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INVENTORY OF BRAZILIAN CAPABILITIES FOR SMALL- AND MEDIUM-SCALE INDUSTRIES*

Prepared by
Department for Programme and Project Development

*This document has not been edited.

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Preface

The aim of the Inventory of Brazilian capabilities for small- and medium-scale industries is to promote, on a practical basis, economic and technical co-operation among developing countries. It not only identifies companies, institutions, availability of resources, and data bases and similar instruments, which are common in directories, but also specifies, whenever possible, the basis of co-operation offered by the owners of technologies, processes and capabilities and, in some cases, qualifies and quantifies this basis. It is intended to be an instrument for promoting South-South co-operation on both the private and official levels. It is impossible at present to compile an exhaustive inventory of all capabilities in Brazil for small- and medium-scale industries. The Inventory will be up-dated periodically, however, not only in terms of sector coverage, but also in terms of the basic preoccupations of and queries faced by the recipient country/partner, even at the planning stage, when there is a need to determine which type of industry and what requirements are necessary to start negotiations with potential partners.

This inventory was prepared by the Section for Economic Co-operation among Developing Countries, Special Programmes and Activities Division of the Department for Programme and Project Development, with the help of a Brazilian consultant, Mr. Rogerio T. Magahhães.

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INVENTORY OF BRAZILIAN CAPABILITIES FOR SMALL AND MEDIUM-SIZED INDUSTRIES

Objectives

The inventory of Brazilian capabilities for small and medium-sized industries forms a part of the broad UNIDO programme for South-South cooperation.

South-South cooperation in the sector of the non-sophisticated industries, from the point of view of the developing countries, has the following advantages:

- These are industries tried out and adapted to operations with labour at the level of education normally encountered in developing countries, and hence capable of absorbing larger numbers of unskilled or semi-skilled workers;

- They are also intended for use of local raw materials normally derived from primary activities (agriculture, mineral extraction, etc);

- The scale of production is such that it can be adapted to the size of the national or regional market, therefore permitting import substitution;

- These industries transform local raw materials into products that can be placed on the international market and thereby generate hard currency;

- They do not usually require heavy investment, pay licensing fees or royalties, or even use equipment of patented design;

- There is no resultant "technological dependency", and a contribution may even be made to the establishment of other local industries and services (downstream or upstream);

- Since the suppliers of the industry (for technology, equipment, etc), are from a developing country, there is greater propensity to use local facilities (civil works, erection, items produced locally, etc);

- Cost of maintenance of such industries is not high, since they do not require highly trained labour nor very expensive spare parts.

As mentioned previously, many of the industries in question, of non-sophisticated design, function at the interface of the industry and the primary activities, using inputs generated by agriculture, animal husbandry, fisheries, forestry operations, mining, etc. Such industries therefore have the function of fostering existing primary activities and creating new ones.

Typical instances of this stimulating function are to be seen in agro-industry:

- Processing and storage of grains that would otherwise have to be marketed right after harvesting to avoid spoilage, foregoing in many instances opportunities of better prices at a later date;

- Processing of oil seeds and other agricultural products to obtain final products of greater value, easier to handle and preserve;

- Utilization of by-products from processing of agricultural inputs (to obtain livestock feeds, etc).

A similar approach can be adopted in relation to animal husbandry and the fisheries.

The "integrated projects" are another idea stemming from the complementarity of primary and industrial activities. One example of this is alternate planting of sugar cane and sugar-bearing sorghum so as to permit operations of alcohol distilleries the whole year round, in conjunction with cattle breeding, using as a basic feed sugar cane tips, sorghum and hydrolyzed bagasse.

Another useful factor to be noted is that the simplicity of the industries referred to could induce their immediate application under a plan of concrete action to the benefit of the less developed countries. Such action might be aimed at the less developed nations of the African continent within the framework of the "Industrial Development Decade for Africa".

