but none, Astafan says can compare to the Amsterdam delivery. And despite its newly-demonstrated learning curve, that's the way CM would like to keep it. ◆

Scrap Tire News is a publication of Recycling Research Institute
133 Mountain Rd., Box 714, Suffield, CT 06078. (203) 668-5422.

THE PROBLEM

Pollution
Overcrowded Landfills
Waste
Health Hazards

CHARLES G. ASTAFAN
SALES DIRECTOR
SARASOTA OPERATIONS
(941) 755-2621
(941) 753-2308 - FAX
TOLL FREE 1-800-848-1071

CM®

COLUMBUS McKINNON CORPORATION
1920 WHITFIELD AVENUE
SARASOTA, FLORIDA 34243

THE FUTURE

Waste. Pollution. Shrinking resources. Vanishing species. All issues of great concern. We worry for future generations even more than for ourselves. Yet [illegible] of us [illegible] ever have a truly significant oppor-tunity to demonstrate [illegible]

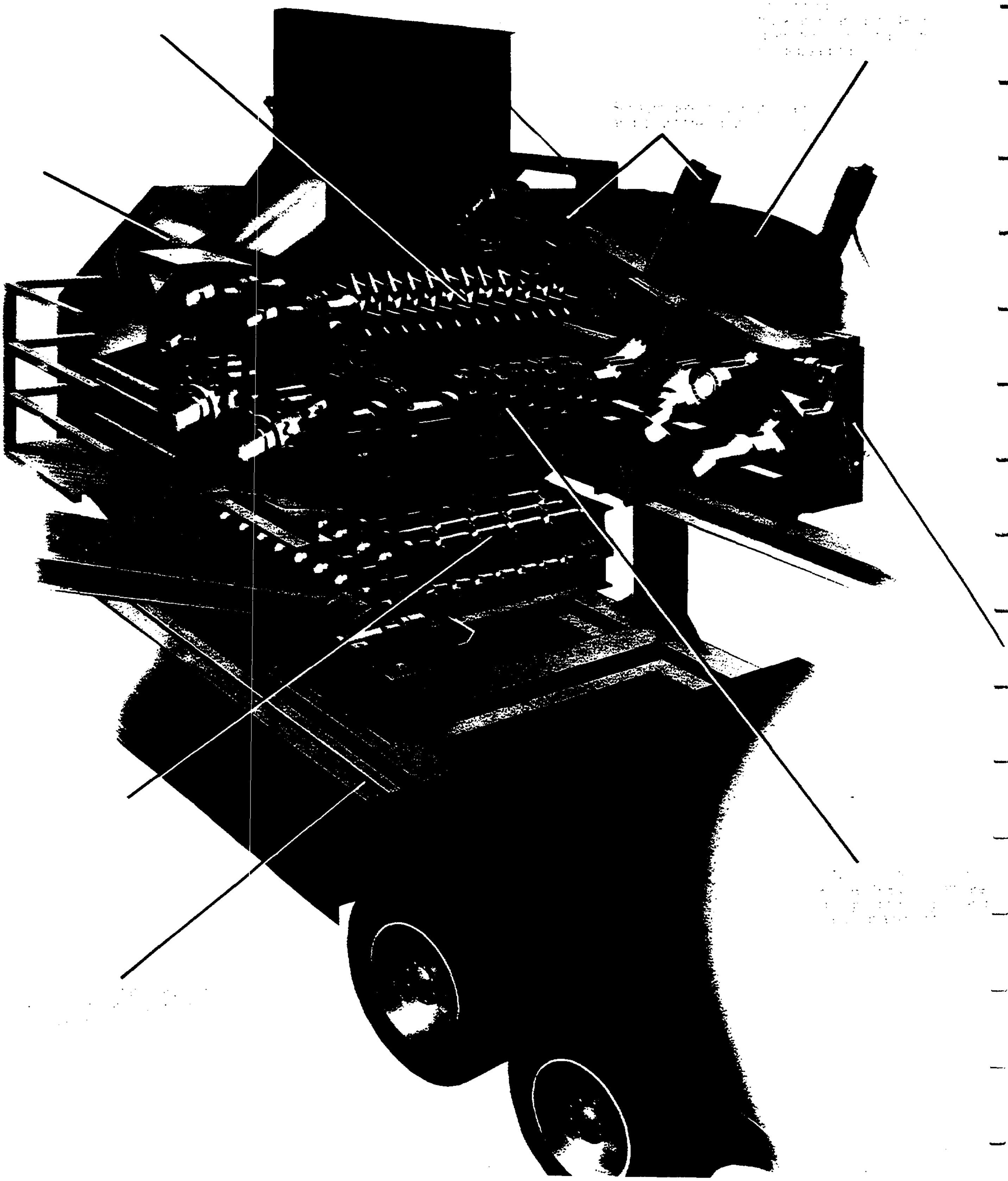
Already, there are proven uses for recycled tires. Paper, cement and other industries show good track records with tire derived fuel. Rubber asphalt paving systems are safer and more durable. Rubber [illegible]

[illegible]

[illegible] harmful [illegible] resources they are

The [illegible] future [illegible] ways to [illegible]

The Means

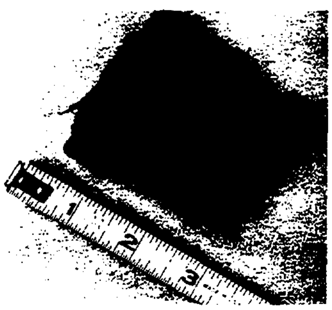


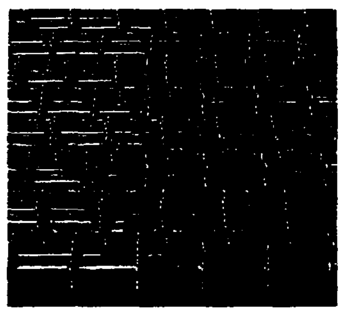
THE CM TIRE SHREDDER

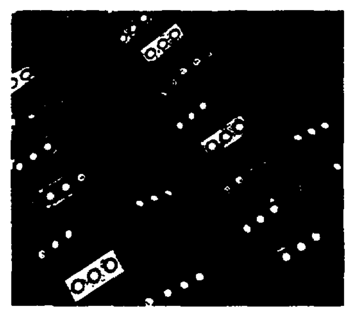
[illegible]

Mobility. Mounted on an exclusive tri-axle dual(?) trailer specially designed by CM, the Shredder can be transported readily from site to site. This mobility allows you the flexibility to bid on jobs wherever you choose, increasing your revenue potential substantially.

Revenue generator. [illegible]







Multi-purpose classifying system. [illegible]

Easy operation. [illegible]

Efficiency. [illegible]

Four production rates

[illegible]

New 1" x 1" classifier. Continuing our efforts to satisfy industry needs, we at CM have adapted our original patented 2" x 2" classifier to produce 1" x 1" and 1" x 1" chips. Existing CM Tire Shredders can be retrofitted easily with our new classifiers.

[illegible]

THE RESOURCE

Tire Derived Fuel

Rubber Asphalt Paving

Rubber-Plastic Compounds

Civil Engineering

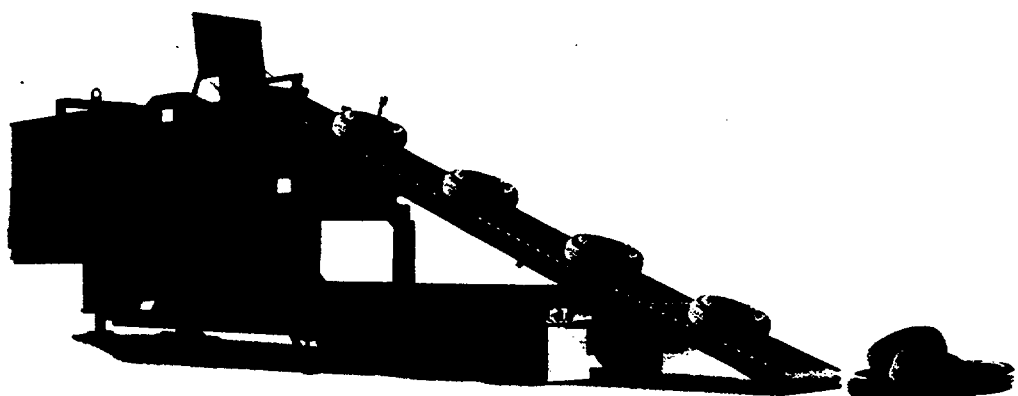
Control panel.

Service & support.

Heavy duty construction.

Specifications

Stationary	Portable



On-site training.

COLUMBUS McKINNON CORPORATION
SHREDDER/WASTE MANAGEMENT DIVISION
1920 WHITFIELD AVENUE
SARASOTA, FLORIDA 34243
(941) 755-2621 1-800-848-1071 FAX: (941) 753 2308
WORLD WIDE WEB: HTTP://WWW.INDUSTRY.NET CM

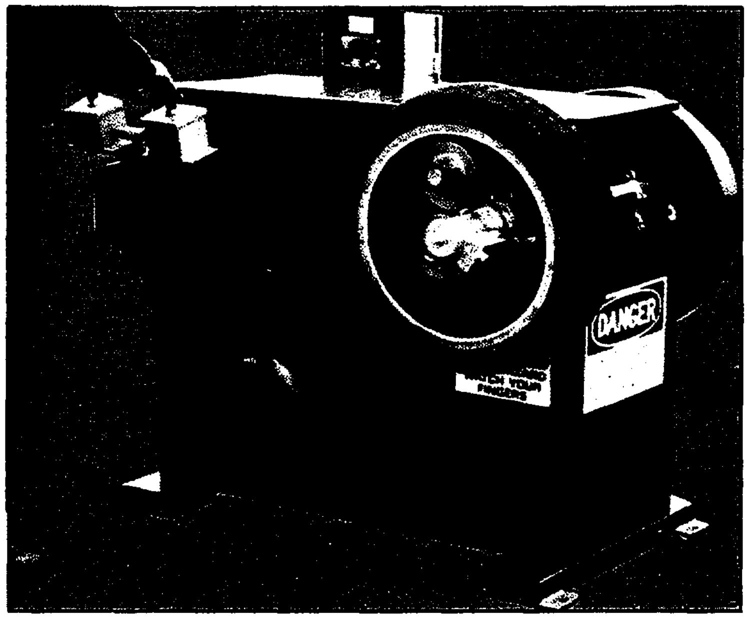
THE PROBLEM

Pollution
Overcrowded Landfills
Waste
Health Hazards

CHARLES G. ASTAFAN
SALES DIRECTOR
SARASOTA OPERATIONS
(941) 755-2621
(941) 753-2308 - FAX
TOLL FREE 1-800-848-1071

COLUMBUS McKINNON CORPORATION
1920 WHITFIELD AVENUE
SARASOTA, FLORIDA 34243

DE-BEAD YOUR SCRAP TIRES FOR ECONOMICAL PROCESSING & LOWER MAINTENANCE COSTS!



CUTS BOTH BEADS AT ONCE

De-Beading tires prior to processing will reduce maintenance downtime, increase productivity and provide a better quality product.

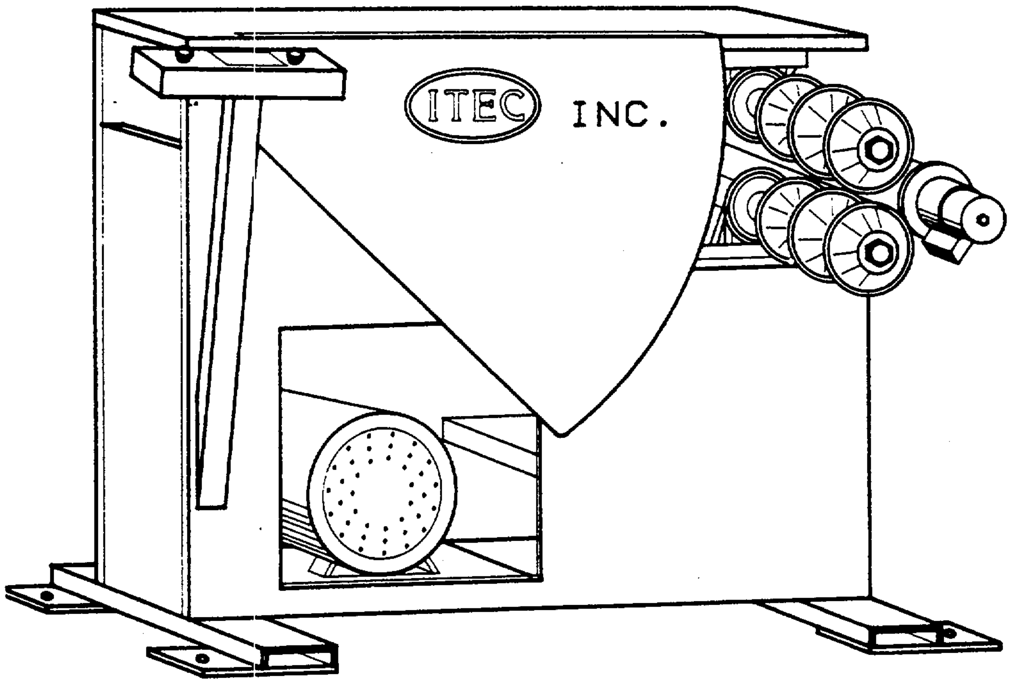
You simply load the tire onto the self-adjusting feeder, hold down the safety switches and de-bead both sides at once.

Two models are available:
Passenger will handle 12-16.5"
Truck will handle 20-24.5"

Let the ITEC tire de-beader reduce your tire processing costs.

FOR MORE INFORMATION CALL NATIONWIDE TOLL FREE
1-800-727-2029
[redacted]

ITEC INTERNATIONAL TIRE EQUIPMENT CO. INC.
Scrap Tire Disposal / Recycling Equipment



PASSENGER & TRUCK TIRE — DE-BEADER SPECIFICATIONS:

DIMENSIONS:

36" W x 58" L x 40" H

WEIGHT:

1,600 lbs. (approx.)

POWER:

(Passenger)

7.5 HP, 220/440 V, 3 Phase Motor

(Truck)

15 HP, 220/440 V, 3 Phase Motor

Endura-MAX Inc.
P.O. Box 205 • Alpena, MI 49707 • fax (517) 356-0770 • 1-800-356-1593

October 28, 1996

Ms. Carmen Guerrero
I C S Kaiser
9300 Lee Hwy
Fairfax, VA 22031-1207

Dear Carmen,

Thank you for your interest in Endura-Max Inc. (EMI) tire processing line of shredders. Enclosed please find literature displaying the various models of EMI tire shredders.

EMI tire shredding equipment is available in both primary and secondary shredders for processing scrap tires into chips as small as one-half inch in size. Our unique cutter design provides for a shearing action which produces cleanly cut chips, rather than the tearing action of most other brand shredders that often leaves long wires protruding from the chips. Operating and maintenance costs also compare favorably with that of most other brand shredders. Shredders are available in both stationary or mobile models and can be purchased with complementary equipment such as classifiers and conveyors.

Should additional product information be required, please do not hesitate to contact us. Demonstration units are also available for your review at our facility in Alpena, Michigan. Endura-Max appreciates your consideration and look forward to providing you with quality tire shredding equipment. Customer references are available upon request.

Sincerely,

Wayne Morgan Jr.

Wayne Morgan Jr.
Sales Coordinator

KEY MACHINE, Inc.

P. O. Box 68 • 1244 West Highway K • Liberal, Missouri 64762 • 417-843-6506 • Fax 417-843-6508

November 1, 1996

Carmen Guerreo
ICF Kaiser, Inc.
9300 Lee Highway
Fairfax, Va 22031-1207

Dear Carmen:

Thank you for your inquiry on tire shredding systems. The information I am putting together for you is very general but it will give us a starting place.

Enclosed are copies of the material I faxed to you yesterday afternoon. Also enclosed is drawing K150-G0003-D showing a Model K150 Tire Shredder with a "Wrap Around" Chip Classifier and drawing K150-G0252-D showing a Model K150 Tire Shredder with a separate "Stand Alone" chip classifier.

The Model K150 Tire Shredder sells for $168,385.00 and the stand it sets on sells for $1,950.00. The "Wrap Around" Chip Classifier sells for $35,750.00. The "Stand Alone" Chip Classifier sells for $28,250.00 and the conveyor system shown on drawing K150-G0252-D sells for $72,585.00. These prices are all in U.S. Funds and are intended to give you a ballpark idea of pricing.

We can also supply truck tire debeaders and wheel crushers.

Let me know how I can serve you and your customer.

Respectfully,

B.J. (Bob) Garrett

KEY MACHINE, INC.
SPECIFICATIONS FOR MODEL K-150 SHREDDER

The Model K-150 Shredder is modular in design and can be used to shred a variety of materials including tires. The Shredder shall conform to the following minimum specifications:

A. CUTTING CHAMBER ASSEMBLY
  1. Frame: Mild steel plate welded construction with heavy bolted on side members.
  2. Two counter rotating 5-1/2" hexagon shafts machined from heat treated alloy steel.
  3. Tapered roller bearings in head and spherical roller bearing in tail. Both are sealed against contamination.
  4. Feed and discharge chamber opening 50" x 32".

B. DRIVE ASSEMBLY
  1. 150 HP, T.E.F.C., 1800 RPM motors.
  2. Heavy duty "V" belt drive.
  3. Heavy duty shaft mounted speed reducer on the cutting chamber. 25.1 ratio
  4. All moving parts are guarded.

C. REVERSING UNIT - If a jam occurs, the reversing unit automatically switches the direction of rotation, clearing the jam, and then switches back to normal operation.

D. STANDARD TIRE SHREDDER CUTTING GROUP
  1. Knives: Alloy steel, heat treated to give maximum performance. 26 knives to be 17" diameter at the tip of the knife hooks. Knives will be approximately 1-7/8" wide.
  2. 26 spacers: Of heavy hardened cross-section.

E. ELECTRICAL CONTROLS
  1. Electrical equipment suitable for operation from 460V, 3 phase, 60 hertz electrical system.
  2. Soft-Start
  3. All wiring in accordance with the National Electric Code (NEC) and J.I.C.
  4. All UL approved components.
  5. Control circuit is grounded (115V) unless otherwise specified.
  6. Electrical panel with flanged disconnect.
  7. All wiring numbered.
  8. All external components (push buttons, pilot lights, limit switches, etc.) are wired to a terminal strip in the panel.

F. BASE - Heavy structural steel I-beam and channel welded construction.

G. FEED CHUTE - The feed chute is constructed of heavy gauge mild steel.

H. GENERAL
  1. Warranty: One year for labor and parts from the shipment date. All purchased parts subject to original manufacturer's warranty.
  2. Maintenance and instruction manuals, drawings, etc. are included.
  3. Installation and set-up instructions included.
  4. Certified dimension prints included.
  5. All externally exposed moving drive components are guarded.
  6. Noise level below 90 dba.
  7. Approximate weight: 22,000 lbs.

k150.doc

KEY MACHINE, INC.
MODEL T60 TROMMEL (CHIP CLASSIFIER)

One (1) Sixty One Inch (61") Diameter Centerless Rotary Chip Classifier (stand alone) with removable screens made of UHMW. The screen area is 61 inch diameter x 120 inch length. The screens are to have 3" diameter holes. The classifier is driven by a 10 HP electric motor and features side screens, dual drive wheels and a custom engineered base. The classifier controls are interfaced with the shredder.

T60.doc

Sec 1

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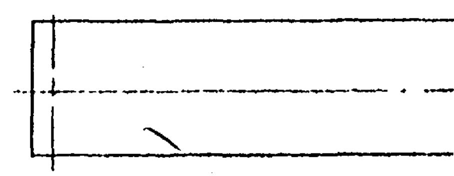

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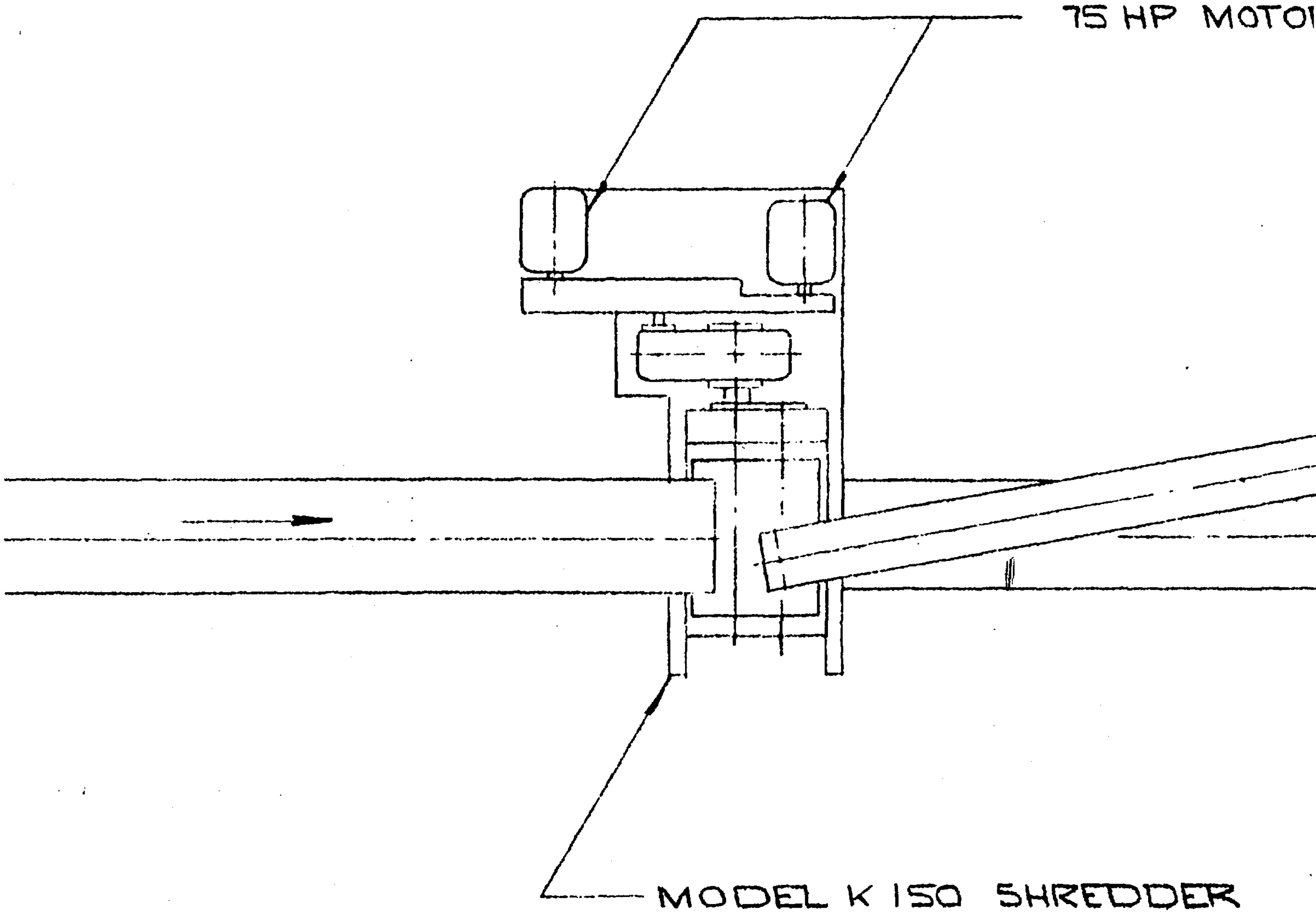

Sec 3

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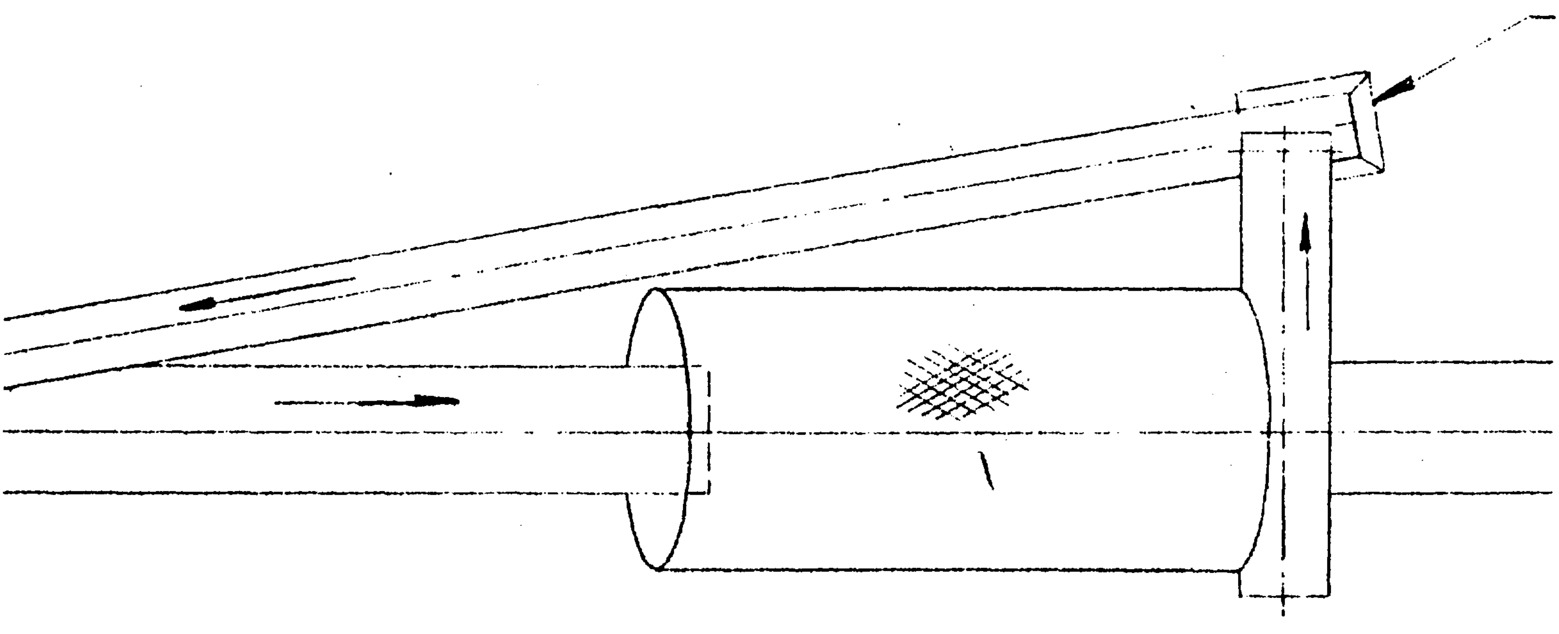

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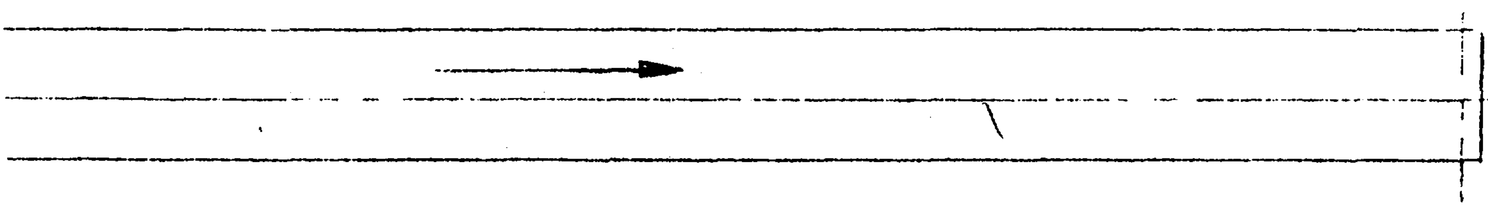
LOC.	REV

Sec 4

—RECEIVING HOPPER
FOR CONVEYOR #5



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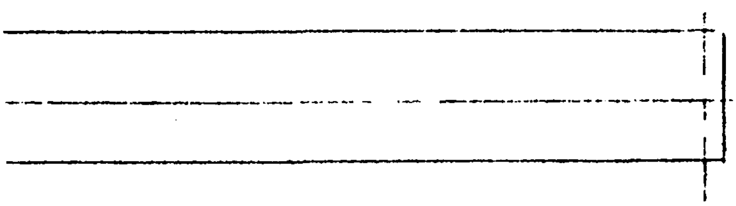
LOC.	REV.	DESCRIPTION

Sec 5



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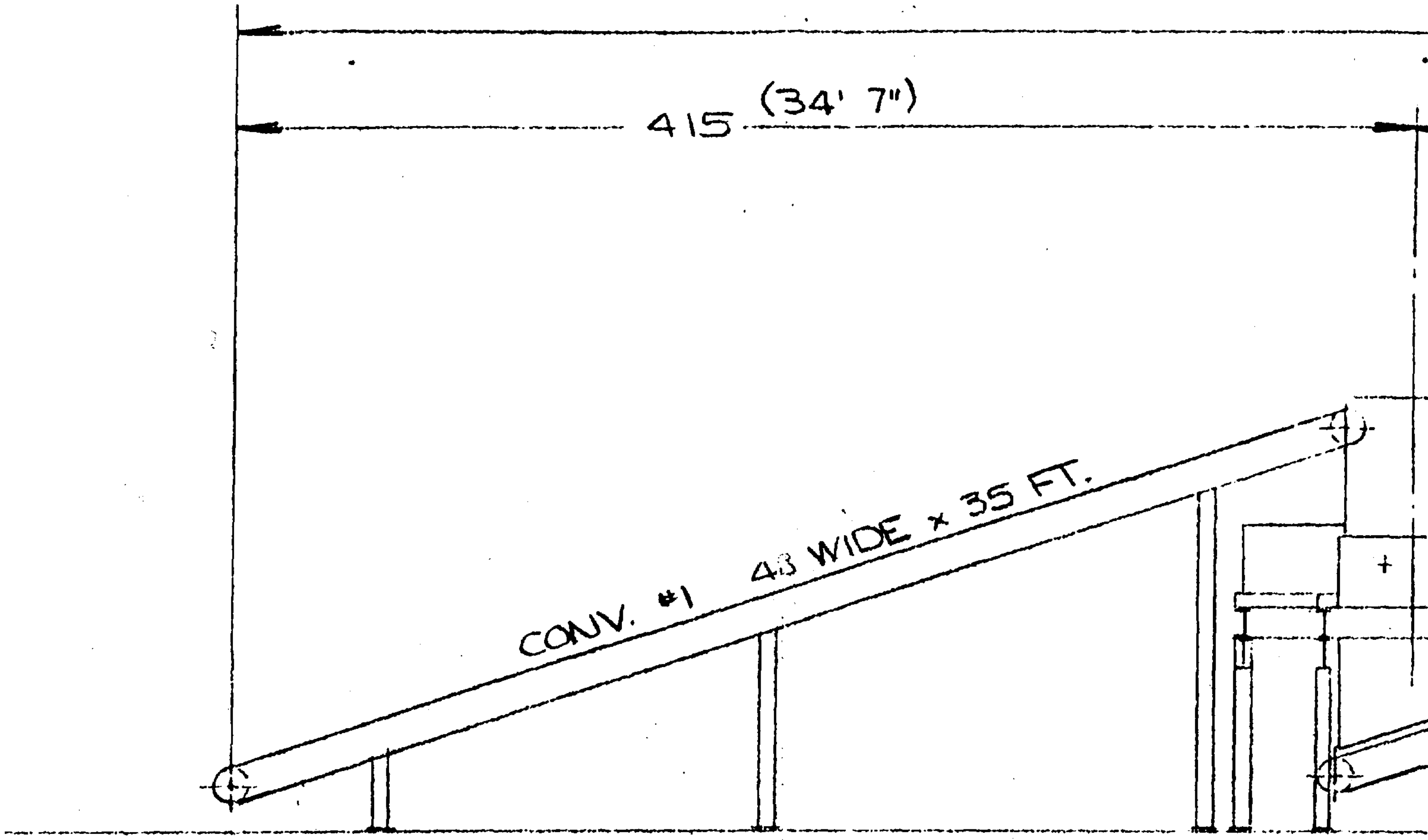

sec 6

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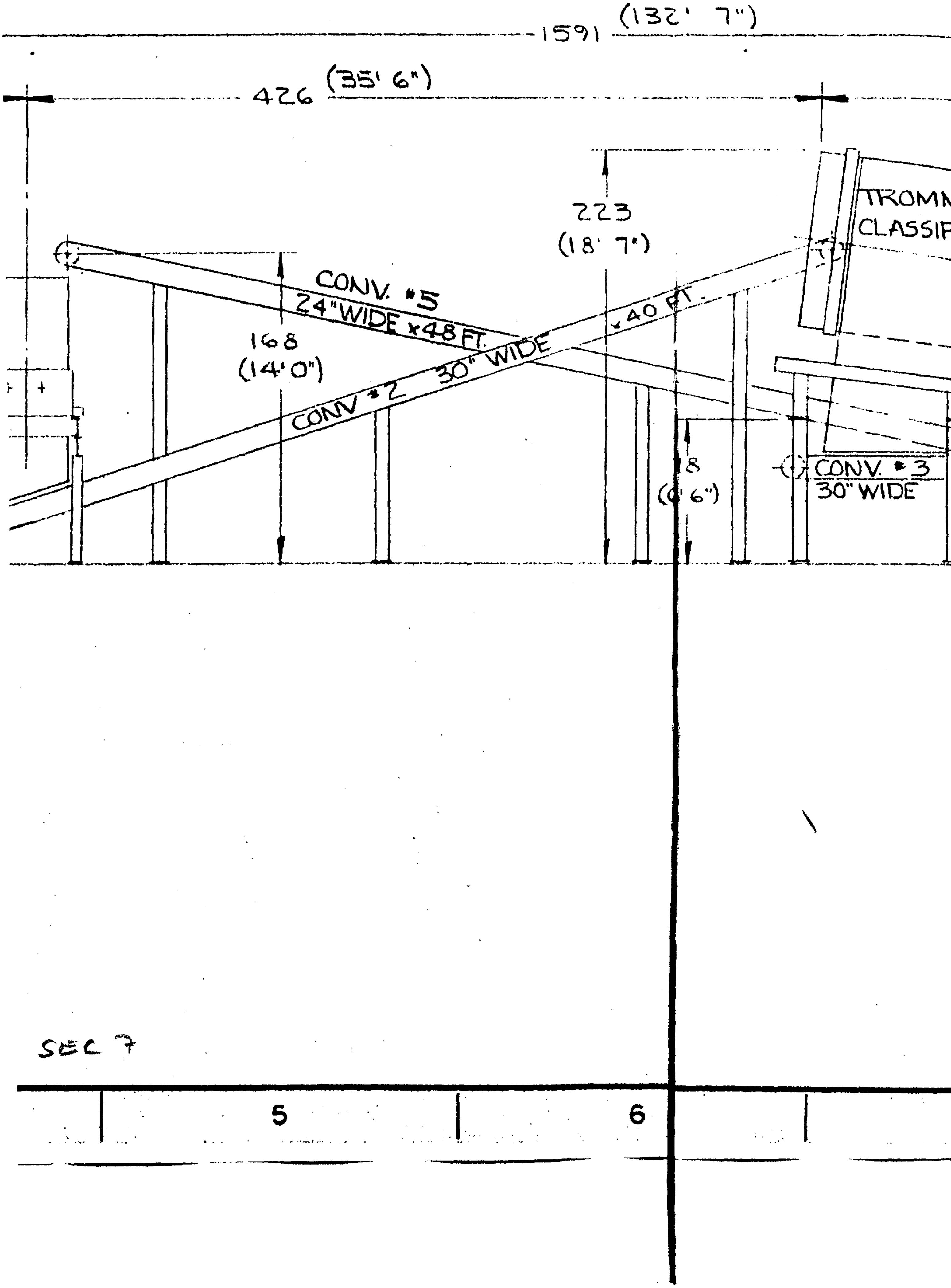
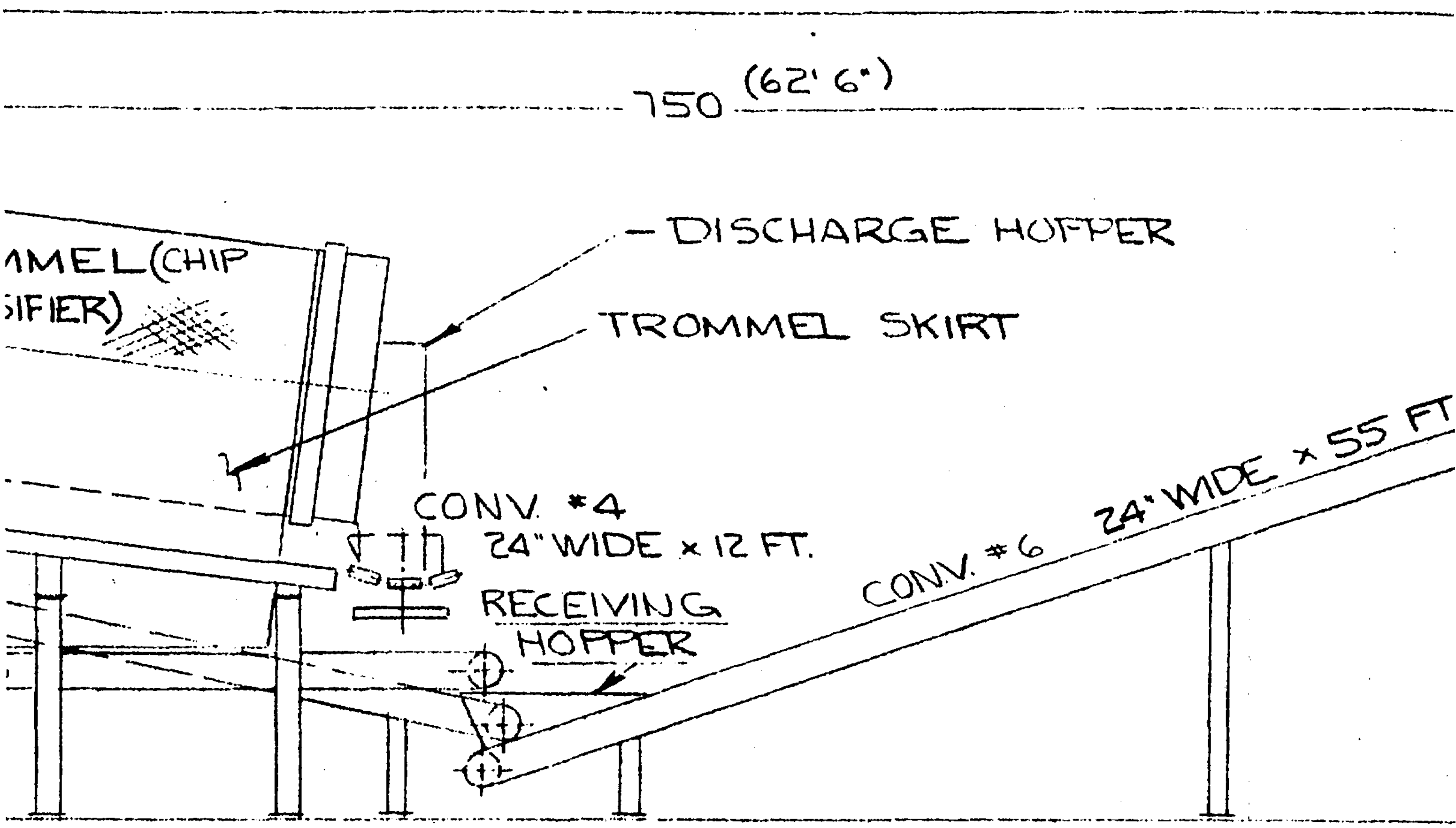
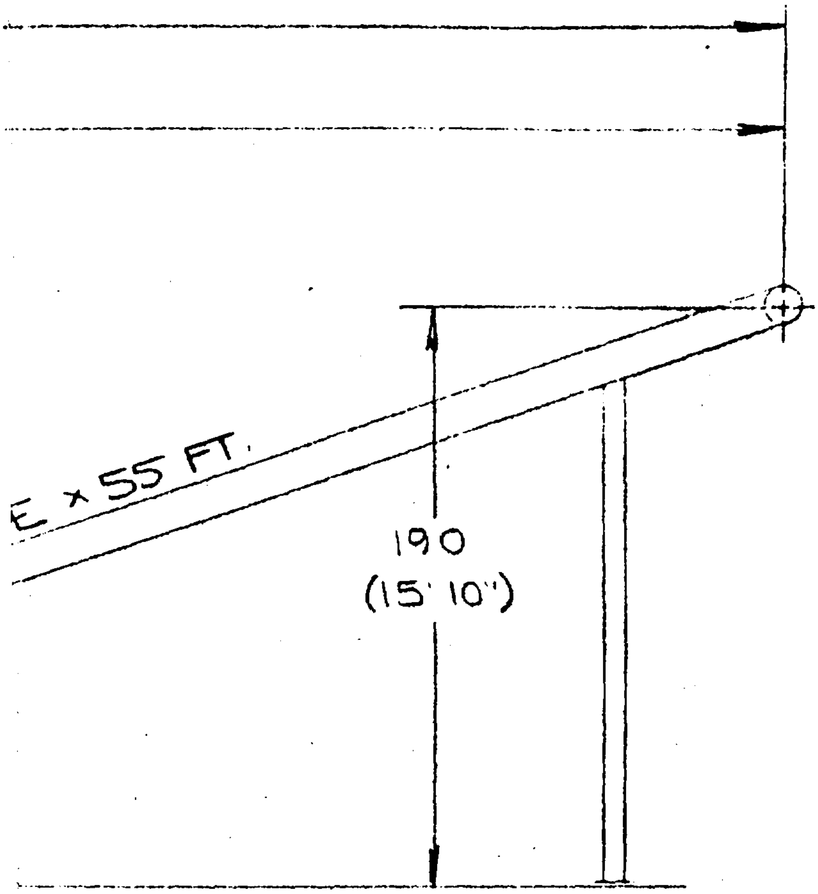

1591 (132' 7")
426 (35' 6")
223 (18' 7")
168 (14'0")
8 (6' 6")
TROMM
CLASSIF
CONV. #5
24" WIDE x 48 FT.
CONV #2 30" WIDE x 40 FT.
CONV. #3
30" WIDE
SEC 7
5
6


750 (62' 6")
DISCHARGE HOPPER
MMEL (CHIP
SIFIER)
TROMMEL SKIRT
CONV. #4
24" WIDE x 12 FT.
RECEIVING
HOPPER
CONV. #6 24" WIDE x 55 FT

SEC 8

7	8	9



E

F

G

DO NOT SCALE PRINT

sec 9

MATERIAL	SIZE	FINISH
XXX ±		XX ±

GENERAL ARRANGEMENT

KEY MACHINE, INC.
LIBERAL, MO.