Another idea associated with the simplicity of the industries presented in this inventory is the "de-mystification" of industrial processes. Resistence to industrialization may stem not only from problems of a political nature but also from unawareness of how simple certain industries may actually be, and what a considerable contribution they make to the training of industrial labour to perform more complex tasks. This makes for not only technical development but also progress in managerial terms.

Thus, the basic idea is to apply industrial technologies that are not sophisticated (though not, on that account, obsolete) in developing countries, based on Brazilian experience.

Brazil has built up a fund of experience in the adaptation of imported technologies and, at the same time, has developed its own technology in many fields of activity. Both experiences have been applied in less developed regions of the country, in a manner more suitable for utilization by the Third World countries. It should be borne in mind, moreover, that sometimes, countries have lost the concept of what small-scale operations mean. Hence, the present "Inventory" is aimed at small and medium-sized industries.

It has been Brazil's own experience in the less developed regions of its territory, that non-sophisticated industries, operating on a small scale, are able to co-exist with other larger and more advanced units in the more advanced areas of the country. This is proof positive that the former are by no means obsolescent, and are indeed themselves quite efficient.

Hence, the purpose of this inventory is to motivate entrepreneurs and officials of national and provincial governments in developing countries to study the possibility of setting up local industries, availing themselves of Brazil's experience with tried, simple and efficient industries.

Who Participates in the Inventory

The Inventory consists of two different sections: the first one contains a collection of Brazilian entities; the second part gives a series of industry profiles.

The Brazilian entities include industry associations, research institutes, consulting firms and industrial companies (grouped by sectors of activity).

The largest contingent comprises industrial firms manufacturing equipment. These are in fact "factories that build factories". Many of them are in a position to mount a "complete plant" if the client so desires. All of them have had experience in little-developed areas of Brazil and many have already supplied complete units or individual pieces of equipment to other developing countries.

It has been deemed interesting to include participation by research institutes since these are the instruments most suitable to the development of processes and/or products derived from local raw materials in the developing countries. In certain cases these raw materials afford some idiosyncrasy that may call for some kind of adaptation to a particular process or item of equipment, and this can be done at the research institutes.

The research institutes are also important centers for basic and advanced education and training of human resources, besides fostering the birth and development of technological inovations.

Consulting engineering firms have been included for the following reasons:

- they are useful for mounting packages, something the equipment manufacturers are not always in a position to do. To put up a spinning, weaving and finishing plant, for instance, calls for the cooperation of a consulting firm, since the manufacturers of textile machines are specialized in the various sectors of the industry and are not "generalists" in the field.

- they are also useful for "opening up the packages" so that local facilities may be "spliced in". The level of incorporation of local facilities is obviously going to depend on the degree of industrial progress in the particular country or region. In many cases the items imported may be from more than one source, in which circumstances the consulting firm performs a function of integration. In a extreme situation, for instance, the respective know-how or "black box" may be derived from a third country and need to be "broken down" or "adapted" in order to be usable in the receiving country;

- many consulting engineering firms have specific know-how in industries of interest to developing countries. Here, too, it may be possible to set up a combination of research institute with consulting engineering operation, the latter handling the "engineering" of a technological development originally devised by the research institute.

Since the inventory is not intended to be exhaustive, it has been deemed that to list research institutes and consulting engineering firms side by side with equipment manufacturers will keep an open door for new ideas and new participants.

Finally, three industry associations are participating in the inventory, as a way the Brazilian industrialists found to welcome their colleagues from all over the world to take advantage of their experience in developing areas.

How to use the Inventory

When an industrial opportunity arises, the entrepreneur or person responsible for administering a government department should address his inquiry to an entity listed in the sector of activity corresponding to the opportunity being surveyed.

To obtain an earlier and more effective reply, inquiries should generally be sent in after certain key parameters have already been defined, such as, for instance, raw materials to be used ,

intended capacity, specifications of final product, etc. In many cases, indeed, the first step of all is precisely that of characterizing the raw material, as in the case of the clay ceramic industry. There are a number of firms and research institutes in a position to carry out the necessary tests.

If the idea of the industry is still embryonary, the best thing to do is to get in touch with research institutes or consulting firms that have experience in the particular sector. It will then be possible to define industrial parameters on the basis of which it would be prepared pre-feasibility and/or feasibility studies.

A number of entities are prepared to send technicians to the consulting countries to carry out diagnoses on the spot. They are likewise prepared to receive visitors and draw up a suitable program of technical visits.

Generally speaking, the participating firms are in a position to present "integrated" or "turn key projects" capable of meeting the requirements of the developing countries. This does not, however, mean that local components could not also be included. Such local items might, for instance, include civil works (sheds, buildings, equipment foundations), erection activities and so on.

Some entities receive trainees and provide training courses.

Normally, after the cooperation arrangement has been stablished, suppliers will provide labor training, pre-operational assistance and start-up facilities. Where necessary, moreover, they may also provide technical assistance in operation.

It is advisable, generally speaking, that interested parties in developing countries make their inquires as specific as possible and indicate precisely what kind of support they look for.

Sectors covered by the Inventory

The inventory covers the sectors listed beneath.

Agro-Industries (including foodstuff industries)

- fruits handling (selecting, classifying, packing, conservation)
- fruit juices extraction
- preserved and dried fruits and vegetables
- candies and pulps of fruits
- soft drinks
- flours, noodles and baking
- grain storage
- grain processing (wheat, corn, rice, sorghum, soya, beans, coffee, sun flower, etc)
- soluble coffee
- coffee roasting
- vegetable oils (soya, palm, copra, etc), oil refining
- margarine, vegetable fats
- hydrogenation of vegetable oils
- dairy products (cheese, butter, etc)
- milk powder
- soya bean milk
- pasteurization (milk, flours, etc)
- beer
- cassava (manioc) products
- sugar from sugar cane
- meat and meat products (beef, pork, sea food and poultry)
- foodstuff additives
- seeds processing
- packing for foodstuffs
- alcohol from sugar cane
- cotton processing
- fodder processing
- livestock feeds
- consulting engineering for agro-industries and foodstuff industries

Building Materials Industry

- red clay ceramic (bricks, roofing tiles, floor tiles,drain pipes)
- sanitary ceramic

- ceramic coatings (floor tiles, wall tiles)
- porcelane tableware
- cement and lime
- cement-based products (lampstandards, drain pipes, blocks, etc)
- concrete mixing plant

Chemical Industry

- basic chemical products
- fertilizers
- paper
- paints
- soap
- pharmaceutical products
- consulting engineering for the chemical industry

Textile Industry

- spinning
- weaving
- finishing
- knitwear
- garments
- plant environment conditioning
- consulting engineering for the textile industry

Wood Processing Industry

- sawmill
- plywood and veneers
- mechanical wooden pulp
- preservation of timber
- carpentry and cabinet making
- consulting engineering for the wood processing industry

Leather Industry

- tannery
- leather finishing
- footware

Miscellaneous

- slaughter houses (cattle, hogs, goats, poultry)
- poultry industry
- cryogenic units
- polyurethane foam mattresses
- plate working shops
- internal combustion engine boring (recuperation)
- tires and inner tubes for agricultural and industrial vehicles
- re-treading of tires
- recovery of mineral oils
- energy conservation
- rubber and plastic products (technical pieces)
- consulting engineering for the mineral and metallurgical industries

PARTICIPANTS LIST

Industrial Associations

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Research Institutes

Consulting Firms

Equipment Manufacturers

Agro-Industry and Foodstuff Industry

Textile Industry

Wood Processing Industry

Leather Processing Industry

Miscellaneous

INDUSTRIAL ASSOCIATIONS

CONFEDERAÇÃO NACIONAL DA INDÚSTRIA (CNI)

(National Confederation of Industry)

Address: Ave. Nilo Peçanha, 50 - 34º Floor
20.044 - Rio de Janeiro, RJ
Brazil

Telex: 55-21-22634

Telephone: (021) 292.7766

Contact: Albano do Prado Franco
President

Field of Activity

The National Confederation of Industry, an agency representing Brazilian industry and entrepreneurs, is the leader of the group of entities comprising the CNI system. It upholds the principle of free enterprise and carries on actions aimed at making sure the private sector participates in decisions by the government, seeking to achieve integration of entrepreneurial sector and the work force in the economic and social development of Brazil.