DRAWN BY	DATE	SCALE
BJG	9-21-93	3/16" = 1'0"
APPROVED BY	DATE	DRAWING NO.
		K150-G0252-D

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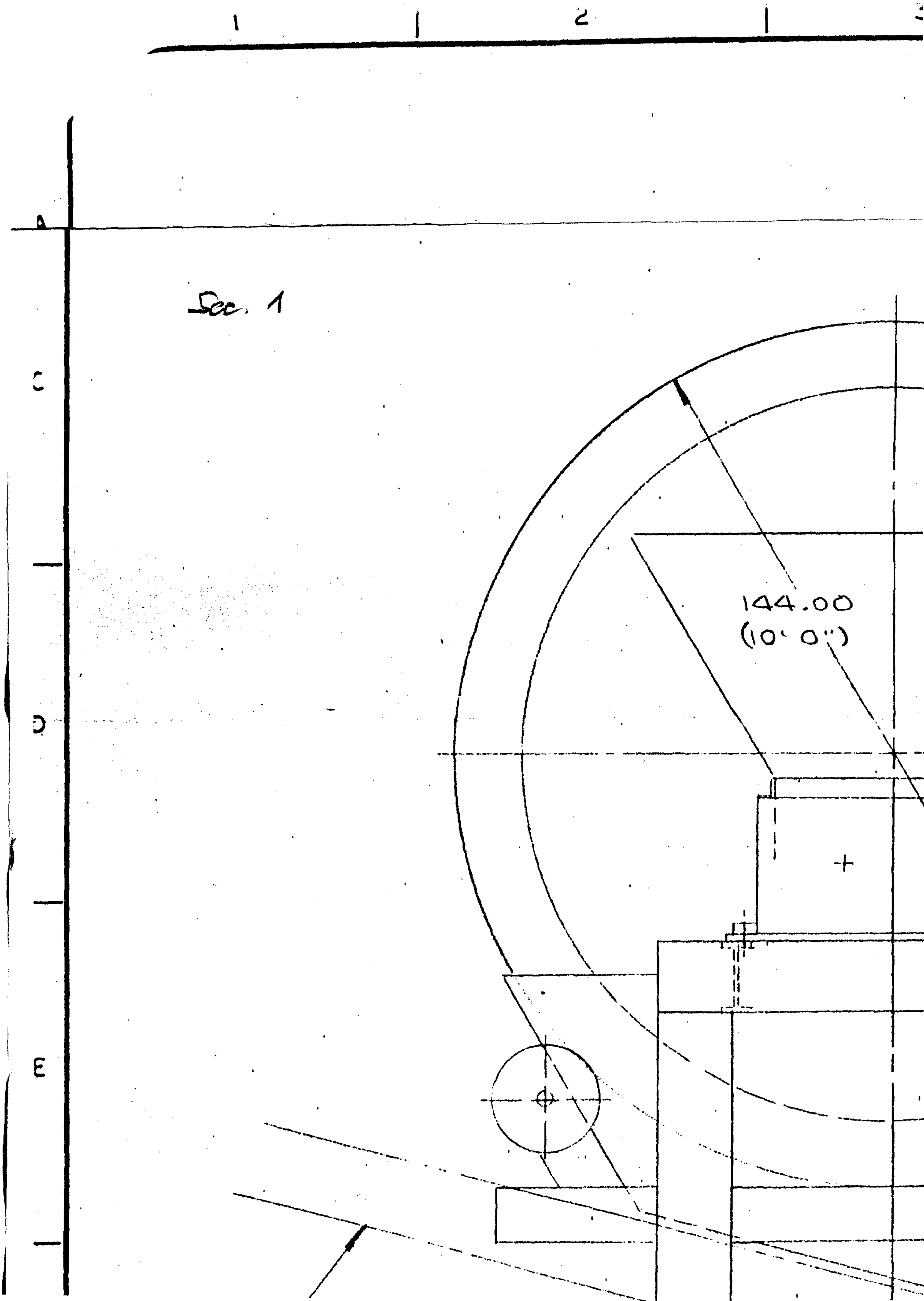

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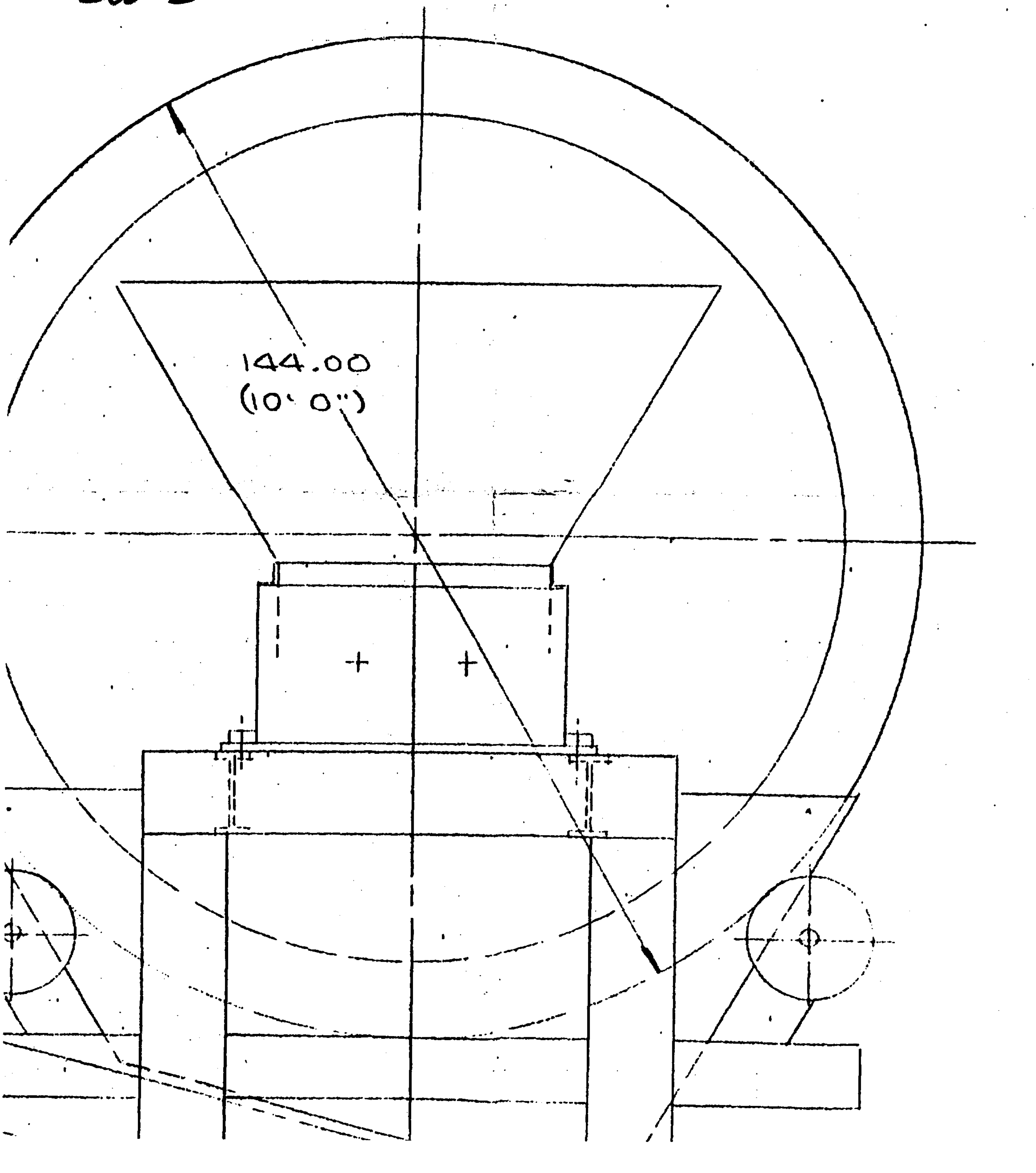
Sec 2



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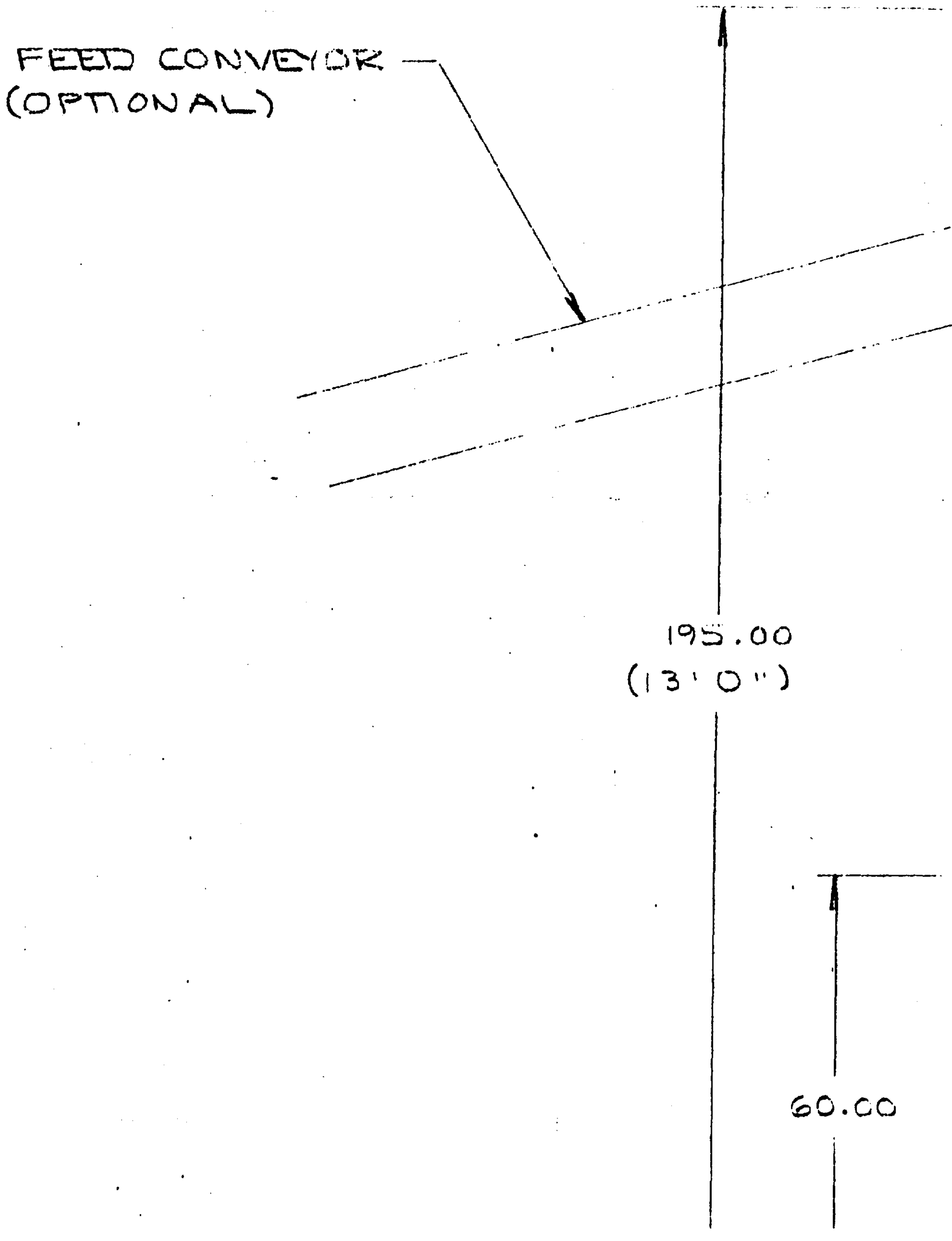
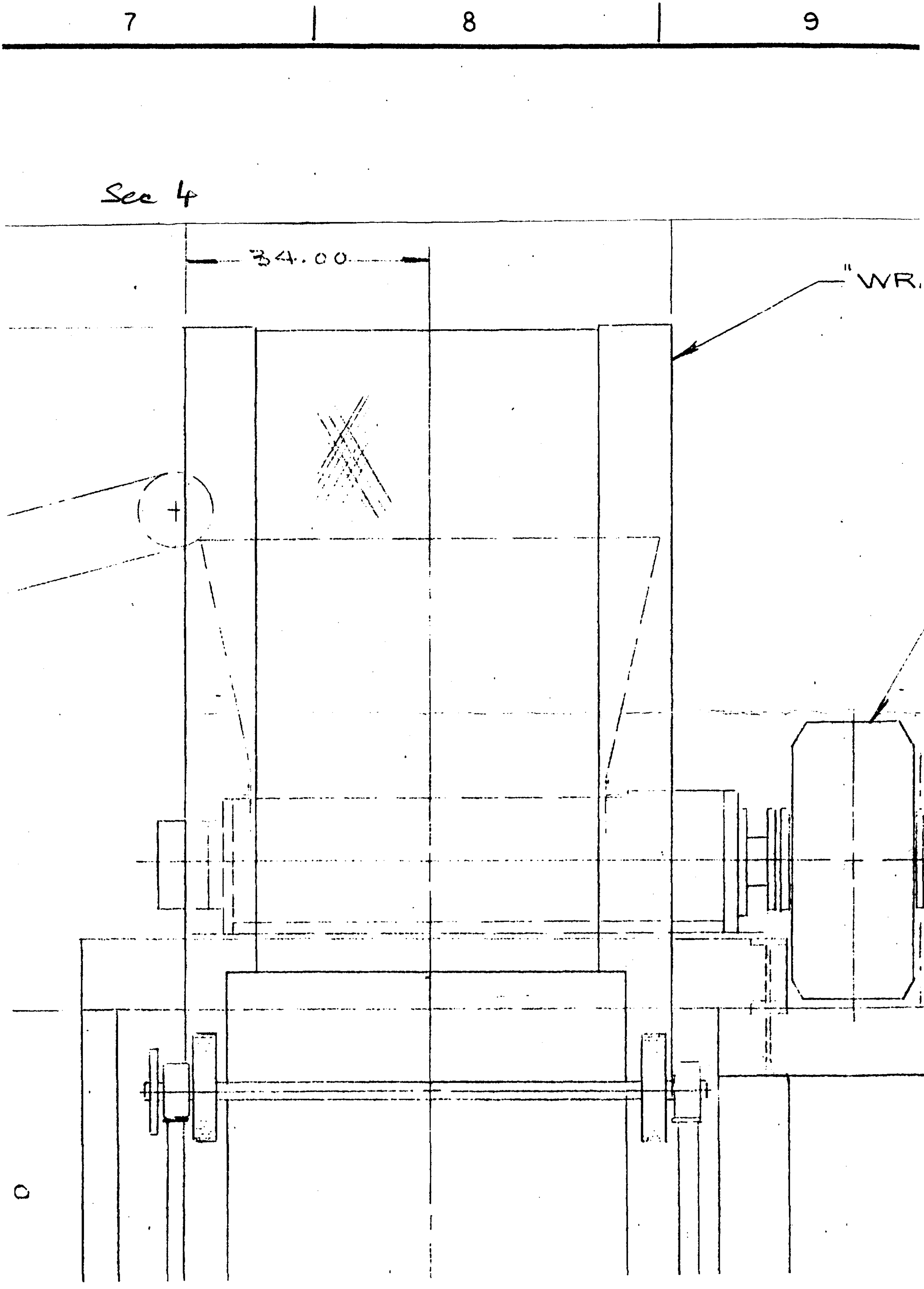
Sec 3

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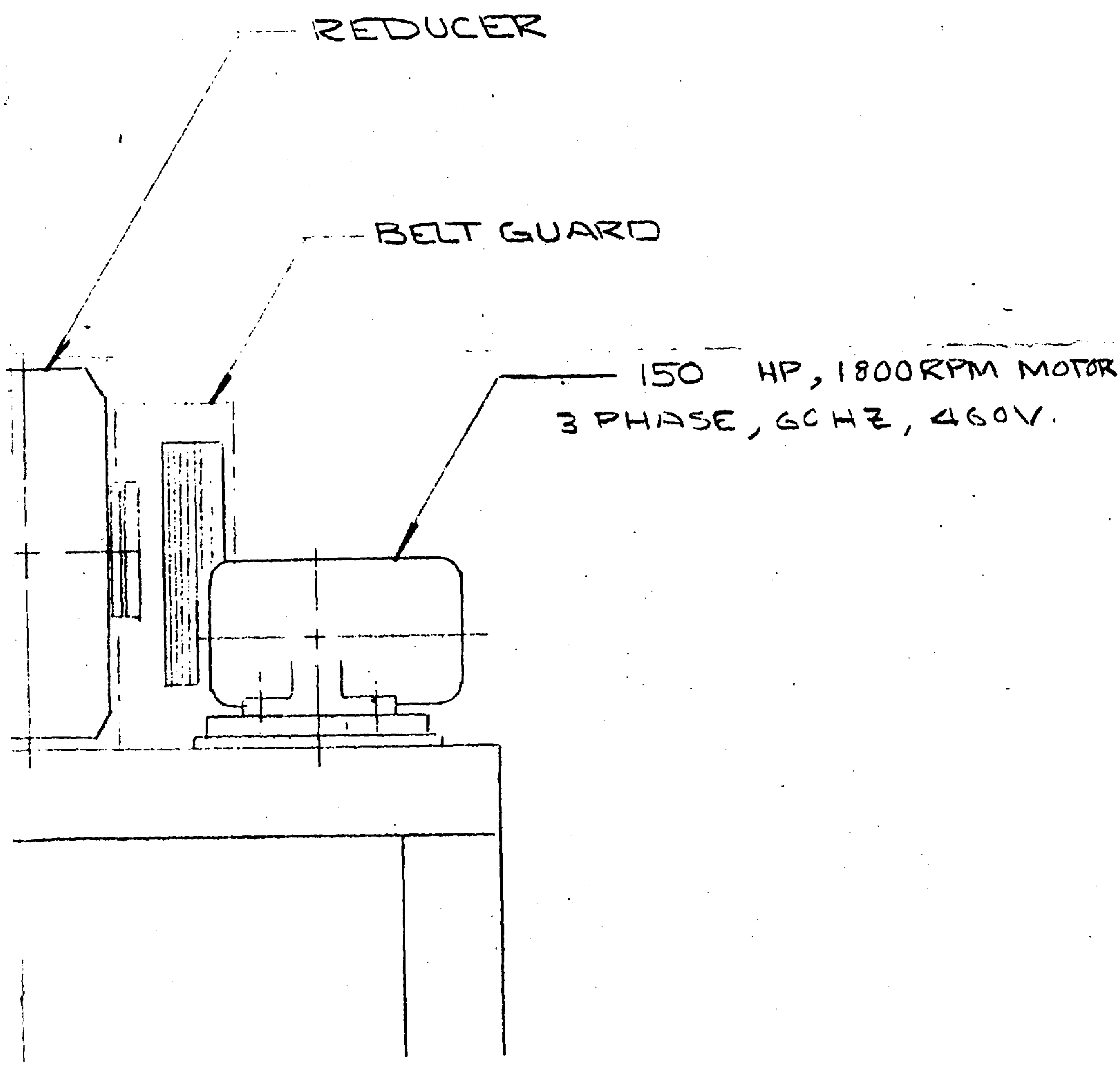
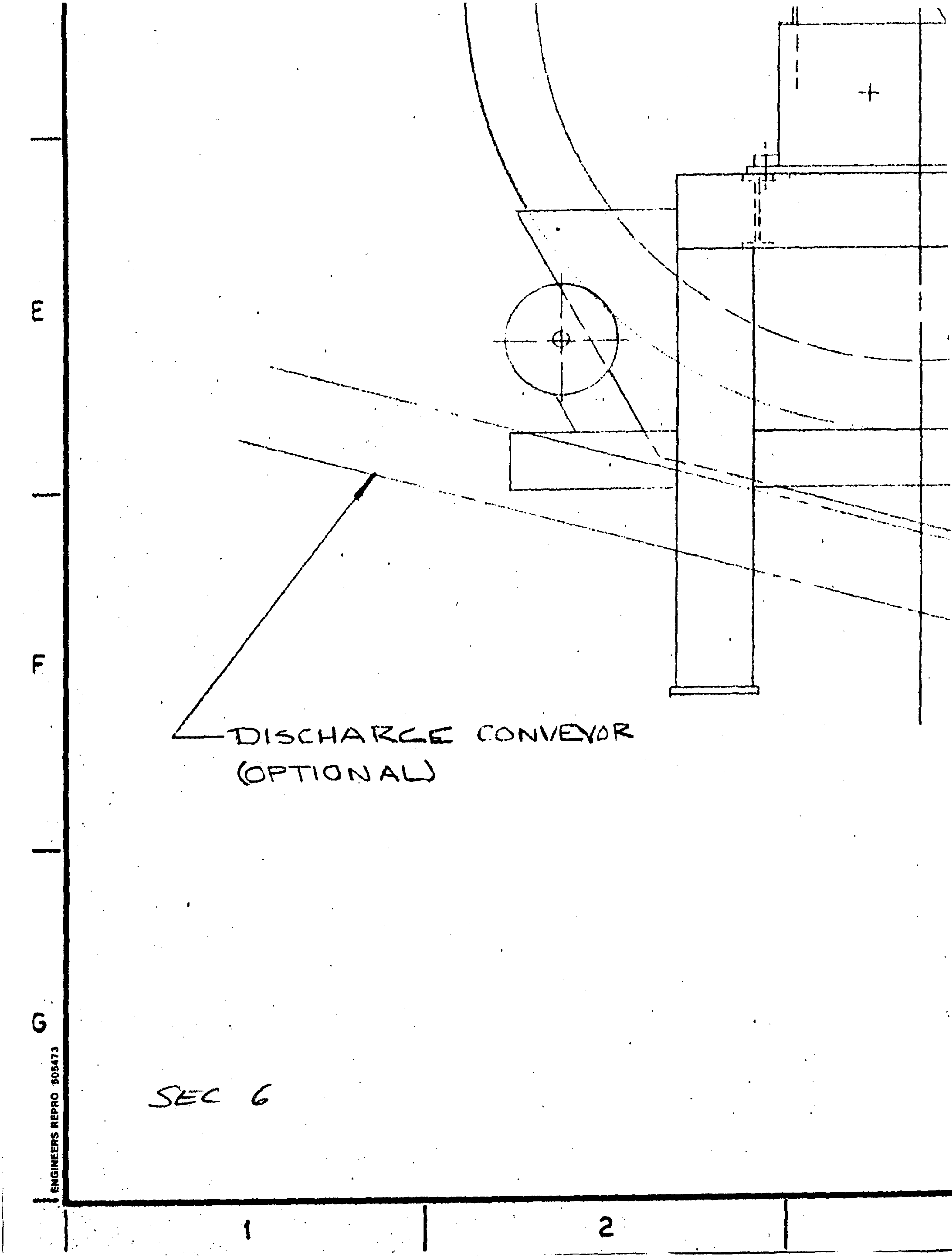
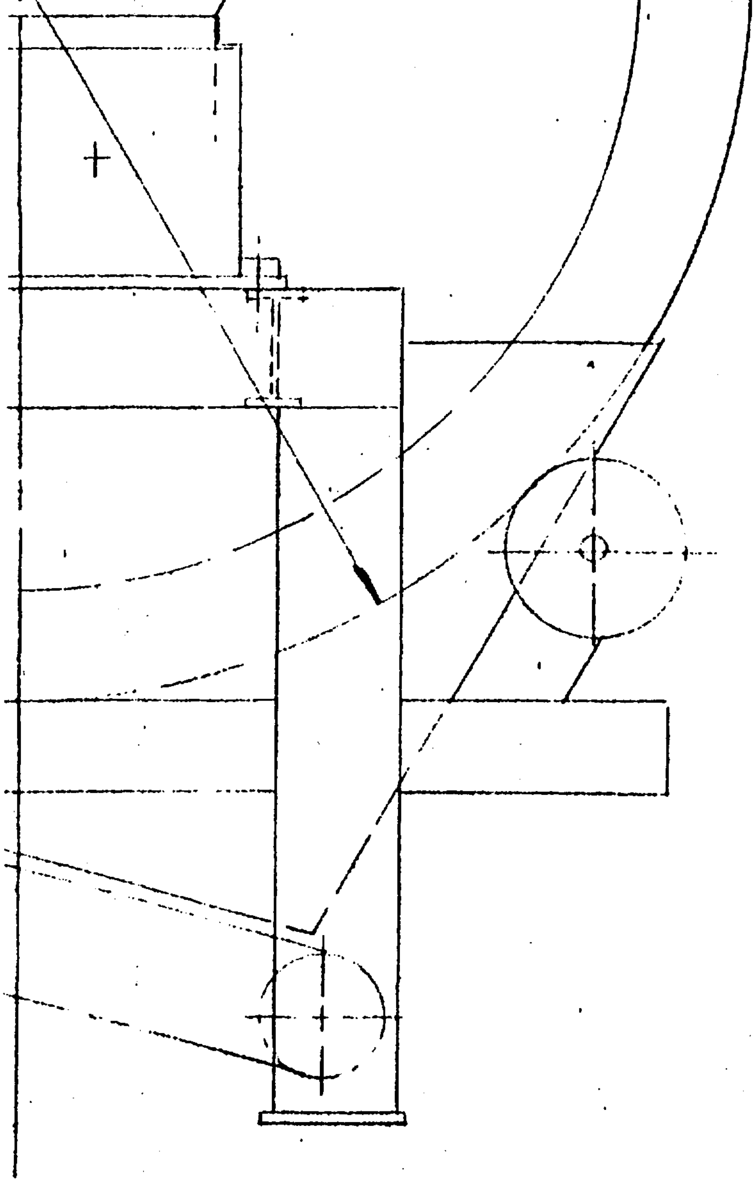
LOC.	REV.	DESCRIPTION

SEC 5

"WRAP AROUND" CHIP CLASSIFIER

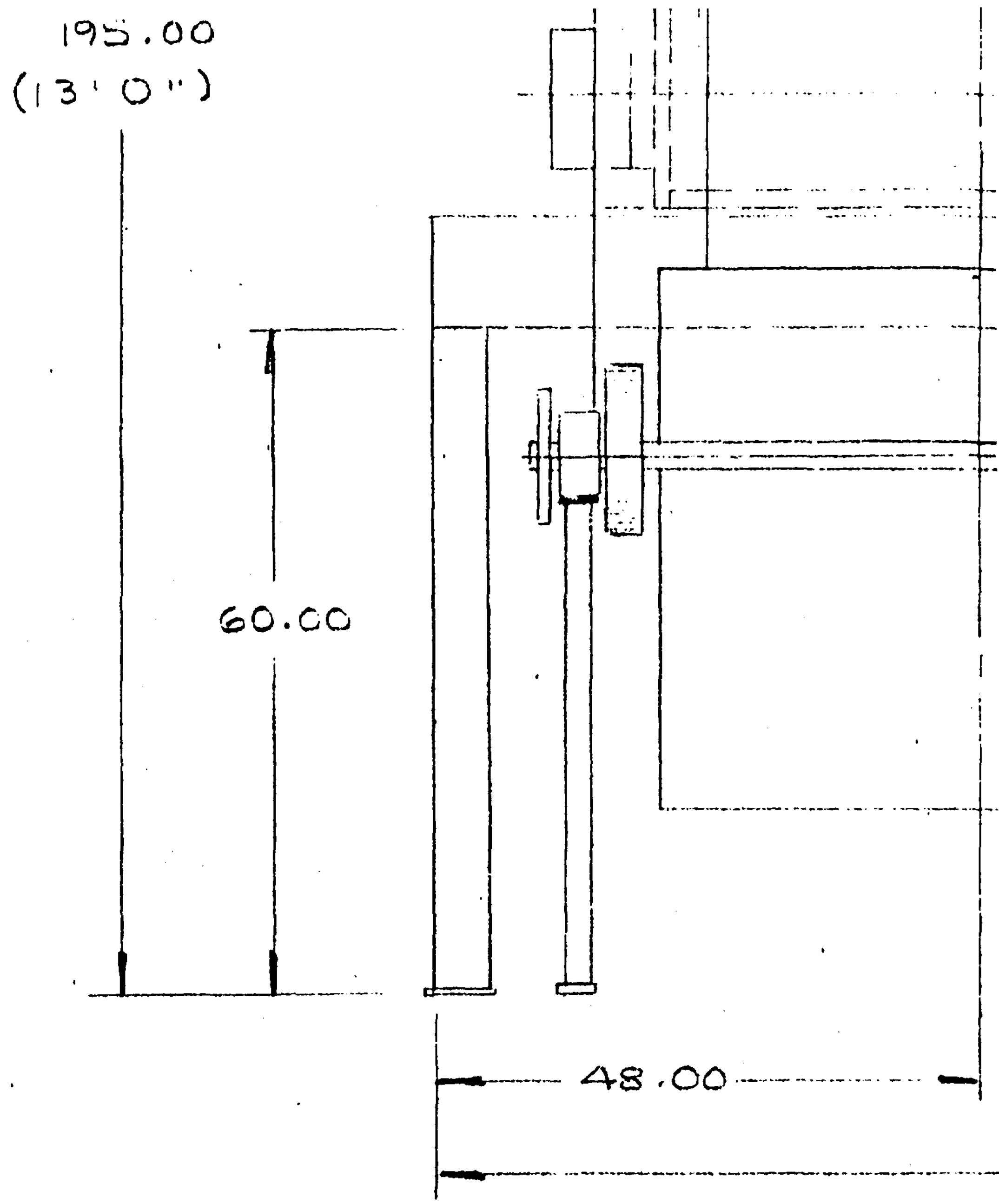



DISCHARGE CONVEYOR
(OPTIONAL)
E
F
G
1
2
SEC 6
ENGINEERS REPRO 505473



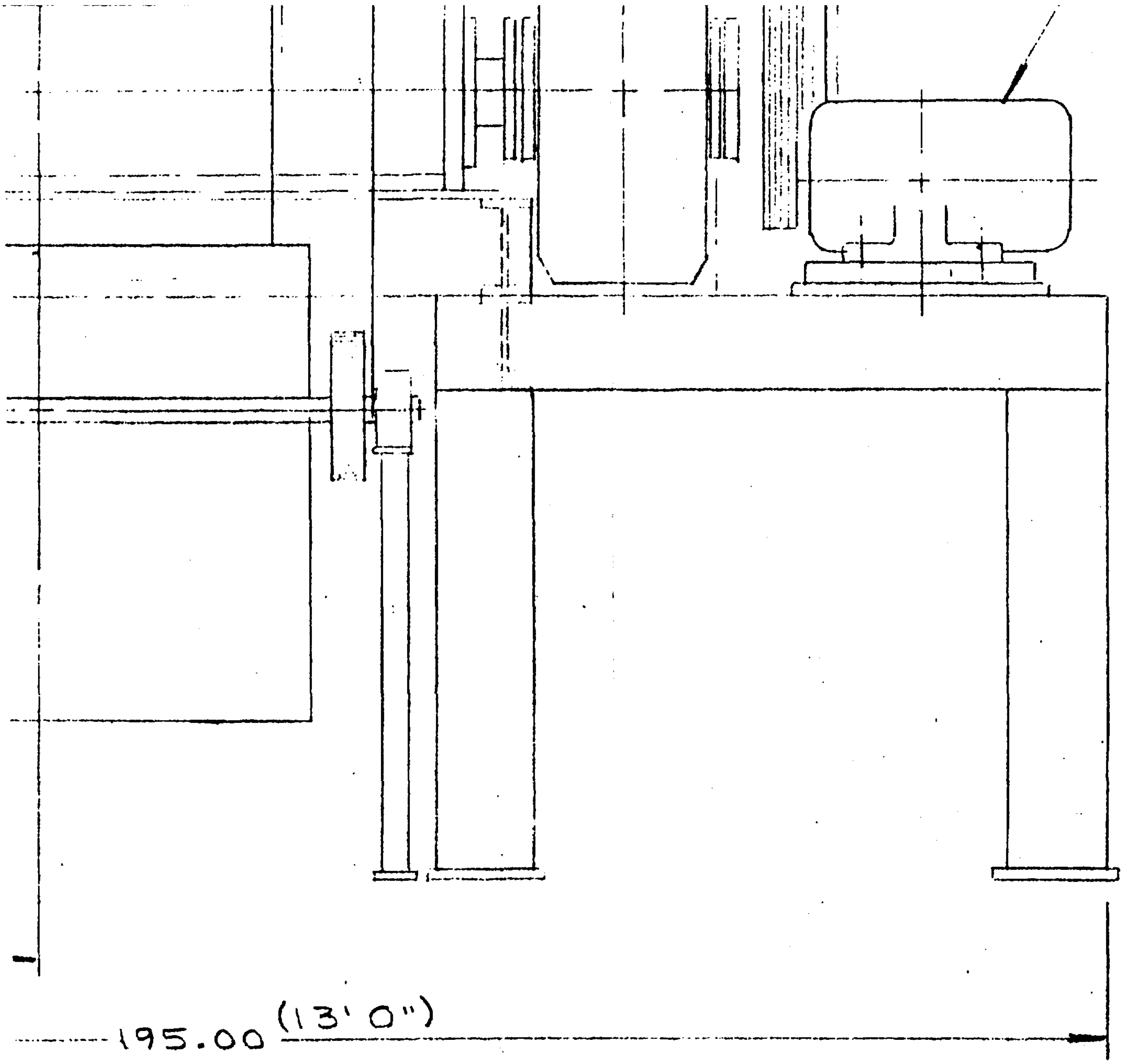
SEC 7

3 4 5



SEC 8

6 7

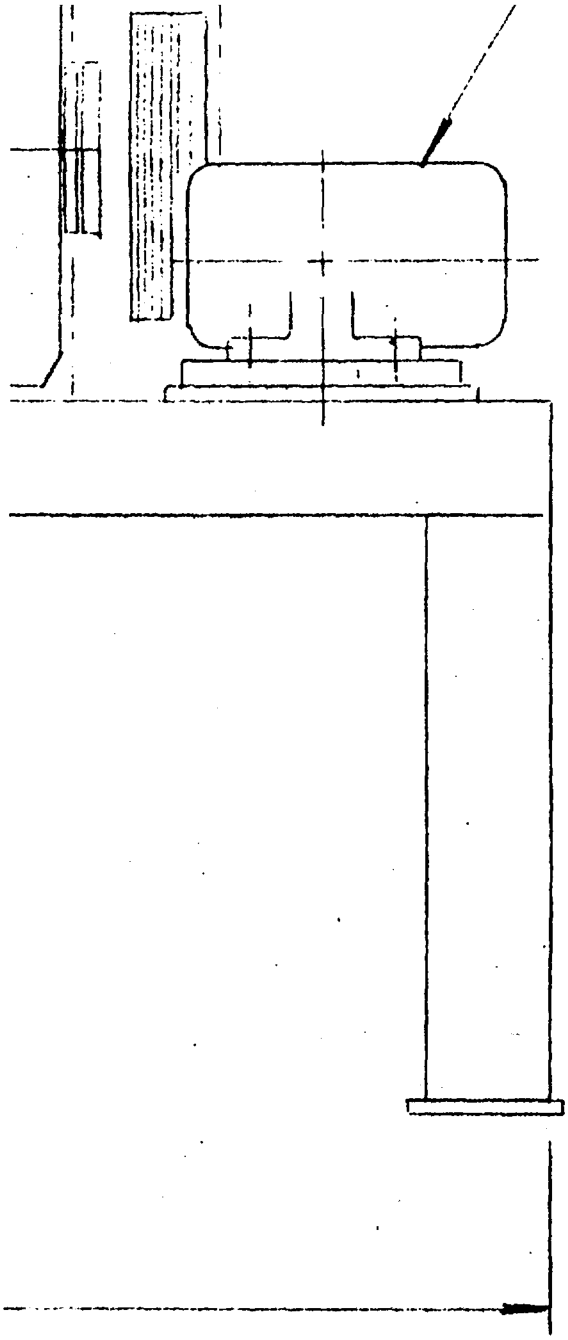


SEC 9

DO NOT SCALE PRINT

MATERIAL	SIZE	FINISH
XXX ±		XX ±

8 9 10



E

F

SEC 10

G

DO NOT SCALE PRINT

MATERIAL	SIZE	FINISH
XXX ±		XX ±

GENERAL ARRANGEMENT

KEY MACHINE, INC.
LIBERAL, MO.

DRAWN BY	DATE	SCALE
BX	3-16-91	1/16
APPROVED BY	DATE	DRAWING NO.
		K150-G0003-D

10

11

KEY MACHINE, Inc.

P. O. Box 68 • 1244 West Highway K • Liberal, Missouri 64762 • 417-843-6506 • Fax 417-843-6508

TIRE BEAD WIRE PULLER

The MODEL 3 Tire De-Beader is constructed of heavy structural steel and powered by a heavy duty hydraulic cylinder and power package.

The wire puller hook is made alloy steel. The bushing through which the steel bead wire is pulled is also alloy steel and is replaceable.

A 5 HP electric motor drives the hydraulic pump which is mounted on the hydraulic power pack. Included in the hydraulic power pack are:

1. Hydraulic pump
2. 5 HP electric motor
3. Shaft coupling and guard
4. Spin on return line filter
5. Suction line strainer
6. Relief valve
7. Lever operated 4-way valve
8. 30 gallon reservoir with sight level guage

The electrical controls consist of a combination starter and a START-STOP pushbutton.

Ameri-Shred Endura-MAX Inc.

Hinged Belt Conveyors

Custom Engineering and Manufacturing

Heavy Duty Construction

2 1/2 in., 4 in., 6 in. and 9 in. Pitch Belts Available

Printed on recycled paper

2 1/2" Pitch Hinged Steel Belt

STANDARD SPECIFICATIONS

Belt 2 1/2 in. pitch plain metal belt. Chain pull 1600#. Pan thickness, 12 gauge.

Belt Widths Standard Width - 6 in., 8 in., 12 in., 18 in., 24 in., 30 in., 36 in. Belt may be furnished from 3 in. minimum to 36 in. maximum in 1 in. multiples.

Frame Closed style, 10 gauge formed steel. Upper/lower tracks, formed 7 gauge.

Bearing Drive end - 2 bolt pillow block, sealed for life.

Belt Speed 20 fpm (other speeds available).

Motor & Reducer 115/220V, 60 Hz single phase or 230/460V, 60 Hz 3 phase; TEFC motor, reversible.

Sprockets 6 tooth, 5 in. PD.

Guards Metal guards, totally enclosed, painted safety yellow.

Curves 30°, 45° or 60°.

Supports Vertical - 3 in. channel
Horizontal - 3 in. channel

OPTIONAL EQUIPMENT

Cleats 1 1/2 in. high, 1/4 in. flat stock (perforated cleats also available).

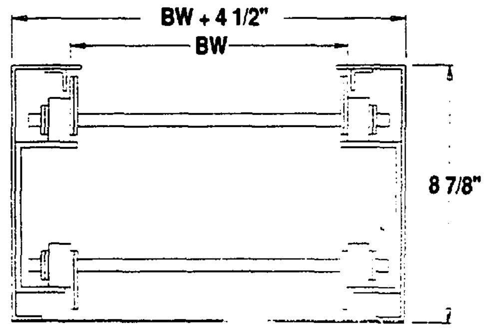
Variable Speed Available in 10-45 fpm.

Electrical Controls 1 or 3 phase, on-off switch, forward-off-reverse switch and thermal overload protection.

Casters 4 in. dia., both rigid and swivel with locks.

Belt Apron Pimpled, perforated or both.

Belt Available with 3200# chain pull sidebars.



Dependable Cost Effective Material Handling Systems.

4" Pitch Hinged Steel Belt

STANDARD SPECIFICATIONS

Belt 4 in. pitch plain metal belt. Chain pull 6000#. Pan thickness, 1/8 in.

Belt Widths 6 in., 12 in., 18 in., 24 in., 30 in., 36 in., 42 in., 48 in. Belt may be furnished from 4 1/2 in. minimum to 48 in. maximum in 1 1/2 in. multiples.

Frame Closed style, 10 gauge formed steel. Upper/lower tracks, 2 1/2 in. x 2 1/2 in. angle.

Bearing Drive end - 4 bolt flange, sealed for life.

Belt Speed 20 fpm (other speeds available).

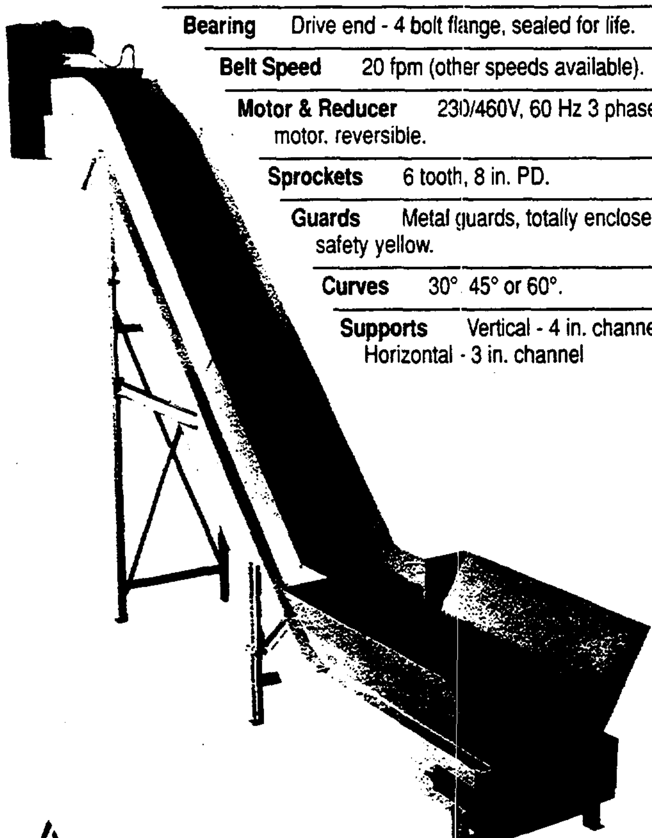
Motor & Reducer 230/460V, 60 Hz 3 phase; TEFC motor, reversible.

Sprockets 6 tooth, 8 in. PD.

Guards Metal guards, totally enclosed, painted safety yellow.

Curves 30°, 45° or 60°.

Supports Vertical - 4 in. channel
Horizontal - 3 in. channel



OPTIONAL EQUIPMENT

Cleats 2 1/2 in. high, 1/4 in. flat stock (perforated cleats also available).

Variable Speed Available in 10-45 fpm.

Electrical Controls 3 phase, on-off switch, forward-off-reverse switch and thermal overload protection.

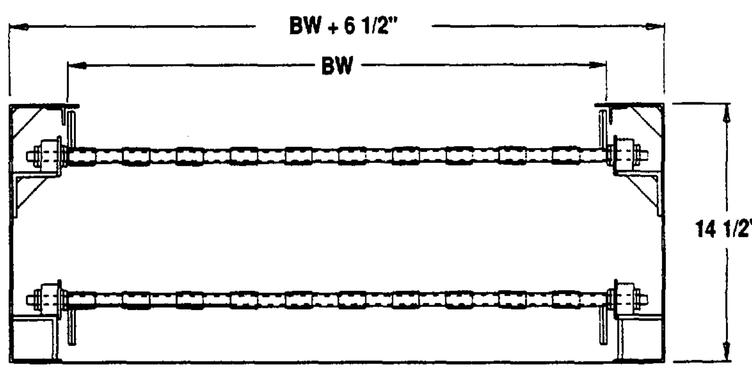
Casters 4 in. dia., both rigid and swivel with locks.

Belt Apron Pimpled, perforated or both. Combination chain/rubber belt also available.

Infeed Hoppers Built to suit application.

Side Skirts 10 gauge, available in 2 in. to 24 in. high.

Designed and Constructed for Years of Continuous Operation.



6" Pitch Hinged Steel Belt

STANDARD SPECIFICATIONS

Belt 6 in. pitch plain metal belt. Chain pull 9000#. Pan thickness, 1/4 in. (Others available)

Belt Widths Standard width may be furnished from 12 in. minimum to 96 in. maximum in 6 in. multiples.

Frame Open style, structural steel. Upper track - 4 in. ship channel. Lower track - 4 in. x 3 in. angle. Impact Beams - 4 in. I-Beam.

Bearing Heavy duty pillow block, sealed and regreasable.

Belt Speed 20 fpm (other speeds available).

Motor & Reducer 230/460V, 60 Hz 3 phase; TEFC motor, reversible.

Sprockets 6 tooth, 12 in. PD.

Guards Metal guards, totally enclosed, painted safety yellow.

Overload Protection Anti-Rollback Device and shear pin hub assembly or fluid coupling.

Curves 20°, 30° or 45°.

Supports Vertical - 6 in. WF I-Beam
Horizontal - 4 in. I-Beam

OPTIONAL EQUIPMENT

Cleats 4 in. high, 1/4 in. angle iron.

Variable Speed Available in 10-45 fpm.

Electrical Controls 3 phase, forward-off switch and thermal overload protection.

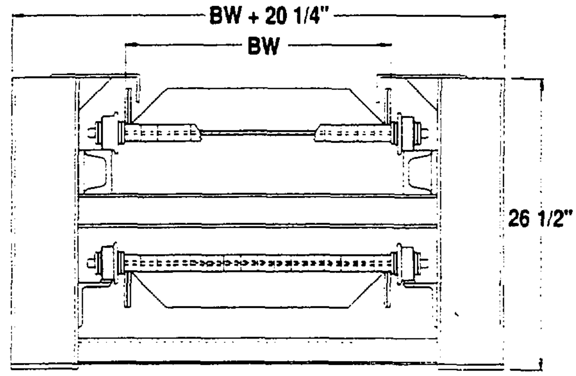
Belt Apron Pimpled, perforated or both. Combination chain/rubber belt also available.

Infeed Hoppers Built to suit application.

Side Skirts 7 gauge, available in 6 in. to 48 in. high.

Oiler Multi-brush, gravity feed, manual or electric delivery.

Covers Bottom covers available in 10 gauge or 7 gauge.



9" Pitch Hinged Steel Belt

STANDARD SPECIFICATIONS

Belt 9 in. pitch plain metal belt. Chain pull 13000#. Pan thickness, 1/4 in.

Belt Widths Standard width may be furnished from 12 in. minimum 96 in. maximum in 6 in. multiples.

Frame Open style, structural steel. Upper track - 4 in. ship channel. Lower track - 4 in. ship channel. Impact Beams - 4 in. I-Beam.

Bearing Heavy duty pillow block, sealed and regreasable.

Belt Speed 20 fpm (other speeds available).

Motor & Reducer 230/460V, 60 Hz 3 phase; TEFC motor, reversible.

Sprockets 6 tooth, 18 in. PD.

Guards Metal guards, totally enclosed, painted safety yellow.

Overload Protection Anti-Rollback Device and shear pin hub assembly or fluid coupling.

Curves 20°, 30° or 45°.

Supports Vertical - 6 in. WF I-Beam
Horizontal - 5 in. I-Beam

OPTIONAL EQUIPMENT

Cleats 6 in. high, 1/4 in. angle iron.

Variable Speed Available in 10-45 fpm.

Electrical Controls 3 phase, forward-off switch and thermal overload protection.

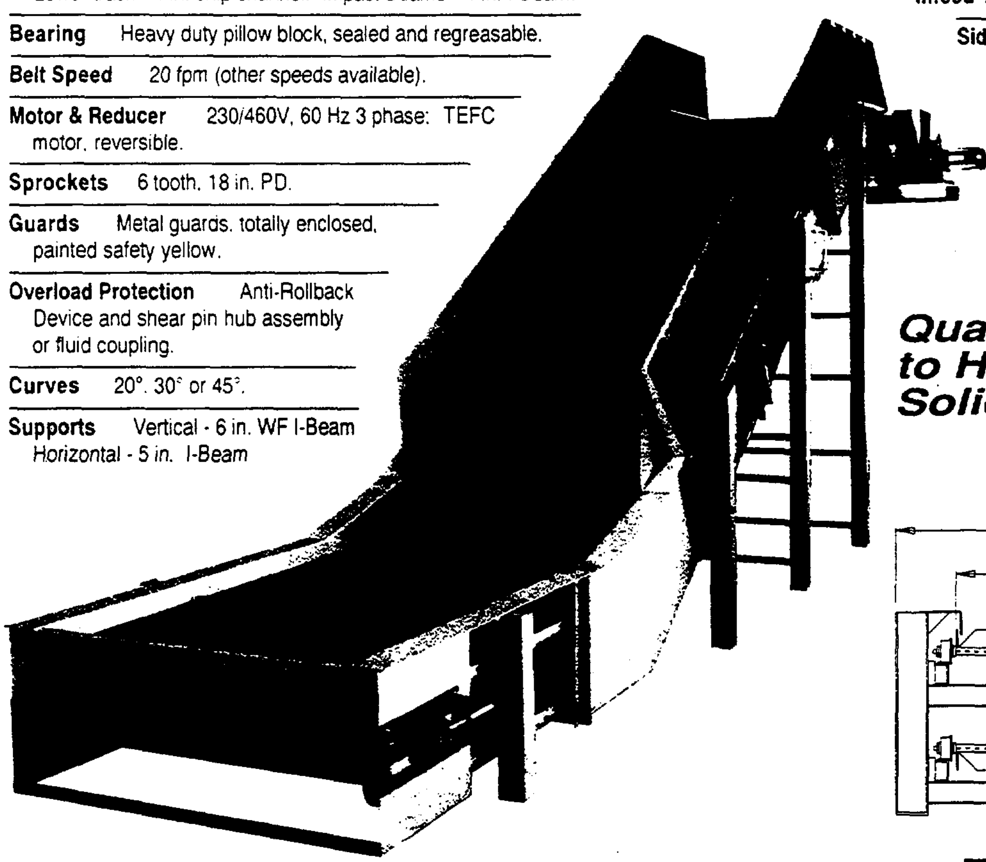
Belt Apron Pimpled, perforated or both. Combination chain/ rubber belt also available.

Infeed Hoppers Built to suit application.

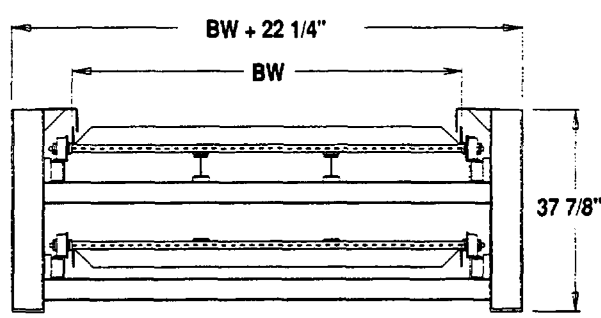
Side Skirts 7 gauge, available in 6 in. to 48 in. high.

Oiler Multi-brush, gravity feed, manual or electric delivery.

Covers Bottom covers available in 10 gauge or 7 gauge.



Quality Built Conveyors to Handle the Toughest Solid Waste Applications ...Effortlessly.