The CNI system is participated in by three other important institutions, namely:

SENAI - The National Industrial Apprenticeship Service: looks after specialized vocational training at the technical level;

SESI - Social Service for Industry: provides complete social assistance to industrial workers, based on special programs for the sectors of education, nutrition, health and leisure pursuits;

I E L - The Euvaldo Lodi Institute, intensifies the dialogue between the universities and industry, by supervising guest study periods within companies and promoting seminars, surveys and printing of publications.

There are 22 State Federations of Industry affiliated with the CNI, covering the whole of Brazil and representing a universe of 600 trade associations.

Experience in developing countries

The external activities of the CNI system have been carried on mainly by SENAI, which has suitable structure and is engaged in continuing action in the fields of technical cooperation and vocational training.

Through its Board of International Cooperation, SENAI has been extremely dynamic in its approaches to the Latin American and African continents, engaging in the mamagement of technical, economic and financial negotiations with other countries and with international agencies.

Through signing of contracts for the provision of services, performance of missions abroad and programs for basic and advanced training of techicians,instructors and administrators from abroad in Brazil, the Board of International Cooperation acts as a liaison mechanism between the international sources of technical cooperation and regional agencies involved.

We would mention the following instances of such cooperation:

- In collaboration with the United Nations Development Program (UNDP), SENAI completed in 1985 training of Angolan technicians in the foundry sector;

- Training periods have been given to holders of study grants from Cabo Verde, in the fields of: welding,machining, mechanical adjusting, machine drawing and electricity;

- Under a program funded by the ILO, study grant holders from Guinea-Bissau took guest study courses in milling machine operations and welding;

- Under a program financed by UNIDO, Technicians from Mozambique participated in a course on welding and in guest study periods on electronics, as well as a course for operational training instructors;

- Technical cooperation with Latin America was extended to the following countries: Argentina, Bolivia, Chile, Colombia, Costa Rica, Equador, Guyana, Mexico, Panama, Paraguay, Peru, Dominican Republic, Uruguay and Venezuela. Within the training areas covered the following might be cited: footwear, micro-computation and applied electronics, precision machanics, instrumentation, tanning, the textile industry, refrigeration, the graphic arts and printing, casting and welding.

Bases of cooperation

The CNI system is in a position to supply information on Brazilian experience in the areas of trade union association, vocational training, social assistance, entrepreneurial support and integration between companies and educational establishments.

Through its Foreign Trade Department, the CNI is qualified to provide information on business opportunities, formation of joint ventures and Brazilian legislation on foreign investments. It also arranges for Brazilian missions to go abroad, receives foreign missions on visits to Brazil, and provides advisory services in relation to contacts between foreign entrepreneurs and their Brazilian colleagues.

The Department for Assistance to Medium and Small Industry (DAMPI) is also ready to provide assistance to other countries.

Cooperation of the CNI system in terms of vocational training is carried on through SENAI, which has a National Department and 22 regional departments. The National Department coordinates the performance of the standards issued by the National Council and the regional departments put into execution the training programs. Both bodies have Basic and Advanced Vocational Training Centers, and Technical Schools are also operated in some of them.

The Vocational qualification programs are oriented on a priority basis towards the sectors of machine maintenance, automotive vehicles and electrical, pneumatic and hydraulic installations. SENAI also operates, however, in the fields, of metallurgy, textiles, civil works, furniture manufacture, editing and printing, leather working, plastics, pulp and paper, ceramics and earthenware, telecommunications, transportation, shipbuilding, petrochemicals, etc.

FEDERAÇÃO DAS INDÚSTRIAS DO ESTADO DE SÃO PAULO (FIESP)

CENTRO DAS INDÚSTRIAS DO ESTADO DE SÃO PAULO (CIESP)

(São Paulo State Federation of Industries)

(São Paulo State Industries Center)

Address: Ave. Paulista, 1313 - 14º Floor
01.311 - São Paulo - SP.
Brazil

Telex: 55-11-22130, 55-11-22269

Telephone: (011) 251-3522

Contact: Benedito de Sanctis Pires de Almeida
c/o Departamento de Comercio Exterior

Field of Activity

FIESP, a trade association, represents São Paulo State industry at all levels, in cooperation with CIESP, a civil entity. The former groups together 112 industrial associations, covering practically all categories of manufacturing production. CIESP groups the individual companies together. A summary panorama of this universe covers: two million workers and 60 thousand industries, production by which corresponds to 50% of the income by the entire industrial sector in Brazil.

Services provided to its associate members:

- Receiving appeals from management and industrial associations and transmitting proposals of interest to the entrepreneurial community to government agencies.
- Bringing together factors of supply and demand amongst Brazilian and foreign companies, in the interests of intensified commercial and entrepreneurial interchange.

- Surveying of the economic situation, within the format of two basic studies: indicator of Level of Activity and Indicator of Level of Employment.

- Organizing of courses,lectures and seminars, besides agreements, so as to boost the levels of quality of output by means of industrial design and quality control techniques.

- Provision of legal orientation in relation to matters of Civil and Commercial law, labor legislation, Social Security matters and so on.

- Supplying of information on the demand an supply of residues and by-products, through the Residues exchange.

- Managerial training aimed more immediately at the micro - and small entrepreneurs, with a view to increasing productivity.

- Handling of subjects connected with the various entities through two publications: Revista Indústria e Desenvolvimento , a monthly, and Boletim Fiesp/Ciesp em Notícias, a weekly.

- Complete education for children, through the Social Service for Industry (SESI) and vocational training, through the National Apprentices Service (SENAI), which are entities maintained and administered by Industry.

Cooperation offered

- Coordinates technical and commercial meetings with its associate and/or staff members.

- Provides managerial support to individual entrepreneurs and/or government officers when visiting or geting in touch with its associate and/or staff members.

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ASSOCIAÇÃO BRASILEIRA DAS INDÚSTRIAS DA ALIMENTAÇÃO (ABIA)

(BRAZILIAN ASSOCIATION OF FOODSTUFF INDUSTRIES)

Address: Av. Nove de Julho, 3452
01406 - São Paulo - SP.
Brazil

Telex: (11) 25785

Telephone: (011) 881-0766

Contact: Paulo Afonso Aguiar
Vice President

Field of activity

Brazilian Association of Foodstuff Industries ABIA, represents the foodstuff industries sector in Brazil.

Cooperation offered

- Coordinates technical visits to the plants of its associate members.
- Technical and commercial meetings can also be arranged to be held at its headquarters.
- Invites for visiting exhibitions and fairs related to foodstuff industries in Brazil.
- Publishes in its bulletin news about international events related to foodstuff industries.