Toll Free: (800) 356-1593

Hinged Belt Conveyor Worksheet

Customer ______________________________ Contact ______________________________

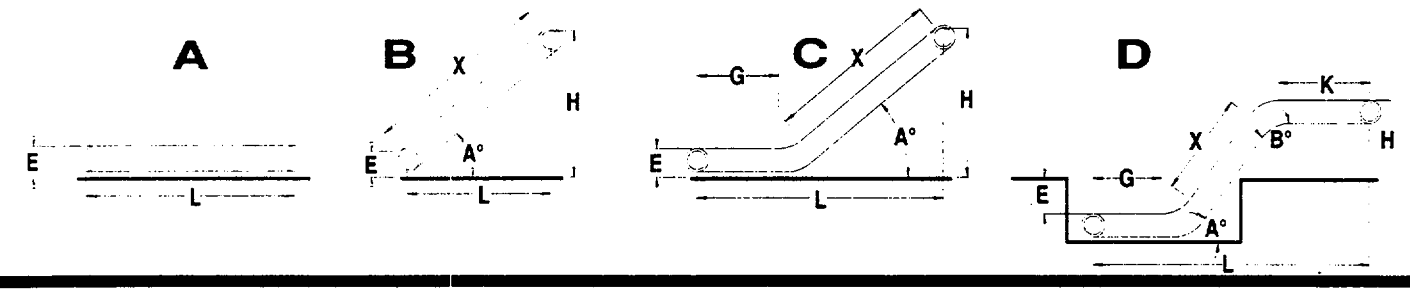
______________________________ Phone # ______________________________

______________________________ Date ____ / ____ / ____ P.O. # ______________

Quote # ______________ Job # ______________

Delivery ______________ Salesperson ______________

Style:



Style of Conveyor ☐ A ☐ B ☐ C ☐ D

Belt Width: ______________ ☐ Steel ☐ Combination

Pitch: ______________________________

Side Skirt Height and Location: ______________________________

Infeed: Above Floor or Pit Mounted: ______________________________

Pit Dimensions (L x W x H): ______________________________

Motor: ______________ Hp Voltage: ______________ (3 phase)

Controls Required: ______________________________

Belt Speed: ______________________________
(Maximum of 50 FPM on chain driven conveyors)

Dimensions (if known):

G ______________ X ______________ K ______________
(lower horizontal) (incline section) (upper horizontal)

Total Conveyor Length: ______________________________

Degree of Incline (**A°**): ______________ Degree of Noseover (**B°**): ______________

Floor Distance (**L**): ______________________________

Infeed Height (**E**) to top of belt: ______________________________

Discharge Height (**H**) to top of belt: ______________________________

Angle Cleats: Height ______________ Centers ______________
(Typically same height as side wings)

Belt Modifications: ______________________________

Any other pertinent information ______________________________

____

____

Material Specifications

Product(s) Being Conveyed ______________________________

____

Minimum/Maximum
Product Size ______________________________

% of Fines Present ______________________________

Product Density #/cu. ft. ______________________________

Product Wt./Hr. ______________________________

Maximum Surge Load ______________________________

Any Liquids Present ______________________________

Product Temperature ______________________________

Method of Loading ______________________________

Distance of Free Fall at Infeed ______________________________

Does Product
Impact on Belt ______________________________

Hours/Day of Operation ______________________________

Continuous/Intermittent
Operating Cycle ______________________________

Conveyor Located Indoors/Outdoors ______________________________

Special Conditions ______________________________

Ameri-Shred Use Only

Pricing: ______________________________ ______________________________

______________________________ ______________________________

______________________________ ______________________________

______________________________ ______________________________

$ ______________________________
net sell price to distributor

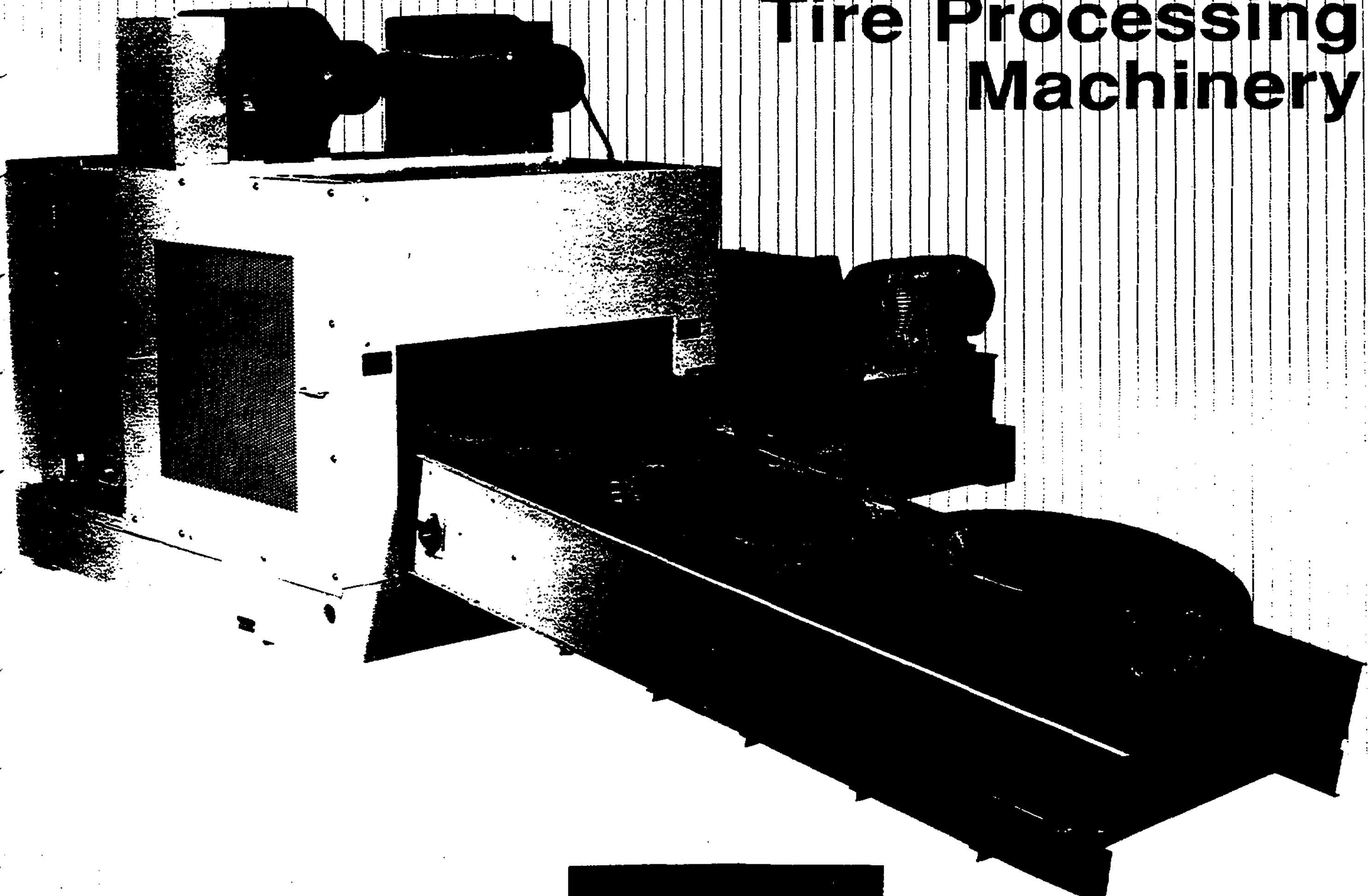
Ameri-Shred Endura-MAX

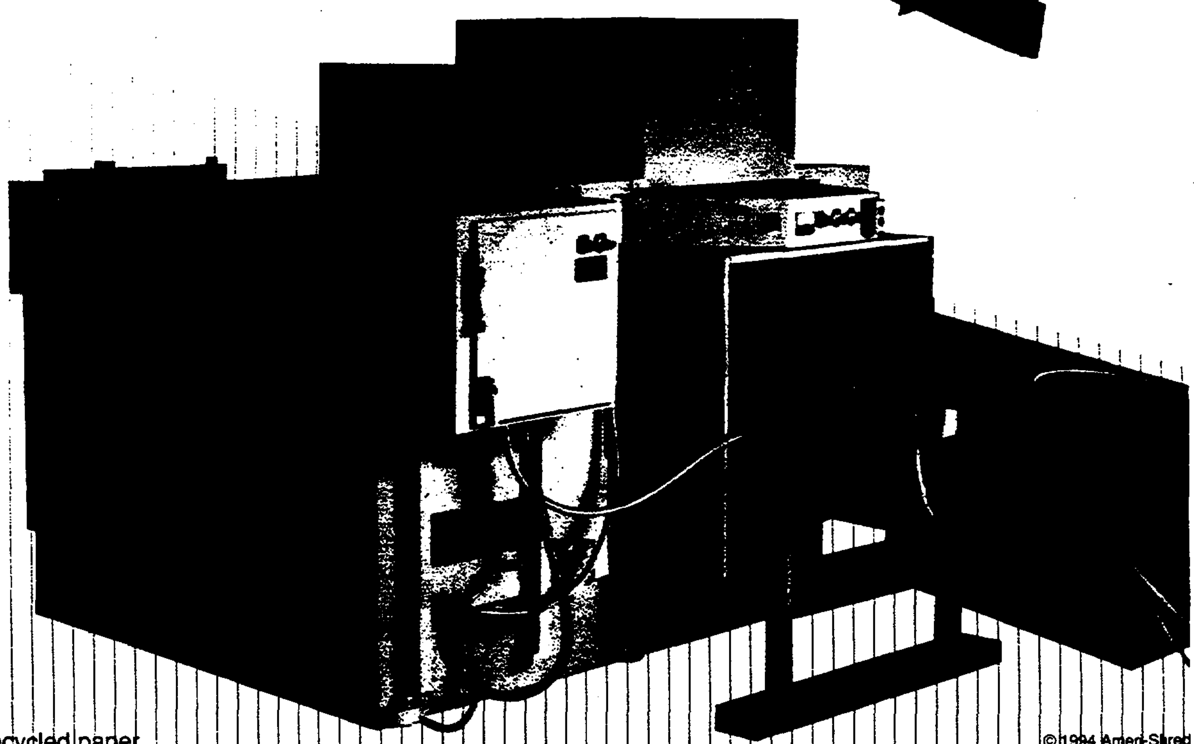
Ameri-Shred Industrial Corp. · P.O. Box 205 · Alpena, MI 49707
Phone: (517) 356-1593 or (800) 356-1593 · Fax: (517) 356-0770

Ameri-Shred

Endura-MAX Inc.

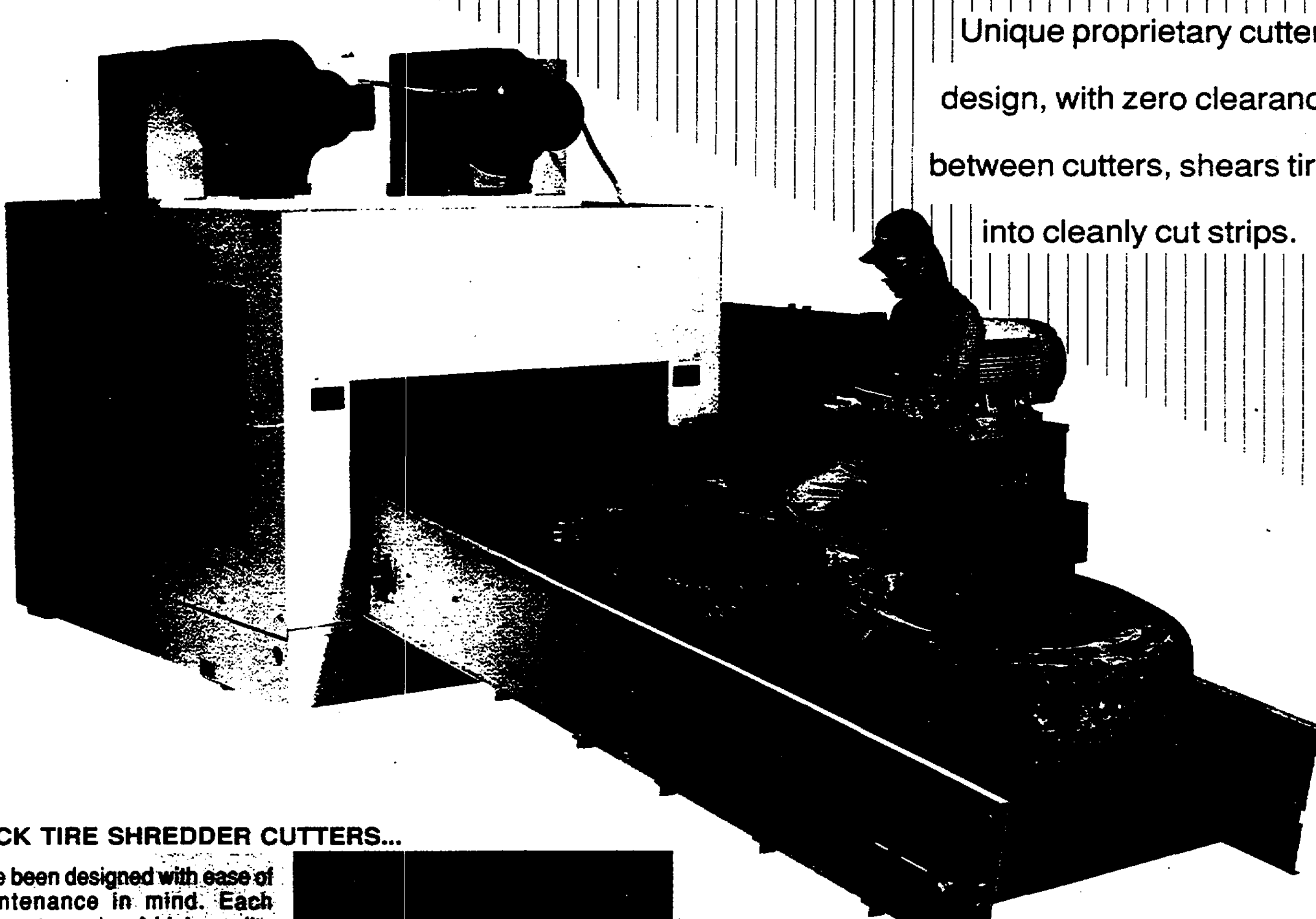
High Efficiency Tire Processing Machinery





Printed on recycled paper

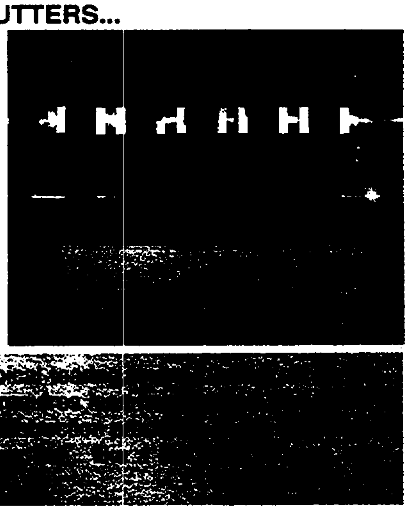
Truck Tire Shredder



Unique proprietary cutter design, with zero clearance between cutters, shears tires into cleanly cut strips.

TRUCK TIRE SHREDDER CUTTERS...

have been designed with ease of maintenance in mind. Each segment, made of high quality tool steel and heat treated to maximize cutter life, can be changed without any machine dis-assembly. An aggressive saw tooth profile ensures positive gripping power and the patented cutter adjustment allows for zero clearance between cutters, creating a shearing action instead of the typical ... equipment. This shearing action ... in less heat generated in the ... to de-bead even the hea... butter, these cutters do the...



PRIMARY

- 54 in. wide throat opening to shred whole truck tires, up to 48 in. in diameter, into 4.66 in. wide strips for volume reduction or to further process into chip form in an Ameri-Shred secondary shredder.
- Only 100 HP drive required.
- High throughput of 9.9 tons per hour (field average) and long cutter life allow for a cost effective operation.
- Ruggedly constructed to shred through miscellaneous debris such as sheet metal, wood or ice trapped in the tires.

Specifications					
Type	Primary Truck	Secondary	Secondary	Secondary	Secondary
Crusher Module	Yes	No	No	No	No
Shred Width	4.66"	1"	2"	1"	2"
Floor Space Req'd	8'-0" x 15'-0"	7'-3" x 7'-6"	7'-3" x 7'-6"	7'-3" x 7'-6"	7'-3" x 7'-6"
Overall Height	12' high w/ stand	5'-2"	5'-2"	5'-2"	5'-2"
Machine Weight	48,000#	10,000#	10,000#	10,000#	10,000#
Motor Size	100 HP	60 HP	60 HP	100 HP	100 HP
TPH (field average)*	9.9 avg.	12.2 avg.	14.0 avg.	19.1 avg.	19.8 avg.
TPH (theoretical)*	19.8 max.	23 max.	23 max.	42 max.	42 max

*See definitions on back page.

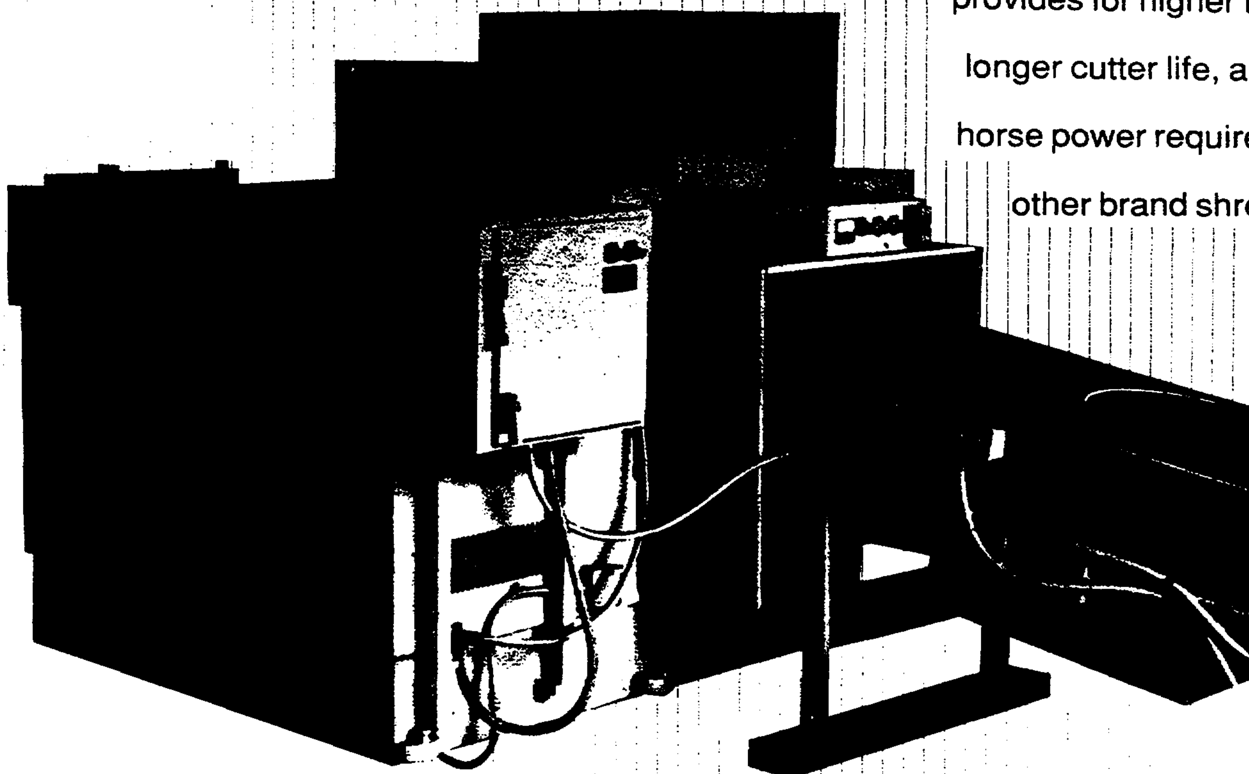
SECONDARY

- Shreds previously shredded tires into finer chips. 1/2 in. through 2 in. shred widths available.
- Available in 60 or 100 HP models.
- Throughputs from 12.2 to 19.8 tons per hour (field average).

Ameri-Shred

Passenger Tire Shredder

Unique proprietary cutter design provides for higher throughput, longer cutter life, and a lower horse power requirement than other brand shredders.

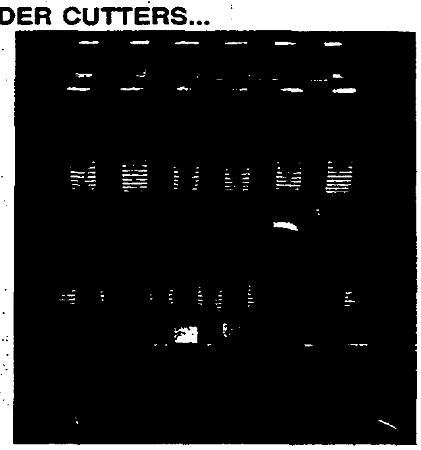


PRIMARY

- 30 in. wide throat opening to shred whole passenger car tires into 2 in. wide strips for volume reduction or to further process into chip form in an Ameri-Shred secondary shredder.
- Only 60 HP drive required, minimizing operating costs.
- High throughput of 13.2 tons per hour (field average).
- Ruggedly constructed to shred through miscellaneous debris such as sheet metal, wood or ice trapped in the tires.

PASSENGER TIRE SHREDDER CUTTERS...

are high alloy thermally processed tool steel with positive saw tooth grip. This alloy is known for durability and its ability to hold a cutting edge. Zero clearance between the cutters shears instead of tears the tire which requires less horse power and creates less heat. Saw tooth type cutters also provide more linear shredding edge than hook type cutters found in other brand tire shredders. More shredding edge extends the cutter life.



SECONDARY

- Shreds previously shredded tires into finer chips. 1/2 in. through 2 in. shred widths available.
- Available in 60 or 100 HP models.
- Throughputs from 12.2 to 19.8 tons per hour (field average).

Specifications	WP-60-20	CP-60-10	CP-60-20	CP-100-10	CP-100-20
Type	Primary Passenger	Secondary	Secondary	Secondary	Secondary
Crusher Module	Yes	No	No	No	No
Shred Width	2"	1"	2"	1"	2"
Floor Space Req'd	7'-3" x 7'-6"	7'-3" x 7'-6"	7'-3" x 7'-6"	7'-3" x 7'-6"	7'-3" x 7'-6"
Overall Height	6'-10"	5'-2"	5'-2"	5'-2"	5'-2"
Machine Weight	12,000#	10,000#	10,000#	10,000#	10,000#
Motor Size	60 HP	60 HP	60 HP	100 HP	100 HP
TPH (field average)*	13.2 avg.	12.2 avg.	14.0 avg.	19.1 avg.	19.8 avg.
TPH (theoretical)*	23 max.	23 max.	23 max.	42 max.	42 max

*See definitions on back page.

Toll Free: (800) 356-1593

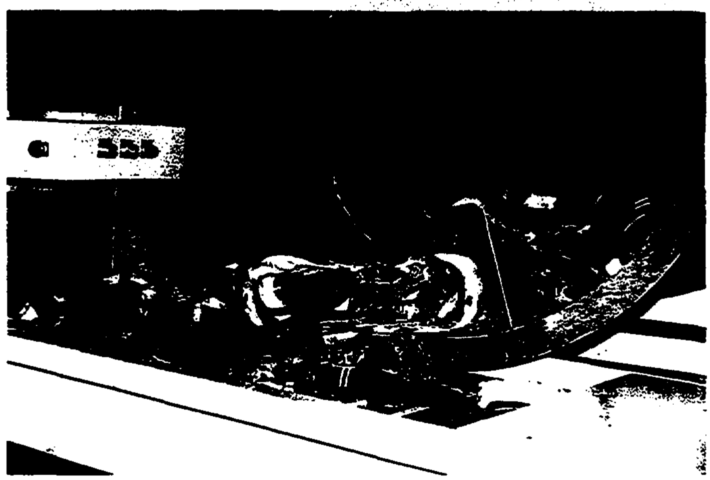
Patent Nos. 5,129,505 and 5,236,139.

FIELD AVERAGE is the tire volume actually processed in the field by Ameri-Shred equipment users and reflects what can be reasonably expected in a production environment. Note: Field average tonnages for the CP Series may be reduced by 50% when used in conjunction with a recirculating classifier.

CONTINUOUS THEORETICAL is determined by presuming the machine would be running at its rated speed with the entire surface of the crusher and the conveyor being fully loaded at optimum conditions, with all drive components loaded to their full load rating. This, of course, is not very realistic. Continuous theoretical capacity is listed in the charts on the previous page. They are only listed for comparison with other brand shredders since many manufacturers use these theoretical capacities in their advertising.

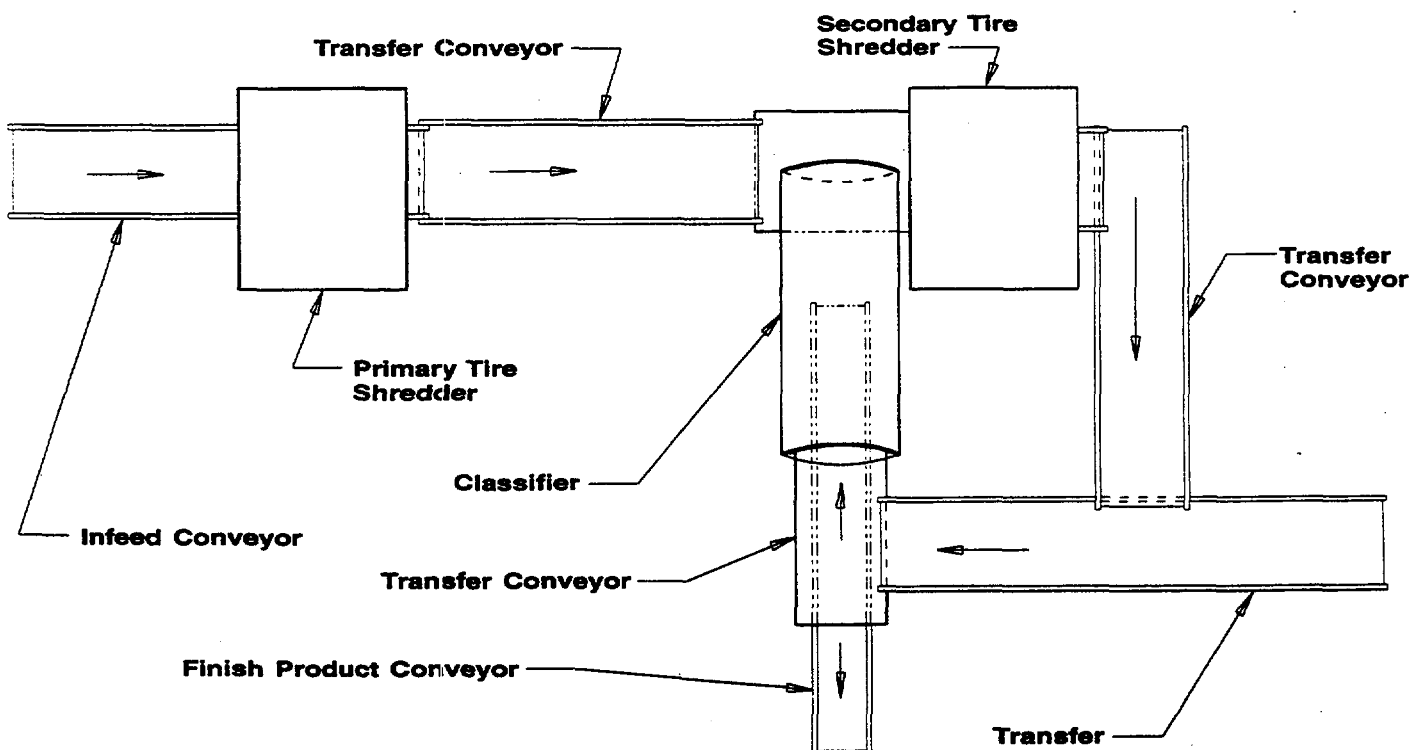
Other Shredder Accessories

CLASSIFIER Photograph illustrates a trommel-style classifier feeding tire chips into a secondary tire shredder. This device allows predetermined sizes to fall through onto a finish product conveyor, while larger tire chips are metered forward to be shredded further.



CONVEYORS Ameri-Shred conveyors are specifically designed for the scrap tire processing industry. Open style slider rib construction minimizes both belt friction and freeze-up in cold climate conditions, and allows fines to fall through the ribs. Cleated polyurethane belting resists penetration from any loose wires cut from tires. Other features include 10 ga. formed side frames, end drive, sealed ball bearings, easy take-up adjustment and formed side skirts to keep product centered on belt.

Example of a Tire Shredding System



Ameri-Shred Industrial Corp. · P.O. Box 205 · Alpena, MI 49707
Phone: (517) 356-1593 or (800) 356-1593 · Fax: (517) 356-0770

Endura-MAX Inc.
P.O. Box 205 • Alpena, MI 49707 • fax (517) 356-0770 • 1-800-356-1593

November 1, 1996

Ms. Carmen Guerrero
I C S Kaiser
9300 Lee Hwy
Fairfax, VA 22031-1207

Dear Carmen,

Thank you for your interest in Endura-Max Inc. (EMI) tire processing line of shredders. Following please find literature displaying the various models of EMI tire shredders.

EMI tire shredding equipment is available in both primary and secondary shredders for processing scrap tires into chips as small as one-half inch in size. Our unique cutter design provides for a shearing action which produces cleanly cut chips, rather than the tearing action of most other brand shredders that often leaves long wires protruding from the chips. Operating and maintenance costs also compare favorably with that of most other brand shredders. Shredders are available in both stationary or mobile models and can be purchased with complementary equipment such as classifiers and conveyors.

We would be very pleased to assist you with your tire shredding questions and of course, with providing you with outstanding Endura-Max tire processing equipment. Please feel free to contact us toll free at 800-356-1593 or fax us at 517-356-0770.

Best Regards,

Endura-Max Inc.

Wayne Morgan

Wayne Morgan Jr.
Sales Coordinator

Ameri-Shred Industrial Corp.

P.O. Box 205, Alpena, MI 49707, FAX (517) 356-0770 • (517) 356-1593

Here's a list of questions you need to ask regarding tire shredder applications:

1. What chip size does the customer want to produce?

2. What production rate is desired?

3. Does the customer plan on processing only passenger tires, or truck tires as well?

4. Will the customer be de-beading the tires prior to shredding?

5. Does the customer plan to incorporate our equipment with some existing shredders? If so, what is the existing equipment?

6. Does the customer have any markets secured for the end product? If so, what markets are they? (ie: tire derived fuel 'TDF', roadbed aggregate, landfill cover, etc.)

7. Does the customer want to further process chips into crumb rubber? If so, what type of equipment do they plan on using & what chip size is required as feed stock for that equipment? Is magnetic seperation required?

8. Does the customer plan on processing tires from tire pile cleanups (those tires are frequestly buried or exposed to the elements for long periods of time and cause greater wear on the shredder cutters)?

9. Does the customer require stationary or mobile units?

10. One of the most important questions...Does the customer have financing secured for this equipment purchase.

Ameri-Shred Industrial Corp.

P.O. Box 205, Alpena, MI 49707, FAX (517) 356-0770 • (517) 356-1593

TIRE-SHREDDER EQUIPMENT REFERENCES

Mr. Norm Emanuel
Emanuel Tire Co.
Baltimore, MD
410-947-0660

Mr. George Dalton
Tire Disposal Service
Waxhaw, NC
704-843-4643

Mr. Leroy Todd
Detroit Tire Disposal
Detroit, MI
313-891-4284

Mr. Manuel Estragadinho
National Rubber Co.
Toronto, ON
416-657-1111

Mr. Calvin Penz
Calvin Penz
Rochester, MN
507-289-0070

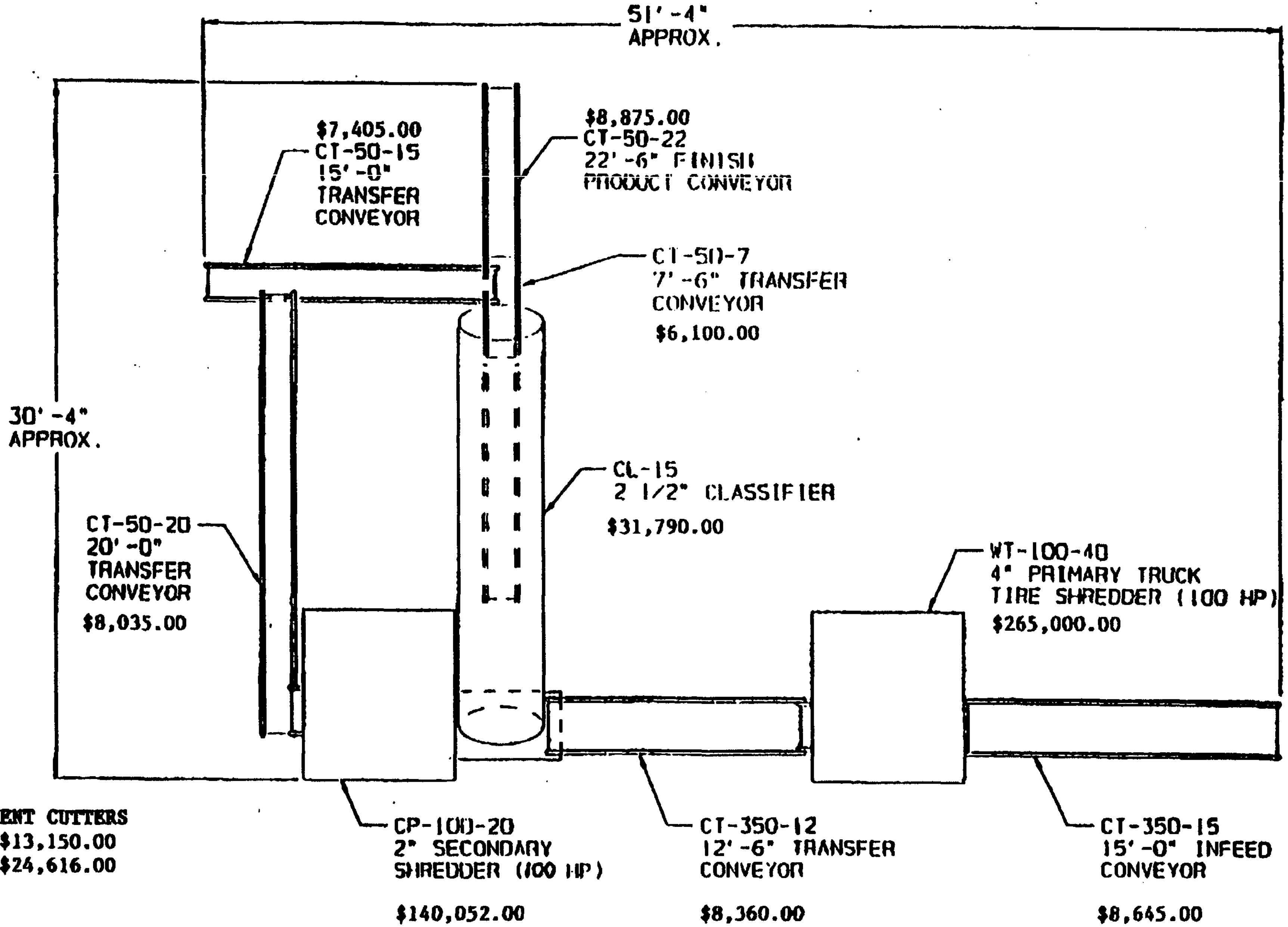
Mr. John C. Evans
T D P Partners Inc.
Greenville, SC
803-233-9087

Mr. Dan Dustin
N R B Materials
Flatrock, MI
313-782-0378

* Also, an electric producing company that has experience with using TDF processed by Ameri-Shred equipment is LFC Power Systems, Hillman, MI.

* Chips processed by Ameri-Shred equipment is also currently being used in South Carolina for septic aggregate material, which requires a VERY cleanly cut product.

TIRE SHREDDING SYSTEM
2" NOMINAL CHIPS
6.0 TONS PER HOUR



REPLACEMENT CUTTERS
CUT-20 $13,150.00
CUT-40 $24,616.00

Ameri-Shred Industrial Corp.

P.O. Box 205, Alpena, MI 49707, FAX (517) 356-0770 • (517) 356-1593

PROPOSAL:

Cost of Tire Shredding Equipment:

1.	CT-350-15	Incoming Conveyor	$ 8,645.00
2.	WT-100-40	Primary Truck Shredder,100Hp,4"	265,000.00
3.	CT-350-12	Transfer Conveyor	8,360.00
4.	CP-100-20	Secondary Shredder,100Hp,2"	140,052.00
5.	CT-50-20	Transfer Conveyor	8,035.00
6.	CT-50-15	Transfer Conveyor	7,405.00
7.	CT-50-07	Transfer Conveyor	6,100.00
8.	CL-20	Classifier,2"	31,790.00
9.	CT-50-22	Exit Conveyor	8,875.00
10.	Cut-20	Replacement Cutters,2"	13,150.00
11.	Cut-40	Replacement Cutters,4"	24,616.00
		Total	$522,028.00

Freight charges not included. F.O.B. Alpena, Michigan.
Sales tax, or any other applicable taxes or fees, are not included and if required will be the purchaser's responsibility.
Installation supervision is available at an additional cost of $4,500.00, which includes SUPERVISION ONLY and an instructional session on appropriate operating and maintenance procedures.

Ameri-Shred Industrial Corp.

P.O. Box 205, Alpena, MI 49707, FAX (517) 356-0770 • (517) 356-1593

PROPOSAL:

A. EQUIPMENT DESCRIPTION.

1. Incoming Conveyor CT-150-15. Provide 48" wide, 15' long conveyor to convey tires to primary shredder.

2. Primary Shredder WT-100-40. Provide a 100 horsepower primary shredder to accept whole truck tires to cut into 4" wide strips. Shredder is available in 230/460 volts, 3 phase. Shredder weight is approximately 48,000 pounds. Shredder equipped with auto-lube and nozzles for water water spray.

3. Transfer Conveyor CT-350-12. Provide 48" wide, 12'6" long conveyor to transfer stock to secondary shredder.

4. Secondary Shredder CP-100-20. Provide a 100 horsepower secondary shredder to accept previously shredded stock and further reduce size.

5. Transfer Conveyor CT-50-20. Provide 20" wide, 20' long conveyor to transfer stock toward classifier.

6. Transfer Conveyor CT-50-15. Provide 20" wide, 15' long conveyor to transfer stock toward classifier.

7. Transfer Conveyor CT-50-07. Provide 20" wide, 7' long conveyor to feed stock into classifier.

8. Classifier CL-20. Provide a trommel style classifier (approx. 2" dia. screen holes) to separate the incoming stock size and return any oversized stock for further size reduction.

9. Exit Conveyor CT-50-22. Provide 20" wide, 22'6" long conveyor to remove stock away from operations area.

10. Replacement Cutters Cut-20. Provide one set of 2" replacement cutters for use with secondary shredder in order to facilitate minimum downtime during cutter replacement.

11. Replacement Cutters Cut-40. Provide one set of 4" replacement cutters for use with primary truck tire shredder to facilitate minimum downtime during cutter replacement.

Ameri-Shred Industrial Corp.

P.O. Box 205, Alpena. MI 49707. FAX (517) 356-0770 • (517) 356-1593

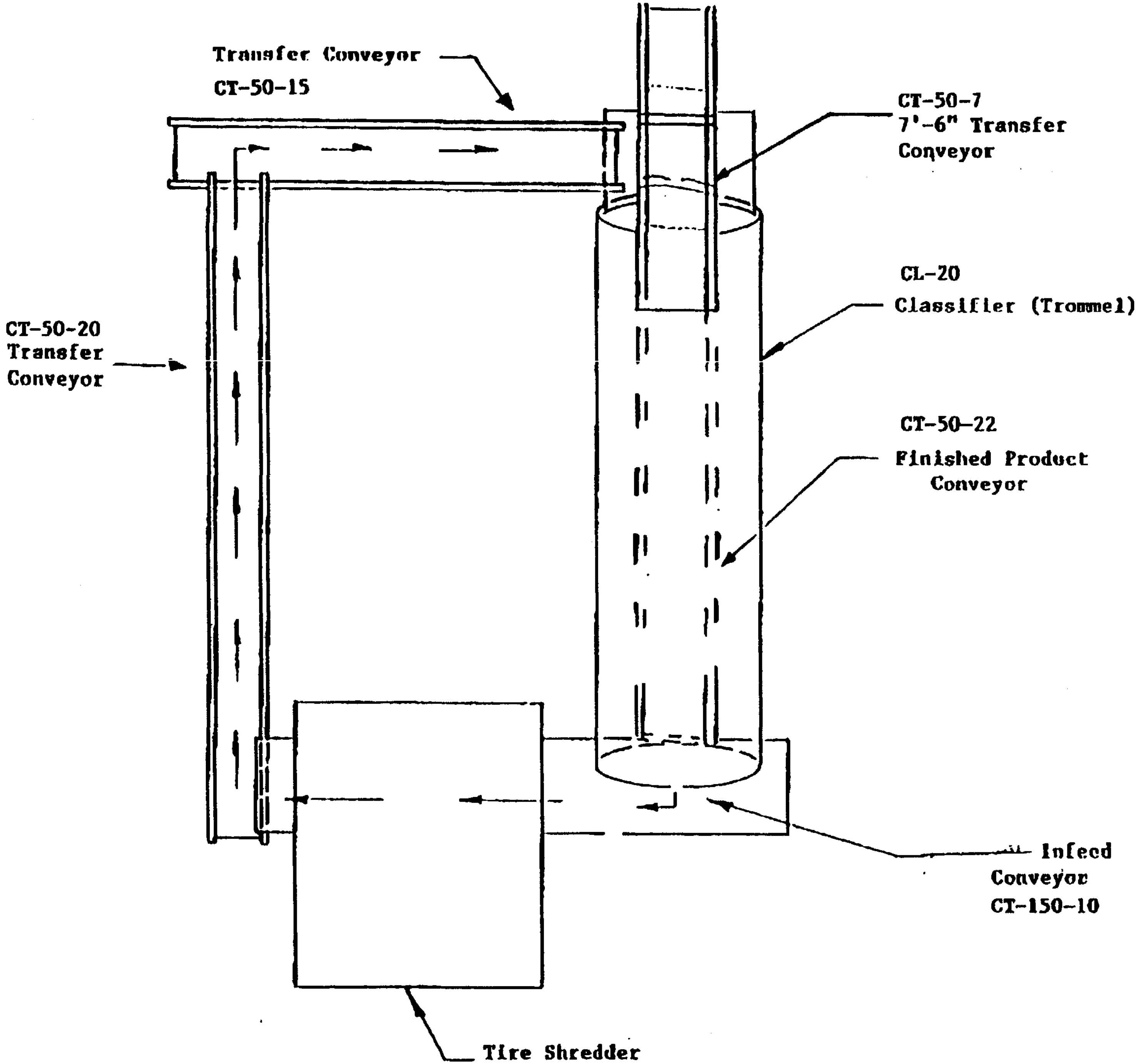
PROPOSAL:

B. SCHEDULE OF DELIVERY. Upon receipt of firm purchase order, total delivery time will be 12-14 weeks (if truck tire primary shredder is purchased delivery for that item is 18-20 weeks).

C. WARRANTY INFORMATION. All Ameri-Shred shredders are warranted for one year manufactured parts, and 90 days for labor. Perishable tooling is not included in any warranty (cutters, belts,etc). Manufacturer's warranty applies to any purchased components not manufactured by Ameri-Shred.

D. TERMS & CONDITIONS OF PAYMENT. Receipt of a firm written purchase order is required along with 50% of total monies due. Receipt of the balance of all monies due is required at time of build completion and prior to shipment. Should any change in direction be requested or initiated by client during the course of the project, any additional efforts expended will be paid for by the client on a time and materials basis at a labor rate of $35.00/hour, machine time at $65.00/hour(plus operator) and materials at actual reasonable cost. See attachment for standard terms and conditions of sale.

NOTE Any reference to production rates and perishable tooling/operating costs are estimates only and are in no event guaranteed or warranted, due to the many variables that may affect these estimations.

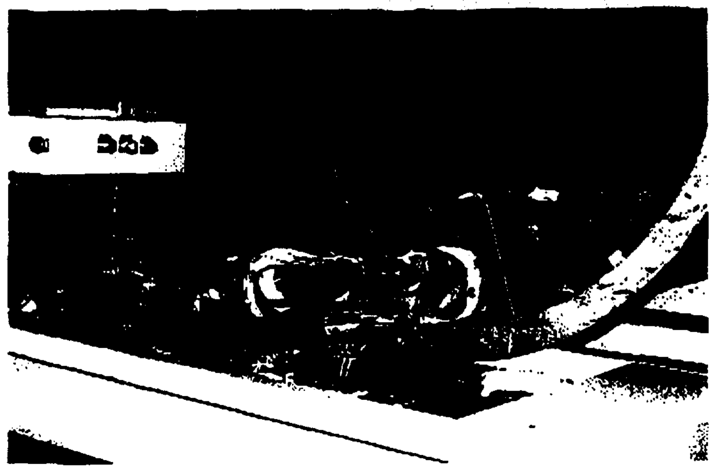

Transfer Conveyor
CT-50-15
CT-50-7
7'-6" Transfer
Conveyor
CL-20
Classifier (Trommel)
CT-50-20
Transfer
Conveyor
CT-50-22
Finished Product
Conveyor
Infeed
Conveyor
CT-150-10
Tire Shredder

FIELD AVERAGE is the tire volume actually processed in the field by Ameri-Shred equipment users and reflects what can be reasonably expected in a production environment. Note: Field average tonnages for the CP Series may be reduced by 50% when used in conjunction with a recirculating classifier.

CONTINUOUS THEORETICAL is determined by presuming the machine would be running at its rated speed with the entire surface of the crusher and the conveyor being fully loaded at optimum conditions, with all drive components loaded to their full load rating. This, of course, is not very realistic. Continuous theoretical capacity is listed in the charts on the previous page. They are only listed for comparison with other brand shredders since many manufacturers use these theoretical capacities in their advertising.

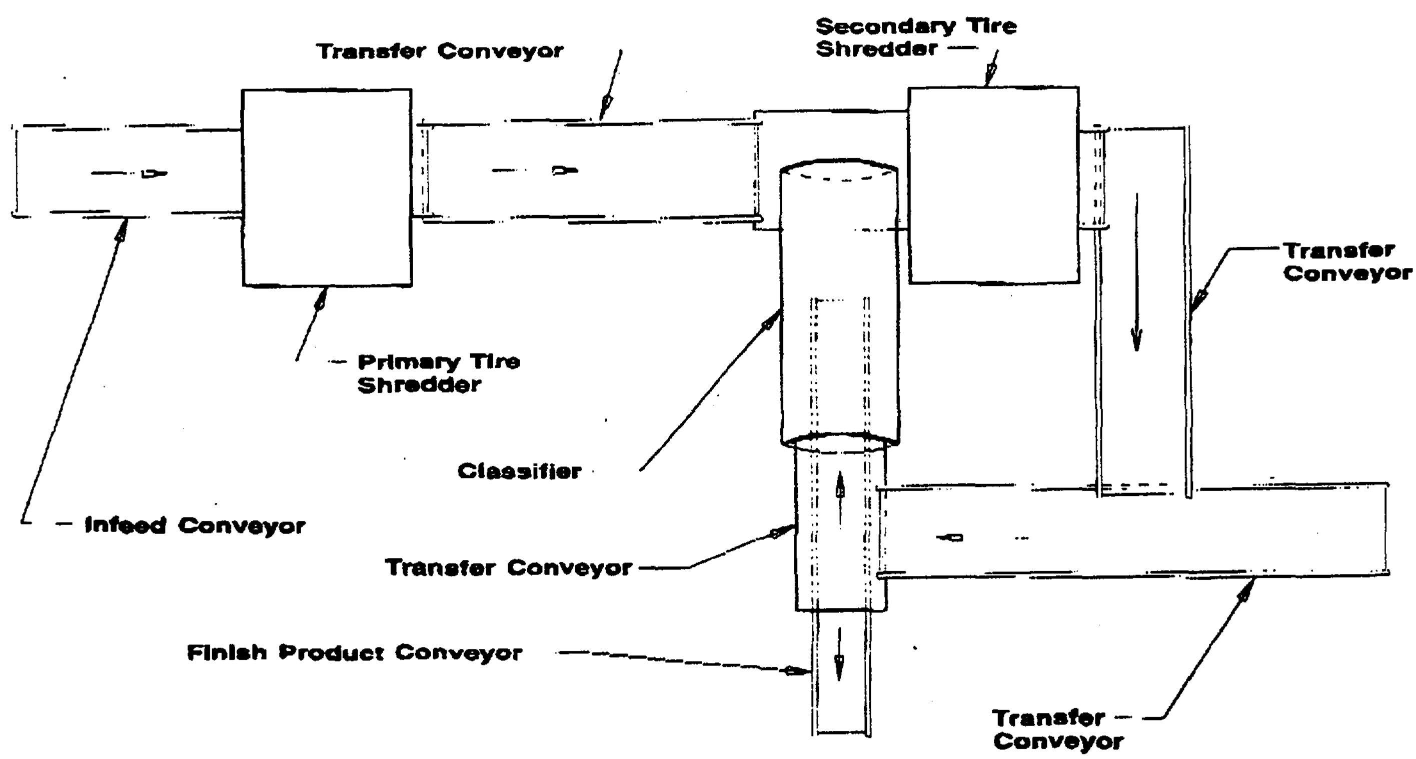
Other Shredder Accessories

CLASSIFIER Photograph illustrates a trommel-style classifier feeding tire chips into a secondary tire shredder. This device allows predetermined sizes to fall through onto a finish product conveyor, while larger tire chips are metered forward to be shredded further.



CONVEYORS Ameri-Shred conveyors are specifically designed for the scrap tire processing industry. Open style slider rib construction minimizes both belt friction and freeze-up in cold climate conditions, and allows fines to fall through the ribs. Cleated polyurethane belting resists penetration from any loose wires cut from tires. Other features include 10 ga. formed side frames, end drive, sealed ball bearings, easy take-up adjustment and formed side skirts to keep product centered on belt.

Example of a Tire Shredding System

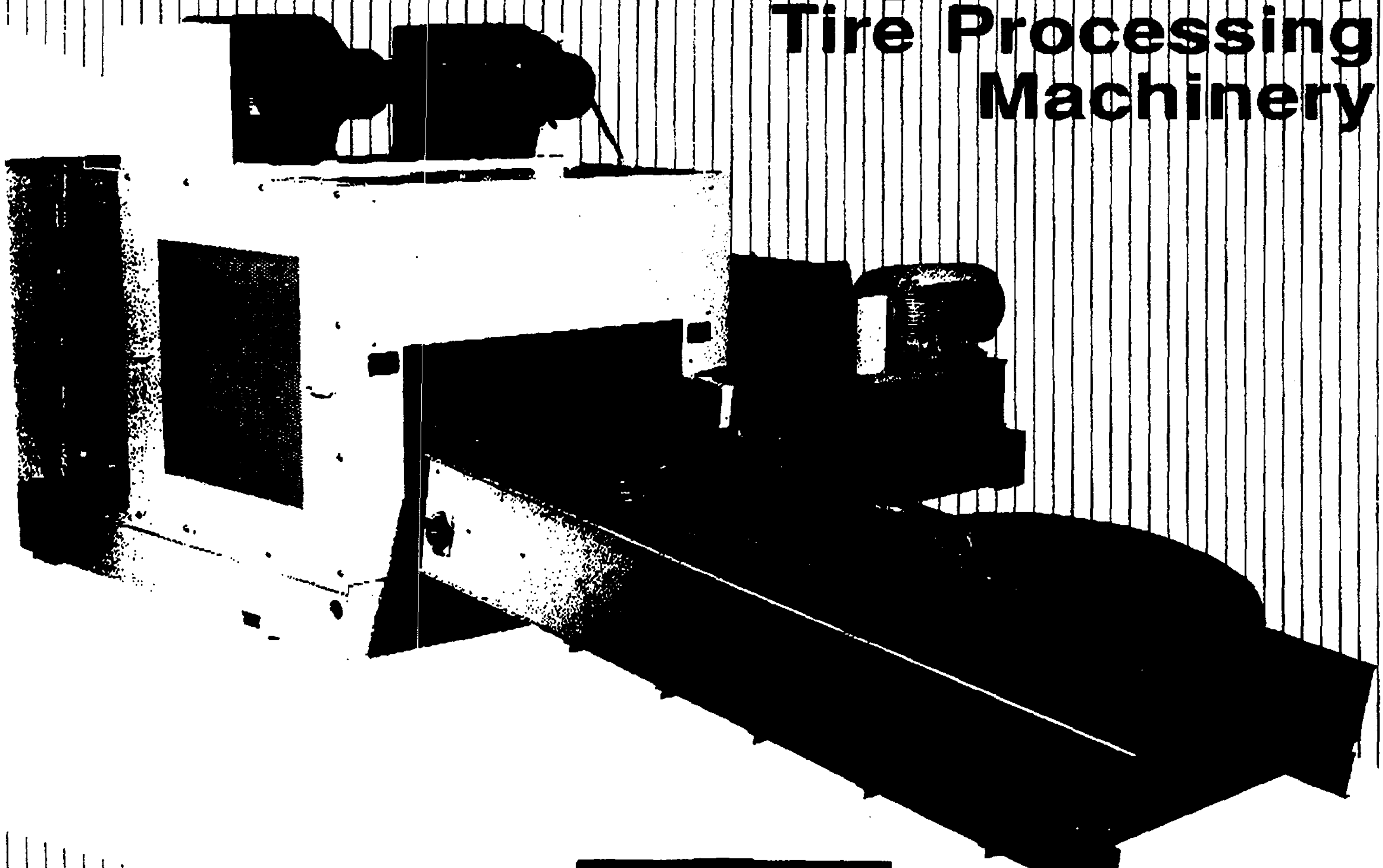


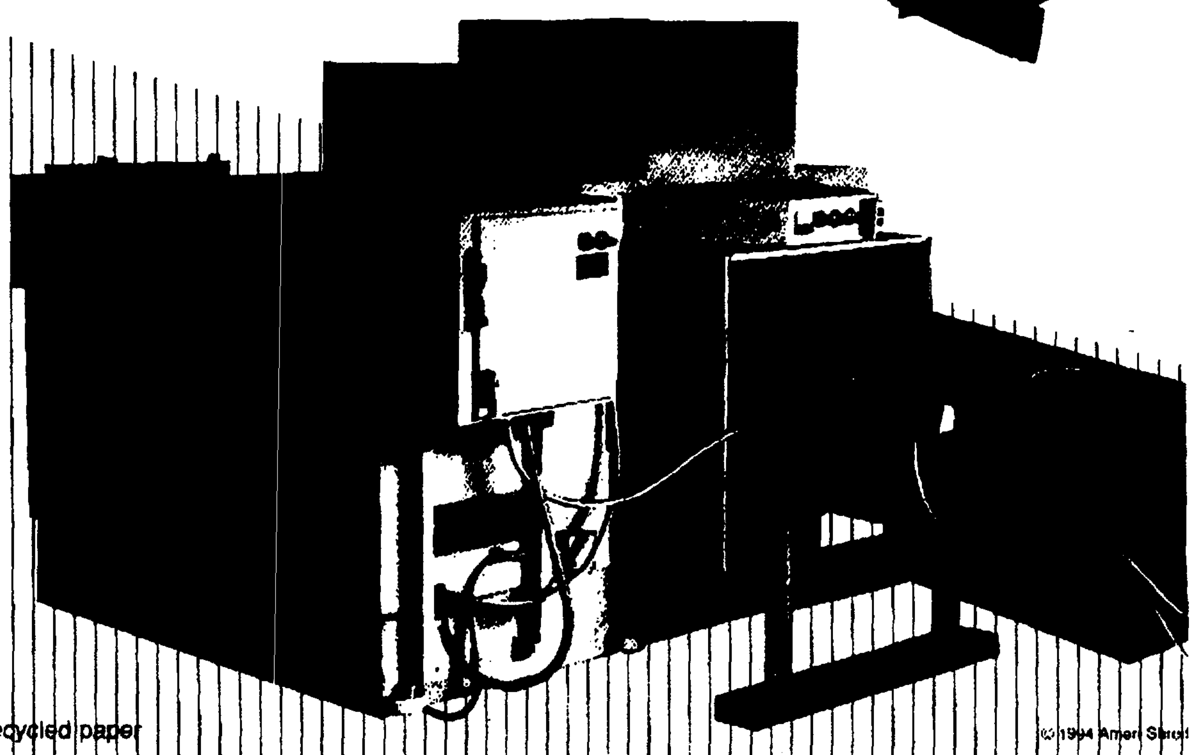
Ameri-Shred Industrial Corp. · P.O. Box 205 · Alpena, MI 49707
Phone: (517) 356-1593 or (800) 356-1593 · Fax: (517) 356-0770

/95 Specifications subject to change without notice.

Ameri-Shred

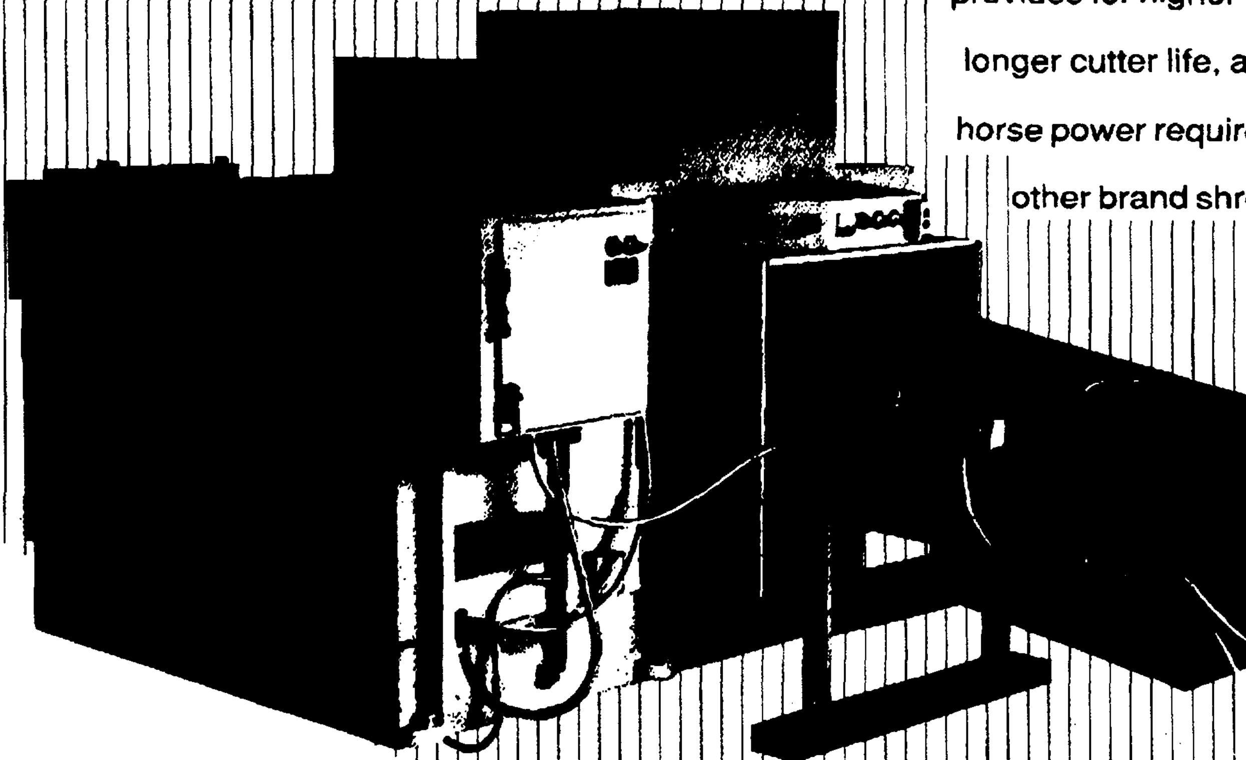
High Efficiency Tire Processing Machinery





Passenger Tire Shredder

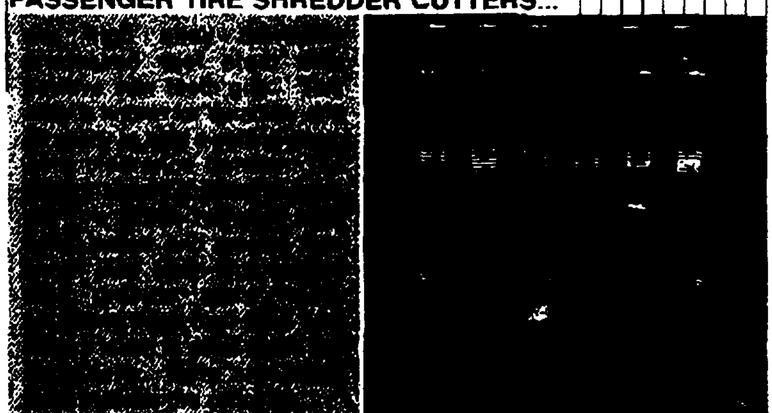
Unique proprietary cutter design provides for higher throughput, longer cutter life, and a lower horse power requirement than other brand shredders.



PRIMARY

- 30 in. wide throat opening to shred whole passenger car tires into 2 in. wide strips for volume reduction or to further process into chip form in an Ameri-Shred secondary shredder.
- Only 60 HP drive required, minimizing operating costs.
- High throughput of 13.2 tons per hour (field average).
- Ruggedly constructed to shred through miscellaneous debris such as sheet metal, wood or ice trapped in the tires.

PASSENGER TIRE SHREDDER CUTTERS...



SECONDARY

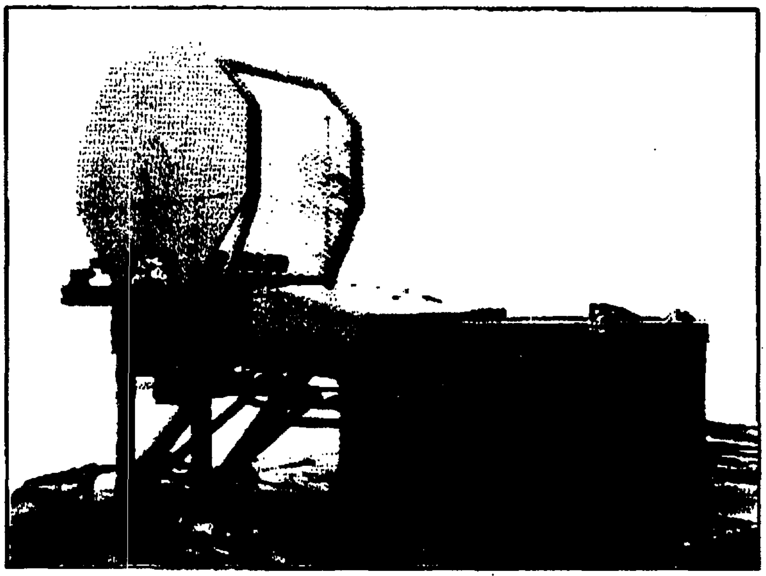
- Shreds previously shredded tires into finer chips. 1/2 in. through 2 in. shred widths available.
- Available in 60 or 100 HP models.
- Throughputs from 12.2 to 19.8 tons per hour (field average).

Type	Primary Passenger	Secondary	Secondary	Secondary	Secondary
Crusher Module	Yes	No	No	No	No
Shred Width	2"	1"	2"	1"	2"
Floor Space Req'd	7'-3" x 7' 6"	7'-3" x 7'-6"	7'-3" x 7'-6"	7'-3" x 7'-6"	7'-3" x 7' 6"
Overall Height	6'-10"	5'-2"	5' 2"	5'-2"	5'-2"
Machine Weight	12,000#	10,000#	10,000#	10,000#	10,000#
Motor Size	60 HP	60 HP	60 HP	100 HP	100 HP
TPH (field average)*	13.2 avg.	12.2 avg.	14.0 avg.	19.1 avg.	19.8 avg.
TPH (theoretical)*	23 max.	23 max.	23 max.	42 max.	42 max

*See definitions on back page.

Patent Nos. 5,129,605 and 5,230,138.

Reducing Your Tire Grinding Cost with the Enviro-Tech Debeader



MODEL 120

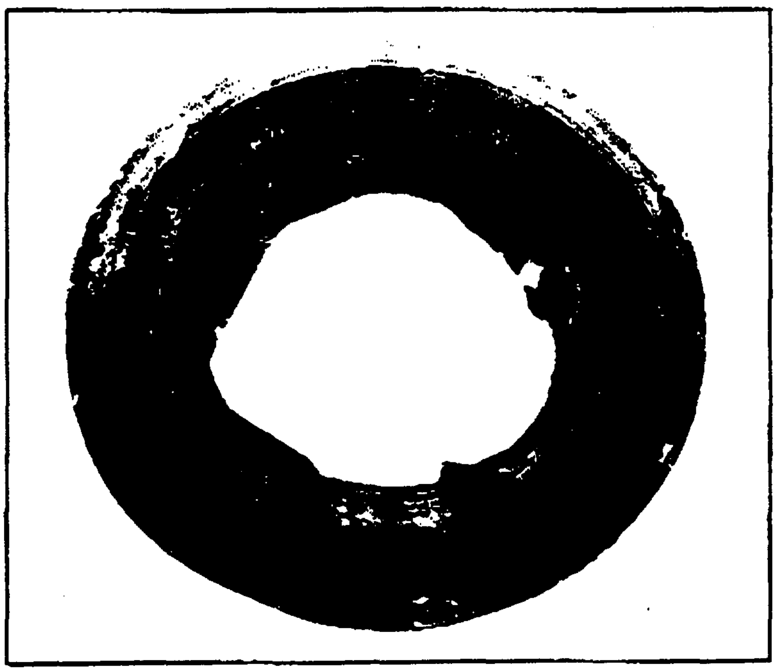
- *Extends Grinder Blade Life*
- *Increases Tire Grinding Production*
- *One Machine Does Car & Truck Tires*
- *Stationary In-Plant Unit*
- *Steel Bead Recovery For Added Sales*
- *Approximately 8 lbs. of salvageable wire in every truck tire.*

(production rate)

2, million

Approximately 8 lbs. of bead wire in a truck tire.

Bead wire is a sellable product earning an extra income.



Pull one bead at a time on truck tires.
Approximate cycle time of 2 minutes per truck tire.

SPECIFICATIONS

Dimensions: O.A.L. 13' Length x 6' Width x 6' Height
Weight: 4000 lbs.
Electrical: 15 H.P. Electric Motor, 3 phase 220/440 volt
Hyd. Res.: 45 Gallons, Hyd. Res.
Hydraulic: Continental Hydraulics - Prince Cyl.

~ $18,000

Alan Ross
Machinery
Corporation

3240 Commercial Ave Northbrook (Chicago) Illinois 60062-
Phone 847 480 8900 Fax 847 480 1830

Carmen Guerrero
ICF Kaiser
9300 Lee Highway
Fairfax, VA 22031-1207

703 934 3816
703 934 9740

OCT 31 96
8278
JS

Purchase Price: $7,500.00
Guaranteed
Shipping: FOB our plant
Salesperson: Jennifer Scianna

Note:

Quotes are subject to prior sale and terms & conditions of sale as stated on reverse side.

ITEC USED TRUCK TIRE DEBEADER

Hydraulic

New 1992

Model 502T

We Take Your Company's Used Equipment In Trade!
Ask Us About Our Leasing.

Alan Ross
Machinery
Corporation

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Carmen Guerrero
ICF Kaiser
9300 Lee Highway
Fairfax, VA 22031-1207

703 934 3816
703 934 9740

OCT 31 96
8298
JS

Purchase Price:	$6,995.00
	Guaranteed
Shipping:	FOB our plant
Salesperson:	Jennifer Scianna
Note:	

Quotes are subject to prior sale and terms & conditions of sale as stated on reverse side.

ITEC USED PASSENGER TIRE DEBEADER

Hydraulic

New 1992

Model 510

We Take Your Company's Used Equipment In Trade!
Ask Us About Our Leasing.

Alan Ross Machinery Corporation

Used and New Equipment For
Recycling & Scrap Processing
Products & Document Destruction
Environmental Testing & Remediation
Solid Waste Management
Materials Handling
Scrap Tire Processing
Magnetic & Air Separation

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Phone 847 480 8900 Fax 847 480 1830

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ICF Kaiser
9300 Lee Highway
Fairfax, VA 22031-1207

703 934 3816
703 934 9740

OCT 31 96
8425P
JS

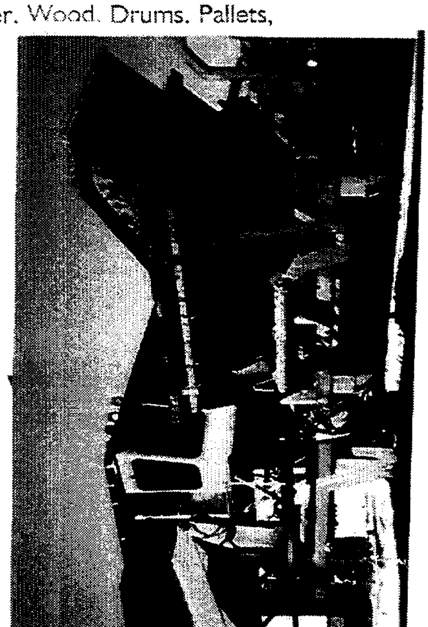
Purchase Price: $95,000.00
As-Is
Shipping: At-Site
Salesperson: Jennifer Scianna

Note:

Quotes are subject to prior sale and terms & conditions of sale as stated on reverse side.

80" X 36" USED MORGARDSHAMMER SHREDDER

2" x 4" Nominal Output Size
Hydraulically Driven
Approx. Weight: 62000 Lbs
Hydraulic Grapple & Arm
Self Stabilizing 3-Axle Lowboy Mounted
Cat 3408 (525 HP) Diesel Engine
10 Yard Capacity Infeed Hopper
Hagglund, Dennison & Marathon Powerpack & Hydraulics
High Torque / Low Speed Cutting Shafts
Shreds Light Metals, Rubber, Wood, Drums, Pallets,
Plastics & More



Alan Ross Machinery Corporation

Used and New Equipment For:
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Products & Document Destruction
Environmental Testing & Remediation
Solid Waste Management
Materials Handling
Scrap Tire Processing
Magnetic & Air Separation

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9300 Lee Highway
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703 934 3816
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8189P
JS

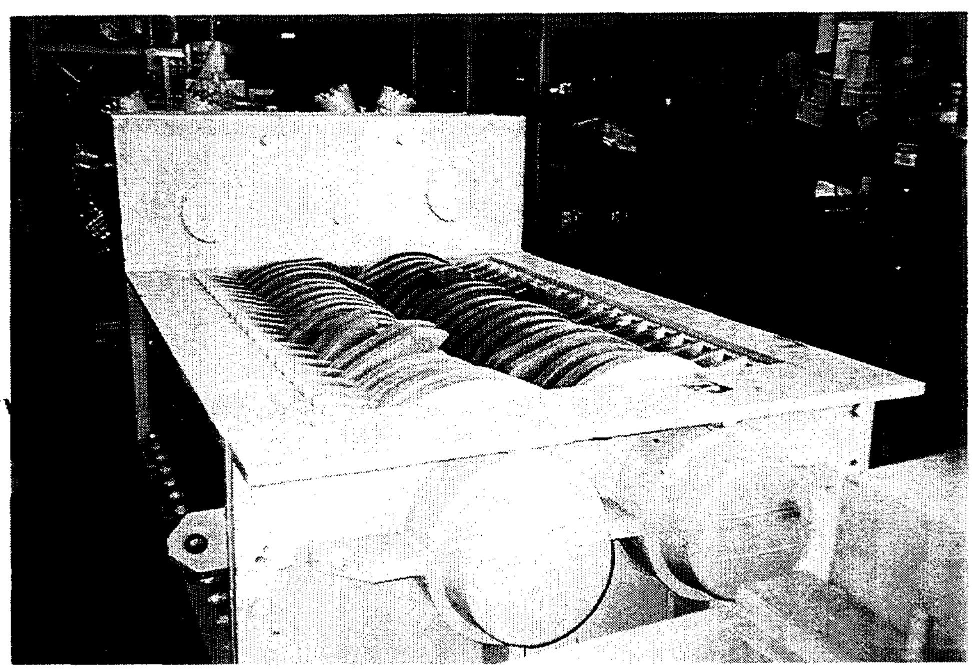
Purchase Price: $150,000.00
As-Is
Shipping: FOB our plant
Salesperson: Jennifer Scianna

Note:

Quotes are subject to prior sale and terms & conditions of sale as stated on reverse side.

MODEL 3800H USED SSI SHEAR SHREDDER

4" Nominal Output Size
Hydraulically Driven
400 HP 3/60/460 Volt Motor
Feed Dimensions: 72" x 52"
(4) 100 HP Motors = 400 HP
(2) Dennison Piston Pumps
Oil Heater • Skid Mounted
Large Infeed Hopper Included



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Used and New Equipment For
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Products & Document Destruction
Environmental Testing & Remediation
Solid Waste Management
Materials Handling
Scrap Tire Processing
Magnetic & Air Separation

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Phone 847 480 8900 Fax 847 480 1830

Carmen Guerrero
ICF Kaiser
9300 Lee Highway
Fairfax, VA 22031-1207

703 934 3816
703 934 9740

OCT 31 96
7158P
JS

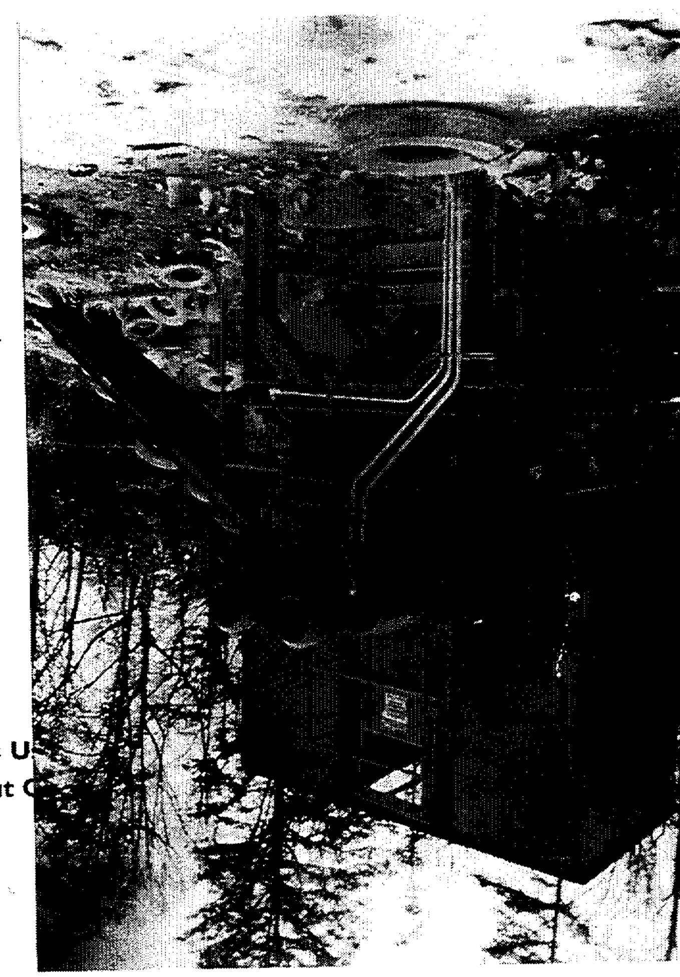
Purchase Price: $59,950.00
As-Is
Shipping: FOB our plant
Salesperson: Jennifer Scianna

Note:

Quotes are subject to prior sale and terms & conditions of sale as stated on reverse side.

MODEL ST 100 USED SHRED-TECH SHEAR SHREDDER

1-1/2" Nominal Output Size
Mechanically Driven
Feed Dimensions: 62" x 32"
Approx. Dimensions: 60" W x 108" H x 145" L
Approx. Weight: 20000 Lbs
New In 1993 (Used Approximately 9 Months)
(30) 1-7/8" Knives
(2) 50HP 3/220/440 Volt Motors
Heavy Duty Hex Shafts With Supports
Labrinth Seals
Close tolerance spacers for cleaner cut. .
Includes 30"w x 32'l infeed conveyor and drum classifier



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Used and New Equipment For
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Products & Document Destruction
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Magnetic & Air Separation

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Phone 847 480 8900   Fax 847 480 1830

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ICF Kaiser
9300 Lee Highway
Fairfax, VA 22031-1207

703 934 3816
703 934 9740

OCT 31 96
8003
JS

Purchase Price: $65,000.00
Guaranteed
Shipping: FOB our plant
Salesperson: Jennifer Scianna

Note:

Quotes are subject to prior sale and terms & conditions of sale as stated on reverse side.

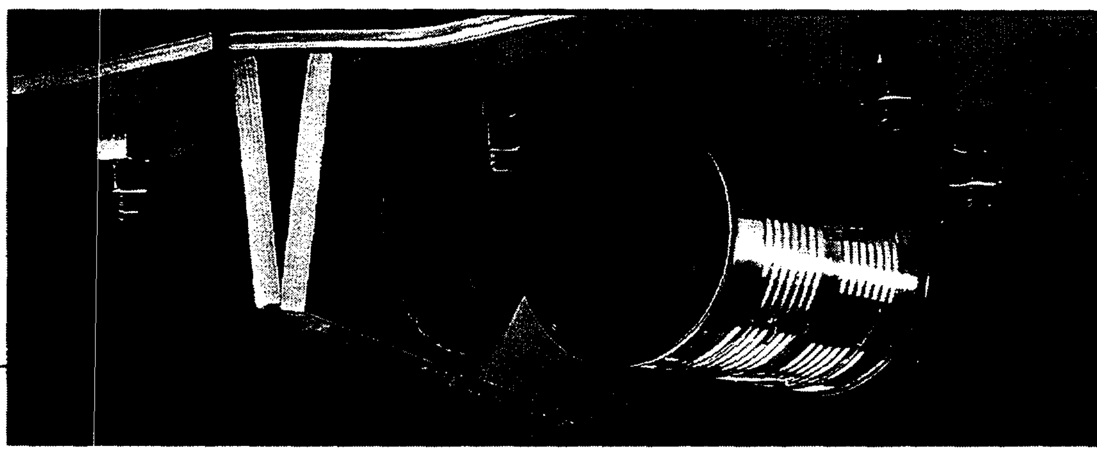
50" X 28" USED CARTHAGE TIRE SHREDDER

Mechanically Driven
150 HP 3/60/440 Volt Motor
Feed Dimensions: 50" x 28"
(24) 2 Hook Knives
(2) 75 HP Motors = 150 HP
New In 1990 • Stationary
Model 5028
Approximate Capacity: 700 - 1000 Passenger Tires Per Hour
Infeed & Discharge Conveyors Included

Dings Co.
magnetic group

Magnetic Separators
For Ferrous and Nonferrous Metals

Ensure Product Purity



Recover Materials

Protect Your Equipment Investment

FOR LARGE BULK

Overhead Magnets (~$2,200 - $50,000)

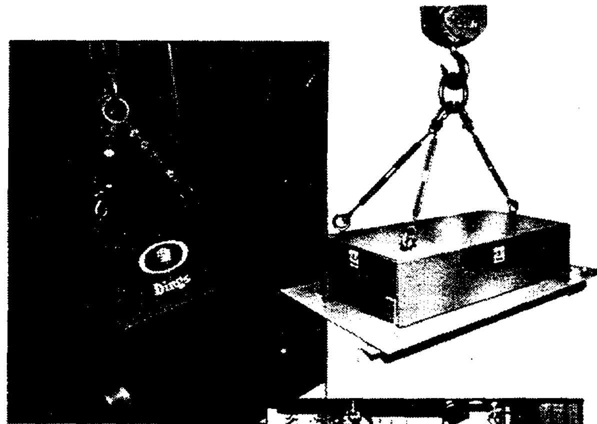
***Electro and Permanent* –** Overhead separators suspend above belt or vibratory conveyors, magnetically lifting ferrous metals out of bulk material. They are used for steel recovery, separating ferrous metals from nonmagnetic material. Overhead magnets also protect processing equipment, removing damaging tramp metal that can cause costly repairs and downtime.

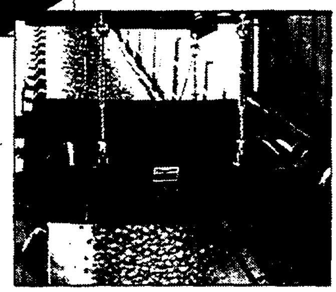
Dings Co. manufactures two styles of overheads, electromagnetic (powered by DC from a rectifier) or permanent (nonelectric). Both are available as self-cleaning or stationary. Separated steel objects are held against the magnet until removed – automatically on self-cleaning models, or manually on stationary models. A belt travels continuously around the body of the magnet to discharge ferrous on self-cleaning models.

Overhead magnets are used for resource recovery, reclaiming steel for resale and separating ferrous contaminants from other recyclable material such as aluminum, glass, plastic, tires, crushed concrete, or wood.

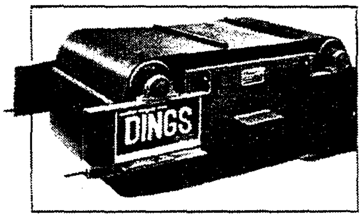
Many facilities use overhead magnets to protect processing machinery, such as crushers at quarries, cement plants, and mines. At power plants, they keep tramp metal out of coal pulverizers. Pulp and paper mills use them on wood chips. In foundries, they remove chills, sprues, and gaggers from sand.

Design Innovations:
Long-life magnet coil. Exclusive flux control circuit (permanent magnet models).





Overhead magnets can be installed at a right angle across the conveyor (crossbelt) or inline over the conveyor head pulley.



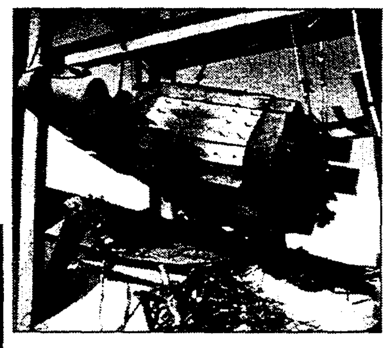
***Severe Duty* –** This rugged version of the overhead magnet is designed for severe-duty applications such as recycling concrete, pallets, and construction and demolition (C&D) debris. The heavy-duty model is also recommended for processing recyclables at material recovery facilities (MRFs), separating steel from organic waste at composting sites, and for retrieving castings out of foundry sand.

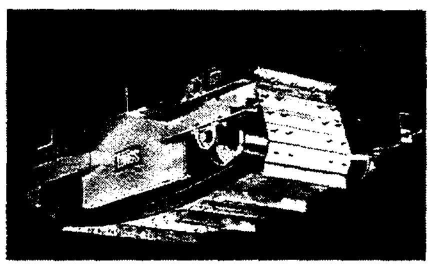
The severe-duty magnet features the armor-clad Durabelt, a heavy-duty drive package for the self-cleaning belt, lagging on the drive pulley, and a wear plate that provides extra protection for the magnet impact area.

Hundreds of installations currently use Dings severe-duty magnets, and have found the savings in belt replacement costs and downtime to be substantial.

Design Innovations:
Long-life magnet coil. Exclusive flux control circuit (permanent models). Metal-clad Durabelt.

Severe-duty magnet removing rebar from crushed concrete



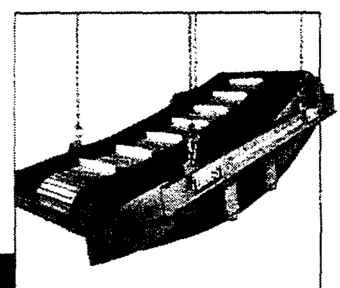


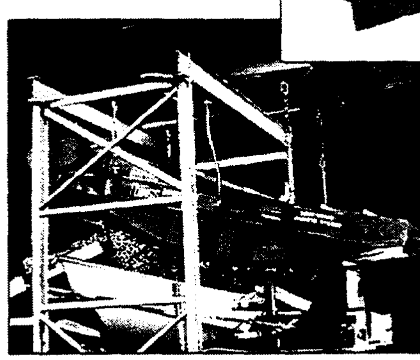
***Solid Waste Magnetic Systems* –** Powerful and highly selective, these systems are designed exclusively for separating steel from solid waste. They are a striking departure in size, shape, and appearance from any other electromagnetic separator. Systems are available for two different applications: a three-stage model which produces very clean, saleable steel and a heavy ferrous model which purifies waste of all equipment-damaging steel.

The three-stage system separates refuse that normally becomes trapped between pieces of steel. Ferrous material is attracted by a strong pickup magnet and conveyed by the cleaning belt through zones of polarity reversal formed by two other magnets. Entrapped pieces of paper, plastic, and other nonferrous material are freed as the metal pieces flip them loose when passing through polarity reversal. The result is clean steel – a recyclable product with a high resale value because it's free of entrapped nonmagnetics.

The single-stage heavies system is a powerful separator used to remove heavy ferrous metal from solid waste at refuse-derived fuel (RDF) plants. These facilities require a reliable method for removing *all* steel, including occasional heavy items, to prevent costly damage to processing equipment. The entire system is more than 16 feet long, with a huge electromagnet that's over 10 feet in length.

Design Innovations:
Long-life magnet coil. Metal-clad Durabelt.





FOR LARGE BULK

MAGNETIC DEEP DRAW DRUMS (8,000 - 80,000)

Designed for heavy-duty, high-volume ferrous recovery, the Deep Draw Drum is a permanent self-cleaning separator. Its rugged construction is ideal for separating ferrous metal from material such as shredded cars, slag, crushed ore, and ash at mass burn plants.

Similar in operation to the smaller Dings Perma Drum, it has a nonmagnetic outside shell that is driven around an internal stationary magnet. Ferrous metal is magnetically drawn out of the material feed, held against the revolving shell, and released when it reaches a discharge point beyond the magnetic field.

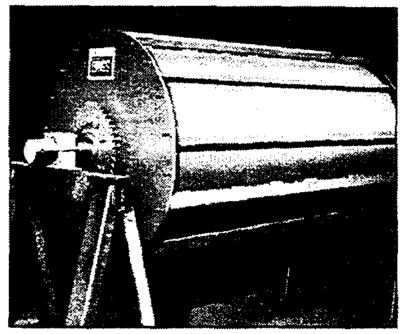
Although operation is similar, Deep Draw Drums have heavier duty construction than that required for Perma Drums. The drum shell is protected by a thick manganese wear cover which can withstand continuous pounding by a steady flow of heavy objects. It greatly extends the life of the drum, and can be replaced in the field if a new wear surface is needed.

The Deep Draw Drum's permanent magnet design outperforms electric-powered models in a number of important ways. It always operates at top efficiency, maintaining constant magnetic strength throughout the day. In contrast, an electro drum loses some magnetism and separating power as the coil heats up during operation. The Deep Draw Drum costs nothing to operate, and does not require a rectifier, generator, switch gear, or wiring. There are no magnet coils to burn out.

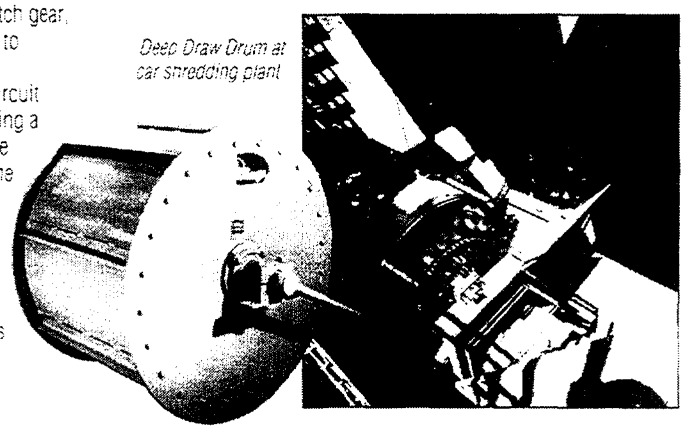
The Dings patented flux control circuit offers another key advantage, providing a stable, even magnetic field across the entire width of the drum to recover the maximum amount of steel.

Deep Draw Drums can be specified in sizes to fit almost any application – models are available up to 5 feet in diameter, weighing over 10 tons, to handle the largest jobs.

Design Innovations:
Exclusive flux control circuit.



This 42" x 96" drum was produced for a mass burn facility.



Deep Draw Drum at car shredding plant

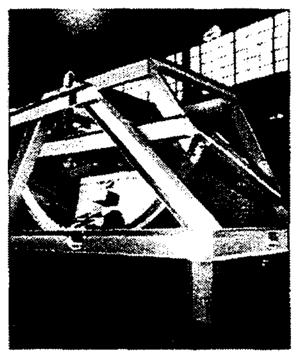
SWINGING PENDULUM MAGNETS

This large and exceptionally durable magnetic separator was originally designed for reclaiming iron from steel mill slag. It can withstand the punishment of continuously attracting massive hunks of steel weighing up to 200 lbs. Other applications include removing ferrous metal from mass burn ash and recyclables where large ferrous is present.

A unique self-cleaning pendulum swings underneath a powerful electromagnet, cooled by a forced oil system. Attracted metal is discharged first to one side and then to the other. All shock and wear is absorbed by the manganese steel plates and cleats on the pendulum face, protecting the magnet.

This unique magnet is another example of the experience and technology that Dings can apply to answer specific industry requirements.

Design Innovations:
Long-life magnet coil.



FOR LARGE BULK & POWDER/GRANULAR

MAGNETIC HEAD PULLEYS

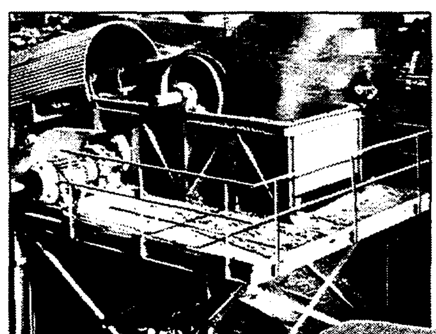
Dings Perma Pulleys are permanent (nonelectric) magnetic separators that operate as head pulleys on belt conveyors. These low-cost, self-cleaning magnets remove tramp iron and purify materials conveyed in bulk form.

When material carried on a conveyor enters the magnetic field surrounding a Perma Pulley, pieces of ferrous metal in the material are attracted to the belt. They're held magnetically against the belt until carried to the underside of the pulley, where the belt takes them away from the magnetic field to be discharged. Nonmagnetic material falls away from the pulley in a normal trajectory. Separation is automatic and continuous.

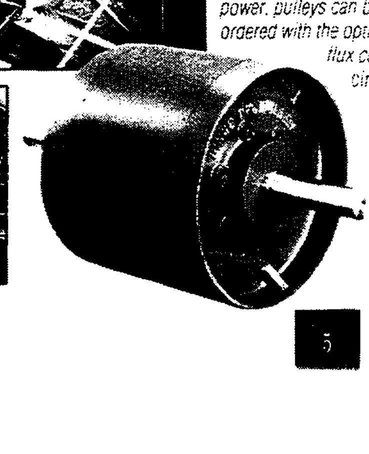
Perma Pulleys are used to protect processing machinery from damaging tramp metal, eliminate ferrous contaminants from product, concentrate magnetic minerals in mining ores, and remove steel from recyclables. They're ideal low-cost separators for light-duty applications at material recovery facilities (MRFs), refuse-derived fuel (RDF) plants, composting sites, and locations recycling plastic, aluminum, wood, or glass.

In many applications, it's possible to replace an existing head pulley with a Perma Pulley, on a size-for-size basis. A wide range of diameters, widths, and shaft sizes are available.

Design Innovations:
Exclusive flux control circuit (optional).



Perma Pulley used in slag operation at steel mill, 42" x 60"



For maximum separa... power, pulleys can be ordered with the optiona... flux co... circ...

Bulletin 1121B
Date 8/91

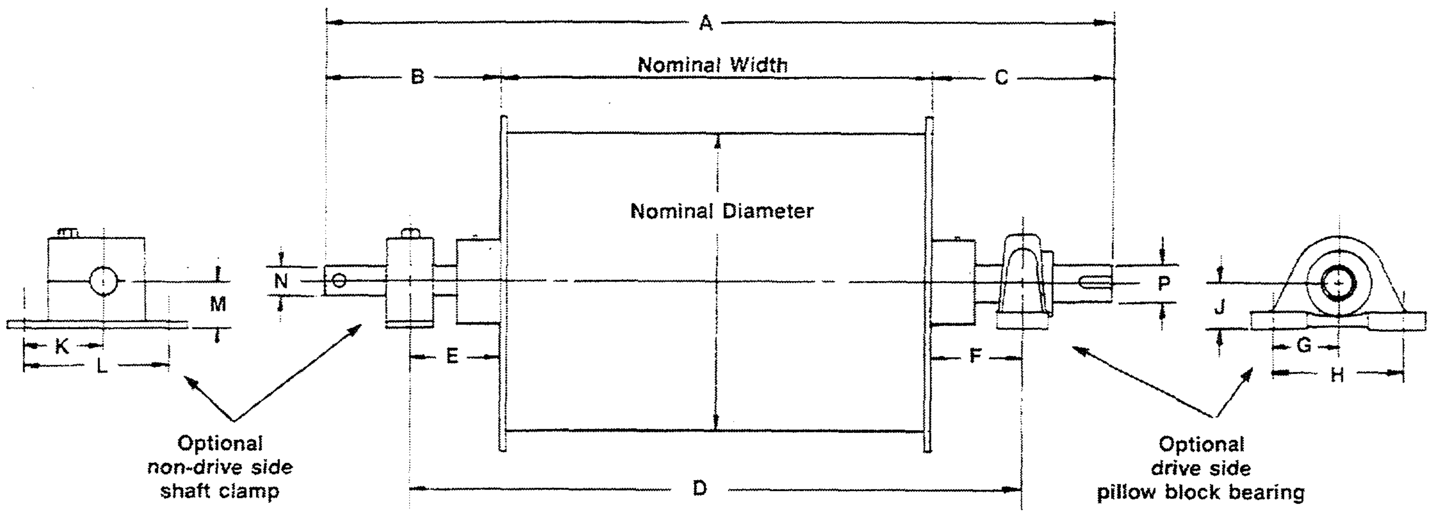
Dings magnetic group

PERMA DRUM DIMENSIONS

Ceramic and Rare Earth Perma Drum

$1,500 - $15,000

TYPE PC



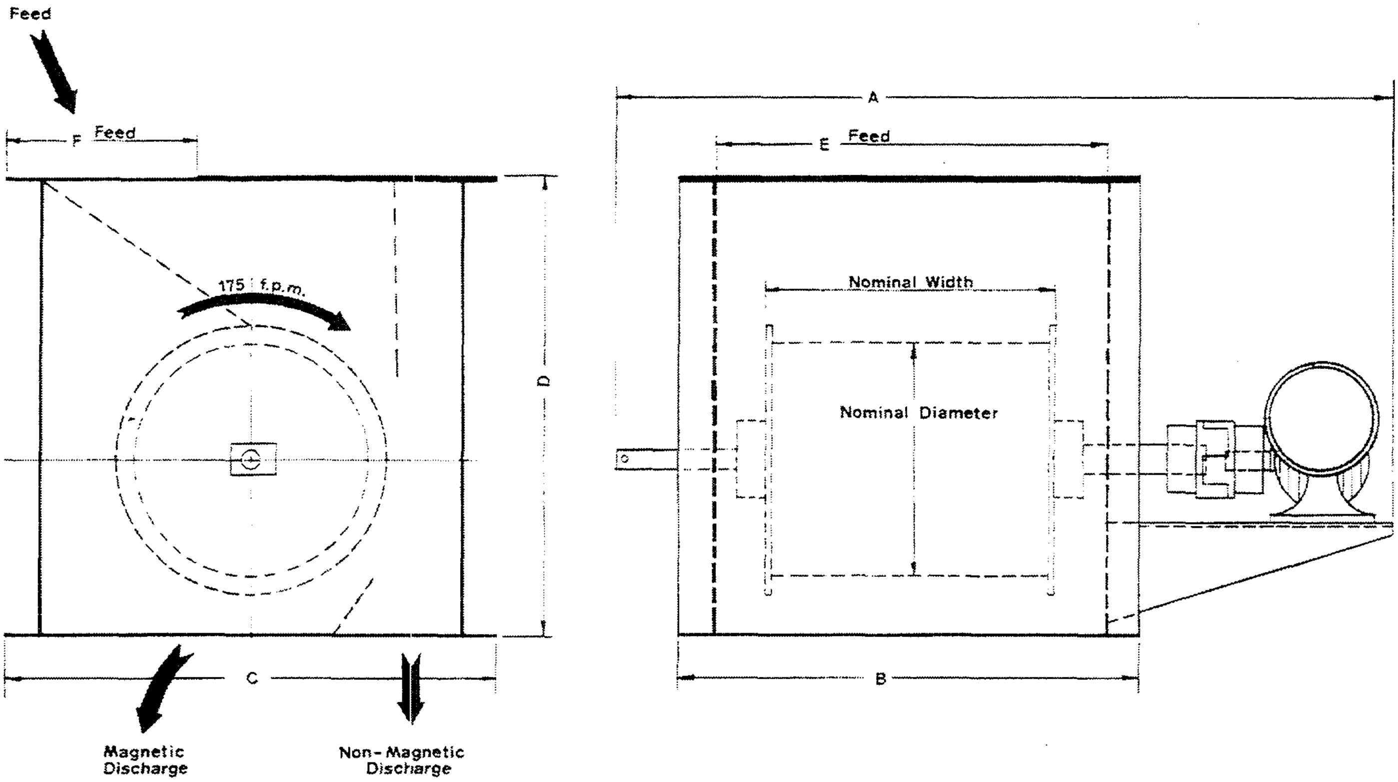
All dimensions are in inches. Dimensions should not be used for construction.