SINDICATO INTERESTADUAL DA INDÚSTRIA DE MÁQUINAS - (ABIMAQ/SINDIMAQ)

(Inter-State Syndicate of Machinery Industry)

Address: Av. Jabaquara, 2925
04045 - São Paulo - SP.
Brazil

Telex: 55-11-21217

Telephone: (011) 579-5044

Contact: Joao Abdalla Neto

Field of activity

ABIMAQ/SINDIMAQ oficially represents Brazilian capital goods industry and has in its files information about 3,000 firms and about 40,000 items of machinery and equipment in such areas as:

- metal working and forming;
- timber and furniture industries;
- textile, plastic, leather, shoe, and rubber industries;
- food, beverage and tobacco industries;
- chemical, pharmaceutical and cosmetic industries;
- graphic and press industries;
- pulp and paper industries;
- ceramic, glass and tile industries;
- engines, turbines, pumps, compressors, valves and fans;
- furnaces and surface treatment equipment, forging equipment;
- equipment for heat exchanger;
- equipment for welding, cutting, soldering;
- handling, conveying, storage equipment;
- iron and steel industries (and other metallurgical plants)
- filling and packaging technology;

- oil hydraulic and pneumatic equipment;
- precision manufacturing industry;
- equipment for measuring, testing, control and automation;
- machine components and transmissions;
- water power plants;
- steam equipment; boilers;
- mining, mineral oil and ore haulage;
- clothing industry;
- dairy farming;
- sugar and alcohol industries;
- grain processing equipment;
- slaughter houses;
- gas producing and treating plants.

Cooperation offered

- Industrialists and governmental missions interested in Brazilian machinery and equipment are welcome for visiting plants and for technical/commercial meetings.
- Provides managerial support to individual entrepreneurs and/or government officers when visiting or geting in touch with Brazilian equipment manufacturers.

RESEARCH INSTITUTES

CENTRO NACIONAL DE PESQUISA DE TECNOLOGIA AGROINDUSTRIAL DE ALIMENTOS - CTAA/EMBRAPA

(NATIONAL CENTER FOR RESEARCH IN AGRO-INDUSTRIAL TECHNOLOGY OF FOODSTUFFS)

Address: Av. das Américas, 29.501 - Guaratiba
23.020 - Rio de Janeiro - RJ.
Brazil

Telex: (21) 33267 EBPA BR

Telephone: (021) 310-1353

Contact: Eduardo P.M. Sarmento

Field of activity

a) Technological research for agro-industries producing foodstuff in the areas of:

- vegetable oils and fats (including those for fuel purposes)
- grains and cereals
- natural additives (dyes, flavors, essential oils)
- bio-technology
- energy

b) Rendering of services to the foodstuffs agro-industry

Typical projects developed or in course of development:

Vegetal oils and fats

- utilization of Brazilian dendê oil (palm oil)
- phosphatides in soya bean oil and other vegetal oils
- technology of extraction and refining of avocado oil

Natural dyestuffs

- dye-stuffs obtained from purple sweet potatoes (yams) for use in foodstuffs
- process for extracting antocyanins from grape skins
- process for obtaining liquid norbixin, in powder and oily flake form, from urucum

Cereals, grains

- production of rolls, pastries, noodles and crackers using mixed flours (sorghum, cassava and defatted corn)
- surveying of physical, chemical and technological properties of "triticale" (hybrid wheat), on a commercial basis in Brazil
- technological development for grinding corn and sorghum, using wheat mill facilities

Material resources

a) Pilot mill with capacity for grinding one ton of wheat per hour

b) Pilot plant with equipment for quality tests and processing of bakery products, noodles and extruded items

c) Unit operations, with various pieces of equipment for extraction and refining of oils, concentration, pasteurization, homogenization, spray drying, etc

Laboratories

a) Quality control laboratories:

- foodstuff chemical properties
- physical properties
- sensorial analysis
- microbiology
- biochemistry
- analysis of amino-acids

b) Flour analysis laboratory

c) Experimental milling laboratory

d) Vegetal oil technology laboratory

e) Pilot plant testing laboratory (for unit operations)

f) Natural additives laboratory

Experience in developing areas/countries

- Development of industrial project for production of pre-gelatinized corn flour. (For State of Piauí, Brazil).

- Complete study for industrial project on thermoplastic extrusion of flours for industrial and nutritional use in West African countries (Request received from: UNIDO).

- Project of technological development to produce rolls from compound flours (Request from: UNIDO).