NOM. DIA.	NOM. WIDTH	A	B	C	D	E	F	G	H	J	K	L	M	N	P	WGT. LBS.
	8"	22-13/16			15-1/2											190
	12"	26-13/16			19-1/2											220
	15"	29-13/16			22-1/2											240
	18"	32-13/16			25-1/2											260
	21"	35-13/16			28-1/2											275
12"	24"	38-13/16	7-5/16	7-1/2	31-1/2	3-3/4	3-3/4	2-7/8	5-3/8	1-15/16	3-1/4	6	2	1-1/4	1-1/2	300
	27"	41-13/16			34-1/2											325
	30"	44-13/16			37-1/2											345
	36"	50-13/16			43-1/2											405
	42"	56-13/16			49-1/2											470
	48"	62-13/16			55-1/2											540
	12"	29-3/16			20-1/2											540
	15"	32-3/16			23-1/2											590
	18"	35-3/16			26-1/2											650
	21"	38-3/16			29-1/2											715
18"	24"	41-3/16	8-13/16	8-3/8	32-1/2	4-1/4	4-1/4	2-5/8	5-3/4	2-1/8	3-1/4	6	2	1-3/4	1-3/4	775
	30"	47-3/16			38-1/2											915
	36"	53-3/16			44-1/2											1,090
	42"	59-3/16			50-1/2											1,350
	48"	65-3/16			56-1/2											1,560
	18"	38-1/4			29											1,230
	21"	41-1/4			32											1,340
	24"	44-1/4			35											1,400
24"	30"	50-1/4	10-5/8	9-5/8	41	5-1/2	5-1/2	3-5/8	7-1/4	2-3/4	3-3/4	7-1/2	3-1/4	3	2-1/4	1,560
	36"	56-1/4			47											1,750
	42"	62-1/4			53											1,975
	48"	68-1/4			59											2,190

See Type FC dimensions on reverse side

Ceramic and Rare Earth Perma Drum

TYPE FC with housing and drive



All dimensions are in inches. Dimensions should not be used for construction.

NOM. DIA.	NOM. WIDTH	A	B	C	D	E	F	WGT. LBS.	DRIVE HP
	8"	32-3/4	17			13		395	
	12"	39-9/16	21			17		445	
	15"	42-11/16	24			20		475	
	18"	41-3/4	27			23		500	
	21"	45-3/4	30			26		525	
12"	24"	47-3/8	33	25-1/2	24	29	10	580	1/3 HP
	27"	50-3/8	36			32		620	
	30"	56-3/8	39			35		665	
	36"	62-3/4	45			41		765	
	42"	68-3/4	51			47		890	
	48"	74-3/4	57			53		1,050	
	12"	37-1/2	22-1/8			18-1/8		890	
	15"	40-1/2	25-1/8			21-1/8		970	
	18"	43-1/2	28-1/8			24-1/8		1,050	
	21"	45-3/4	31-1/8			27-1/8		1,150	3/4 HP
18"	24"	49-3/16	34-1/8	32	36	30-1/8	14-3/4	1,245	
	30"	60-1/4	40-1/4			36-1/4		1,455	
	36"	70-5/16	47-3/8			43-3/8		1,750	
	42"	75-3/8	52-3/8			48-3/8		2,050	
	48"	81-3/8	58-1/2			54-1/2		2,450	
	18"	57	32-1/2			28-1/2		1,600	
	21"	60	35-1/2			31-1/2		1,720	
	24"	63	38-1/2			34-1/2		1,840	1-1/2 HP
24"	30"	62	44-1/2	41-1/2	45	40-1/2	17	2,050	
	36"	68-1/2	50-1/2			46-1/2		2,280	
	42"	74-1/2	56-1/2			52-1/2		2,600	
	48"	80-1/2	62-1/2			58-1/2		2,890	

Dings magnetic group

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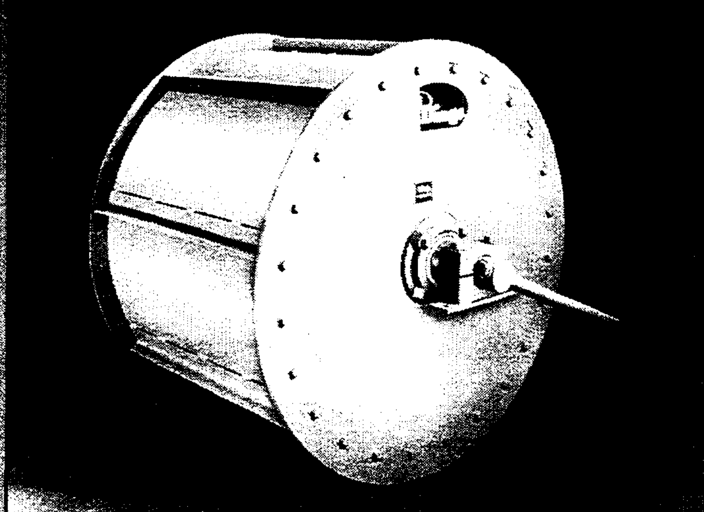
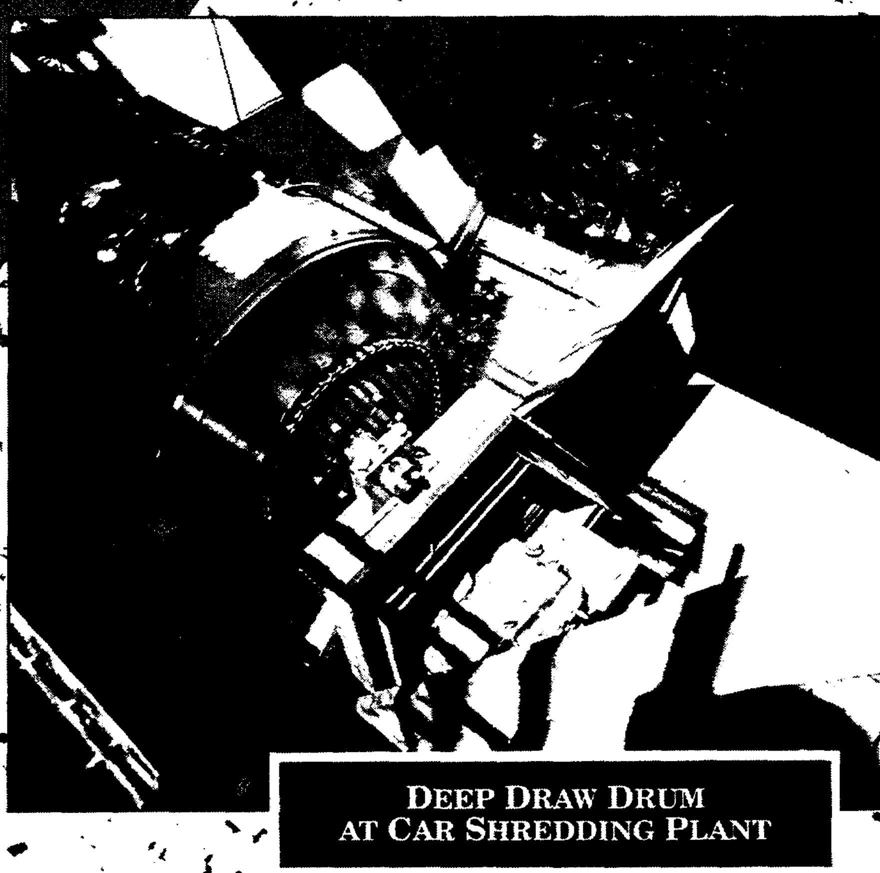
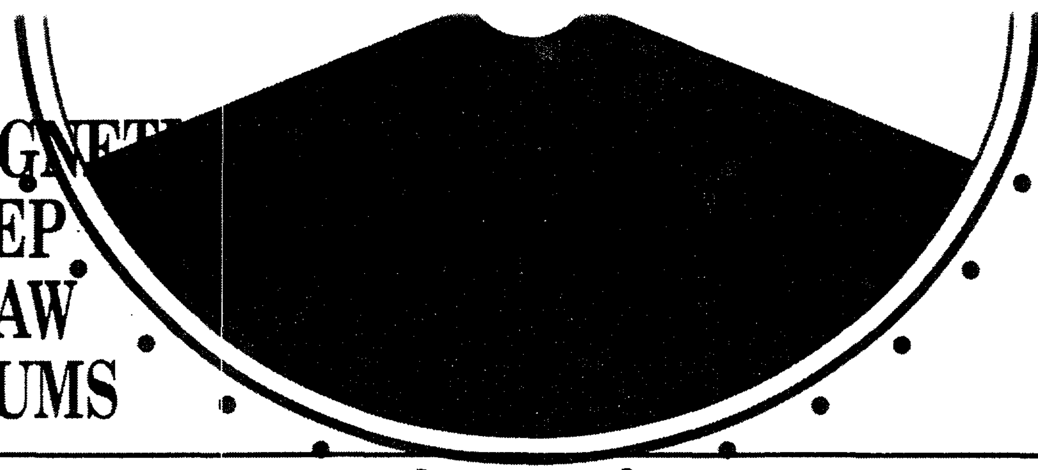




DEEP DRAW DRUM
AT CAR SHREDDING PLANT



MAGNETIC DEEP DRAW DRUMS

Designed for heavy-duty, high-volume ferrous recovery, the Deep Draw Drum is a permanent self-cleaning separator. Its rugged construction is ideal for separating ferrous metal from material such as shredded cars, slag, crushed ore, and ash at mass burn plants. Its tough, weatherproof design is built for operating outdoors or in any severe-duty, dirty, or dusty environment.

This large and powerful magnetic drum has a nonmagnetic outside shell that is driven around a fixed magnet. Ferrous metal is magnetically drawn out of the material feed, held against the revolving shell, and released when it reaches a discharge point beyond the magnetic field.

Although operation is similar, Deep Draw Drums have heavier duty construction than that required for Dings standard magnetic drums. The drum shell is protected by a thick manganese wear cover which can withstand continuous pounding by a steady flow of heavy objects. It greatly extends the life of the drum, and can be replaced in the field if a new wear surface is ever needed.

Permanent Magnet Outperforms Electro Models

The Deep Draw Drum's permanent magnet design outperforms electric-powered models in a number of important ways. It always operates at top efficiency, maintaining a constant gauss, or magnetic strength, throughout the day.

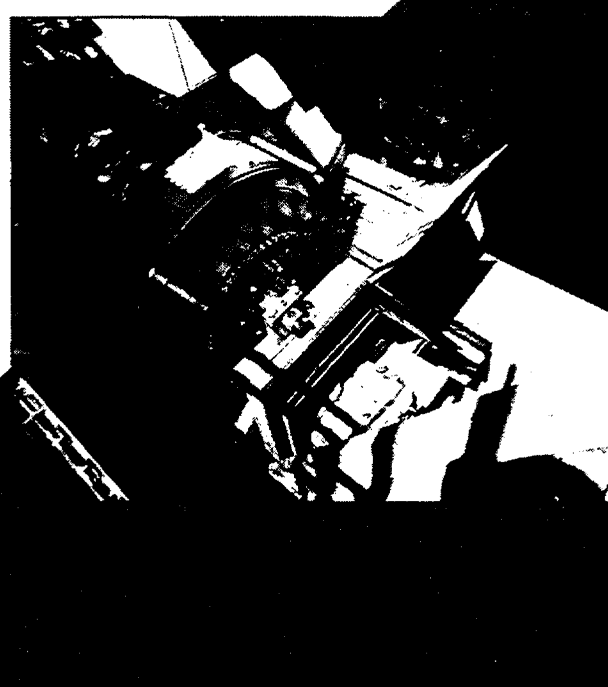
In contrast, an electro drum loses some magnetism and separating power as the coil heats up during operation. This reduction in magnetism from startup to the operating temperature reached several hours later can be as great as 30%. The result: a drop-off in metal recovery.

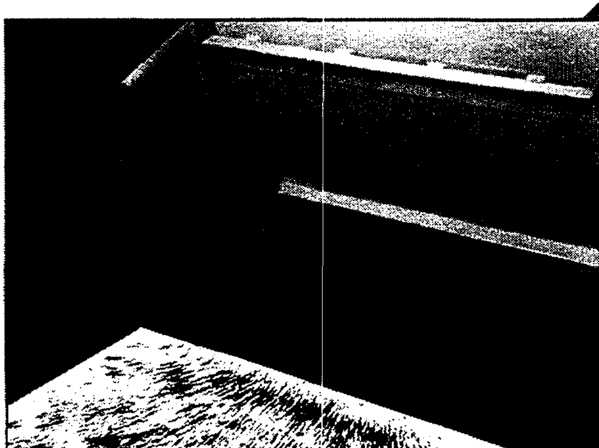
The Deep Draw Drum costs nothing to operate, and does not require a rectifier, generator, switch gear, or wiring. There are no magnet coils to burn out.

Dings offers a lifetime warranty on the magnet – magnetic strength is guaranteed within normal tolerances for the life of the installation.

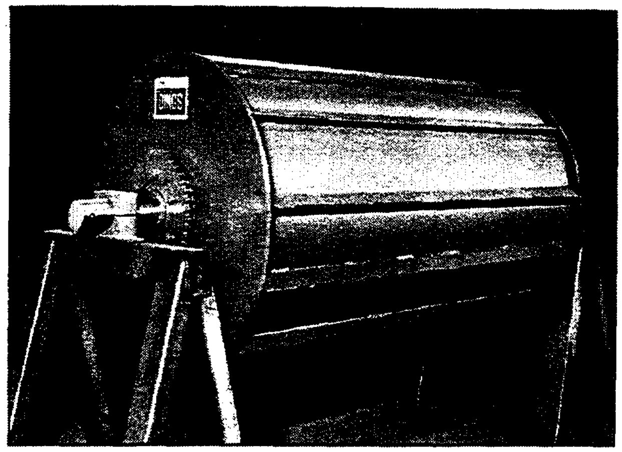
Only Dings Has Flux Control

The Dings patented flux control circuit offers another key advantage, providing a stable, even magnetic field across the entire width of the drum to recover the maximum amount of steel.





Two drums provide maximum separation
Deep Draw Drums in tandem recover steel at a car shredder. The material is fed to the 42" diameter drum from a conveyor underneath. Ferrous metal separated by that drum is then directed to the 36" diameter drum for a secondary cleaning, producing very clean, saleable steel.



This 42" x 96" drum was produced for a mass burn facility to recover ferrous material from bottom ash.

Applications

General

- Granular materials with deep burdens or high tonnage capacity
- Slag processing: reclaiming steel, or removing ferrous contaminants from slag
- Separating ferrous from deep burden of dense foundry sand
- Crushed ore
- Shredded metals
- Outdoor or severe-duty installations

Recycling or Reclaiming

- Separating recoverable ferrous from mass burn ash
- Automobile scrap
- Recycling heavy items, such as crushed engine blocks
- Removing tramp iron from compost and wood waste
- Dirty or severe-duty applications, such as recycling oil filters
- Removing high volumes of wire and steel from shredded tires

Three Magnetic Arc Designs

A choice of three magnetic arc designs offers a custom fit to your application:

Standard Design

- 150° arc radial pole design

Extended Arc

- 170° arc radial pole design

The extended arc ensures the widest possible field of recovery. It has a greater length of magnetic transfer than the standard design for applications that require a longer magnetic field.

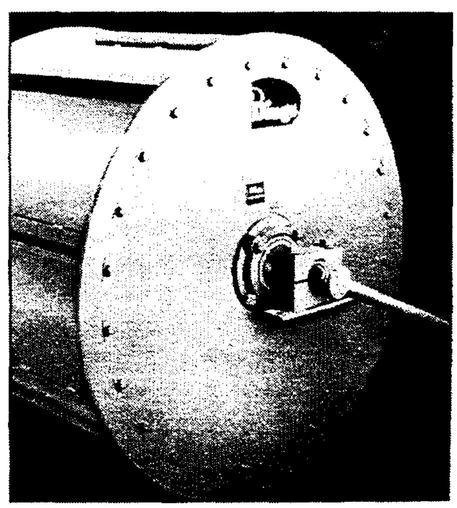
The 170° arc is often specified for mass burn and other applications where the ferrous is carried up and over the top of the drum. This method of separation ensures little or no entrapment of burned material.

Fines Design

- 180° arc lateral pole design

North and south poles alternate around the arc, producing an agitating action that releases entrapped nonmagnetic material.

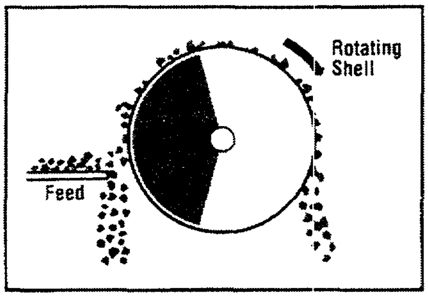
Some applications, such as slag fines, use a top feed arrangement because maximum separating strength is required. Although this feed position can entrap some nonmagnetic material, the agitating pole design minimizes this and produces a clean ferrous product. It's also used for material with high ferrous content, such as tire recycling.



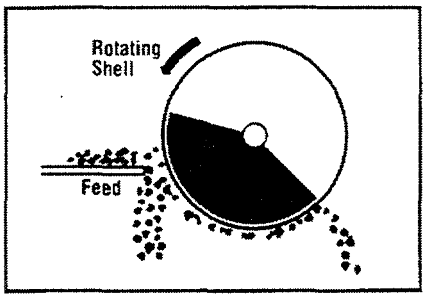
The magnet adjusting arm is used to position the magnetic arc after installation to match the feeder location. In addition, the arm can also be used to rotate the magnetic field to another position if work needs to be done near the magnet.

Feed Arrangements

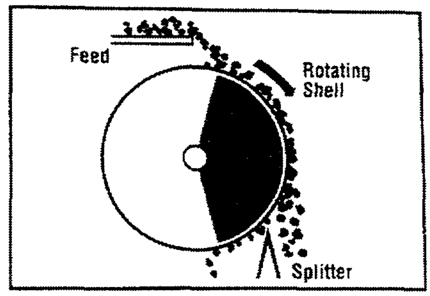
The Deep Draw Drum can be fed in any position since the internal magnet assembly is adjustable. The drum is easy to install on general contractor I beams. After mounting, the magnet arc is adjusted to match the feed location. Feed position can affect the purity of the recovered steel. In the top feed position, for instance, ferrous attracted to the drum can entrap nonmetallic material against the drum shell, with both being deposited on the ferrous side of the splitter.



UP-AND-OVER FEED
Ferrous is lifted out of the burden and carried up and over the magnet while the nonferrous material drops off the feeder. Commonly used for mass burn ash handling, auto shredding, and other applications with high ferrous content, this feed arrangement minimizes the amount of entrapped nonferrous material and produces a clean ferrous product.



DOWN-AND-UNDER FEED
This arrangement has the shortest and most direct transfer area for the ferrous, and is often recommended for material with large and heavy pieces of ferrous.



TOP FEED
Commonly used for slag processing, this arrangement is not as effective as the two other feed positions for obtaining maximum ferrous purity. Often used with ferrous material that is weakly magnetic, or with feed that contains nonferrous pieces too large to pass through a reasonable gap setting.

Size Selection

Peak performance depends on a number of factors, including the position of the magnet arc, particle or lump size of the material, the rate of feed and how constant the rate is kept, the distance or gap between the feeder and drum surface, and whether the feeder trough is made of nonmagnetic material.

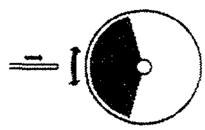
The magnetic strength of the drum is determined by the diameter; the larger the drum diameter and width, the greater the volume of material which can be handled.

The selection chart shows recommended drum diameters based on the gap distance, magnet arc, and feed position. The type and size of the material are also considered in determining the capacity and drum diameter.

Feeder and drum positions may vary from the recommended locations shown due to physical restrictions at the job site. The magnet arc should then be adjusted accordingly, to produce the best separation possible.

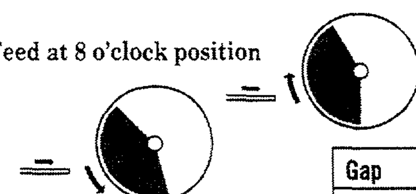
STANDARD AND EXTENDED ARC DRUMS

Feed at 9 o'clock position



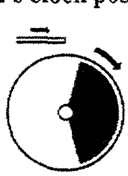
Gap	6"	8"	10"	12"	14"	16"
Drum Dia.	24"	30"	36"	42"	48"	60"

Feed at 8 o'clock position



Gap	4-5"	6-7"	8-9"	10-11"	12-13"	14-15"
Drum Dia.	24"	30"	36"	42"	48"	60"

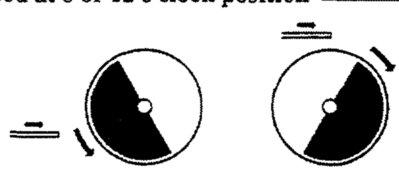
Feed at 12 o'clock position



Burden Depth	4"	5"	6"	8"	10"	12"
Drum Dia.	24"	30"	36"	42"	48"	60"

FINES DRUM

Feed at 8 or 12 o'clock position



Gap or Burden	2"	4"	6"
Drum Dia.	24"	30"	36"

Models Available

Deep Draw Drums can be specified in sizes to fit almost any application. Dings has manufactured drums up to 6 feet in diameter, weighing over 10 tons, to handle the largest jobs.

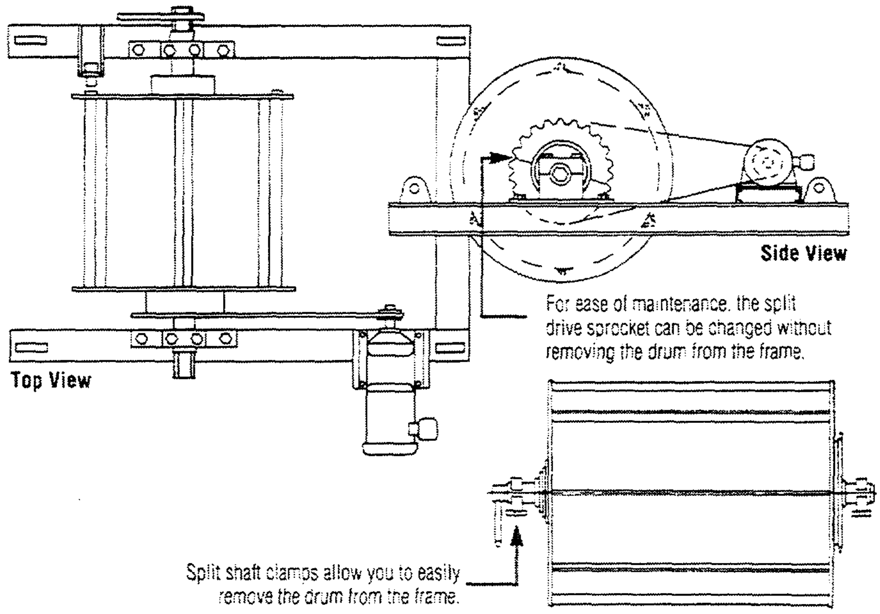
Drum Only

- Includes two shaft clamps and a magnet arc adjusting arm
- Standard diameter: 24" through 60"
- Width: 24" through 84". Drum width can be same as feed width due to Dings exclusive flux control design.

Drum with Standard Frame and Drive

- Furnished with drive components
- Horizontal structural steel support frame

Drum and Horizontal Support Frame



Patented Circuit Provides Stronger, More Uniform Magnetic Field

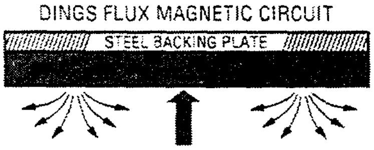
Flux Control Increases Efficiency

The Dings flux control circuit (DFC) was a breakthrough in the design of permanent magnetic separators. A magnetic circuit patented by Dings, it eliminates internal leakage between magnetic poles and improves separating performance.

Blocking magnets are strategically positioned in spaces between magnetic poles, where there would normally be air or filler material. These blocks control the flux by redirecting the leakage, which is wasted magnetism in conventional circuits. Nearly 100% of generated flux is converted to working force with the DFC circuit.

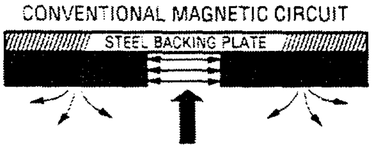
Patent #3,365,599

DINGS FLUX MAGNETIC CIRCUIT



Flux control magnet converts internal leakage between poles into working magnetism.

CONVENTIONAL MAGNETIC CIRCUIT

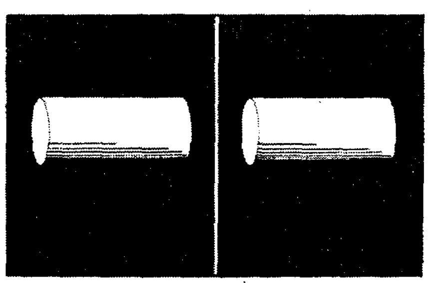


Wasted magnetism

Uniform Field Improves Performance

In addition to increasing the magnetic strength of Dings drums, this exclusive circuit design produces a very uniform magnetic field. There are no dead spots or dips across the entire width of the drum.

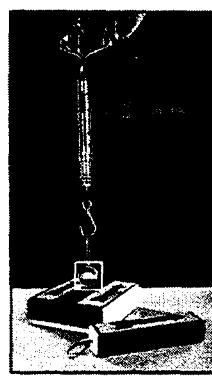
In contrast, electro drums and permanent drums without flux control have a nonuniform field. There are peaks and valleys in the magnetism, with the greatest concentration near the center. An uneven field can cause entrapment of nonmagnetic material in the center and also loss of ferrous metals in the low strength areas. If the drum is being used to produce clean, saleable ferrous, entrapped material can mean a loss of revenue.



Flux control produces a far more efficient magnetic field pattern.

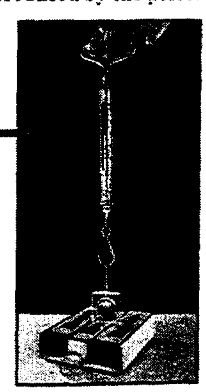
100% Increase in Pull with the DFC Circuit

This is the maximum pull just before breakaway on a 1" diameter steel ball.



Magnet assembly with no blocking magnet. The reading on the pull scale is 1/2 lb

The same pull test is done with the same magnet assembly. This time, a specially oriented magnet block is placed between the poles. The block redirects what had been flux leakage in the gap into working magnetism produced by the poles.



Magnet assembly with blocking magnet (DFC circuit). The reading on the pull scale is 1 lb.

Dings Design Produces Substantial Cost Savings

Minimal Operating Costs and Maintenance

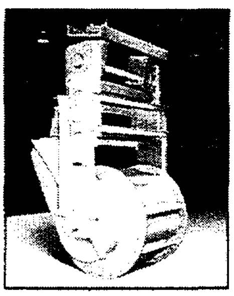
Since the magnet in the Deep Draw Drum™ is nonelectric, it costs nothing to operate. The permanent design also eliminates expensive downtime, since there are no electro coils to burn out and no rectifier, generator, or switch gear which may require service. Moisture inside an electro drum can cause electrical problems; a Deep Draw Drum is so resistant to moisture that it can operate in a wet environment, and can even be hosed down.

No cooling oil is required, which means there's no need to monitor the level, add oil, or check for leaks. The only maintenance needed on the Deep Draw Drum is periodic lubrication of the bearings.

The wear cover on an electro magnet is subject to uneven use and may need to be replaced more often. Since the magnetic field is nonuniform, contacts against the wear cover are concentrated in narrow bands that correspond to the poles of magnetism. These bands become areas of accelerated wear on the electro drums, causing more frequent replacement.

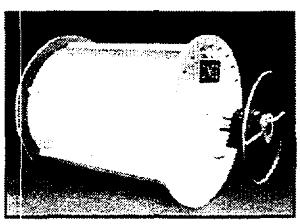
Narrower, Less Expensive Width Can Be Used

The uniform field on a Dings drum allows it to be sized more efficiently for significant cost savings. A Dings magnetic drum with flux control can have a narrower face, identical to the width of the feeder. An electro drum or permanent drum without flux control must be considerably wider than the feeder because of low magnetic strength near each end. Consequently, a larger investment is required for such a drum compared to the narrower flux control drum.



Drum with vertical support frame
The Swing-Away model with pendulum-style frame protects against possible damage caused by jamming of large objects. If an oversized piece is conveyed to the separator, the drum would simply swing away, allowing the piece to be either conveyed with the ferrous or split to the nonferrous material. The compact frame also makes it easier to install or retrofit where space is critical.

Drum with handwheel
A handwheel on the drive side shaft allows the internal magnet to be manually rotated by one person. The large magnet is counterbalanced for ease of rotation. This optional design makes servicing easier, and moves the magnetic field to a different position if work is required around the drum.



Providing Separation Solutions Since 1899

Dings Co. manufactures a full line of magnetic separators, ranging from 6" grates to 17-ton systems. Products also include magnetic sweepers and magnets for material handling.

To help you with your application, Dings Co. has sales engineers located at our manufacturing facility as well as local representatives throughout the U.S. and Canada. They can select and size a Dings magnet to your exact requirements.

Specifications

Magnetic drum assembly
- Nonelectric design
- Shell speed: 200-250 FPM
- Standard diameters: 24"-60" (other diameters available)
- Widths: 24"-84"

Magnet:
- Ceramic VIII magnetic material, highest grade of ceramic available. Completely encapsulated inside stainless steel.
- Choice of magnet arc designs: standard – 150° radial pole; optional – 170° extended arc radial pole or fines design with 180° lateral agitating pole.
- Patented flux control magnetic circuit with magnetic field pattern as shown on p. 5.
- Lifetime warranty: magnetic strength is guaranteed within normal tolerances for the life of the installation.

Drum shell:
- Nonmagnetic 304 stainless steel revolving shell.
- Replaceable manganese steel wear cover with manganese or stainless steel cleats. *(Option: additional or custom designed cleats.)*
- Mild steel heads. *(Option: stainless steel heads.)*
- Split drive sprocket mounted on head.
- Heavy duty ball bearings in heads are self-aligning and sealed.
- Two supporting split shaft clamps.
- Magnet adjusting arm. Magnet can be rotated counterclockwise or clockwise to adjust magnetic arc position. *(Option: Handwheel allows easier rotation of magnet by one person. Includes counterbalanced magnet design.)*
- Weatherproof, dust-tight construction.
- Option: special paint.

Drum with frame and drive
Includes magnetic drum assembly, standard frame, and drive components, all sized to the application.

Frame:
- Horizontal structural steel support frame.
- Four support lugs are furnished on the frame for a suspended installation.
- Options: motion sensor; winch mounted on frame to adjust magnetic arc; Swing-Away model with vertical pendulum-style frame; other custom frame designs.

Drive components:
- TEFC gearmotor that operates at 230/460V 3 ph. 60 Hz, 40° C ambient, with Class B insulation. Includes drive sprocket.
- Motor speed, drum sprocket, and motor sprocket are matched to produce the correct rotational speed for the drum diameter.
- Fabricated sheet metal guards.
- Rollerchain.
- Option: sheave- and belt-driven drums (rather than sprocket and chain).

Dings Co magnetic group

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(414) 672-7830 FAX (414) 672-5354

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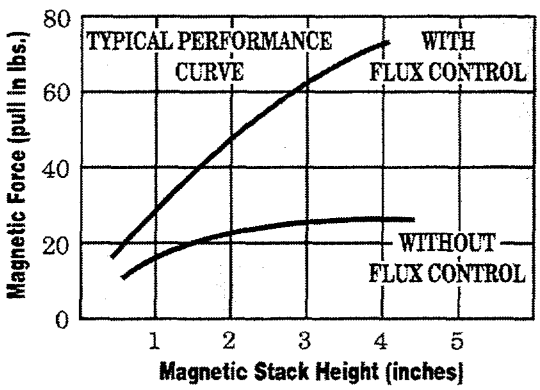
ONLY DINGS HAS FLUX CONTROL – *A PATENTED CIRCUIT THAT PROVIDES A STRONGER, MORE UNIFORM MAGNETIC FIELD.*

FLUX CONTROL INCREASES EFFICIENCY

The Dings flux control circuit (DFC) was a breakthrough in the design of permanent magnetic separators. A magnetic circuit patented by Dings, it eliminates internal leakage between magnetic poles and improves separating performance.

Blocking magnets are strategically positioned in spaces between magnetic poles, where there would normally be air or filler material. These blocks control the flux by redirecting the leakage, which is wasted magnetism in conventional circuits. Nearly 100% of generated flux is converted to working force with the DFC circuit.



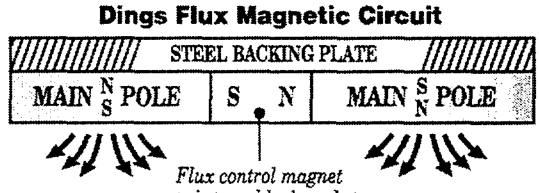
Magnetic force increases with Dings flux control circuit.

DINGS PRODUCTS WITH FLUX CONTROL

Deep Draw Drums, magnetic drums (ceramic magnet models), wet drums, permanent overhead magnets, and DFC magnetic pulleys.

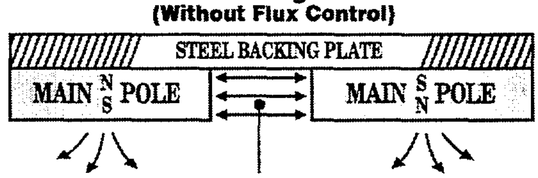
Patent #3,365,599

Dings Flux Magnetic Circuit



Flux control magnet converts internal leakage between poles into working magnetism.

Conventional Magnetic Circuit (Without Flux Control)

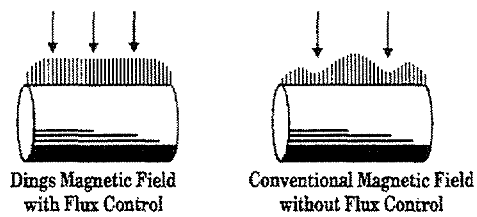


Wasted magnetism

UNIFORM FIELD IMPROVES PERFORMANCE

In addition to increasing the magnetic strength of Dings separators, this exclusive circuit design produces a very uniform magnetic field. There are no dead spots or dips across the entire width of the separator.

In contrast, magnets without flux control have a nonuniform field. There are peaks and valleys in the magnetism, with the greatest concentration near the center. An uneven field can cause entrapment of nonmagnetic material in the center and also loss of ferrous metals in the low strength areas. If the separator is being used to produce clean, saleable ferrous, entrapped material can mean a loss of revenue.

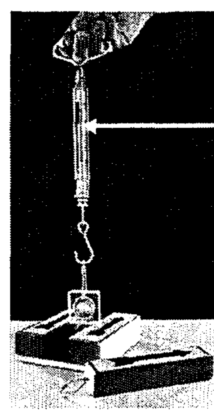


Flux control produces a far more efficient magnetic field pattern.

The uniform field also allows Dings magnetic drums to be sized more efficiently for significant cost savings. For instance, a Dings drum with DFC can have a narrower face, similar to the width of the feeder. A drum without flux control must be considerably wider than the feeder because of low magnetic strength near each end of the drum.

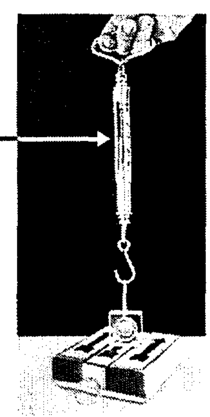
100% INCREASE IN PULL WITH THE DFC CIRCUIT

This is the maximum pull just before breakaway on a 1" diameter steel ball.



Magnet assembly with no blocking magnet. The reading on the pull scale is 1/2 lb.

Magnet assembly with blocking magnet (DFC circuit). The reading on the pull scale is 1 lb.



The same pull test is done with the same magnet assembly. This time, a flux control magnet is placed between the poles. It redirects what had been flux leakage in the gap into working magnetism produced by the poles.

4740 W. Electric Avenue, Milwaukee, WI 53219 • (414) 672-7830 • FAX (414) 672-5354

ALLEGHENY

ALLEGHENY PAPER SHREDDERS

Built to Be the Best

Model TR-36 Automobile Tire Shredder

→ $85,000

Specifications

Capacity	400-500 automobile tires per hour (actual capacity depends on available power supply and operator performance).
Hopper opening	36" x 24"
Feed opening	36" x 12"; with two 9" diameter all-steel crusher paddles.
Cutting assembly	36" wide
Cutters	Individual, solid steel; sawtooth; 11" diameter; machined from D-2 tool steel; heat-treated to optimum Rockwell hardness.
Shred width	2"
Motor	20 Hp., manufactured by Lincoln; TEFC
Voltage	460 Volt AC, three-phase, 60 cycle
Electrical components	Cutler-Hammer reversing starter and controls; low voltage key-locked control panels with two-position stop buttons for additional safety. Current-sensing relay stops the machine in the event of a jam. Reversing starter allows operator to clear jam in seconds.
Gear reducer	Base-mounted gear reducer for highest reliability; helical gearing - completely sealed and running in oil.
Running torque	126,000 inch pounds
Operating speed	29 feet per minute
Bearings	Cutter shafts turn on heavy-duty double spherical roller bearings. (Load rating of roller bearings: 110,000 pounds per bearing each). Flange-mounted bearings on all other shafts.
Covers and frame assembly	Extra heavy-duty, all-steel construction
Dimensions	54" L x 107" W x 125" H
Weight	10,000 lbs.
Warranty	1-year warranty (2080 hours) on parts and labor (except for cutters and cutter replacement costs).
Manufactured	United States of America

As we constantly improve our products, specifications are subject to change without notice

Over 25 Years of Customer Satisfaction 1-95

Allegheny Paper Shredders Corporation
P.O. Box 80, Old William Penn Highway East, Delmont, PA 15626-0080 • (800) 245-2497 • (412) 468-4300 • FAX: (412) 468-5919

ALLEGHENY PAPER SHREDDERS

Built to Be the Best

Model TR-50 Truck/Automobile Tire Shredder

→ $168,000

Specifications

Capacity	300-400 truck tires per hour / 700-800 automobile tires per hour (actual capacity depends on available power supply and operator performance).
Hopper opening	50" x 24"
Feed opening	50" x 16"; with a 36" diameter all-steel crusher paddle driven by a 3 Hp. Lincoln TEFC motor and base-mounted gear reduction.
Cutting assembly	50" wide
Cutters	Individual, solid steel; sawtooth; 20" diameter; machined from D-2 tool steel; heat-treated to optimum Rockwell hardness.
Shred width	2 1/8"
Motor	75 Hp., manufactured by Lincoln; TEFC
Voltage	460 Volt AC, three-phase, 60 cycle
Electrical components	Cutler-Hammer reversing starter and controls; low voltage key-locked control panels with two-position stop buttons for additional safety. Current-sensing relay stops the machine in the event of a jam. Reversing starter allows operator to clear jam in seconds.
Gear reducer	Base-mounted gear reducer for highest reliability; helical gearing - completely sealed and running in oil.
Running torque	675,000 inch pounds
Operating speed	37 feet per minute
Bearings	Cutter shafts turn on heavy-duty double spherical roller bearings. (Load rating of roller bearings: 558,000 pounds per bearing each). Flange-mounted bearings on all other shafts.
Covers and frame assembly	Extra heavy-duty, all-steel construction
Dimensions	102" L x 151" W x 150" H
Weight	50,000 lbs.
Warranty	1-year warranty (2080 hours) on parts and labor (except for cutters and cutter replacement costs).
Manufactured	United States of America

As we constantly improve our products, specifications are subject to change without notice

Over 25 Years of Customer Satisfaction

1-95

Allegheny Paper Shredders Corporation
P.O. Box 80, Old William Penn Highway East, Delmont, PA 15626-0080 • (800) 245-2497 • (412) 468-4300 • FAX: (412) 468-5919

PRINTED ON RECYCLED PAPER

Tire Turf®

Continental Turf Systems, Inc.
P.O. Box 389, Continental, OH 45831
(419) 596-4242 • FAX (419) 596-4409

October 23, 1996

ICF Kaiser Company
Attn: Carmen
9300 Lee Highway
Fairfax, VA 22031-1207

Dear Carmen:

Thank you for your telephone call and your interest in our whole tire granulating system and tire de-beaders.

Per our conversation, please find enclosed a brochure and specification sheets on the de-beaders and a specification sheet on the granulating system.

If we can be of any further assistance or answer any questions you might have, please do not hesitate to contact us.

Cordially,
CTS, INC.

Polly Hilty

Polly Hilty
PRH/p

enc:

CONTINENTAL TURF SYSTEMS, INC.
21801 ROAD E-16
P. O. BOX 389
CONTINENTAL, OH 45831
800-727-2029 NATIONWIDE WATTS
419-596-4242 LOCAL PHONE
419-596-4409 FAX

TRUCK TIRE DE-BEADER
Model 502-T

Size--------------------------------36" Wide x 62" Long x 32" High

Weight------------------------------1,850 Lbs.

Tires Accepted----------------------All truck tires up to and including 11.00 R 24.5 Bias & Steel Belted

Production Rate---------------------Up to 75/hour

Power Required----------------------15 HP, 3 Phase Electric Motor

Air Supply--------------------------3 cu. ft./min. @ 120 PSI

Knives Required---------------------Two (2) per machine

PRICING:

502-T Truck Tire De-Beader---------------------------$18,000.00

502340 Replacement Knives---------2 req'd------------$ 25.00/ea

FOB: Continental, Ohio

TERMS: 30% deposit with signed Purchase Agreement
Balance by certified funds prior to shipment
Taxes not included

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

03-31-92

CONTINENTAL TURF SYSTEMS, INC.
21801 ROAD E-16
P. O. BOX 389
CONTINENTAL, OH 45831
800-727-2029 NATIONWIDE WATTS
419-596-4242 LOCAL PHONE
419-596-4409 FAX

PASSENGER TIRE DE-BEADER
Model 501-P

Size--------------------------------36" Wide x 58" Long x 40" High

Weight------------------------------1,600 Lbs.

Tire Accepted-----------------------All automotive & light commercial

Production Rate---------------------250-300/hour

Power Required----------------------7 1/2 HP, 3 Phase Electric Motor

Air Supply--------------------------3 cu. ft./min. @ 100 PSI

Knife Cost--------------------------$2.50/1000 tires

PRICING:

501-P Passenger Tire De-Beader-----------------------$15,000.00

502343 Replaceable Knives----------2 req'd-----------$ 1.25/ea

FOB: Continental, OH

TERMS: 30% deposit with signed Purchase Agreement
Balance by certified funds prior to shipment
Taxes not included

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

03-31-92

CONTINENTAL TURF SYSTEMS, INC.
P. O. BOX 389
CONTINENTAL, OH 45831

(419) 596-4242 PHONE
(419) 596-4409 FAX

MODEL CTS-100
WHOLE TIRE GRANULATING SYSTEM

* Cost		$450,000.00
* Delivery time		14-16 weeks
* Set-up time	(at destination)	3 days
* Training time	(at origin)	3 days
* Terms		30% deposit with signed contract, balance in guaranteed funds to be released as follows: 30% sixty (60) days after start of project, 40% on completion & approval at our facility.
* Minimum power requirements		400 AMP service, 460 Volt, 3 Phase
* Pounds per hour mat'l		2400 lbs/hr at 1/4 & 3/8 nominal granulated particle
* Tires per hour		140/hr
* Requirements of client		all electrical service all air service all freight rigging service
* Man hour cost for set-up		Three (3) days (no charge) $60.00 a day after that per man
* Floor space required		2,000 sq. ft.

* Component List: One (1) Tire granulating system complete containing and utilizing but not limited to the following components

ITEM

ITEC Passenger Car Tire De-Beader
Tire Lift Conveyor
Tire Shredding Unit
Granulating Unit with Air Separation System
Magnetic Separator
Screw Classifying Conveyor with Dust Removal
System Complete
Air Conveying Fans for Product

* Warranty — Six (6) months on Quality and Workmanship

PRICES SUBJECT TO CHANGE

11-1-92

Recycling Concepts Int'l Group, Inc.

Wednesday, October 23, 1996

Carmen Guerrero
ICF Kaiser
9300 Lee Highway
Fairfax, VA 22031-1207

Dear Carmen:

Thank you for your interest in Recycling Concepts Int'l Group, Inc.

There has not been an economical and profitable way to produce crumb rubber, free of steel and fiber, **until now!**

The RCI 2001 relies on new technology to reduce tire chips to a valuable commodity. Our system processes **1" and 2"** tire **chips** (**1x1 1-1/2x1-1/2, 2x2**) through an ambient process, without the use of blades or rasps to crumb rubber. The mesh sizes vary from 3mm to -100 mesh. Compare the RCI 2001 to current methods of tire chip reduction.

The RCI 2001 is more efficient, less expensive, and lower maintenance costs. Our system includes the control panel, pulverizer, air reduction center, fluff separator, magnet for steel removal, and a four screen crumb classifier. The RCI 2001 has a 300 hp motor which requires 460 volts, 600 amp service to start, and energy use at 245 kw.

In addition to the RCI 2001 system, you will need a chipping machine that will reduce whole tires to a **1x1"** chip and a maximum **2x2"** chip.

The RCI 2001 system, without a chipper requires an operating area of 20' wide, 65' long and 16' high.

Please do not hesitate to call for further information on the RCI 2001.

Sincerely,

RECYCLING CONCEPTS INT'L GROUP, INC.

Judy Torre

Judy Torre

99 Sherwood Ave., E. Farmingdale, NY 11735 516-454-0505 1-800-257-3292 Fax: 516-454-1573

Recycling Concepts Int'l Group, Inc.

PROPOSAL

For

ICF Kaiser

The RCI 2001 system includes:

RCI pulverizer
one ton hopper
automatic auger screw feeder
control panel with soft starts
air reduction center
fluff separator
magnetic separator
one (1) scrap steel conveyor
one (1) step up crumb bucket conveyor
selector screen classifier, four (4) separate grades
two (2) dual track crumb bucket conveyors
one (1) year warranty

Price:	$700,000.00* (US dollars through a Federal Reserve Bank) FOB Ronkonkoma, New York.
Additional:	Any applicable custom & duty, delivery and installation charges. The securing of any necessary certifications to enter your country, Installation charges include airfare & hotel for 3 men to stay 5 days. <u>Wiring into control panel & hookup are customers responsibility</u>.
Delivery time:	16 weeks upon down payment and signed order.
Payment Terms:	40% down payment with signed order. 40% due within 30 days of order date. 20% to be secured prior to delivery.

* The above price quote will be held for sixty (60) days.

In addition, you would also need a fork lift and crane for the installation, a chipping machine that will reduce whole tires to **1" x 1", 1-1/2" x 1-1/2", 2 x 2" chips**. The RCI 2001 will take tire chips no larger than specified above.. For chipping tires we recommend Columbus McKinnon (FL), SSI (OR), or Tryco (IL).

10/23/96

99 Sherwood Ave., E. Farmingdale, NY 11735 516-454-0505 1-800-257-3292 Fax: 516-454-1573

Recycling Concepts Int'l
Group, Inc.

Presents The

RCI 2001 Pulverizer

And

Separation System

RCI 2001 -TIRE CHIP TO CRUMB RUBBER IN A SINGLE PROCESS

Recycling Concepts Int'l announces production of its newly retrofitted RCI 2001 tire reduction system.

At the heart of the system is the RCI 2001 Pulverizer, designed to separate steel and fiber while producing crumb rubber in a single revolutionary process.

Applying the principle of centrifugal force, a chemical free ambient reaction is created causing the separation of the tire chip components while at the same time producing fine grade crumb rubber without the use of blades or grinders.

All types of tires and scrap rubber can be processed at the rate of one ton per hour.

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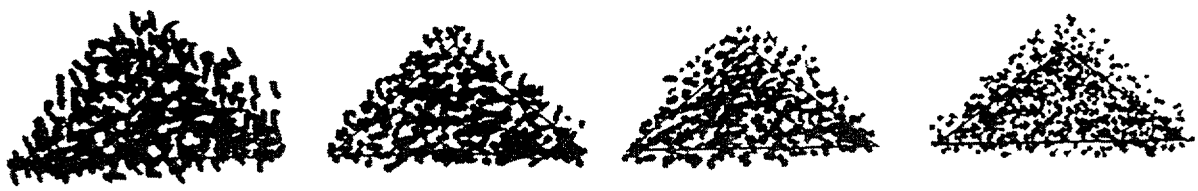
Crumb Rubber is produced in fine grades ranging from 3/8 inch to 100 mesh. Steel is separated into fragments polished clean of all rubber residue and packaged for sale as scrap steel.

Maintenance is simple, requiring only spare part replacement quarterly - each taking less than three hours to complete. Electricity is consumed at the rate of 245 kw per hour.

The RCI 2001 can be purchased as an integrated system, or as a pulverizer to complement existing systems.

Currently there are systems in operation throughout the United States.



3 mm 20 mesh 30 mesh 100 mesh

Ten Mesh Sizes - - 3mm To 100 Mesh

The RCI 2001 Tire reduction system produces ten Crumb rubber grades from 3 mm to 100 mesh. These ten are considered standard sizes and satisfy most industrial uses and requirements. In addition, the system is capable of producing up to 200 mesh should customized sizes be required. The RCI 2001 produces crumb to the highest standard of purity available anywhere -- virtually free of fiber, metal, etc. It separates the Crumb from metal and fiber. You wind up with three separate by-products .

Crumb Brokerage Service

Recycling Commodities, Inc., is a division of Recycling Concepts Int'l Group, Inc. It is a wide scale brokerage service that buys and sells Crumb rubber in quantities. In addition, we often purchase the end Crumb product from our customers who have purchased our reduction system. Thus, we are a reliable steady source who prides itself on service, attention to detail, concerned with discriminating customer requirements.

THE RCI 2001 TIRE REDUCTION SYSTEM

CONSISTS OF THE FOLLOWING
COMPONENTS

ONE (1)	CONTROL CENTER WITH SOFT STARTS
ONE (1)	ONE TON HOPPER
ONE (1)	AUGER SCREW FEEDER
ONE (1)	RCI PULVERIZER
ONE (1)	DUST COLLECTOR (AIR REDUCTION CENTER)
ONE (1)	FLUFF SEPARATOR
ONE (1)	MAGNETIC SEPARATOR
ONE (1)	SCRAP STEEL CONVEYOR
ONE (1)	STEP UP BUCKET CONVEYOR
ONE (1)	SELECTOR SCREEN CLASSIFIER
ONE SET	DUAL TRACK CRUMB CONVEYORS

Manufacture

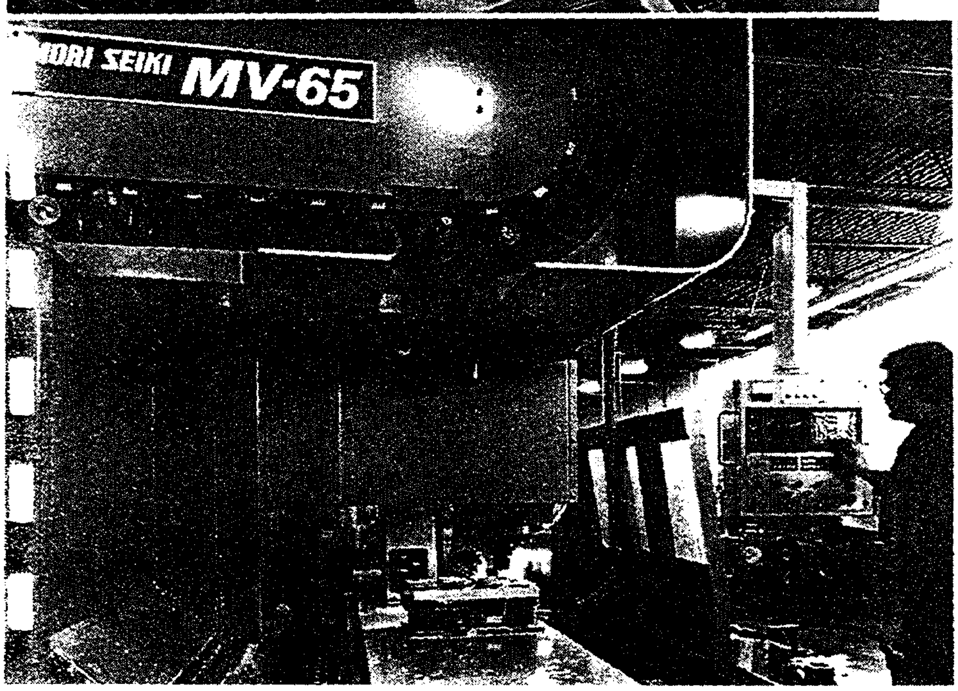
Our manufacturer's expert staff and computerized climate controlled provide everything necessary to as reliable delivery and a perfect pro regardless of quantity, size or complexi

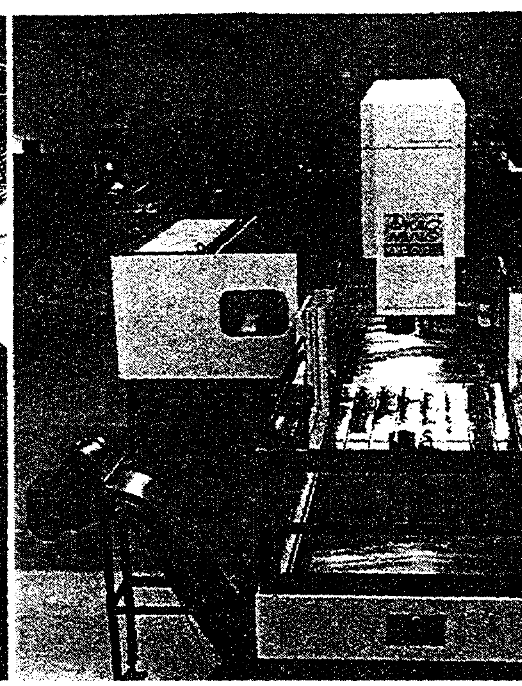
Their on premises capabilities complete,from a precision compute prototype area, including an Omega- borer, to fully outfitted welding and shops.

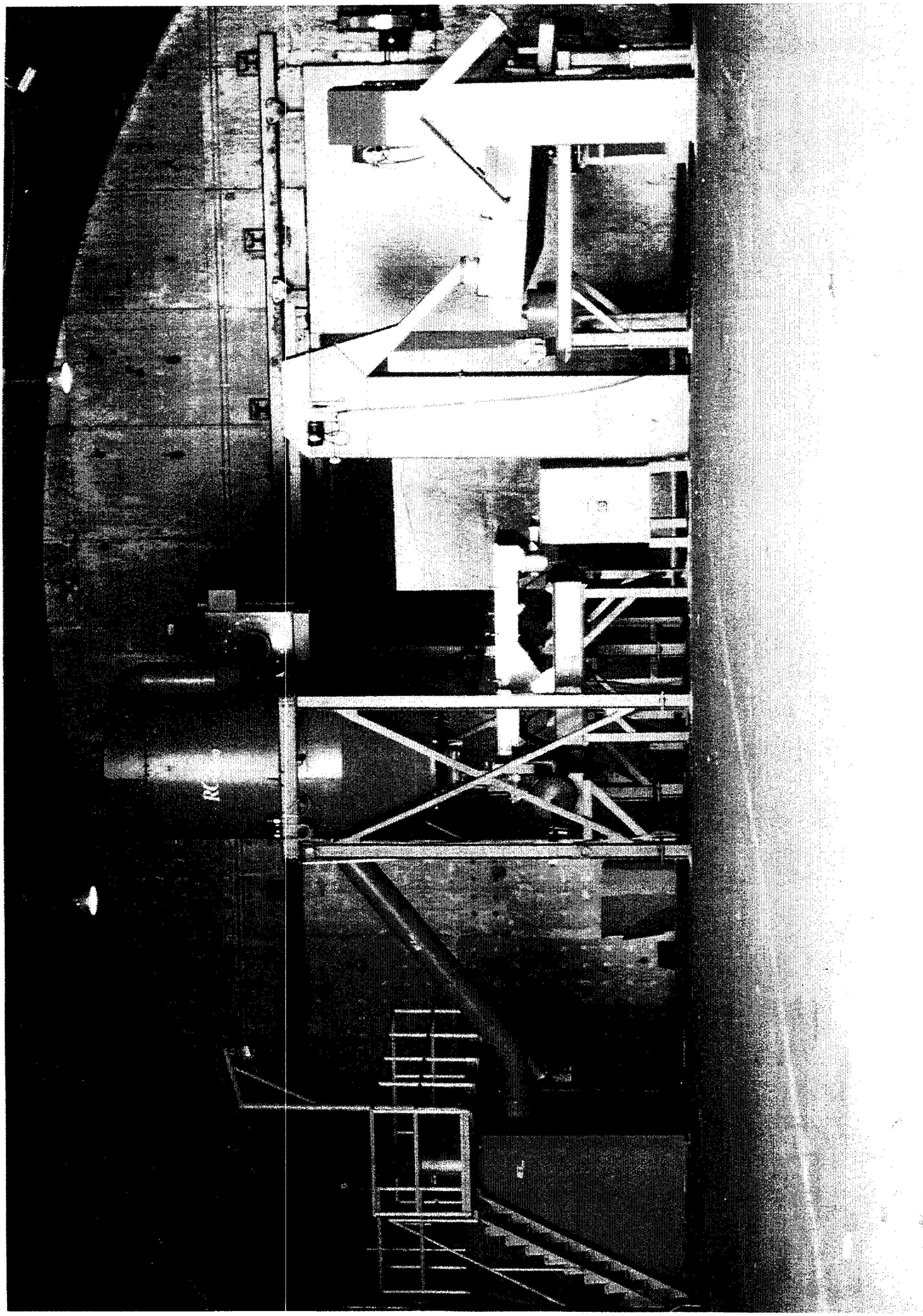
They can handle the largest and complex jobs with LeBlond Makino 106 and Mori Seiki MV-65 CNC mi centers—both with 4th axis capabil and a Kao Ming KMC-3000.

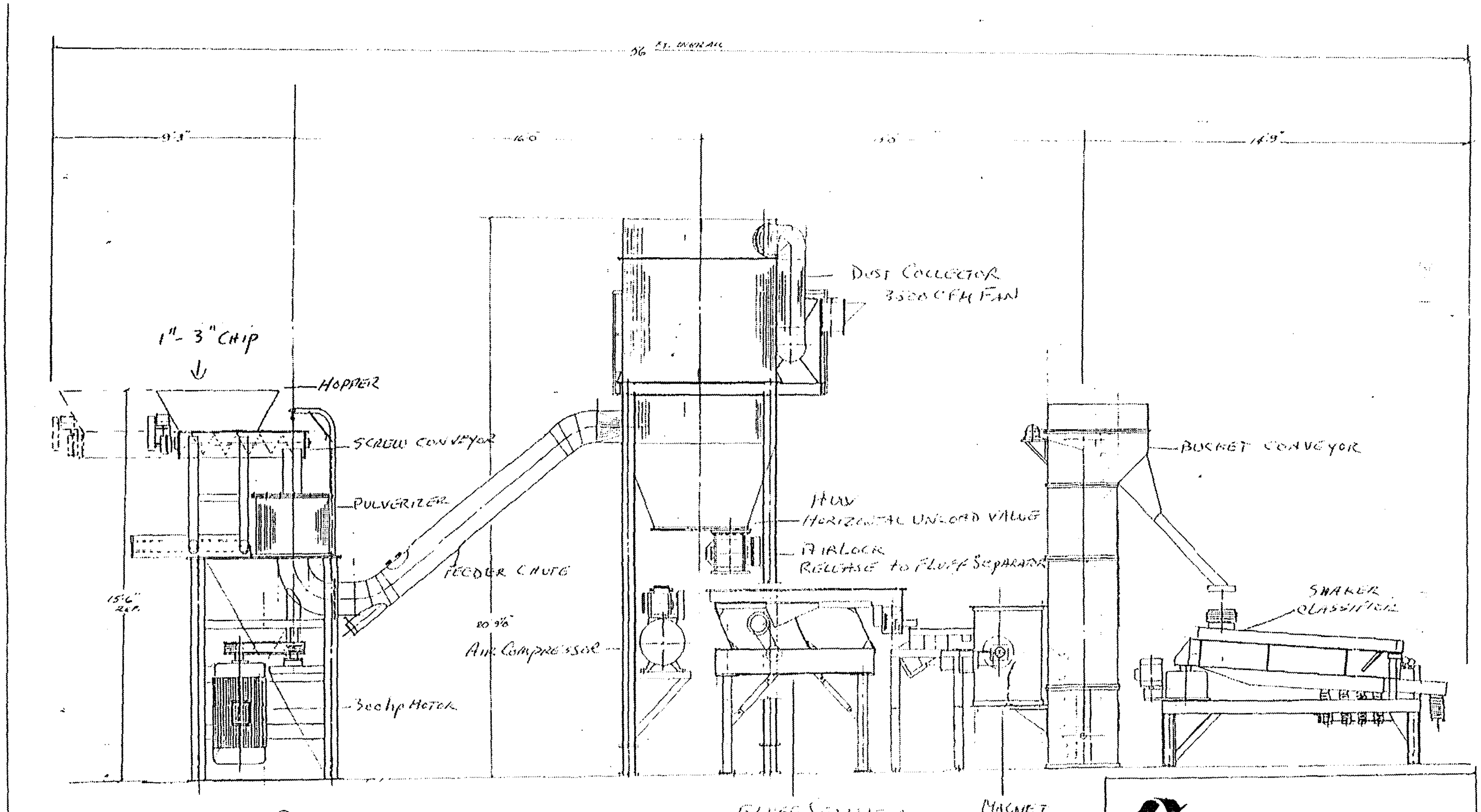
Individual parts can be large. For exa their American 120 lathe can turn ma blocks of metal—up to 500 lbs.

Final assembly for large production r easily accommodated by their res Fanuc Robot and ample on-site st space.









PLUS - CONTROL PANEL
3 PHASE

Recycling Concepts Int'l Group, Inc.

GENERAL LAYOUT of RCI PULVERIZING SYSTEM

10-12-95 RCI DWG. NO. 2860

RCI 2001 Specifications

Material:	**Maximum two inch** tire chips. (1x1, 2x2)
Output Results:	10 to 100 mesh Crumb at full production. Steel and fiber separated.
Throughput:	2000 lbs. or 100 tires per hour.
Advantages:	(1) High quality Crumb for industrial use. (2) Minimal manpower requirements. (3) Ambient process. (4) Durability. One year warranty
Delivery:	16 weeks
Power Supply:	One 300 h.p. motor, 460 volts, 60 Hertz 600 amp service, 245 kw per hour.
Manufactured under:	U.S. Patent - 4,886,216; Australia Patent - 603,286; Canada Patent Pending - 592,139.

Recycling Concepts Int'l Group Inc
99 Sherwood Avenue
E. Farmingdale, New York USA 11735

1-800-257-3292 (516) 454-0505

Fax: (516) 454-1573

APPENDIX 2

United States
Environmental Protection
Agency

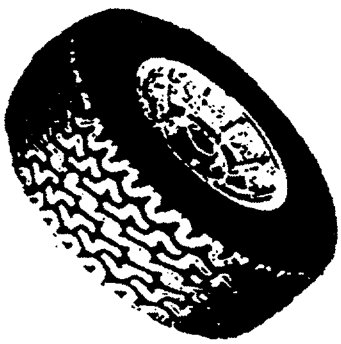
Solid Waste and
Emergency Response
(OS-305)

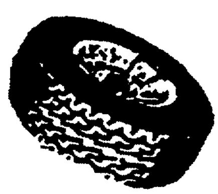
EPA 530-B-93-001
April 1993

EPA

State Scrap Tire Programs

A Quick Reference Guide





Printed on paper that contains at least 50 percent recycled fiber.

INTRODUCTION

Scrap tire management has become a serious concern over the past several years. Every year, approximately 242 million scrap tires are generated in the U.S. The majority of these are added to the 2 to 3 billion scrap tires already in stockpiles across the country. Since the first scrap tire law was passed in 1985, 47 states have addressed scrap tire management through specific scrap tire laws and regulations, or through state solid waste or transportation legislation.

The following matrix summarizes each state's scrap tire management legislation and programs. It is intended to provide state regulators, as well as members of industry, with a quick reference on state scrap tire regulations across the country. The regulations summarized here address collecting, selling, hauling, processing, storing, and disposing of scrap tires. The matrix also includes information on market incentives, funding sources, special field tests or studies, and innovative uses for scrap tires within each state.

For further information on scrap tire management, contact the EPA RCRA/ Superfund Hotline, Monday through Friday, 8:30 a.m. to 7:30 p.m. EST. The national toll-free number is (800) 424-9346. For the hearing impaired, the number is TDD (800) 553-7672. The document, "Summary of Markets for Scrap Tires", on scrap tire management (published October 1991, EPA/530-SW-90-074B) is available through the Hotline or by writing: RCRA Information Center, U.S. Environmental Protection Agency, Office of Solid Waste (OS-305), 401 M Street SW, Washington, DC 20460. The full report, "Markets for Scrap Tires", (EPA/530-SW-90-047A) is available from the National Technical Information Service (NTIS), 5285 Port Royal Road, Springfield, VA 22161, (703) 487-4600.

ALABAMA

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Walter Nichols Alabama Department of Environmental Management (ADEM) Solid Waste Section 1751 Congressman W.L. Dickinson Drive Montgomery, Alabama 36130 205-271-7761	• Alabama's Solid Waste Act was passed in May 1989. • State solid waste management plan expected to be completed in 1993. • A scrap tire program bill will be introduced in the 1993 legislative session. The program will be administered by the Alabama Department of Public Health (DPH). The proposed bill will: - Place a $2/tire surcharge on new tire sales to fund scrap tire collection, processing, and disposal; - Reimburse scrap tire processors for processing scrap tires at a rate of $0.95 per 26 pounds of tires; - Require the DPH to identify unauthorized tire dump sites and prepare an enforcement list; - Require storage and processing facilities to provide evidence of financial assurance for cleanup and closure; and - Prohibit disposal of processed tires in landfills. • The ADEM has developed draft language for a scrap tire bill. The bill will be introduced in 1993 and includes a $2 per tire surcharge on the sale of new tires. The funds would be used to establish collection sites, cover administrative costs, and fund stockpile remediation. The bill also includes the establishment of requirements for tire collection, storage, and disposal facilities.	• The Department of Environmental Management is preparing draft language for a tire bill to be introduced in 1993 that includes provisions for a $1/tire surcharge on tires to fund scrap tire collection and disposal.	• Not addressed.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• Facilities that process and/or store tires must have a health permit. • A manifest record showing origin of tires delivered to site and destination of tires leaving the site, tire stacking dimensions, separation distances and site description is also required.	• Disposal facilities must have a solid waste permit.	• Not addressed.	• One monofill for shredded tires is permitted and operating. • In 1990, the state legislature required that a study be performed to plan for improved scrap tire management in the state. A Tire Recycling Center was established at Gladsden State Community College in 1990 to conduct this study. It was completed in August 1991.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and
itory v: 19 ecas rary ınd li tion States

ALASKA

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Glenn Miller Alaska Department of Environmental Conservation P.O. Box O Juneau, Alaska 99811-1800 907-465-5153 David Wigglesworth Anchorage Office 907-563-6529 Tom Moses Alaskan Department of Transportation 5750 East Tudor Anchorage, Alaska 99507 907-338-4200	• No scrap tire legislation at the present time.	• Not addressed.	• No specific regulations.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• Tire piles cannot exceed 500,000 tires.	• Not addressed.	• Recycling bill gives bidders' preference to recycled products.	• The Alaskan Department of Transportation was the first in the United States to field test rubberized asphalt.

Sources: *Scrap Tire News* Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

ARIZONA

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Daniel Zeller Arizona Department of Environmental Quality (DEQ) Solid Waste Unit Office of Waste Programs 3033 North Central Avenue Phoenix, Arizona 85012 602-207-4118 or Tammy Shreeve Arizona Department of Environmental Quality Waste Assessment Office of Waste Programs 3033 North Central Avenue Phoenix, Arizona 85012 602-207-4212	· The Scrap Tire Law (HB 2687, Chapter 389) was passed in July 1990 and took effect on September 27, 1990. · SB 1252, which took effect in September 1991, amends the Scrap Tire Law. · HB 2144, which took effect September 30, 1992, also amends the Scrap Tire Law.	· A waste tire fund was established in September 27, 1990. Monies are raised through a 2% sales tax (not to exceed $2/tire) on the retail sales of new tires. · Counties receive a share of the waste tire fund based on the number of vehicle registrations in each county. · New car dealers can charge a maximum of $1/tire at the sale of a new car. New care dealers can charge a greater amount if they specify the dollar amount and its purpose.	· Retail tire sellers must accept waste tires from customers at the point of transfer. · Scrap tire collection sites must be approved as a solid waste facility by the Department of Environmental Quality. · Scrap tire collection sites must require, and tire sellers must show, a manifest for disposal of waste tires at the site. · DEQ registration and plan approval is required for all collection sites. · State-funded waste tire collection sites must accept up to five tires per person per year from county residents with no fee assessed. Also must accept waste tires from retail sellers of new tires with no fee. However, if a county can demonstrate that the funds it receives from the waste tire fund are insufficient to manage its program, then the county may charge a fee for disposal. · A county or private enterprise receiving a contract or grant for tire management activities must provide at least one waste tire collection site in the county and may not refuse to accept waste tires from designated dealers.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· Storage and processing facilities must obtain plan approval in accordance with guidelines as a solid waste facility.	· As of January 1992, whole tires are banned from disposal in landfills. Chopped or shredded tires can be monofilled, but not landfilled. · Rules were passed by the State's Regulatory Review Council in November 1992 that affect the disposal of scrap tires generated at mining facilities. Burial of tires generated at mining facilities will be permitted on-site for a period of five years. Companies must report to the DEQ the number of tires buried and allow inspection of tire disposal operations. · Scrap tire manifests are required for disposal of tires at a collection site.	· The waste tire fund established in 1990 is used to provide funds to counties for use in contracting with private enterprises for waste tire processing and/or collection facilities.	· Extensive field demonstrations and tests of rubberized asphalt have been performed over the past twenty years by the City of Phoenix.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review; 1993 Forecast, January 1993; and information from States.

ARKANSAS

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Susan Speake Arkansas Department of Pollution Control and Ecology Solid Waste Division P.O. Box 9583 Little Rock, Arkansas 72209 501-570-2856	• Act 752 of 1991 establishes regional solid waste management authorities and requires authorities to provide collection centers for tires. • Act 748 of 1991 provides for an income tax credit for equipment used exclusively to reduce, reuse, or recycle solid waste. • Act 749, enacted in 1991, requires tire regulations to be written. These regulations were promulgated in July 1992. The Act includes language regarding the hauling, storage, and disposal of tires and requires permits for these activities. The Act may be amended in 1993 to include the implementation of a scrap tire manifest system and a $1.50 fee on original equipment tires on new cars.	• As of July 1992, a $1.50/tire retail sales tax is collected. Monies collected are placed in the Waste Tire Management Fund to provide grants for tire cleanup, recycling, and the establishment of waste tire collection centers. • The Tire Grant Program sets aside 10% of total grant funds for special grants to districts for the removal of tires from illegal disposal sites. • As of July 1991, there is a $1/tire fee on all tires imported into Arkansas for disposal.	• Permits are required for haulers of scrap tires handling more than 25 tires per load. • Collection centers must be permitted.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• Storage sites with over 1,000 tires must be permitted as a processing facility.	• As of July 1992, whole tires are banned from landfills. Scrap tires can be landfilled if they are cut, sliced, or shredded, or they can be monofilled.	• An income tax credit is available to businesses engaged in the reduction, reuse, or recycling of solid wastes. • A 10% price preference is given for the purchase of retreads for state vehicles. If the retread tires were produced in Arkansas, an additional 1% price preference is added. • A 30% income tax credit is available to waste management companies that invest in equipment used to reduce, reuse, or recycle solid waste, including scrap tires.	

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

CALIFORNIA

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
General: Bob Boughton Research and Technology Development Division Regulations and Permitting: Tom Micka Permitting and Compliance Division California Integrated Waste Management Board (CIWMB) 8800 Cal Center Drive Sacramento, California 95826 Boughton: 916-255-2417 ~~Micka: 916-255-2443~~	· SB 1322 was passed in 1989. It allows the Department of General Services and the California Integrated Waste Management Board (CIWMB) to promulgate regulations for state purchase of retread tires and requires the use of retreads on state vehicles (other than high-speed vehicles) after July 1, 1991. · Under Assembly Bill 1843 (1989) the CIWMB is required to develop a permit program for waste tire facilities; set up a tire recycling program to reduce the landfilling of whole tires; and report to the legislature on the feasibility of using tires as a fuel supplement in cement kilns, lumber operations, and other industrial processes. The permit program and recycling program are still being developed and should be in place by early 1993. The feasibility report has been completed. · CIWMB is drafting final regulations for minor and major tire facilities. They are expected to be effective in 1993. · AB 1306 requires that the California Department of Transportation (CalTrans), with CIWMB, review and modify all bid specifications for paving materials to encourage use of recycled materials, including scrap tires.	· Effective July 1, 1990, a $.25/tire disposal fee is collected on all used tires left with a dealer or other retailer. The fee generates $3 million annually for the California Tire Recycling Management Fund. The CIWMB is administering the fund. · The CIWMB is in the process of developing a grant and loan program to encourage the recycling of tires. Grant money is expected to be available by mid-1993.	· No specific regulations.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· Effective July 1, 1992, new major waste tire facilities (over 5,000 stored tires) must obtain a major waste facility permit from the CIWMB. Permit requirements include fire prevention, security and vector control measures, tire pile size and height limits, closure and pile reduction plans. · In February 1992, the CIWMB issued requirements for obtaining a minor (under 3,000 tires) waste tire facility permit.	· Effective January 1, 1993, whole tires are banned from landfills.	· A 5% purchase price preference is available for state purchased products made from materials derived from used tires. · The CIWMB has the authority to issue grants and loans to qualified companies engaged in tire recycling, reuse, recovery or reduction operations, including tire shredding, crumb rubber production, pyrolysis, and the manufacture of products from scrap tires. · The CIWMB is mandated to designate market development zones, and provide economic and regulatory incentives to businesses within these zones for producing end products made with no less than 50% recycled material.	· In early 1992, CIWMB completed a feasibility study on using tires as a fuel supplement for cement kilns, lumber operations, and other industrial processes. · The Department of General Services has given final approval to an agreement between CIWMB and CalTrans to conduct research on asphalt rubber and rubber-modified asphalt concrete (RUMAC). · An agreement with CalTrans is being developed to provide funds for the paving projects' maintenance using asphalt rubber. CalTrans will provide long term reporting on the project. · The CIWMB is working on a demonstration project designed to obtain operating data and emissions data from cement kilns and biomass combustion units that burn scrap tires.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

COLORADO

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Paul Poulsen Solid Waste Program Unit Colorado Department of Health (DOH) Hazardous Materials and Waste Management Division 4300 Cherry Creek Drive South Denver, Colorado 80222-1530 303-692-3300	· Solid waste regulations affecting scrap tire management became effective in May 1988. These regulations govern the final disposal of tires and regulate any site containing 10,000 or more tires as a solid waste facility. · An enforcement program is in place. · HB 1208, introduced in February 1991, concerns the recycling of motor products such as tires, batteries, etc. and would place a $1/tire surcharge on the retail sale of tires in Colorado, if passed. · HB 1231 has been introduced, and if passed would affect tires as follows: - Place a $1/tire surcharge on retail sale of tires and on new vehicle tires; - Require tire pile site owners to register with Colorado DOH. Colorado DOH would assess and permit piles; and - Establish a grant fund for tire pile abatement and tire recycling projects. · Neither HB 1208 nor HB 1231 passed in the 1992 legislative session. Both bills are on hold until the implications of recently passed Amendment One are understood. Amendment One may require citizens' approval before a $1/tire surcharge can be implemented, in which case nothing is likely to happen with these two bills until 1994.	· Nothing to date. See "Legislation and Regulations.	· No specific regulations.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· A facility is limited in the number of tires it can accept to the number it can process, store, recycle, or dispose of in a year. · Storage requirements include fire control, security measures, access roads, and proper solid waste and environmental permits. · Safe storage is defined as placing tires or tire shreds in trenches and covering them with sheets of plastic and dirt.	· Not addressed.	· A 20% tax credit for recycling equipment purchases.	

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

CONNECTICUT

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Charles Atkins Connecticut Department of Environmental Protection Waste Management Bureau Waste Engineering and Enforcement Division 165 Capital Avenue Hartford, Connecticut 06106 203-566-5847	· Guidelines for Rubber Tire Storage Areas [1978-80]. · Tires are managed as a special waste under the Connecticut General Status, which became effective February 1985. · The State Mandatory Recycling Act designates tires as future recyclables.	· Not addressed.	· Any tire handler must comply with the regulations set out in the Connecticut General Status.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· Tire storage facilities must be licensed by the Department of Environmental Protection. Requirements include ground water protection, environmental health and safety provisions and financial assurance.	· Tires may be accepted at landfills until there are sufficient facilities with tire recycling capabilities in the state.	· State has a 10% price preference for products made from recycled materials.	· A 300 ton/day scrap tire-to-energy facility is now operating in the Town of Sterling. · In 1991, tires began to be diverted from landfills to a waste-to-energy facility in the state. The facility operates in Sterling, CT and is burning approximately 10 million tires annually.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

DELAWARE

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
David Johnson Delaware Department of Natural Resources and Environmental Control Division of Air and Waste Management Solid Waste Management Branch 89 Kings Highway P.O. Box 1401 Dover, Delaware 19903 302-739-3820	· No scrap tire legislation at the present time. However, tires are being managed as either a solid waste or recyclable material under existing solid waste regulations.	· Not addressed.	· Scrap tire haulers are not required to be permitted or registered. Tire haulers are exempt from the $300 fee for solid waste transporters.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· Not addressed.	· Some landfills accept whole tires (with restrictions) at a cost of $80 per ton. Shredding or splitting scrap tires prior to delivery to the landfill reduces the cost to $45 per ton.	· The State's Green Industries Initiative provides tax incentives and/or low interest loans to business and industry to use recycled materials in manufacturing or to process recyclables. To date, two loans have been given out under this program, including one to a crumb rubber operation.	· Two county landfills contract mobile shredding services. These counties used the shreds on a limited basis in leachate drainage systems at the landfills. · Currently working on diverting whole tires to a waste-to-energy facility, and to crumb rubber applications.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and Information from States.

FLORIDA

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Bill Parker Department of Environmental Regulation Office of Solid Waste Twin Towers Office Building 2000 Blair Stone Road Tallahassee, Florida 32399-2400 904-922-6104	· SB 1192, enacted in 1988, is the Solid Waste Act. Scrap tires are addressed by the Act. · Section 17-711 of the Florida Administrative Code defines terms and contains rules for handling and disposing of waste tires.	· A $1/tire tax on the retail sale of tires.	· Waste tire collectors must be registered with the Department of Environmental Protection. · Collection centers must have a general permit.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· Waste tire sites must be closed under a closure permit or located at a permitted facility. · Processing or disposal facilities, collection centers, and mobile operators must have a general permit.	· Tires must be cut into at least eight pieces prior to landfilling.	· Not addressed.	· A Florida Department of Transportation research study and a project on the feasibility of using crumb rubber in asphalt for road resurfacing material have been completed. · A common use of scrap tires is to use tire chips as daily cover for landfills. · Several refuse fuel facilities and one cement kiln in the state are burning tire chips.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

GEORGIA

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Denny Jackson Scrap Tire Management Program Environmental Protection Division (EPD) 4244 International Parkway Suite 100 Atlanta, Georgia 30354 404-362-2696	• HB 1385, a recycling amendment to the 1990 State Solid Waste Management Act that includes tires, was passed in May 1992. • Georgia's Waste Tire Committee and regulators from the EPD have written proposed carrier and generator rules required by HB 1385. They were promulgated in December 1992 and were effective January 1993.	• As of July 1, 1992, there is a $1/tire management fee on the sale of new passenger and truck tires. Monies generated are used for grants/loans to cities and counties for pile abatement and enforcement, and for innovative technology development. Funds for grants and loans will not be available until after July 1993.	• HB 1385 requires generators of scrap tires to obtain an identification number. Carriers must obtain permits including financial assurance. • HB 1385 establishes a manifest/tracking system for scrap tires. • Retail dealers must keep accurate records and report to the EPD quarterly on the number of new replacement tires sold.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• No one may store more than 100 scrap tires anywhere in the state. Exceptions include: - Solid waste disposal sites with a permit to store scrap tires prior to disposal; - tire retailers, if the number of scrap tires stored is under 500; - tire retreader with not more than 1,500 scrap tires, if the tires will be retreaded; - Auto salvage yards with not more than 500 scrap tires in storage. • Storage and processing facilities must comply with pile dimension requirements. • Processors of scrap tires are not required to have permits if 75% of the incoming tires are recycled.	• Effective January 1, 1995, whole tires are banned from landfills. Shredded or chopped tires can be landfilled if no other end markets are available.	• A Recycling Market Development Council has been established to determine what needs to be done to facilitate development and expansion of markets for recovered materials, possibly including scrap tires.	• The EPD is gathering information on the locations and number of tires in unpermitted tire stockpiles in the state. • Criteria for scrap tire dump abatement will be developed in 1993.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

HAWAII

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Gary Siu Department of Health Office of Solid Waste Management Five Waterfront Plaza Suite 250 500 Ala Moana Boulevard Honolulu, Hawaii .96813 808-586-4226	· No scrap tire legislation at the present time. However, the Office of Solid Waste Management is planning to propose either a ban on the disposal of tires in landfills or a per tire tax on the retail sale of tires during the January 1993 legislative session.	· A $1.50/tire advance disposal fee that failed in the 1992 legislature is expected to be filed in the 1993 legislative session.	· No specific regulations.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· No specific regulations.	· As of July 1, 1992, whole tires are banned from landfills by the City and County of Honolulu.	· The Department of Accounting and General Services has finalized (under legislative direction) its procurement rules and specifications. They include a 10% preference for products made with recycled materials, including retread tires. The rules will be promulgated by mid-1993.	· Honolulu City and County are implementing a scrap tire management program including provisions for selling shredded tires to Honolulu Power as fuel. An assessment on tire sales is under consideration as a source of funds for the program.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and [illegible]lator[illegible] ew: [illegible] Forec[illegible] nuary [illegible]; and [illegible] natio[illegible] Sta[illegible]

IDAHO

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Todd Montgomery Department of Health and Welfare Division of Environmental Quality (DEQ) Water Quality Bureau 1410 North Hilton Street/Statehouse Boise, Idaho 83720 208-334-0464	· HB 352, passed in March 1991, addresses fees from the sale of tires, acceptance of scrap tires, collection sites, and disposal of scrap tires. · As of August 1992, regulations were passed that allow payment of funds from the Waste Tire Grant account to retreaders to begin.	· A $1/tire fee on the retail sale of motor vehicle tires is in place. The fee is paid to the Division of Environmental Quality for deposit on a quarterly basis in the Waste Tire Grant account.	· No specific regulations. · Tire sellers must accept a number of scrap tires from consumers for disposal/recycling equal to the number of tires sold/year. · Scrap tire collection sites must register with the DEQ.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· An owner or operator of a waste tire collection site must register with the Division of Environmental Quality and provide information concerning the site's location and size and the approximate number of waste tires that are stored at the site.	· Disposal of tires at landfills and incineration sites is banned (except as allowed under permissible fuel uses), effective July 1, 1993. · Beginning January 1, 1993, tires must be disposed at scrap tire collection sites. · Each county will establish a program addressing waste tire disposal by October 1, 1992.	· As of July 1, 1992, the Division of Environmental Quality may establish a program to make grants to counties or contract with private entities to do any of the following, either individually or collectively: - Contract for a waste tire processing facility service; - Remove, or contract for the removal of, waste tires from county landfills or removal of other existing unlawful tire piles in the state; - Establish waste tire collection centers at solid waste disposal facilities or waste tire processing facilities. · The Waste Tire Grant account: - Provides a $0.10/tire credit to dealers for accounting/reporting expenses; - Provides end users of tires and tire derived materials a $20/ton reimbursement for eligible uses, such as energy recovery, shredding, soil erosion control, collision barriers, crumb rubber for asphalt use or as a raw material for other products and hauling to out-of-state processing facilities. To date, no funds have been dispersed under this provision, which requires that companies submit a proposal; - Reimburses retreaders $1.00 for every tire they retread.	· The Division of Environmental Quality will provide an annual report to the Legislature on the grant programs that includes an examination of the adequacy of the funding.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

ILLINOIS

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Alan Justice Department of Energy and Natural Resources (DENR) Office of Recycling and Waste Reduction 325 West Adams Room 300 Springfield, Illinois 62704-1892 217-524-5454	• HB 1085 (PA 86-452), enacted August 31, 1989, amends the Environmental Protection Act to create the Used Tire Management Program. Financial assistance can be provided to local governments for cleanup of tire piles, development of markets for tire-based products, and regulations to control mosquito infestations in tire piles. • SB 989 (PA 87-727), enacted September 23, 1991, further amends the Environmental Protection Act by establishing a new fee on tires sold, sets priorities for how monies generated are earmarked, requires tire retailers to accept used tires for recycling, and requires the development and implementation of a plan to eliminate large tire piles. The Act also creates a waste management hierarchy for used tires generated. • HB 1159 (PA 87-476) enacted September 13, 1991, amends the Civil Administrative Code of Illinois by requiring the Illinois Department of Central Management Services to develop and implement a program to use retreads as replacement tires on state-owned vehicles whenever possible. • SB 1768 (1992), pending final certification, will authorize retailers to enter agreements with their suppliers to have the supplier remit the $1/tire fee collected to the state.	• As of January 1, 1990, $.50 of each vehicle title fee is deposited into a Used Tire Management Fund. Approximately $1.7 million is generated annually. This source of funding expires on December 31, 1994. • As of July 1, 1992, any person offering tires at retail sale in Illinois must collect a fee of $1/tire sold and delivered in the state. After collection allowances are paid to the retailer and the Illinois Department of Revenue, $.80 of each dollar is deposited into the Used Tire Management Fund. Approximately $8 to $10 million is expected to be generated annually.	• Final rules for licensing scrap tire transporters were finalized in 1990. • As of July 1, 1992, any person offering tires for retail sale must accept for recycling one used tire for every tire sold. • As of July 1, 1992, any person offering tires for retail sale in Illinois must post a written notice that includes the universal recycling symbol and the following statement: "DO NOT put used tires in the trash"; "Recycle your used tires"; and "State law requires us to accept used tires for recycling, in exchange for new tires purchased." • Any retailer that collects used tires for recycling under PA 87-727 may not allow the tires to accumulate for a period of more than 90 days.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• As of April 1991, scrap tire storage facilities were requested to limit tire pile size, and assure that water does not accumulate in tires. Site owners must maintain daily records of tires received and/or processed. • Sites with more than 5,000 tires are required to have financial assurance to cover the cost of site cleanup. • As of January 1992, processors are regulated. Provisions include assuring that tires are processed in a manner that prevents water accumulation. • As of January 1, 1992, no one can operate a tire storage site containing more than 50 used tires unless the site has been registered with the Illinois Environmental Protection Agency. Registered sites must report the number of tires accumulated, the status of vector control, and the actions to handle and process the tires.	• Effective July 1, 1994, whole tires will be banned from landfills.	• The Illinois DENR's Used Tire Recovery Program: - awards a low interest loan to expand existing used tire processing facilities in the state; - funded five tire-derived fuel test burns in 1991; - is making low interest loans available to fuel users to retrofit existing equipment or make improvements to facilitate the use of tire-derived fuel; - conducted a test of passenger retread tires with the Illinois State Police. - conducted a test on rubber modified asphalt concrete in conjunction with the Illinois Department of Transportation. - is expanding its current guidelines to include a more comprehensive program with rebates, grants, and loans to help develop markets for scrap tires. • A portion of the money generated from the $1/tire fee imposed by PA 87-727 will be available to the Illinois DENR to provide grants and loans for: - assisting units of local government and private industry in establishing facilities and programs to collect, process and use scrap tires and tire-derived materials; and - demonstrating the feasibility of innovative technologies and applying these technologies at the recycling facilities.	• A study was conducted by the Department of Energy and Natural Resources, entitled "Illinois Scrap Tire Management Study" and published October 1989. • The Illinois Environmental Protection Agency will investigate the use of alternative materials, including shredded tire material, to serve as a daily cover at sanitary landfills.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and R[illegible]ory P[illegible] 199[illegible] [illegible]cast, [illegible]ary 19[illegible] [illegible]nd information from States.

INDIANA

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Timothy Hotz Department of Environmental Management (DEM) Office of Solid and Hazardous Waste 105 South Meridian Street Indianapolis, Indiana 46206-6015 317-232-7155	• HB 1391, signed into law March 1990, establishes regulations on the disposal of lead acid batteries and waste tires. • HB 1056, an act amending HB 1391, was passed in 1990. When HB 1056 sunsetted, it was replaced by HB 1047, which requires that rules be written on tire storage and transport. HB 1047 also extended the life of the Waste Tire Task Force. • PL 19, passed in 1990, created the Waste Tire Management Fund and established a price preference for recycled materials, including retread tires. • PL 236, passed in 1991, affects tire retailers, wholesalers, haulers, and processors. • PL 88, passed in March 1992, sets up a registration system for storage of waste tires. • The DEM issued interim guidelines for scrap tire cutting facility and storage facility permits. The guidelines establish the number of tires that may be stored at either cutting or storage facilities, sets forth fire protection/safety requirements, on-site waste water requirements, mosquito control requirements, and identifies tire pile size requirements for whole and processed tires. These guidelines remain in effect until the rules developed in accordance with HB 1047 are passed by the Solid Waste Management Board. As of January 1993, the rules had been revised and were undergoing public review. It is expected that the Board will act on the proposed rules within the first six months of 1993. • The DEM's Waste Tire Task Force expects to make recommendations to the state legislature on additional scrap tire management legislation for introduction in 1993.	• As of July 1991, a waste tire management fund was created to pay for cleaning up tire dumps when the responsible party is unknown or cannot afford the cleanup. The fund is supported by permit fees from waste tire storage sites, additional appropriations, and other fees as established by the General Assembly.	• Provisions and permit fee amounts have been established for registering/licensing scrap tire haulers. • Tire retailers are required to post a notice in the establishment advising customers that the retailer is required to accept the customer's used tires for recycling. • Retailers must retain one used tire for each new tire sold. • A manifest form is required for shipment of scrap tires from a generator to a disposal or processing facility.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• A permit is required for scrap tire storage facilities. • Waste tire cutting facilities are defined in PL 236 and requirements are set forth for operating a facility. Waste tire cutting facilities are not required to obtain permits as long as they shred tires only. • Provisions and permit fee amounts have been established for registering/licensing other processing facilities. • The amount of time retailers and wholesalers can retain whole tires is limited.	• Individual landfills are allowed to restrict the disposal of tires.	• A 10% price preference for state purchases of supplies that meet recycled content requirements. • The Waste Tire Task Force, which is working to develop marketing strategies and incentives for dealing with tire piles, meets once a month. The Task Force recently made 10 recommendations to the legislature, including a tire tax and the use of retread tires on state agency vehicles.	

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

IOWA

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Brian Tormey Iowa Department of Natural Resources (DNR) Waste Management Division 900 East Grand Avenue Henry A. Wallace Bldg. Des Moines, Iowa 50319-0034 515-281-8382	· House File 753, the Waste Management and Recycling Act, was passed in 1989. A portion of the Act addresses waste tire disposal. · House File 706, Registration of Waste Tire Haulers, was passed in 1990. · House File 2475, An Act Relating to Waste Tire Management, was passed in 1992. The Act set up a one year waste tire collection pilot program, which runs from July 1, 1992 to June 30, 1993. The program has $515,000 in funding and involves 19 counties. Waste tires must be collected at no charge and may not be landfilled. The program is intended to encourage the creative reuse and recycling of tires.	· DNR's 1993 legislative proposal package includes a recommendation that a financial program be established through a surcharge applied at the time of new vehicle registration and title transfer.	· HF 706 requires that waste tire haulers register with, and obtain a certificate of registration from the Secretary of State's Corporation's Division Office. A $10,000 surety bond is required of each hauler to be registered. "Waste tire hauler" means a person who transports for hire more than 40 waste tires in a single load for commercial purposes. · Haulers are liable for any costs associated with improper disposal of tires. · Generators of scrap tires must contract with a registered hauler for removal of scrap tires. · Transporters of scrap tires for final land disposal are required to dispose of the tires at permitted sanitary disposal facilities.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· HF 2475 established permitting requirements for waste tire storage and processing facilities. The requirements, which will include a permit fee and a financial assurance instrument, apply to facilities with more than 500 tires. The rules for implementing the permit program are still being developed.	· As of July 1, 1991, disposal of whole tires in landfills is banned. Tires must be processed by, at a minimum, shredding, cutting, or chopping into pieces that are no longer than 18 inches on any side. · Disposers of scrap tires must contract with a registered hauler for removal of waste tires.	· The Landfill Alternatives Grant Program (passed as part of the 1987 Iowa Ground Water Protection Act) provides funding for source reduction and recycling projects. Since 1988, five projects for scrap tire management have received funding. The Grant Program is funded by a tonnage fee, a surcharge on all wastes, paid in addition to a tipping fee, at landfills.	· The Iowa Department of Natural Resources prepared a study entitled "Waste Tire Abatement in Iowa: A Study to the General Assembly" published in January 1991. The report recommended: - waste tire haulers be registered and bonded; - the use of tire-derived fuel at the state's three public universities; - local governments use tire chips as a leachate collection medium in landfills; - a financial mechanism to fund the program. Preferred method is a vehicle registration surcharge; and - a modified "bounty" system for local governments for tire pile cleanups. · The University of Iowa has been using shredded tires in its boilers for the past 3 years. The Iowa DNR is working to encourage other institutions to do the same.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

KANSAS

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Joe Cronin Kansas Department of Health and Environment Bureau of Waste Management Forbes Field, Building 740 Topeka, Kansas 66620 913-296-1667	• SB 310, a recycling bill, was signed into law in June 1990. Regulations for waste tire processing facilities, collectors, and collection centers went into effect on July 1, 1992.	• An excise tax of $.50 on the retail sale of new tires. An estimated $1.3 million per year in tire fund revenues will be used for grants to local governments and program administration. • The Waste Tire Management Fund was established in 1990 to provide grants to cities and counties for scrap tire recycling, management, collection, and disposal operations; and to enforce laws relating to collection and disposal fees.	• Collectors, haulers, and processors are required to have permits and provide financial assurance.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• Permit requirements for waste tire processing facilities, collectors, and collection centers include zoning and site plans, a management/operation plan for the site containing information on the number of tires to be processed, type of processing to be used, a contingency plan for fire or other emergencies, proof of ownership of site, a closure plan, financial assurance, pile size limitations, and site operation standards.	• As of July 1, 1990, whole tires are banned from disposal in landfills. • Tires, if cut sufficiently small, may be disposed of in landfills. • Tires may be disposed only in permitted disposal facilities.	• The first municipal grants issued through the Waste Tire Management Fund are expected to be awarded in 1993. • Income tax credits are available to businesses for the purchase of equipment to manufacture products using recycled feedstocks.	• Whole tires may be used as part of a proven and approved leachate collection system. • Cut tire chips may be used as daily landfill cover material.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and Information from States.