- Basic engineering design and economic feasibility study for establishment of industrial unit to process copra oil, soap and coconut cake.

- Basic engineering design and economic feasibility study for establishment of industrial unit to process frozen concentrated juice and livestock feeds from pineapple (For State of Minas Gerais, Brazil).

Cooperation offered

CTAA/EMBRAPA offers assistance in the areas below. Costs will be estimated according to specific proposed cooperation.

- Quality control of products: chemical, physical and microbiological analysis of foodstuffs.

- Development, upgrading and/or adaptation of products and processes on a bench scale or pilot scale.

- Preparation of preliminary industrial projects.

- Technical and economic feasibility studies.

- Technical advisory and consulting services.

- Human resource training courses.

Furthermore, CTAA/EMBRAPA can assign technicians abroad to make preliminary evaluations, subject to payment of costs of travel and stay. Receives visitors and trainees without payment for their expenses.

FUNDAÇÃO CENTRO TECNOLÓGICO DE MINAS GERAIS - CETEC

(Technology Center Foundation of Minas Gerais State - CETEC)

Address: Av. José Cândido da Silveira, 2000 - Horto
31170 - Belo Horizonte - MG.
Brazil

Telex: (31) 1031

Telephone: (031) 461-7933

Contact: Evaldo Abdala

Field of activity

CETEC is currently operating through thirteen different programs, of which those sectors of major interest to UNIDO are highlighted here.

Energy

. Conservation of energy in industrial processes

Foodstuffs

. Technology of meat and meat by-products
. Technology of milk and milk by-products
. Technology for products of vegetal origin: development of products of low cost and high nutritional value, especially those intended for the lower income brackets of the popula - tion; research on the utilization of agricultural and indus- trial residues for human nutrition and livestock feeds.

Mineral Products

. Development of new uses and applications for non-metallic and industrial minerals;
. Performance of studies for mineral characterization.

Products of the Metallurgical and Metal and Mechanical Indus - tries

. Rational and complete development of natural resources through devising of new processes or modification of those already existing so as to obtain ferrous and non-ferrous alloys;

- Development of Pyro-metallurgical processes;
- Development of methods for standardization and evaluation of quality for metallurgical reducing agents.

Examples of small-sized projects:

1. Unit for pasteurization of milk and for cheese manufacture.

   Capacity: up to 1,000 liters of milk per day

   CETEC offers licensing for mechanical construction of equipment, technical assistance in operation, and a manual covering manufacture of cheese and other milk derivates.

2. Unit for production of low cost foodstuffs.

   Capacity: 350 tons per year of force-filled meat products
   165 tons per year of pre-cooked soya bean products
   52 tons per year of fruit products

   (on ten hour per day operating basis)

   Raw materials:

   For force-filled and stuffed packaged products: beef, pork, texturized soya bean products, bacon, organ meats and condiments.

   For pre-cooked products: soya beans, bean flour, corn meal,powdered whole milk, vitamins and mineral salts.

   For fruit products: fruit pulps, sugar, pectin and citric acid.

   CETEC provides technical assistance for setting up unit (lay-out , equipment list, estimates of investments and so on), training of personnel, assistance for start-up of operations.

3. Meat processing unit:

   Capacity: 50 to 150 kgs/day

   Products: salame, spiced meat-loaf, sausage, pre-cooked ham, home-style meat pastes.

   CETEC provides technical assistance and training of personnel.

Experience in developing areas/countries

. Gasification of biomass (financed by BIRD)

  Monitoring of gasification of biomass to drive engines and heat industrial furnaces.

. Energy Forests and Energy Optimization for Wood-Fuelled Stoves in Brazil and Bolivia (financed by UNEP)

. I Course on Charcoal for Central America (financed by OLADE)

. Production of Low Cost Foodstuffs in Montes Claros

  Implementation of a unit for production of low-cost foodstuffs, on a industrial scale: production of canned meats (salami and sausage), pre-cooked on a basis of soya bean products, plus products based on fruits.