KENTUCKY

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Charles Peters Department of Environmental Protection Division of Waste Management 14 Reilly Road Frankfort, Kentucky 40601 502-564-6716 Randy Johann Kentuckian Regional Planning and Development Agency 11520 Commonwealth Drive Louisville, Kentucky 40299 502-266-6084	• HB 32, passed in April 1990, specifically addresses the storage and processing of scrap tires.	• A $1/tire tax on the retail sale of tires. • A waste tire trust fund was established for cleanup of tire piles, to fund loan and grant programs, to develop uses for waste tire material, and to fund collection and storage programs. Application requirements for the grant and loan programs have been established.	• No specific regulations.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• Tire piles with more than 100 waste tires must be registered with the Department of Environmental Protection. • Tire piles cannot contain more than 500 tires. • Tires must be stored so that they do not accumulate water.	• Only tires "rendered suitable for disposal" may be disposed of in landfills. This means tires must be cut.	• Not addressed.	• The Kentuckian Regional Planning and Development Agency coordinated an effort to enact a flow control ordinance for tires. All tires generated in nine counties would have had to be sent to a local cement plant to be burned for fuel. The ordinance was not passed and there is no regional collection system, however, the cement plant is burning tires.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

LOUISIANA

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Michael Vince Louisiana Department of Environmental Quality Office of Solid and Hazardous Waste P.O. Box 82178 Baton Rouge, Louisiana 70884-2178 504-765-0249	· Act 185, a solid waste recycling and reduction law affecting scrap tires, was passed in 1989, and became effective January 20, 1992. · The Department of Environmental Quality formulated regulations for scrap tire recycling in accordance with Act 185. Revisions to these regulations are expected to be promulgated in early 1993. The current regulations include: - manifest and reporting requirements; - site notification requirements; - permitting requirements for transporters and waste tire collection, storage, recycling and disposal sites; - outdoor/indoor storage requirements; - tire dealer responsibilities; and - provisions for a $2/tire fee on retail sale.	· As of January 1992, a waste tire management fund pays for clean up of tire piles where the responsible party is unknown or cannot afford cleanup costs. Source of funding is permit fees from tire transporters, collection/processing facilities. · A $2/tire fee on retail sales became effective February 1992.	· Permit fees have been established for tire haulers, collectors, and processors. · Tire retailers are required to post a notice in their establishment advising customers that the retailer is required to accept the customer's used tires for recycling. · Customers are required to pay the disposal fee whether they leave the waste tire or take it with them. · Retailers must retain one used tire for each new tire sold. · The period of time over which collection/processing facilities can retain whole tires is limited.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· As of January 1990, tires must go to a permitted recycling or solid waste disposal facility or to waste tire collection sites. · Permit fees have been established for processors.	· As of January 1, 1991, whole tires cannot be disposed in landfills. They must be cut or shredded prior to disposal.	· A 5% price preference for State purchase of supplies that meet recycled content requirements. · Tax credits equal to 20% of the cost of recycling equipment may be used to process recyclables or to manufacture materials using recycled feedstock.	

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

MAINE

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
General: Cliff Eliason Enforcement: Terry McGovern/ Brent McCarthy Department of Environmental Protection (DEP) Bureau of Hazardous Materials and Solid Waste Control State House Station 17 Augusta, Maine 04333 207-287-2651 Recycling: Jody Harris Maine Waste Management Agency Office of Waste Reduction and Recycling State House, Station 154 Augusta, Maine 04333 207-289-5300	· LD 1431, passed in 1989, established a funding source for scrap tire management activities. It went into effect January 1990. · Chapter 406 of the State Solid Waste Management Plan contains requirements for proper storage or disposal of scrap tires and the licensing of storage and processing facilities. The rules that apply to tire storage facilities include provisions for surface and ground-water protection. · The Tire Stockpile Abatement Law, enacted in 1991, gives DEP authority to investigate uncontrolled tire stockpiles, gives enforcement authority to DEP to require owners/operators of such sites to clean up the sites, and contains provisions concerning assignment of liability and state authority to recover funds.	· A $1/tire advance disposal fee paid on the retail sale will fund tire pile cleanup and scrap tire recycling grant and loan programs.	· As of April 1, 1991, scrap tire haulers are required to be licensed, meet manifest requirements, and show financial responsibility.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· A permit is required if tire storage area is greater than 10,000 square feet. · Permit requirements decrease for storage areas less than 10,000 square feet. Exemptions are possible for short-term storage and for temporary use of portable tire shredders. · All scrap tire storage facilities are covered under state solid waste processing and disposal regulations, and have the same siting restrictions. · A permit is required for scrap tire processing facilities.	· Not addressed.	· The state requires the purchase of recycled materials if it is feasible and environmentally sound. This includes retread tires, chipped tires for road fill, and rubberized asphalt. · The state's loan program will provide up to $50,000 to a company or entity to start a recycling company or purchase recycling equipment. · Tax credits allow firms to deduct 30% of the cost of recycling equipment from their business taxes. · A grant program provides funding to municipalities for capital equipment to start or expand recycling programs.	· A report by the Department of Transportation (DOT) was submitted to the legislature in March 1990. The subject was the use of ground tire rubber as an additive to asphalt concrete. · A DOT recycling project was established. It included a comprehensive review of feasible alternatives for using recyclable materials in construction. Ground rubber from tires was one of several materials specifically identified in the study. · Maine's three tire-derived fuel processors have been licensed pursuant to Chapter 406 of the regulations. A pulp and paper mill has been licensed to burn 30,000 tons per year of tire-derived fuel.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

MARYLAND

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Muhamud Masood Department of the Environment Hazardous and Solid Waste Management Administration 2500 Broening Highway Building 40 Baltimore, Maryland 21224 410-631-3315 Larry Walsh Maryland Environmental Services Department of Natural Resources 410-974-7254	· An emergency scrap tire law, the Scrap Tire Storage and Disposal Act, was passed in 1989 and took effect immediately. · HB 1202, the Scrap Tire Management Law, was enacted on May 24, 1991. It regulates the proper disposal of scrap tires; established licenses for scrap tire haulers, recyclers, and disposers; and set a fee of $1 on the sale of new tires to fund used tire cleanup and recycling fund. · Storage, Collection, Transferring, Hauling, Recycling, and Processing of Scrap Tires Regulations (COMAR 26.08.04) were published in the Maryland Register in June 1992.	· Maryland's Scrap Used Tire Cleanup and Recycling Fund is created through loan authorization and state budget appropriations. · As of February 1, 1992, the state has a tire recycling fee of up to $1 to be collected by retail tire dealers on the sale of a new tire in the state, including new tires sold as part of a new or used vehicle. Dealers keep 1.2% of the gross amount of the fee collected and give the remainder to the Comptroller of the Treasury, which transfers these fees to the Used Tire Cleanup and Recycling Fund. · The Used Tire Cleanup and Recycling Fund is used for: - Cleaning up existing stockpiles of used tires; - Establishing a tire recycling system; - Assisting tire recycling projects; - Providing financial assistance to recycling companies; and - Providing public education.	· As of July 1, 1992, all scrap tire haulers and collection facilities must be licensed by the Department of the Environment. · See Disposal Restrictions.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· Tire dealers, recyclers, and other tire collectors cannot store scrap tires unless they prove that they will have a market for the tires within 90 days, either by showing contracts for materials or otherwise documenting the firm's efforts to secure markets. · Effective July 1, 1992, all scrap tire recyclers must be licensed by the Department of the Environment. · Facilities that use tires for fuel may only be approved/licensed if no other options for returning tires to the marketplace for reuse exist.	· Tires banned from all Maryland landfills after January 1, 1994. · If dealers, recyclers, or collectors do not satisfy the requirements for selling or disposing of the tires, they are required to use a state-approved disposal system. The law allows the Secretary of the Environment to take remedial action and/or remove tires at any site if he determines disposal may be carried out improperly or in a way that threatens the environment.	· State has a 5% price preference for products containing recycled materials. · Maryland Environmental Service Scrap Tire Management Program to date includes: - Retreaded Tire Utilization Pilot Project; - Remanufactured Tire Demonstration Project; - Promoting the use of tire chips as a supplemental fuel in cement kilns; - Researching the use of scrap tires in asphalt and in composting; - Catalog of products issued to promote use of products manufactured of scrap tire material; - Tire reef project.	· The Department of Natural Resources' Maryland Environmental Service (MES) is responsible for developing the statewide tire recycling system. This includes establishing regional collection centers and haulers. The MES is also setting up demonstration programs and distributing money from the Used Tire Cleanup and Recycling Fund. · State completed a market study for recyclables, including tires, in 1990.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

MASSACHUSETTS

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Jamie Doucett Department of Environmental Protection Division of Solid Waste One Winter Street, 4th Floor Boston, Massachusetts 02108 617-292-5868	• An Act to Protect the Environment and Public Health by Proper Disposal of Certain Automotive Wastes was reintroduced in 1992, attached to an omnibus recycling bill. A similar tire bill could be introduced in 1993. • The Solid Waste Management Facility Regulations require that storage, collection, processing, and disposal sites meet permit criteria, such as proof of ownership; site location, topography, and wetlands impact; site and pile dimensions; number of tires received and processed; fire prevention plans; and security measures.	• Not addressed.	• Massachusetts DEP does not regulate solid waste haulers. • Scrap tire collection facilities are exempt from solid waste regulations if the facility can demonstrate that the tires are being recycled or reused. • Collection sites must meet permit criteria.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• Storage and processing facilities are regulated as handling facilities, and must meet permitting criteria. • Processing facilities are exempt from solid waste regulations if the facility can demonstrate that the tires are being recycled or reused.	• As of December 31, 1991, whole tires are banned from disposal in landfills. Tires must be shredded prior to disposal in landfills. • Disposal sites must meet permit criteria.	• A 1988 Executive Order established 10% purchasing preference for buying recycled products or goods with recycled content. Initially targeted at paper, plastic, aluminum, and compost; the Executive Order allows a broader list at discretion of purchasing agent.	• A feasibility study was performed that investigated burning tire chips with coal in coal-fired power plants. The study found limited potential due to the cost of retrofitting power plants.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and [illegible]

MICHIGAN

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Kyle Cruse Department of Natural Resources (DNR) Technical Services Section P.O. Box 30241 Lansing, Michigan 48909 517-335-4757	• HB 5339 was enacted in 1990. It is an amendment to the Michigan Vehicle Code (1990 PA 148). • HB 4068, a Scrap Tire Regulatory Act, was passed in 1990 (1990 PA 133, effective January 1, 1991). • A criminal statute provides for fines up to $10/tire, 90 days in jail, and 100 hours of community service. An increased criminal enforcement effort is planned for non-complying operations.	• A $.50/tire disposal surcharge on each certificate of vehicle title. Monies from the surcharge are deposited in the Scrap Tire Regulatory Fund, established to clean up scrap tire piles on public land and pay for implementing and enforcing scrap tire regulations.	• Haulers must be registered in order to haul scrap tires. • All scrap tire collection sites must register with the Department of Natural Resources and pay a $200/year registration fee. • Uncovered tire collection sites with more than 500 tires are regulated. • Tire retailers must use registered scrap tire haulers for removal of their tires.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• Tires must not be stored in piles greater than 15 feet in height, with horizontal dimensions no greater than 200 by 40 feet with 20 foot spacing between. • Tires must not be stored within 20 feet of the property line or within 60 feet of a building or structure. • Tires must be covered, shredded, or sprayed to limit potential of mosquito breeding. • Surety bond required for outside storage of tires to assure removal. • Sites with an accumulation over 100,000 tires must operate as processors by at least shredding the tires.	• Tires may be landfilled at facilities licensed under the Solid Waste Management Act, 1978 PA 641 as amended, or stored in compliance with Act 133 (see Storage and Processor Regulations).	• A 10% price preference is available for recycled products. • The Department of Commerce administers a Resource Recovery Loan Program, a no interest, negotiable-term loan program for businesses that reuse or recycle materials. • The DNR administers a grant program for recycling projects initiated and administered by the public or private sector.	• A tire clean-up program is expected to be operating by Spring of 1993. It will provide matching grants for clean-up of state/ municipal lands and will require that tires be recycled.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

MINNESOTA

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Tom Newman Minnesota Pollution Control Agency Waste Tire Management Program 520 Lafayette Road St. Paul, Minnesota 55155 612-296-7170	· The Scrap Tire Law was passed in 1984.	· A $4 tax on vehicle title transfers. The fee generates about $4 million/year in revenue, of which about $2.6 million goes to fund a stockpile cleanup program and a grant/loan program for companies recycling, reusing, or processing tires. Funding for this program ends in 1994.	· Transporter ID requirements and enforcement policies have been established and implemented. · Tire retailers must accept as many scrap tires from a customer as tires are sold to that customer. · Tire retailers may charge a disposal fee. · Tire retailers may store up to 500 scrap tires without a storage permit. · Tire retailers are required to use only scrap tire transporters that have a valid ID number from the state.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· Landfills are exempt from scrap tire storage permits if they store no more than 10,000 waste tires. · Permitted transfer facilities are allowed to temporarily store and transfer up to 10,000 scrap tires. · Permitted processing facilities can temporarily store, for processing, up to 70,000 scrap tires. · Permitted storage facilities can store up to 500,000 scrap tires. · All facilities must provide financial assurance to ensure clean closure.	· Tires are banned from disposal in landfills.	· New revisions to the Minnesota Pollution Control Agency's waste tire grant and loan rules provide money to help companies manufacture products incorporating scrap tires. · Since 1990, Minnesota has awarded about $340,000 in grants and loans to Minnesota businesses and government organizations to help develop markets for recycled scrap tire products. · The Minnesota Pollution Control Agency is assisting businesses and organizations to develop innovative products, such as athletic surfaces and oil-spill cleanup material made from crumb rubber.	· The Minnesota Pollution Control Agency published a study on leachate from the disposal of tires in 1990. · Minnesota Department of Transportation and the University of Minnesota are testing rubberized asphalt.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

MISSISSIPPI

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Mark Williams Department of Environmental Quality Office of Pollution Control Division of Solid Waste Management P.O. Box 10385 Jackson, Mississippi 39289 601-961-5171	· SB 2985, a bill addressing the disposal of batteries, tires, and household hazardous waste, was passed in 1991. · Scrap tire transportation regulations were adopted December 19, 1991 and became effective in 1992. · Scrap tire management regulations were finalized and adopted in August 1992. The regulations include requirements for collection sites, processing facilities, and disposal sites; and financial responsibility requirements for agriculture, erosion control, or other alternative uses of scrap tires. · SB 2985 may be amended in 1993 to reduce county governments' scrap tire management obligation. This would mean a reduction in funds available to counties. The original bill forced counties to develop a scrap tire management system for all scrap tires generated in the county. Only four of 82 counties have some type of system in place. Commercial businesses are filling the scrap tire management need adequately so the counties do not need to be as involved as was mandated in the original bill.	· A $1/tire fee on the retail sale of tires. · Scrap tire grant regulations became effective July 1, 1992. Regulations address the eligibility and allocation of funds from the Environmental Protection Trust Fund. Counties and regional solid waste disposal authorities are eligible for 50% of the monies in the fund for planning and storage, processing, and/or disposal.	· As of January 1, 1992, scrap tire haulers must be registered with the state. · Tires may be deposited only at authorized collection, processing or disposal points. · Transportation of tires must be certified by using state manifest forms and keeping records of transportation. · A scrap tire collection site permit must be obtained if storing more than 500 tires or more than 100 for more than 90 days. · As of January 1, 1992, scrap tire haulers/ collectors, generators and processors must maintain manifest records of the numbers of tires generated from a facility, transported and processed, reused or disposed.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· Collection, processing, and disposal sites must obtain authorization to operate from State DEQ. · Draft regulations have been released for public comment. · Processors must maintain manifest records of the numbers of tires generated from a facility, transported and processed, reused or disposed.	· Tires must be shredded prior to landfilling.	· Fifty percent of the Environmental Protection Trust Fund is allocated for manufacturing incentive grants, research and demonstration projects, pile abatement, and administrative activities.	

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from Sta[illegible]

MISSOURI

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Kate Walker Department of Natural Resources Waste Management Program P.O. Box 176 Jefferson City, Missouri 65102 314-751-3176	• SB 530, an omnibus solid waste bill passed in August 1990, includes provisions for regulating tires. • HB 438, passed in August 1990, establishes purchase preferences. • Waste tire rules, CSR 80-8.010, 10 CSR 89-8.020, 10 CSR 80-8.030, and 10 CSR 89-8.040 became effective July 8, 1991.	• A $.50/tire tax on retail sales of new tires (no fee collected for tires from off-the-road vehicles). The funds collected are to be used to clean up tire dump sites and for grants for end users of waste tires.	• Waste tire haulers who carry more than 25 tires per load must obtain a permit. • Tire dealers can use only permitted haulers and must keep records of where their tires go. • A hauler that has a first-stage hauler permit must have applied for a second-stage permit by December 1, 1991. A waste tire hauler that did not obtain a first-stage waste tire hauler permit in 1991 must apply for and obtain a second-stage waste tire hauler permit from the department. The second-stage hauler permit requires an annual $100 permit fee. • A business that hauls its own tires in vehicles driven by its own employees is not required to obtain a permit. • A waste tire hauler must keep records of the number of tires collected, the number of tires delivered, and basic information about the facility accepting the tires. • Tire dealers must keep records of the number of waste tires collected and basic information about the hauler accepting the waste tires.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• Sites that store more than 500 tires for more than 30 days must obtain a permit from the Department of Natural Resources. Sites that obtained a first-stage tire site permit in 1991 must have applied for a second-stage waste tire site permit by January 1, 1992. A site that did not obtain a first-stage waste tire site permit in 1991 must obtain a second-stage permit prior to accepting over 500 waste tires. • A facility that stores fewer than 500 whole, cut, chipped, or shredded waste tires does not need to obtain a permit, but must conform to storage and record-keeping requirements.	• As of January 1, 1991, whole tires are banned from disposal in landfills.	• Tire tax funds are expected to be available to provide grants to businesses for demonstration projects, for capitol expenditures, for using tires as a fuel or in a product, and for removal and cleanup of tires from illegal piles. • Purchase preferences of 10% for products that use recovered materials, including retread tires.	• An advisory council on waste tires was established to assist in the development of waste tire rules and grant criteria. • The State Department of Transportation is conducting demonstration projects using recovered rubber from waste tires as surfacing material, structural material, sub-base material and fill consistent with standard engineering practices.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

MONTANA

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Jon Dillard Department of Health and Environmental Sciences Bureau of Solid and Hazardous Waste 836 Front Street Helena, Montana 59620 406-444-1430	· Scrap tires are regulated under the Montana Solid Waste Management Act and the Montana Motor Vehicle Recycling and Disposal Act and the associated administrative rules. Both Acts were passed in 1977.	· Not addressed.	· Collection sites must be licensed as a solid waste management facility. · Collected or stored scrap tires must be shielded from public view.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· Scrap tire collection/storage facilities must be permitted and licensed as solid waste management facilities. · Collected or stored scrap tires must be shielded from public view.	· Tires are currently accepted at landfills. · Some landfills are beginning to charge differential fees for whole versus split tires.	· A 25% tax credit is available to businesses for the purchase of recycling and processing equipment. · Income tax credits are available to individuals and corporations procuring recycled products. · State is instructed to purchase recycled products whenever possible, but it is not a mandate.	

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

NEBRASKA

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Ms. Dannie Dearing Department of Environmental Control Land Quality Division P.O. Box 98922 Lincoln, Nebraska 68509-8922 402-471-4210	• LB 163, a waste reduction and recycling bill addressing scrap tire management, was passed in April 1990. • LB 1257, the Integrated Solid Waste Management Act, was passed in 1992.	• As of October 1990, there is a $1/tire fee on the retail sale of new tires. The fee also applies to new car sales. Proceeds from the fee are deposited in the Waste Reduction and Recycling Incentive Fund. The funds are used to underwrite costs of state recycling programs. • LB 1257 requires a $1.25/ton disposal fee on waste disposed of at permitted solid waste disposal facilities. Fifty percent of the fee is remitted to the Waste Reduction and Recycling Incentive Fund for grant awards. • As of July 1991, a fee is assessed on businesses in the state with retail sales of tangible personal property. Businesses with sales of at least $30,000 but less than $199,000 are assessed an annual fee of $25. Businesses with sales over $200,000 are assessed an annual fee of $50.	• No specific regulations.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• No specific regulations.	• *Effective September 1, 1995, tires are banned from disposal in landfills unless processed in a manner approved by the Department of Environmental Control.*	• *Grant funding is available to Nebraska political subdivisions for market development for recyclable materials.*	

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

NEVADA

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
David Emme Division of Environmental Protection (NDEP) Bureau of Waste Management 123 West Nye Lane Carson City, Nevada 89710 702-687-5872	• AB 320, passed in 1991, requires NDEP to adopt regulations governing tire disposal and develop a plan for managing waste tires. Permitting regulations for haulers, processors, and storage facilities will be drafted by Spring 1993. • The regulations being drafted pursuant to AB 320 will focus on restricting disposal of whole tires (e.g., requiring that tires be cut prior to landfilling).	• AB 320 requires a $1/tire surcharge on new tires sold at retail. For 15 months, revenue goes to the account for recycling and is used to fund recycling and solid waste management programs. After this time, the funds will go to the state highway fund to develop projects that incorporate tires in highway use.	• No specific regulations.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• No specific regulations.	• Effective January 1, 1992, tires are banned from disposal in landfills unless no alternative is available. • Any plan to dispose of quantities of commercial scrap tires requires review and approval by the designated solid waste management authority. • The regulations being drafted pursuant to AB 320 will focus on restricting disposal of whole tires (e.g., requiring that tires be cut prior to landfilling).	• A 10% price preference is given for recycled products manufactured in Nevada. • A 5% price preference is given to all other recycled products.	

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

NEW HAMPSHIRE

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Sharon Yergean New Hampshire Department of Environmental Services Waste Management Division 6 Hazen Drive Concord, New Hampshire 03301 603-271-2901	• Automotive Waste Disposal Law (HB 332-FN-A, Chapter 89-263) was passed in 1989. • Solid Waste District Law (RSA 149-M:13I) requires towns/districts to provide sites or access to sites for disposal of residents' tires. • Two bills being prepared for introduction are: - A bill "Relative to a Waste Tire Management Program and Establishing a Preference for Rubber Asphalt Paving;" - A bill "Relative to the Collection of Automotive Wastes."	• Towns are authorized to collect fees for the collection and disposal of town motor vehicle wastes including tires, batteries, and used oil. • Towns may request the Office of State Planning to increase the town's fees if they prove insufficient to fund proper management of motor vehicle wastes under existing conditions.	• The transportation of tires, either whole or shredded, is required to be accomplished in such a manner as to prevent tire pieces or whole tires from blowing or falling onto the roadways. • The Office of State Planning is required to maintain and distribute to the state's towns, a current list of approved contractors for collection and disposal of motor vehicle wastes.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• Outdoor storage of tires at collection sites must be in accordance with height, width, fire lane, and berm specifications.	• Tires must be cut prior to landfilling. • Tires may be disposed by one of the following methods: (a) Scrap tires may only be disposed in a permitted facility after being shredded, filled, or split to prevent creeping. (b) No processing of scrap tires is required at facilities that are capable of processing whole tires.	• Not addressed.	• A committee to study the development of a State Waste Tire Management Program was established. The committee was required to identify and study the reuse of waste tires for asphalt aggregate, water mains and other uses. The final report, issued in February 1992, found that ample markets for waste tires exist in the state.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and [illegible]tory [illegible]: 199[illegible] [illegible]ecast, [illegible]ary 199[illegible]; and information from States.

NEW JERSEY

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Steve Rinaldi Department of Environmental Protection and Energy (NJDEPE) Division of Solid Waste Management Office of Recycling CN414 Trenton, New Jersey 08625-0414 609-530-8208	• The Statewide Mandatory Recycling Act, passed in 1987, addresses tire management. • Regulations at NJAC 7:26A address solid waste recycling and contain provisions relating to scrap tire recycling.	• Not addressed.	• Transporters hauling solid waste must be registered with the state if the solid waste is destined for disposal. • Transporters hauling source-separated materials (e.g., tires) for recycling need not register.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• Facilities that recycle tires are regulated as a recycling facility through an approval process, rather than as a solid waste facility through a permitting process. • Regulations regarding scrap tire processors and storage of scrap tires were adopted November 18, 1991, as part of general solid waste recycling regulations. • Guidance regarding on-site management practices is being developed to minimize and control the potential hazards associated with scrap tire stockpiles.	• Tires must be taken to permitted solid waste facilities or approved tire recycling facilities.	• Tires qualify for municipal tonnage grant credits. • Industries purchasing new recycling equipment may receive a 50% tax credit against their state corporation business taxes. • Industries purchasing new recycling equipment may be eligible for low interest loans. • NJDEPE is currently drafting a rule to exempt facilities that make artificial reefs from scrap tires from the recycling facility approval process.	• The state's Department of Transportation completed a demonstration project using tire-derived materials for road construction. • Retread passenger tires are being tested on the state's fleet vehicles. • Recent Federal legislation designated $1 million from the United States Environmental Protection Agency to be transferred to the New Jersey Department of Environmental Protection and Energy to develop a model program to clean up and recycle scrap tires. It specified that the program's facility is to be located in New Jersey. • A special project to locate and characterize major scrap tire piles throughout the state is in progress under the direction of the New Jersey Environmental Prosecutor.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

NEW MEXICO

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Philip Westen Environment Department Solid Waste Bureau 1190 St. Francis Drive Santa Fe, New Mexico 87502 505-827-2892	· A waste tire bill has been drafted by the New Mexico Senate and will be introduced in both houses of the state legislature during the 1993 session. Provisions include: - a $1.25/tire fee on the retail sale of new tires; - a ban on landfilling of whole tires; - approval for shredded tires to be used as landfill cover; and - funds provided to counties to establish tire recycling programs and fund a State Department of Transportation study of road construction and highway maintenance projects incorporating waste tire rubber.	· Not addressed.	· No specific regulations.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· No specific regulations.	· Not addressed.	· A 5% price preference is provided for products containing recycled content procured by state agencies.	· Split tires are used to contain landfill cell liners at the City of Albuquerque landfill.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

NEW YORK

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Ben Pierson Division of Solid Waste Department of Environmental Conservation (DEC) 50 Wolf Road Albany, New York 12233-4015 518-457-7337	· State Regulations for Solid Waste regulate scrap tire storage and processing facilities. · An amendment to Chapter 226 (Section 27-0303) of the Environmental Conservation Law, passed in 1990, designated commercial scrap tires as a regulated waste. Commercial waste tires are defined as waste tires that are transported for a fee for the purpose of reuse, recycling, or disposal. · DEC is reviewing scrap tire regulations contained in Part 360 of the Statis Solid Waste Management Act. Revised rules are expected to include surety bond requirements for scrap tire facilities and an allowance for used tires versus waste tires in the regulatory language. These rules are expected to become final by the end of 1993. · A Scrap Tire Utilization and Management Act was introduced in 1992 and will be refiled in 1993. Provisions include: - a $2/tire surcharge on new vehicle tires; - a requirement that the Department of Transportation use rubber modified asphalt concrete in 50% of paving projects; - a requirement that the Department of Environmental Conservation develop regulations for stockpile cleanup and management; and - a request to the Department of Economic Development to build a state tire recycling program. · Restriction on Disposal of Recyclables was introduced in 1992 and will be reintroduced in 1993. The bill would direct DEC to establish regulations to restrict burial or incineration of recyclable materials. Whole tires are one of the recyclable materials identified.	· A $5/tire fee for funding various environmental programs, which was included in the Governor's 1992-93 Executive Budget, was defeated. The 1993-94 budget includes the fee, but the final budget is not complete.	· Transporters of commercial waste tires must register with the DEC.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· Storage requirements cover tire pile dimensions and fire controls. · Processor regulations establish standards for tire shredding.	· Not addressed.	· The Department of Economic Development administers low-interest loan and grant programs for tire recycling.	

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

NORTH CAROLINA

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Ernest Lawrence Department of Environment, Health, and Natural Resources (DEHNR) Solid Waste Section P.O. Box 27687 Raleigh, North Carolina 27611-7687 919-733-0692	• SB 111, passed in 1989, requires each county to provide a place for disposal of scrap tires.	• As of January 1, 1990, a 1% tax on new tire sales was levied. • Counties are allowed to impose tipping fees for tires if the sales tax fails to generate adequate funding for scrap tire management.	• Scrap tire haulers must register with the Solid Waste Section of the DEHNR and obtain a hauler identification number. • Counties must provide a site for tire collection. • Collection sites require permit from Solid Waste Section of DEHNR.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• The number of scrap tires stored at a scrap tire collection site must not exceed the stated number of scrap tires shipped off-site per month plus the stated number of scrap tires disposed of on-site per month. At no time can more than 60,000 scrap tires be stored.	• Tires must be shredded or sliced prior to landfilling.	• Not addressed.	• North Carolina Department of Transportation is evaluating the use of tires in constructing retaining walls and the use of crumb rubber in asphalt.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

NORTH DAKOTA

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Steve Tillotson State Department of Health *Division of Waste Management* P.O. Box 5520 Bismarck, North Dakota 58502-5520 701-221-5166	· Solid Waste Management rules have been adopted and went into effect December 1, 1992. The rules address scrap tire storage.	· A portion of the state's $2/new vehicle sale fee for cleanup of abandoned vehicles may be used to clean up tire piles.	· No specific regulations.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· Tire piles of more than 800 tires must be in compliance with regulations governing pile dimensions, control of access, fire control, and run-on/run-off control systems. · Tire piles of more than 800 tires must have a solid waste management permit. · Tire piles with a base area exceeding 10,000 square feet must comply with liner requirements.	· Not addressed.	· Not addressed.	

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

OHIO

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Natalie Farber Ohio Environmental Protection Agency Division of Solid and Hazardous Waste Management 1800 Watermark Drive P.O. Box 1049 Columbus, Ohio 43266-0149 614-644-3135	· State Solid Waste Law (HB 592) became effective in June 1988. It defines waste tires as a solid waste. · The State Solid Waste Management Plan, adopted in June 1989, addresses scrap tire management. · Ohio EPA finalized Draft Rules for Storage of Scrap Tires that became effective August 1991. · The Ohio Tire Recycling and Recovery Act (SB 115 and HB 293), originally introduced in 1990, will be reintroduced in 1993. The Act would: - regulate tire storage and disposal, require licensing of scrap tire transporters, collectors, and processors; and - set up a system to track waste tires from collection through disposal.	· Not addressed.	· No specific regulations.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· Rules on storage of scrap tires specify pile dimension limits, prohibit open burning near tire piles, and require fire lanes, vector control, and pile covering at tire storage sites.	· Effective January 1, 1993, tires must be cut or shredded prior to disposal in sanitary landfills. · Effective January 1, 1995, tires will only be accepted at tire monofills (shredded) or at "legitimate" recycling facilities.	· Not addressed.	

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

OKLAHOMA

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Glen Wheat Solid Waste Management Service – 0206 Oklahoma State Department of Health 1000 NE Tenth Street Oklahoma City, Oklahoma 73117-1299 405-271-7159	• Oklahoma Waste Tire Recycling Act was enacted July 1, 1989. • 63 OS, Section 11-2324 addresses scrap tire management.	• A $1/tire surcharge on new tire sales is in effect. Monies from the surcharge are deposited in the Waste Tire Indemnity Fund to help eliminate stockpiles of tires and to promote recycling by reimbursing facilities that process scrap tires.	• Tire haulers and transporters are not regulated. • Collectors of more than 50 tires must be permitted by State Department of Health.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• A site storing, collecting, or disposing of more than 50 tires must be permitted by the State Department of Health. This does not apply to tire manufacturers, retailers, wholesalers, or retreaders who store 2,500 or fewer used tires. • Processors must be permitted by the Oklahoma State Department of Health and must document that at least 25% of the tires processed came from illegal tire dumps identified by the Oklahoma State Department of Health to participate in the state's reimbursement programs.	• Tires must be cut before being disposed in a landfill.	• Oklahoma State Department of Health permitted waste tire processing facilities are eligible for reimbursement at a rate of $.50/tire, if they demonstrate that 25% of the tires processed at their facility are from designated illegal tire dumps. • Oklahoma State Department of Health permitted waste tire processing facilities are eligible for an additional $.35/tire reimbursement if they demonstrate that their facility is providing pickup and transportation of waste tires from each and every county of the state on a regular basis.	

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

OREGON

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Angela Schrock Brad Price Department of Environmental Quality Hazardous and Solid Waste Division 811 SW Sixth Avenue Portland, Oregon 97204 Schrock: 503-229-6912 Price: 503-229-6792	· HB 2022 Waste Tire Law, passed in 1987 and enacted in January 1988, set up a self-funded comprehensive program for waste tires. The Law regulates the transportation, storage, and landfilling of waste tires. · SB 66, passed in 1991, effective July 1, 1991, banned disposal of tires at landfills. · HB 2246, passed 1991: - extended tire fee to October 1, 1992; - extended reimbursement for use of scrap tires to June 30, 1993; - gives DEQ authority to regulate tire product piles; - expedited abatements; and - restricted carrier permit requirement to those who haul for hire.	· A $1/tire disposal tax on the sale of new tires. The monies were used to clean up tire piles. Tire fee ended October 1, 1992.	· Anyone transporting more than 4 tires commercially must be licensed with DEQ. · Tire dealers with more than 1,500 scrap tires on-site must have storage permit. · Generators are allowed to haul scrap tires generated at their facility without a permit but they must maintain documentation of their disposal.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· A facility that stores more than 99 tires on-site must have a storage site permit, unless they have been granted a beneficial use permit by DEQ. · Retreading facilities that have more than 3,000 tires on-site must have a storage permit.	· As of July 1, 1991, tires are banned from landfills.	· The tire disposal tax is used to promote the use of waste tires by subsidizing markets for waste tires or chips. · In January 1990, the Oregon Department of Environmental Quality established a demonstration program allowing a higher subsidy ($.01/lb is the established subsidy) for uses of waste tires that do not yet have an established market in the state. The program includes: - two rubber modified paving projects, approved and completed in 1990; - a project conducted by the Oregon State Highway Division using tire chips as a light fill; - demonstration projects conducted by the Department of Environmental Quality and the Metropolitan Service District to test rubber from waste tires in paving projects using generic specifications for rubber modified asphalt concrete suitable to Oregon's climate and paving practices; - burning tire-derived fuel in two paper mills and one cement kiln; - using Oregon produced tire-derived fuel in three out-of-state cement kilns.	

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and

PENNSYLVANIA

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Jay Ort Department of Waste Management P.O. Box 2063 Fulton Building Harrisburg, Pennsylvania 17105-2063 717-787-7381	· Existing tire regulations were adopted under the Solid Waste Management Act of 1980. Residual waste regulation became effective in 1992. · A regulatory change in 1992 redesignated tires as a residual waste rather than a municipal solid waste when scrap tires are used as fuel at cement kilns.	· A $1/tire fee on new tire sales was established in 1992, under the Recycling and Planning Act of 1988. These monies have been redirected to fund mass transit systems in the state.	· No specific regulations.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· There is an interim storage policy for tires. · Current requirements include access control, hazard prevention, nuisance control, record-keeping, reporting, and site closure. Isolation distances are required between piles. · Limits set on pile size, height and width. · Processing facilities that have markets other than landfills for tires or tire-derived materials are permitted-by-rule under the new designation and are not required to have additional solid waste permits. · Storage of scrap tires for over one year is considered disposal and issubject to permit requirements, including pile size, fire lanes, and placement.	· Not addressed.	· A 5% price preference for state purchase of supplies that meet recycled content requirements. · A $1 million Environmental Technology Fund offers low interest loans for recycling research and development projects and for funding new recycling equipment.	· Pennsylvania Department of Transportation is planning six rubber-modified asphalt paving projects for 1993 in conjunction with the Federal Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA) legislation. · The state has a year-old policy that suggests the use of whole tires over a landfill cover system to mitigate the problem of tires floating in landfills.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

RHODE ISLAND

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Janet Keller Office of Environmental Coordination 83 Park Street Providence, Rhode Island 02903 401-277-3434 Adam Marks Central Landfill 65 Shun Pike Johnson, Rhode Island 02919 401-942-1430	· RIGL 37-15.1, "Hard-to-Dispose Material -- Control and Recycling" applies to scrap tires. · Solid waste management facility regulations apply to tire dumps and regulate size of piles, fire control measures, etc. · RIGL 23-63 "Vehicle Tire Storage and Recycling," enacted in 1992, establishes a $5 deposit on each new vehicle tire purchased and provides for a full refund to the consumer upon return of used tires. This deposit system is effective January 1, 1993.	· As of January 1, 1990, a $.50/tire tax on new tire sales was imposed. Revenues are deposited in a "Hard-to-Dispose Material Account" along with monies from surcharges on other "hard-to-dispose" wastes included in the bill. The state generates $3 million/year from the fees to fund educational and technical assistance programs for collection, marketing, recycling, reuse, reduction, and safe disposal of "hard-to-dispose materials;" to establish grant and research programs; to survey, track, and monitor hard-to-dispose materials; and to establish regional collection centers for hard-to-dispose materials. · Tire recyclers are assessed an initial license fee of $50 and an annual renewal fee of $25. · Effective January 1, 1993, the Rhode Island Port Authority must establish a tire site remediation account funded by an additional $0.75/tire tax on new tire sales. · Ninety percent of the funds in the tire remediation account will be used for the cleanup, recycling, and disposal of existing tire piles; 10% will be used to assist municipalities with collection and proper disposal of waste tires.	· No specific regulations.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· Facilities storing more than 400 tires must obtain a license from the Department of Environmental Management. · Tire recycling or recovery businesses must be licensed by the Department of Environmental Management.	· Disposal of scrap tires is restricted to one of three methods: - facilities operated by the State Solid Waste Management Corporation; - licensed privately-operated tire storage, recycling, or recovery facilities; or - transport to an out-of-state recycling facility. · Burning of scrap tires within the state is banned. · Exporting tires for burning as fuel outside the state and within 30 miles of any reservoir watershed for Rhode Island can occur only after the DEM receives written assurance that the burning facility meets all applicable state and Federal pollution control standards.	· The Hard-to-Dispose Material Account will fund educational and technical assistance programs for collection, marketing, recycling, reuse, reduction, and safe disposal of hard-to-dispose materials, including scrap tires.	

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

SOUTH CAROLINA

State Contact	Current Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
John Ohlandt Charleston County Health Department 334 Calhoun Street Charleston, South Carolina 29401 803-724-5970 - W - F or John Ohlandt South Carolina Department of Health and Environmental Control Environmental Quality Control Office 803-740-1590 - M&T	· South Carolina's Solid Waste Policy and Management Act of 1991 (SB 388 and HB 3096) contains provisions for a $2/tire tax on the sale of new tires that became effective in November 1991: - $.06 of the tax will be retained by the dealers; - $1.50/tire will go to counties, based on the number of vehicles registered in the county, to fund collection, recycling and/or disposal systems; and - $.44 will go into the Waste Tire Grant Trust Fund. For 3 years after the effective date, these monies must be used exclusively to fund grants to counties or regions to pay for the cost of disposal of accumulated waste tires, after which the monies may be used for research and development of alternatives to the landfilling of tires. · The Act establishes a 10-member Waste Tire Committee. · The Act requires state and county solid waste plans to include a section on waste tires. · Department of Health and Environmental Control (DHEC) is required to establish regulations for permitting/registering collectors, processors, haulers, and disposers of waste tires. These regulations should be promulgated in early 1993.	· The state imposes a $1.50/tire tax on tire purchases. · Retailers and wholesalers may be funded $1/tire for each tire delivered to a permitted waste tire disposal facility. · Provides for deposit of the remaining $0.50/tire of the tire fee in a Waste Tire Grant Trust Fund. · Prohibits counties from charging additional disposal fees except for oversize and out-of-state tires.	· Counties are required to establish waste tire collection sites within 12 months of promulgation of regulations.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· The Department of Health and Environmental Control currently has mandatory guidelines for scrap tire storage. · Requires owners and operators of waste tire sites to notify the South Carolina Department of Health and Environmental Control of the site's location, size, and number of tires accumulated.	· Bans whole waste tires from disposal at landfills.	· Not addressed.	

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

SOUTH DAKOTA

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Terry Keller Department of Environment and Natural Resources (DENR) Office of Solid Waste Foss Building 319 South Coteau c/o 523 East Capital Pierre, South Dakota 57501 605-773-3153	• Scrap tire law was passed and became effective July 1, 1992. • DENR is required to prepare a scrap tire study for the legislature by January 1, 1993. The Department will develop regulations based on the study findings. • Until new regulations are developed, tires are managed under the state's revised solid waste regulations effective July 1990. Rules were phased in between July 1990 and July 1992.	• A $0.25/tire per vehicle registration fee (not to exceed $1/vehicle). Fees are remitted to state to develop a grant fund for tire recycling end uses. Burning tires in waste-to-energy units does not qualify for grant funds.	• No specific regulations.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• Storage facilities must have a general permit (similar to that required of a solid waste facility). • Tire handlers may accumulate up to 100,000 tires annually before removal. Accumulated tires must be removed annually.	• Tires must be cut into at least four pieces prior to landfilling. • Open burning of tires is prohibited except in areas with populations less than 5,000.	• Not addressed.	• Office of Waste Management and South Dakota DOT are working to develop specifications for asphalt rubber.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and
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TENNESSEE

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Don Manning Department of Environment and Conservation Division of Solid Waste Assistance 401 Church Street 14th Floor Nashville, Tennessee 37243-3538 615-532-0076	· State Solid Waste Management Planning Act (HB 1252) was passed in 1991. It requires the Department of Environment and Conservation to purchase two mobile shredders and operate them throughout the state to process segregated and temporarily stored tires at landfills, or for the DEC to contract with a shredding service. · Several bills relating to scrap tires were introduced in 1992, but none were passed. Several may be reintroduced in the next legislative session.	· Fees on waste disposal ($0.85/tire) and new tire sales ($1.00/tire) effective October 1991. State of Tennessee collects all fees. · Prohibits counties from imposing additional disposal fees or surcharges on tires.	· By January 1995, each county must establish at least one waste tire collection site.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· Not addressed.	· Effective January 1, 1995, whole tires will be banned from disposal in landfills.	· Not addressed.	· Under the provisions of the law, the DEC has contracted with a private shredding service to process tires at county collection sites. The program is expected to begin in 1993. · The Tennessee Valley is completing a tdf test burn and expects to begin burning the fuel in late 1993.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

TEXAS

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Jennifer Sidnell Mark Mintz Waste Tire Program Texas Water Commission P.O. Box 13087 Capitol Station Austin, Texas 78711 Sidnell: 512-371-6445 Mintz: 512-371-6424 Jefferson Grimes Texas State Department of Transportation Materials and Tests Division 125 East 11th Street Austin Texas 78701 512-463-8662	• SB 1516, passed in 1989, addresses scrap tire management. • SB 1340, passed in 1991, provides for a scrap tire recycling program and cleanup of old tire dumps. • Health and Safety Code, Title S, Subchapter P (V.C.S.) Waste Tire Recycling Program, passed in 1991, establishes the program and regulations on the recycling of scrap tires in the state. • Article 6674l-1 (Roads, Bridges, and Ferries - Title 116) (V.C.S.), authorizes the government to give bid preference to bidders using rubberized asphalt paving processed by an in-state facility. • Article 6016, Section 3.211 (V.C.S.) allows the purchasing commission to give preference to rubberized asphalt paving made from scrap tires by an in-state facility.	• As of January 1, 1992, a $2 waste tire recycling fee applied to each new tire purchase is collected and deposited in the Waste Tire Recycling Fund to pay for tire dump cleanup and recycling. A Waste Tire Recycling Fund was created to pay for cleaning up tire dumps when the responsible party is unknown or cannot afford the cleanup. Effective April 1, 1992, $0.85/per tire (approximately 18 lbs. of shredded tires.) will be paid from the Fund to the processors (shredders) who clean up tire dumps and get tires from wholesalers and retailers on a specific percent basis.	• Haulers must be registered by the state. • All scrap tire generators (tire wholesalers, retailers and certain fleet operators) must obtain an identification number. • Transporters can charge limited disposal fees on tires they deliver to processors who are receiving reimbursements from the Waste Tire Recycling Fund. • Tire dealers who are required to collect waste tire recycling fees may retain 2-1/2 cents from each fee the dealer collects. • Tire transporters must be registered with the Texas Water Commission.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• If more than 100 scrap tires are stored at a single site, they must be processed (cut or shredded). • If over 500 scrap tires are stored on public or private property, the site must be registered with the state, and have a site identification number. • If less than 500 whole tires are stored at a site, the site must have a site identification number. • Processors and shredders (mobile or stationary) must be registered with the Texas Water Commission. • All storage sites will be given an identification number. This includes illegal dump sites. • Processors who participate in the tire dump cleanup program have to pick up tires from wholesalers and retailers at no charge to them. • For reimbursement, processors must remove 25% of the tires they shred from sites on the Priority Enforcement List.	• All tires must be split, quartered, or shredded before disposal. • Processors who participate in the Waste Tire Recycling Fund program to cleanup tire dumps must not dispose of the shredded tires in a landfill but must take them to a recycling, reuse or energy recovery facility. • The Texas Water Commission will maintain a Priority Enforcement List for the tire dumps in the state.	• A 15% price preference for the use of rubber in state funded asphalt paving projects.	• Revising application and annual report forms for transporters, processors, and storage sites. • Establishing work group with local, county, and state government representatives to develop individualized management plans for scrap tire piles.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

UTAH

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Dorothy Adams Salt Lake City County Health Department Sanitation and Safety Bureau 610 South 200 East Salt Lake City, Utah 84111 801-534-4526	• SB 5, passed in May 1990, established a per tire graduated tax. • Local health departments have authority over the management of waste tires. • Two new waste tire bills that would amend the 1990 Waste Tire Bill have been introduced before the 1993 Legislative session. The main difference between the two bills is the amount of reimbursement from the waste tire fund for which recyclers would be eligible.	• As of July 1, 1990, there is a per tire graduated tax on all tire sales including new car sales. Monies will be deposited in a recycling fund. Tax includes: - $1/tire up to 14 inches in diameter; - $1.50/tire 15 to 19 inches; or - $2/tire 19 to 26 inches.	• All haulers and collectors must keep records illustrating how many tires are picked up, how many tires are disposed of and where. Licenses can be suspended if companies are not in compliance. • All haulers and collectors must be licensed. • Salt Lake City regulates scrap tire collection through a manifest system.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• All storage and processing facilities have to be licensed through Health Department. Facilities storing more than 1,000 tires are required to furnish bonds, comply with local zoning and fire ordinances, and are strictly limited as to how many tires can be stored at any one time. The Health Department enforces a manifest system to regulate tire collection.	• Not addressed.	• Recyclers (end users) can receive up to $20/ton for the use of tire-derived materials in manufactured products and in TDF. The end user incentive is administered through local health departments.	

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

VERMONT

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Eldon Morrison Agency of Natural Resources Department of Environmental Conservation Solid Waste Management Division 103 South Main Street Laundry Building Waterbury, Vermont 05671-0407 802-244-7831	• Act 286, passed in June 1990, addresses scrap tire management. • The State Solid Waste Management Program, published in 1989, requires the state to develop and propose a disposal/deposit charge on tires at a rate high enough to encourage the return of tires to dealers and to fund scrap tire management programs. The program also recommends that the state investigate the feasibility of a mobile tire shredding operation and the potential for using rubber asphalt on state roads.	• Loans are available to businesses for processing, converting, and manufacturing.	• No specific regulations.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
• No specific regulations.	• As of January 1, 1992, all tires are banned from disposal in landfills. • Landfills will be allowed to continue accepting tires if the facility functions as a tire recycling facility or a transfer station.	• A 5% price preference is authorized for products containing recycled materials. • A higher price preference is allowed if state entities that will use the product agree on the higher price. • Market development grants are provided to the private sector for the development of new products that may stimulate in-state demand for recyclable materials.	• The Agency of Transportation has used tire chips in one project for slope stabilization and has done some experimental work using asphalt rubber surface treatment. Tires have also been allowed to be used for riverbank and slope stabilization work in several areas, but only above low water level elevations and where environmental concerns are minimal. • A study was commissioned entitled "A Report on the Use of Shredded Scrap Tires in On-Site Sewage Disposal Systems." Effective in 1992, the state approved the use of tire chips in place of crushed stone in septic systems that have a pre-approved design that includes a monitoring system. • The state will approve the use of whole tires for retaining walls on a case-by-case basis.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review; 1993 Forecast, January 1993; and information from States.

VIRGINIA

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Allan Lassiter Department of Waste Management Division of Litter Control and Recycling 101 North 14th Street James Monroe Building, 11th Floor Richmond, Virginia 23219 804-371-0044	· The Waste Tire Act was passed in 1989. · Legislation directed the Department of Waste Management to create a Used Tire Management Advisory Committee to make recommendations on scrap tire management. · Demonstration of the state's overall Scrap Tire Management Plan began in 1992. Components of the plan are increased enforcement, assistance to local governments, and the market assistance demonstration.	· As of January 1, 1990, a $.50/tire disposal fee is imposed on new tire sales. The money is deposited in a Waste Tire Fund. The tax sunsets on December 31, 1994.	· No specific regulations.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· Tire piles at recycling sites may not exceed 1,000 tires without a permit.	· As of July 1, 1992, whole tires are banned from landfills.	· The Waste Tire Act established a 10% tax credit for recycling equipment. Retreading equipment is eligible; tdf is not. · In January 1993, Virginia will begin demonstrating market assistance methods in various parts of the state.	· The Advisory Committee and Department of Waste Management are developing a management program including a state subsidized test burn of tire-derived fuel combined with coal, and a network of tire collection centers. The state has also subsidized a test burn of whole tires at a cement kiln. · The state expects to establish two state funded collection centers by the end of 1992. · A Stockpile Action Plan has been developed to address the management of 400 piles containing on estimated 25 to 50 million tires.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

WASHINGTON

State Contact	Current Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Dale Clark Department of Ecology (DOE) Waste Reduction, Recycling and Litter Control Program Mail Stop PV-11 Olympia, Washington 98504-8711 206-459-6258	· HB 1671, the "Waste Not Washington" Act passed in July of 1989, provides for funding of tire programs. · Washington Advisory Code 173-304-420 addresses storage of scrap tires.	· A $1/tire fee on the retail sale of new tires for five years was established. The funds may be used for: - grants to local governments for removal of tire piles and enforcement; - information and education; - marketing studies; - contracts by the state. · Approximately $3 million per year is collected through the fee.	· Haulers must pay a $250/year license fee and must document delivery of scrap tires under provisions of the current scrap tire law.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· A permit from the local jurisdiction is necessary for tire piles of more than 800 tires. · Storage yard owners must develop site plans with local fire departments for fire control. · Storage yard owners must comply with size and enclosure requirements. · Site owners must document delivery of scrap tires.	· The state's new combustor rules limit the number of tons of solid waste that can be burned in incinerators or industrial boilers that are not solid waste combustion facilities to 12 tons/day. These rules apply to tire fuels and equal 50 tires/hour.	· The State can issue grants to local governments for enforcement or clean-up of tire piles.	· A Waste Tire Advisory Committee was formed to implement the Waste Not Washington Act and to help formulate policy. · The DOE is ranking tire piles across the state, based on environmental health and safety factors, and developing a list of qualified contractors to remove and manage the tires. · The Clean Washington Center is providing technical support for the design and development of new mixing equipment for asphalt-rubber applications and to rubber products manufacturers to develop purchase specifications for recycled rubber products. · The Clean Washington Center is working with DOE and Pierce County officials to develop innovative strategies for the clean-up of a large tire pile. · The Clean Washington Center is providing cooperative support to DOE and the State Highway Administration Research Program in evaluating the performance of different types of rubberized asphalt pavements compared t: conventional asphalt.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

WEST VIRGINIA

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Paul Benedun Division of Natural Resources Solid Waste Management 1356 Hansford Street Charleston, West Virginia 25301 304-558-6350	· October 1991 Special Section. SB 18 - Chapter 20, Article 11, Section 8, effective June 1, 1993 bans the disposal of waste tires in landfills. Incineration of solid waste, including tires, is prohibited until May 1, 1993 except for "pilot" projects.	· Not addressed.	· Regulated by West Virginia Public Service Commission. · Haulers must be permitted.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· No more than 1,000 tires can be stored unless a facility is permitted. · Stationary processing facilities must be permitted. Mobile shredders are not required to have a permit. · Storage at processing facilities is limited to are piles of whole tires, and no more than 9 piles of shredded tires, each pile measuring no more than 200 feet by 50 feet by 15 feet.	· Tires must be split/cut or shredded prior to landfilling. Shreds must then be dispersed in the workface of the fill with other wastes. · Alternate burial plans for non-cut or whole tires will be approved if the plan assures that the tires will stay buried. · Effective June 1, 1993 bans the disposal of waste tires in landfills. Incineration of solid waste, including tires, is prohibited until May 1, 1993 except for "pilot" projects.	· Not addressed.	· Shredded tires may be used as landfill daily cover or in the landfill liner as a leachate drainage.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

WISCONSIN

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Paul Koziar Department of Natural Resources Bureau of Solid and Hazardous Waste Management P.O. Box 7921 Madison, Wisconsin 53707 608-267-9388 Dennis Pippin Southern District Headquarters 3911 Fish Hatchery Road Fitchburg, Wisconsin 53711 608-275-3331	· AB 481, passed in 1987, established a tire fee. · Act 355, passed in 1990, addresses scrap tire recycling programs and landfill bans.	· Since May 1, 1988, there is a $2/tire fee on new vehicle titles. The fee generates approximately $3 million annually. Funds are deposited in the Waste Tire Reimbursement Grant Program.	· All waste collectors, transporters, storage and processing facilities must be licensed.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· All waste collectors, transporters, storage and processing facilities must be licensed. · Proof of financial responsibility for stored tires.	· Effective January 1, 1995, tires must be cut before being disposed of in landfills.	· The Waste Tire Reimbursement Grant Program is designed to financially assist the cost of developing or operating certain types of waste tire reuse, and provides eligible companies with a $20/ton (or $.01/lb) reimbursement for use of waste tire material for energy recovery, construction or in the manufacture of products. $750,000 set aside annually.	· The State's Waste Tire Management or Recovery Grant Program is intended to research new uses and expand existing uses of scrap tires. It has funded the following projects: - air emission testing to evaluate air emissions resulting from the combustion of waste tires with coal and wood waste; - testing fly ash and bottom ash resulting from combustion of waste tires and wood; - environmental assessment of air emissions for the proposed waste tire medical waste incinerator; - testing combustion technology; - investigating fuel feed system designs to accommodate combustion of waste tire material in fluidized bed boilers; - testing the development of various rubber products, such as bed liners for pick-up trucks; - testing leaching characteristics of shredded waste tires; - constructing roads using rubberized asphalt; and - develop pilot waste storage facility. · The state's waste tire cleanup program is intended to clean up nuisance waste tire stockpiles: - $2 million set aside annually to clean up 2 million tires per year; and - cost recovery from responsible parties.

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and Information from States

WYOMING

State Contact	Legislation & Regulations	Funding Sources	Collector, Seller, and Hauler Regulations
Timothy Link Department of Environmental Quality Solid Waste Management Program 122 West 25th Street Herschler Building, 4th floor Cheyenne, Wyoming 82002 307-777-7752	· HB 213, passed in 1989, amends the Solid Waste Management Act for solid waste storage and treatment facilities. It established bonding and location requirements and a permitting system for solid waste facilities, and limits the accumulation of waste, including tires, prior to disposal.	· Not addressed.	· Levels are set for the number of tires that can be stored at retail stores, collection centers, and landfills without obtaining a permit.

Storage and Processor Regulations	Disposal Restrictions	Market Incentives	Other Activities
· Levels are set for the number of tires that can be stored at retail stores, collection centers, and landfills without obtaining a permit. · Landfills must have a permit to store more than 5,000 whole tires. · Regulations establish bonding and location requirements and a permitting system for solid waste facilities. (Tires are defined as a solid waste.)	· Not addressed.	· Not addressed.	

Sources: Scrap Tire News Fourth Annual Legislative Update, January 1992; Scrap Tire News Mid-Year Update, July 1992; Scrap Tire News, Scrap Tire Management in the States, 1992 Legislative and Regulatory Review: 1993 Forecast, January 1993; and information from States.

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

VIRGINIA WASTE TIRE PROGRAM

WASTE TIRE END USER REIMBURSEMENT PROGRAM PACKAGE 1996

The Virginia Department of Environmental Quality (DEQ) is pleased to report on the progress of the Waste Tire End User Reimbursement Program. Under the program, qualified end users of a Virginia waste tire may be eligible for a reimbursement from the Waste Tire Trust Fund of up to $30 per ton of tire material which was recently raised to $50 per ton. The Program was authorized by the Virginia General Assembly through enactment of Sections 10.1-1422.2 and 1422.3 and 58.1-640-644 of the Code of Virginia (copies attached).

The Virginia Waste Management Board adopted the Waste Tire End User Reimbursement Regulation (9VAC 20-150-10), effective on December 13, 1994 and modified on January 4, 1996. A copy of the Regulation is attached. DEQ can distribute up to $1.7 million dollars per year from the Tire Fund for reimbursement.

PROGRAM PROVISIONS

Eligible end uses include: (Paragraph 9VAC 20-150-40 of Regulation)

A. Civil engineering applications which utilize waste tire material as a substitute for soil, sand, or aggregate in construction projects such as road bases and embankments, fill material and daily cover at a permitted (Subtitle D) solid waste facility if the facility's permit is so modified.

B. Burning of waste tire materials for energy recovery.

C. Pyrolysis of waste tires.

D. Products made from waste tire materials such as rubberized asphalt, mats, recreational surfaces, drainage systems, building materials and products.

The waste tires must be shown to have been generated in Virginia through documentation such as a Waste Tire Certification (WTC). Waste tire piles are considered Virginia-generated if they meet one of these criteria (Paragraph 9VAC 20-150-100 of the Regulation):

A. Discarded as the result of a sale, trade, or exchange in Virginia; or

B. from a Virginia tire pile that existed prior to the effective date of the Regulation (December 13, 1994); or

C. from a Virginia tire pile that was created without the property owner's knowledge or permission.

PROGRAM MODIFICATIONS FOR PILE CLEAN UPS

On January 4, 1996, the Virginia Waste Management Board changed the reimbursement rates. Effective April 1, 1996, the reimbursement amount decreased to $22.50 per ton for "current flow" tires and up to $50 per ton of tires generated out of a tire pile. The minimum application amount is 50 tons of waste tire materials. Applications are accepted by the calendar quarter and are paid on a first come, first serve basis.

DOCUMENTATION AND APPLICATIONS

It is recommended that tire haulers, processors and end users use the following forms to document the origin, hauler, processor and end user of Virginia generated waste tires:

1. The Waste Tire Certification (DEQ-WTC), (copy attached) when properly completed, can provide all the information needed to properly document the origin and handling of the tires.

2. Waste Tire Hauler Registration Form (DEQ-HR) (copy attached) provides means for tire "jockey" (haulers) to register with DEQ. Registration is voluntary but highly recommended. If your hauler is not registered, encourage him to do so using this form. If a generator transports his own tires, he should also sign the WTC as a hauler.

3. End User Reimbursement Application (DEQ-EURR) (copy attached) - Eligible end users can apply for a reimbursement using form DEQ-EURR. The records required to justify the claim are to be kept on file with the end user; DEQ auditors will come and inspect the records on a regular basis.

OTHER PROGRAM INFORMATION

Please use the attached Fact Sheets to guide your participation in the End User Reimbursement Program.

1. Waste Tire End User Reimbursements Paid - This fact sheet gives the latest information on the type and amount of applications approved to date.

2. DEQ-WTC Instructions - This fact sheet provides instructions on the use of each section of the WTC.

3. Registered Waste Tire Haulers - This provides a listing of all of the haulers who register with the DEQ in the voluntary hauler registration program. Each hauler is assigned a Hauler ID#.

4. Authorized Collection Centers - These collection centers that will accept Virginia -generated waste tires, if accompanied by a valid Waste Tire Certification. Operating hours and drop off charges may vary so call before you deliver waste tires to these locations.

5. Waste Tire Processors - Processing of waste tires usually requires a Materials Recovery Facility (MRF) permit from DEQ. If you or the processor you use do not have a MRF permit, contact Paul Farrell in the DEQ permitting section at (804) 698-4214. We currently have a list of processors with Virginia permits and out-of-state firms that have permits with their home state. See the enclosed list.

If you have any questions, please call Donna Jackson, Waste Tire Program Analyst, at (804) 698-4225.

10/96

DEQ

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

VIRGINIA WASTE TIRE PROGRAM

WASTE TIRE REIMBURSEMENTS PAID in CY 1995

Company	Tons	Reimbursement	Use
Atlantic Waste Sussex, Va.	14,794	$443,820	Daily cover
BFI, Inc. Glen Bernie, Md.	9,681	$290,428	Landfill drainage media
Georgia Pacific Paper Mill Bedford Co., Va.	5,916	$145,869	Tire-derived fuel (TDF)
Environmental Golf Systems Pine Bluff, N.C.	4,477	$134,310	Drainage system
Chambers Landfill Charles City Co., Va.	4,318	$125,494	Landfill gas collection; daily cover
Dodge Regupol, Inc. Lancaster, Pa.	2,753	$ 82,590	Recycled products, mats
Brown Septic Conway, S.C.	2,480	$ 72,785	Septic drainfields
OGDEN/Martin Fairfax, Va.	2,406	$ 72,180	TDF
DuBrook Concrete Chantilly, VA	2,086	$ 62,580	Highway noise pads
CRAFCO Allentown, Pa.	1,726	$ 51,780	Pavement sealant
SPSA RDF Plant Portsmouth, Va.	1,640	$ 49,380	TDF
LeHigh Cement Co. Leeds, AL	1,590	$ 47,700	TDF

ESSROC Cement Co. Frederick, Md.	1,073	$ 32,190	TDF
TIREC, Inc. Wilmington, Del.	1,070	$ 32,100	Playground material
ABEX Winchester, Va.	584	$ 17,520	Brake pads
Chambers Waste System Amelia, VA	263	$ 7,890	Daily cover
Comer Brothers Sharon, S.C.	336	$ 5,964	Septic drainfields
Jones Construction Longs, S.C.	216	$ 4,175	Septic drainfields
American Blasting Norfolk, VA	129	$ 3,870	Blasting mats
Totals	58,303	$1,705,575	

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

VIRGINIA WASTE TIRE PROGRAM
WTC INSTRUCTIONS

INSTRUCTIONS FOR THE WASTE TIRE CERTIFICATION (WTC)

The Waste Tire Certification is a management information system using a multi-part form developed by the Department of Environmental Quality for use by waste tire generators, haulers, collectors and processors. When properly completed, it can provide all the information needed to properly document the origin and handling of the tires. It is designed to provide assurance to each person that has custody of the waste tires that the tires were properly handled.. In addition, the End User Reimbursement Program depends on the WTC to certify that the tires originated in Virginia.

PART 1 should be completed by **THE GENERATOR** whose act or process produces waste tires. This can be a tire retailer, retreader, or tire pile owner. Each of the blank lines should be filled out completely. The business ID is the tax ID assigned by the tax Department or the Virginia Drivers License number for persons other than tire retailers. Specify the number of tires by type, counting each tire. The Generator should keep his copy (Canary) after it is completed by the Hauler.

PART 2 should be completed by **THE HAULER** who picks up or transports waste tires for the purpose of removal to a permitted storage, processing or handling facility from the Generator listed above. The Hauler may be an employee of the Generator, in which case, writing "SAME" of the first line is sufficient. If the Hauler is a separate company, each of the blank lines should be filled out completely. Also, DEQ offers a voluntary Hauler Registration System; if you transport tires you are encouraged to register. The Hauler should keep his copy (Goldenrod) after it is completed by the Collector.

PART 3 should be completed by **THE COLLECTOR** that is a permitted waste management facility, such as a landfill or transfer station that receives tires. The Collector should keep his copy (Pink) after it is completed by the Processor. If the processor is the same as the Collector writing "same" on the first line is sufficient.

PART 4 should be completed by **THE PROCESSOR** that is engaged in the processing of waste tires including, but not limited to, stamping, stripping, shredding or crumbing; that operates under a permit issued by the local, state, or federal government; or is exempt from permit requirements. The Processor should keep his copy (Blue).

The remaining top copy (White) with the original signatures should be given to the "end user," so that he may claim End User Reimbursement.

DEQ 6/95

PROCESSORS OF VIRGINIA WASTE TIRES

The following is a listing of businesses known to process waste tires generated in Virginia. DEQ does not endorse any of these businesses nor can it ensure compliance with all applicable environmental permits. It is the user's responsibility to ensure that his waste tires are handled properly.

VIRGINIA

Ogden Martin/Fairfax Co.
9898 Furnace Road
Lorton, VA 22079
Permit # VA PBR 510
(703) 690-6960

Buck Scott
Old Dominion Recycling
P.O. Box 1316
Hampton, VA 23661
Permit # VA PBR 006
(804) 723-0757

Christopher Kuhn
Virginia Recycling
P.O. Box 359
Providence Forge, VA 23140
Permit # VA PBR 039
(804) 966-5159

Matt Brownlee
Atlantic Waste Disposal, Inc.
3474 Atlantic Lane
Waverly, VA 23890
Permit # VA PBR 562
(804) 834-8300

Charles White
Tire Recyclers, Inc.
2640 Roxbury Road
Charles City, VA 23030
Permit # VA Experimental 557
(804) 966-5847

Bill Vincent
Emanuel Tire
P.O. Box 2559
Appomattox, VA 24522
Permit #86
(804) 352-8889

David Horne
SPSA
P.O. Box 1346
Chesapeake, VA 23320
Permit # VA PBR 072
(804) 548-2256

MOBILE - VIRGINIA

William Smith
East Coast Mobile Recyclers
VSH 607
Kilmarnock, VA 22482
1-800-435-3202

Syd Farrar
Resource Recycling, Inc.
7716 Midway Place
Lorton, VA 22079
(703) 339-6511

Henry Mikus
Shenandoah County
P.O. Box 452
Woodstock, VA 22664
(703) 984-8573

Pat Therrien
ARRC
1612 Wadsworth Street
Radford, VA 24143
(703) 639-9314

Rodney Rollins
Rollins Enterprises
12026 Kings Highway
King George, VA 22485
(540) 775-4275

James Waldren
TRI-Rinse
P.O. Box 15191
St. Louis, MO 63110
(314) 647-8338

NORTH CAROLINA

William Forrester
T.I.R.E.S.
617 Waughton Street
Building 300
Winston Salem, NC 27804
Permit # NC 34-10TP
(910) 784-0390

Bob Johnson
U.S. Tire
6322 Popular Tent Road
Concord, NC 23154
Permit # NC 13-03
(704) 784-1210

MARYLAND

Lisa Remsung
Cadence/ESSrock Cement
4120 Buckeys Town Pike
Frederick, MD 21702
Permit # MD 1993 RFF
(301) 662-8241

Emanuel Tire Co.
1300 Moreland Drive
Baltimore, MD 21216
Permit # MD 1993 RTR-0042
(410) 947-0725

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

VIRGINIA WASTE TIRE PROGRAM
END USER REIMBURSEMENT APPLICATION
(FORM DEQ-EURR)

COMPANY NAME ______________________________

ADDRESS ______________________________

CITY ______________________________ STATE __________ ZIP __________

FEDERAL ID# ______________________________

PHONE ______________________________ CONTACT ______________________________

WASTE TIRE PILES: TO QUALIFY FOR $50 PER TON REIMBURSEMENT, STATE THE DEQ PILE #__________ AND ATTACH A COPY OF THE CERTIFICATION STAMPED BY A DEQ STAFF PERSON.

LOCATION AND DESCRIPTION OF END USE ______________________________

USE OCCURRED BETWEEN (DATES) ____________________ AND ____________________

COMPLETE THE CALCULATION FOR PURCHASE PRICE OR COST OF USE.

PURCHASE PRICE CALCULATION

TONS OF MATERIAL PURCHASED __________

PURCHASE PRICE PER TON __________

COST OF USE CALCULATION

COST OF USE PER TON __________

MINUS TIPPING FEE __________

NET COST OF USE __________

TONS OF MATERIAL USED __________

CERTIFICATION: I certify that the amount of waste tire material listed above was utilized in the manner specified on this request during the period listed. I further certify that the documentation exist at the office of the company listed above that demonstrates that waste tire material was from waste tires that were Virginia generated as defined in the Waste Tire End User reimbursement Regulations (VR 672-60-1). Additionally, I certify that records exist in our office, for review by DEQ, that shows the purchase price paid or cost of use and the amount of waste tire material that was used.

Signature ______________________________ Date __________

FOR DEQ USE ONLY

USE	TONS	RATE	AMOUNT OF REIMBURSEMENT DUE
__________	__________	__________	__________

APPROVED FOR PAYMENT PROCESSING ______________________________ Date __________

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

VIRGINIA WASTE TIRE PROGRAM
WTC INSTRUCTIONS

INSTRUCTIONS FOR THE WASTE TIRE CERTIFICATION (WTC)

The Waste Tire Certification is a management information system using a multi-part form developed by the Department of Environmental Quality for use by waste tire generators, haulers, collectors and processors. When properly completed, it can provide all the information needed to properly document the origin and handling of the tires. It is designed to provide assurance to each person that has custody of the waste tires that the tires were properly handled.. In addition, the End User Reimbursement Program depends on the WTC to certify that the tires originated in Virginia.

PART 1 should be completed by **THE GENERATOR** whose act or process produces waste tires. This can be a tire retailer, retreader, or tire pile owner. Each of the blank lines should be filled out completely. The business ID is the tax ID assigned by the tax Department or the Virginia Drivers License number for persons other than tire retailers. Specify the number of tires by type, counting each tire. The Generator should keep his copy (Canary) after it is completed by the Hauler.

PART 2 should be completed by **THE HAULER** who picks up or transports waste tires for the purpose of removal to a permitted storage, processing or handling facility from the Generator listed above. The Hauler may be an employee of the Generator, in which case, writing "SAME" of the first line is sufficient. If the Hauler is a separate company, each of the blank lines should be filled out completely. Also, DEQ offers a voluntary Hauler Registration System; if you transport tires you are encouraged to register. The Hauler should keep his copy (Goldenrod) after it is completed by the Collector.

PART 3 should be completed by **THE COLLECTOR** that is a permitted waste management facility, such as a landfill or transfer station that receives tires. The Collector should keep his copy (Pink) after it is completed by the Processor. If the processor is the same as the Collector writing "same" on the first line is sufficient.

PART 4 should be completed by **THE PROCESSOR** that is engaged in the processing of waste tires including, but not limited to, stamping, stripping, shredding or crumbing; that operates under a permit issued by the local, state, or federal government; or is exempt from permit requirements. The Processor should keep his copy (Blue).

The remaining top copy (White) with the original signatures should be given to the "end user," so that he may claim End User Reimbursement.

DEQ 6/95

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

VIRGINIA WASTE TIRE PROGRAM
WASTE TIRE HAULER REGISTRATION
(FORM DEQ-HR)

DEQ has developed a voluntary waste tire hauler registration system. Any transporter can apply and will qualify if they have a valid Tax ID number and/or a number issued on their DMV license, and have no outstanding compliance or enforcement actions with DEQ or the locality in which they operate. Virginia does not regulate the transporters of any solid waste, which includes waste tires. There are of course, federal transportation requirements (CDL, placards, etc.) and local business license requirements that must be met.

DEQ will provide the list of currently registered haulers to anyone requesting it. DEQ does not endorse any of the registered haulers nor can it ensure that they comply with all applicable environmental laws, regulations and permits. It is the user's responsibility to do so.

To register, complete the form and mail it to DEQ. After investigation of DEQ records on enforcement and a positive response from the locality, DEQ will issue a Hauler ID Number to be used in all future transactions.

For more information on the Hauler Registration System, contact the Waste Tire Program at (804) 698-4225.

APPLICATION FOR HAULER REGISTRATION

BUSINESS NAME______________________________TAX ID__________

MAILING ADDRESS____

____

TELEPHONE__________________________CONTACT__________________

COUNTY OR CITY WHERE BUSINESS IS LOCATED______________________

ESTIMATED NUMBER OF TIRES HAULED PER YEAR

CAR____________________TRUCK______________OVERSIZED______

USUAL DESTINATION FOR WASTE TIRES____________________________

DATE OF REQUEST__________ _______________ _____________

SIGNATURE____

DEQ-HR

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

VIRGINIA WASTE TIRE PROGRAM AUTHORIZED COLLECTION CENTERS

The following collection centers will accept Virginia-generated waste tires, if accompanied by a valid Waste Tire Certification. Operating hours and drop-off charges may vary so call before you deliver waste tires to these locations.

If you need assistance, call the Virginia Waste Tire Program at (804) 698-4225.

LOCALITY	LOCATION	PHONE NUMBER
TIDEWATER AREA		
Norfolk, Portsmouth Chesapeake, VA Beach, Suffolk Franklin, Isle of Wright Co. and Southampton Co.	SPSA Tire Processing Center; Suffolk Landfill; Route 58	(804) 548-2256
Accomack Co.	County Landfill Route 620, Bobtown Road	(804) 787-2814
Northampton Co.	County Landfill Seaside Road	(804) 331-2699
RICHMOND - PETERSBURG AREA		
Chesterfield Co.	Northern Area Transfer St. 3200 Warbro Road	(804) 744-7309
Goochland Co.	County Transfer Station Route 632 near Route 522	(804) 556-5374
Hanover Co.	County Landfill Route 301	(804) 537-6183
Henrico Co.	Nuckols Road Landfill Ford Country Lane	(804) 747-1865
Powhatan Co.	County Transfer Station 2407 Mitchell Road	(804) 598-5673
City of Petersburg	City Landfill	(804) 733-2417

City of Petersburg also serving: Colonial Heights Hopewell Prince George Co. Ft. Lee	City Landfill 390 Industrial Pkwy	(804) 733-2417
City of Richmond	City Transfer Station 3506 N. Hopkins Road	(804) 785-5053

LYNCHBURG AREA

Lynchburg	City Landfill Concord Turnpike	(804) 847-1806
Amherst Co.	County Landfill Route 733	(804) 946-5817
Appomattox Co.	County Landfill Route 634	(804) 352-8184
Bedford City	City Landfill Orange Street	(703) 586-7186
Bedford Co.	County Landfill Route 43 South	(703) 297-1024
Campbell Co.	County Landfill Route 674	(804) 821-7125

SOUTHWESTERN VIRGINIA

Bath Co.	County Transfer Station Route 611	(804) 839-5468
Botetourt Co.	County Landfill Route 779	(703) 992-5111
Craig Co.	County Transfer Station Route 615	(703) 864-7105
Franklin Co.	County Landfill Route 220 South	(703) 489-1600
Floyd Co.	Transfer Station Route 710	(703) 745-9371

Giles Co.	County Conv. Center Route 626	(703) 626-7046
Montgomery Co.	County Landfill	(703) 382-5796
Radford/Pulaski Co.	New River Res. Auth. Landfill Rt. 232/I 81	(703) 639-5743
Smyth Co.	County Transfer Station Route 107	(703) 646-2907
Lee Co.	County Transfer Station Route 70	(703) 346-7788
Bristol City	City Landfill Shakesvill Road	(703) 645-7392
Scott Co.	Transfer Station Route 72	(703) 452-4825
Wise Co. Norton	Blackwell Landfill Route 58 Alt.	(703) 679-0515

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

VIRGINIA WASTE TIRE PROGRAM
REGISTERED WASTE TIRE HAULERS

THE FOLLOWING BUSINESSES HAVE VOLUNTARILY REGISTERED WITH THE VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ). DEQ DOES NOT ENDORSE ANY OF THESE BUSINESSES NOR CAN IT ENSURE THEIR HANDLING OF WASTE TIRES IS IN COMPLIANCE WITH ALL APPLICABLE ENVIRONMENTAL LAWS, REGULATIONS AND PERMITS. IT IS THE USER'S RESPONSIBILITY TO ENSURE THAT HIS WASTE TIRES ARE HANDLED PROPERLY.

ID #	BUSINESS NAME	CONTACT	ADDRESS	TAX ID #	ISSUE DATE
1001	SPSA	David Horne (804) 548-2256	P.O. Box 1346 Chesapeake, VA 23320	54-1087433	Renewed 9/27/96
~~1003~~	~~Terran Kraft Work, Inc.~~	~~Bradley Werrell~~ ~~(703) 382-3486~~	~~3107 Eagle Brook Road~~ ~~Christiansburg, VA 24020~~	~~225-06-7025~~	~~6/7/94~~
1006	US Tire Recycling	Mike Campbell (800) 328-8473	6322 Poplar Tent Road Concord, NC 28027	56-1775006	Renewed 10/3/96
1008	Resource Recycling	Syd Farrar (703) 339-6511	7716 Midway Place Lorton, VA 22079	54-1678242	Renewed 10/3/96
1009	American Truckload Transport	Artis Miles (804) 798-0566	P.O. Box 6801 Richmond, VA 23230	54-1207436	Renewed 10/3/96
1010	Atlantic Waste Disposal, Inc.	Sandy Logan (804) 834-8300	3474 Atlantic Lane Waverly, VA 23890	36-3852536	Renewed 10/3/96

1011	Confederate Tire	Michael Conner (703) 373-9075	7036 Battlefield Green Drive Fred'burg, VA 22407	54-1579394	Renewed 12/27/95
1012	Virginia Custom Grinding	Michael Scott (703) 972-4100	11304 Wilderness Park Dr. Spotsylvania, VA 22553	54-1710244	Renewed 12/27/95
1013	Resource Products	David Bailey (804) 834-8300	3474 Atlantic Lane Waverly, VA 23890	36-3852536	Renewed 12/29/95
1014	Chandler Enterprises	Richard Barton (804) 486-2545	333 W. Farmington Road VA Beach, VA 23454	139-28-0670	Renewed 1/5/96
1015	Virginia Recycling	Chris Kuhn (804) 966-5159	P.O. Box 359 Prov. Forge, VA 23140	54-1318470	Renewed 1/5/96
1016	Pro-Per Tire Services	Ken Proper (804) 558-0614	3301 S. Military Hwy. Chesapeake, VA 23323	54-1514602	Renewed 1/5/96
1017	Guynn Hauling	Charles Guynn (804) 654-0918	22137 Cross Keys Road Newsoms, VA 23874	228-86-4717	Renewed 1/17/96
1018	MetalPro, Inc.	Bob Ward (703) 451-8300	7956 Twist Lane Springfield, VA 22153	54-146388	Renewed 1/17/96
1019	Garner Tire	Carl Garner (703) 56304071	921 Hunt Ave. NW Roanoke, VA 24012	223-68-6673	Renewed 1/17/96
~~1020**~~	~~VA Rubber Recycling, Inc.~~	~~Marcus Haley~~ ~~(703) 483-2926~~	~~506 State Street~~ ~~Rocky Mount, VA 24151~~	~~54-1713049~~	~~1/17/95~~
1021	Sanford Tire Removal	Percy Sanford (804) 275-8710	2420 Coles Street Richmond, VA 23234	226-64-8133	Renewed 1/17/96
1022	Penn Turf, Inc.	P. Bottenfield (814) 696-7669	RR 4 Box 624 Hollidaysburg, PA 16648	184-42-5752	Renewed 2/27/96
1023	Old Dominion Recycling, Inc.	Buck Scott (804) 723-0757	P.O. Box 1316 Hampton, VA 23661	54-0925163	Renewed 2/27/96
1024	Reclamator, Inc.	Buck Scott (804) 723-0757	P.O. Box 1438 Hampton, VA 23661	54-1460952	Renewed 2/27/96
1025	Taylor Disposal Services, Inc.	Bryan Wheeler (804) 360-1304	11 Ranhorne Ct. Hampton, VA 23661	54-1650049	Renewed 2/27/96

1026	M&S Tire Disposal	Marion Marshall (703) 582-2313	5139 Stanfield Road Spotsylvania, VA 22553	54-1735774	Renewed 2/27/96
1027	John Toms	John Toms (804) 737-6172	5 West McClellan St. Sandston, VA 23150	223-68-7143	Renewed 2/27/96
1028	Quality Used Tires, Inc.	J. Beninghove, Jr. (804) 737-7306	305 W. Williamsburg Road Sandston, VA 23150	223-68-7143	Renewed 2/27/96
1029	Tires Into Recycled Energy & Supplies, Inc.	James Gentry (910) 784-0390	617 Wanghtown Street Building 300 Winston Salem, NC 27107	56-1792767	Renewed 2/27/96
1030	Davis Industries, Inc.	Bill Bukevrz (703) 550-7402	P.O. Box 507 9920 Richmond Hwy, Lorton, VA 22079	54-0882577	Renewed 2/27/96
1031	Emanuel Tire	Mark Rannie (410) 947-0660	1300 Moreland Ave. Baltimore, MD 21216	52-0881822	Renewed 2/27/96
1032	Intenational Recycling, Inc.	Carroll Chandler 1 800 638-3732	3 Koger Center, Suite 101 Norfolk, VA 23502	54-174135	Renewed 2/27/96
1033	J&O Auto & Tire	Owen Davidson (804) 633-5829	13395 Villeboro Raod Woodford, VA 22580	001622504-5	Renewed 2/27/96
1034	T's Tire	Linda Puckett (804) 796-5946	5530 Old Warson Drive Richmond, VA 23237	226-13-7815	Renewed 4/18/96
1035	Casings, Inc.	Jim Fabrizio (518) 943-9404	P.O. Box 731 Catskill, NY 12414	13-3285045	Renewed 4/20/96
1036	Casings of NJ, Inc.	Jim Fabrizio (518) 943-9404	711 Ramsey Ave. Hillside, NJ 07205	22-3236401	Renewed 4/20/96
1037	VA Tire Removers	Emmett Barker (804) 829-6271	7223 Barnetts Road Charles City, VA	223-70-4004	Renewed 4/20/96
1038	Shenandoah Tire CO.	Brad Shaner (804) 845-1300	613 5th St. Lynchburg, VA 24504	54-0907890	Renewed 4/20/96
1039	The Tire Shop	Grace Ross (804) 492-4838	71 Airport Road Farmville, VA 23901	226-48-9631	Renewed 9/17/96

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

1993 WASTE MANAGEMENT ACT

§ 10.1-1422.1
Disposal of waste tires.

The Department shall develop and implement a plan for the management and transportation of all waste tires in the Commonwealth (1989. c 630; 1993. c. 211)

§ 10.1-1422.2
Waste Tire Trust Fund established; use of moneys; purpose of Fund.

A. All moneys collected pursuant to § 58.1-642 minus the necessary expenses of the Department of Taxation for the administration of this tax as certified by the Tax Commissioner, shall be paid into the treasury and credited to a special nonreverting fund known as the Waste Tire Trust Fund, which is hereby established. Any moneys remaining in the Fund shall not revert to the general fund but shall remain in the Fund. Interest earned on such moneys shall remain in the Fund and be credited to it. The Department of Waste Management is authorized and empowered to release moneys from the Fund, on warrants issued by the State Comptroller, for the purposes enumerated in this section, or any regulations adopted thereunder.

B. Moneys from the Fund shall be expended to:

1. Pay the costs of implementing the waste tire plan authorized by § 10.1-1422.1 as well as the costs of any programs created by the Department pursuant to such a plan and

2. Provide partial reimbursement to persons for the costs of using waste tires or chips or similar materials.

C. Reimbursements under § 10.1-1422.4 shall not be made until regulations establishing reimbursement procedures have become effective (1993.c.211)

§ 10.1-1422.4
Partial reimbursement for waste tires; eligibility; promulgation of regulations.

A. The intent of the partial reimbursement of costs under this section is to promote the use of waste tires by enhancing markets for waste tires or chips or similar materials.

B. Any person who (i) purchases waste tires generated in Virginia and who uses the tires or chips or similar material for resource recovery or other appropriate uses established by regulation may apply for partial reimbursement of the costs of purchasing the tires or chips or similar material or (ii) uses but does not purchase waste tires or chips or similar material for recovery or other appropriate uses as established by regulations may apply for reimbursement of part of the cost of such use.

C. To be eligible for the reimbursement (i) the waste tires or chips or similar materials shall be generated in Virginia, and (ii) the user of the waste tires shall be the end user of the waste tires or chips or similar material of similar materials. The end user does not have to be located in Virginia.

D. Reimbursements from the Waste Tire Trust Fund shall be made quarterly. Any costs reimbursed under this section shall not exceed seventy-five percent of the previous year's collections as certified by the Department of Taxation.

E. The Board shall promulgate regulations necessary to carry out the provisions of this section. The regulation shall include, but not limited to :

1. Defining the types of uses eligible for partial reimbursement;

2. Establishing procedures for applying for and processing of reimbursements; and

3. Establishing the amount of reimbursement.

F. For the purposes of this section "end user" means (i) for resource recovery, the person who utilizes the heat content or other forms of energy from the incineration or pyrolysis of waste tires, chips, or similar materials and (ii) for other eligible uses of waste tires, the last person who uses the tires, chips, or similar materials to make a product with economic value. If the waste tire is processed by more than one person in becoming a product, the end user is the last person to use the tire as tire chips, or as similar material. A person who produces tire chips or similar materials and gives or sells them to another person to use is not an end user. (1993,c.211.)

CHAPTER 6.1.
VIRGINIA TIRE TAX.

§ 58.1-640. Definitions. - As used in this chapter, unless the context requires a different meaning:

"Fund" means the Waste Tire Trust Fund.

"Retailer of tires" means any person engaged in the business of making retail sales of tires, whether new or used, within this Commonwealth. "Retail sales" do not include the sale of tires to a person solely for the purpose of resale, provided the subsequent retail sale in this Commonwealth is subject to the tax levied by the provisions of this chapter.

"Tire" means a continuous solid or pneumatic rubber covering encircling the wheel of a vehicle used for transportation purposes. (1989, c. 630.)

§ 58.1-641. Imposition of tire tax. - There is hereby levied and imposed upon every retailer of tires in the Commonwealth, in addition to all other taxes and fees of every kind now imposed by law, a tax of fifty cents for each new tire sold by such retailer. (1989, c. 630.)

§ 58.1-642. Collection of tire tax; deductions; exemptions. - A. The tire tax levied under this chapter shall be collected by the Tax Commissioner in the same manner as is the retail sales and use tax, pursuant to Chapter 6 (§ 58.1-600 et seq.) of this title.

B. The tax imposed under § 58.1-641 shall not apply to new tires for:

1. Any device moved exclusively by human power;
2. Any device used exclusively upon stationary rails or tracks; or
3. Any device used exclusively for farming purposes, except a farm truck.

C. For the purpose of compensating a retailer of tires for accounting for and remitting the tax levied by this chapter such retailer shall be allowed five percent of the amount of tax due and accounted for in the form of a deduction in submitting his return and paying the amount due by him if the amount due was not delinquent at the time of payment. (1989, c. 630.)

§ 58.1-643. Waste Tire Trust Fund established; use of moneys. -

A. All moneys collected pursuant to § 58.1-642, minus the necessary expenses of the Department of Taxation for the administration of this tax as certified by the Tax Commissioner, shall be paid into the treasury and credited to a special nonreverting fund known as the Waste Tire Trust Fund, which is hereby established.

B. Any moneys remaining in the Fund shall not revert to the general fund but shall remain in the Fund. Interest earned on such moneys shall remain in the Fund and be credited to it.

C. The Department of Waste Management is hereby authorized and empowered to release moneys from the Fund, on warrants issued by the State Comptroller, for any of the purposes enumerated in § 10.1-1422.1, or any regulations adopted thereunder. (1989, c. 630.)

§ 58.1-644. Provisions of Chapter 6 of this title to apply, mutatis mutandis. - The provisions in Chapter 6 (§ 58.1-600 et seq.) of this title shall apply to this chapter, mutatis mutandis, except as herein provided and except that replacement truck tires shall be subject to the tax imposed pursuant to this chapter. (1989, c. 630.)

§ 10.1-1418. Penalty for violation of article. — Every person convicted of a violation of this article for which no penalty is specifically provided shall be punished by a fine of not more than fifty dollars for each such violation. (1987, c. 234, § 10-277.5; 1988, c. 891.)

§ 10.1-1418.1. Improper disposal of solid waste; civil penalties. — A. It shall be the duty of all persons to dispose of their solid waste in a legal manner. Any owner of real estate in this Commonwealth, including the Commonwealth or any political subdivision thereof, upon whose property a person improperly disposes of solid waste without the landowner's permission, shall be entitled to bring a civil action for such improper disposal of solid waste. When litter is improperly disposed upon land owned by the Commonwealth, any resident of the Commonwealth shall have standing to bring a civil action for such improper disposal of solid waste. When litter is improperly disposed of upon land owned by any political subdivision of this Commonwealth, any resident of that political subdivision shall have standing to bring a civil action for such improper disposal of solid waste.

B. In any civil action brought pursuant to the provisions of this section, when the plaintiff establishes by a preponderance of the evidence that (i) the solid waste or any portion thereof had been in possession of the defendant prior to being improperly disposed of on any of the properties referred to in subsection A of this section and (ii) no permission had been given to the defendant to place the solid waste on such property, there shall be a rebuttable presumption that the defendant improperly disposed of the solid waste.

C. Whenever a court finds that a person has improperly disposed of solid waste pursuant to the provisions of this section, the court shall assess a civil penalty of up to $200 against such defendant. All civil penalties assessed pursuant to this section shall be paid into the state treasury and deposited by the State Treasurer into the Virginia Environmental Emergency Response Fund pursuant to Chapter 25 of this title, except as provided in subsection D.

D. Any civil penalty assessed pursuant to this section in a civil action brought by a political subdivision for improper disposal of solid waste upon land owned by the political subdivision shall be paid into the treasury of the political subdivision, except where the violator of this section is the political subdivision or its agent. (1990, c. 430; 1991, c. 718; 1992, c. 27.)

The 1992 amendment, in subsection C, substituted "that a person has improperly disposed" for "a defendant guilty of improper disposal" in the first sentence, and added "except as provided in subsection D" to the end of the second sentence, and added subsection D.

§ 10.1-1418.2. Improper disposal of tires; exemption; penalty. — A. It shall be unlawful for any person knowingly to store, dump, litter, dispose of, speculatively accumulate or otherwise place more than 500 waste tires on public or private property in the Commonwealth, without first having obtained a permit as required by § 10.1-1408.1. For the purposes of this section, *"speculatively accumulated waste tires"* means any waste tires that are accumulated before being used, reused, or reclaimed or in anticipation of potential use, reuse, or reclamation. Waste tires are not being accumulated speculatively when they can be used, reused, or reclaimed; they have a feasible means of use, reuse, or reclamation available; and at least seventy-five percent of the waste tires accumulated are being removed from the site annually.

B. No person shall knowingly, or knowingly allow others to, store, dump, litter, dispose of, speculatively accumulate or otherwise place on his property more than 500 waste tires, without first having obtained a permit as required by § 10.1-1408.1.

C. Any person who violates any provision of this section shall be guilty of a Class 6 felony.

D. Salvage yards licensed by the Department of Motor Vehicles shall be exempt from this section; provided, that the waste tires do not pose a hazard or a nuisance. (1994, c. 556.)

Cross references. — As to punishment for Class 6 felonies, see § 18.2-10.

COMMONWEALTH OF VIRGINIA
WASTE TIRE CERTIFICATION

101423

PART 1 - GENERATOR CERTIFICATION

Company Name ____________________

Address ____________________

City ____________ State ______ Zip ______

Telephone ( ) ____________________

Business ID or VDL ____________________

Specify Quantities by Count or Tons

Car / Light truck ________

Truck ________

Oversize ________

or

Tons of tire material ________

I certify under penalty of law that the information contained on this form is to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of a fine and imprisonment for willful violations. I further certify that, to the best of my knowledge and belief, all the waste tire materials identified by me on this Waste Tire Certification and delivered to the hauler below were generated in the Commonwealth of Virginia in accordance with the Waste Tire End User Reimbursement Regulations (VR 672-60-1).

Signature ____________________ Date ________

PART 2 - HAULER CERTIFICATION

Company Name ____________________

Address ____________________

City ____________ State ______ Zip ______

Telephone ( ) ____________________

Business ID or VDL ____________________

Specify Quantities by Count or Tons

Car / Light truck ________

Truck ________

Oversize ________

or

Tons of tire material ________

I certify that the waste tire materials listed in this section were received from the generator in the amounts indicated, to the best of my knowledge and belief.

Signature ____________________ Date ________

PART 3 - COLLECTOR CERTIFICATION

Company Name ____________________

Address ____________________

City ____________ State ______ Zip ______

Telephone ( ) ____________________

Business ID or VDL ____________________

Specify Quantities by Count or Tons

Car / Light truck ________

Truck ________

Oversize ________

or

Tons of tire material ________

I certify that the waste tire materials listed in this section were received from the generator or hauler in the amounts indicated, to the best of my knowledge and belief.

Signature ____________________ Date ________

PART 4 - PROCESSOR CERTIFICATION

Company Name ____________________

Address ____________________

City ____________ State ______ Zip ______

Telephone ( ) ____________________

Business ID or VDL ____________________

Specify Quantities by Count or Tons

Car / Light truck ________

Truck ________

Oversize ________

or

Tons of tire material ________

I certify that the waste tire materials listed in this section were received from the generator, hauler, or collector in the amounts indicated, to the best of my knowledge and belief.

Signature ____________________ Date ________