Cooperation offered

CETEC is in a position to carry on technological research all the way from characterization of raw materials up to development of products on a bench and/or pilot scale, including training of personnel, in line with the Course Programs, opportunity studies and pre-feasibility surveys.

In carrying out its work, CETEC may send technicians abroad, though this will depend on prior analysis and financing of travel.

CETEC is prepared to receive visitors and trainees, but does not cover their costs of travel and stay.

FUNDAÇÃO NÚCLEO DE TECNOLOGIA INDUSTRIAL - NUTEC

(Industrial Technology Center Foundation)

Address: Rua Monsenhor Otávio de Castro, 21
60.050 - Fortaleza - CE.
Brazil

Telex: (85) 1336

Telephone: (085) 226-7944 - (085) 226-7945

Contact: Francisco Ariosto Holanda - Executive Director
Manoel Decio Pinheiro Filho - Technical Manager

Field of activity

- Preventive and corrective maintenance (mechanical, electrical and electronic)
- Mineral and hydrological technology
- Technology of foodstuffs
- Chemical technology

Projects carried out

- Industry for processing whole cashew fruit juice
  Capacity: 12 tons of cashew per day
  Total investment: US$ 77, 357

- Cheese processing industry
  Capacity: 300 litres of milk per day
  Total investment: US$ 12,886

- Plant to make cashew fruit juice soft drink ("Cajuina")
  Capacity: 500 halfliter bottles per day
  Estimated fixed investment: US$ 7,200

- Cashew fruit soft drink and candy plant
  Capacity: 300 halfliter bottles per day
  100 jars of 1 kg of cashew candy per day
  Fixed investment approximately: US$ 8,000

Cooperation offered

NUTEC offers assistance in the areas below, costs of which should be discussed according to specific proposed cooperation:

- analysis of raw materials and products.
- development of products and manufacturing processes on a bench scale and pilot scale.
- opportunity and pre-feasibility studies.

Subject to prior consultation and payment of expenses, NUTEC can send technicians to work abroad.

Traineers can be received, subject to prior consultation.

FACULDADE DE ENGENHARIA DE ALIMENTOS

(SCHOOL OF FOODSTUFF ENGINEERING)

CAMPINAS STATE UNIVERSITY

Address: P.O. Box 1170
13100 - Campinas - SP.
Brazil

Telex: (19) 1150

Telephone: (0192) 39-1301

Contact: Prof. Iracema de Oliveira Moraes
Prof. Carlos Alberto Gasparetto

Areas of cooperation

Departments: Foodstuff Engineering
Foodstuff Science
Foodstuff Technology
Foodstuff and Nutritional Planning
Agricultural Engineering

Laboratories and Pilot Plants.

Experimental field covering twelve hectares.

Provides undergraduate, master's and doctorate courses as well as special training.

Can develop technologies (process and equipment) and offer technical assistance.

INSTITUTO DE PESQUISAS TECNOLÓGICAS - IPT

(Technology Research Institute)

Address: Cidade Universitária
05508 - São Paulo - SP.
Brazil

Telex: (11) 22831

Telephone: (011) 268-2211

Contact: Amantino Ramos de Freitas

COOPERATION OFFERED

1. Red clay and sanitary ceramic

Facilities available:

. laboratories and pilot plants

Assistance provided:

. personnel training (individual training periods or courses)
. organization of technical visits to plants
. raw material analysis (chemical, mineralogical and technological characterization)
. process development
. product development
. technical assistance (including new projects)

2. Fertilizers

Facilities available:

. chemical analysis laboratory
. laboratory for study of physical properties of fertilizers
. laboratory for agricultural experimentation
. process development laboratory
. granulation and mixture pilot plant

Assistance provided:

. training of labor
. raw materials analysis
. technical assistance

3. Textile industry

Facilities available:

- **laboratories and pilot plants**

Assistance provided:

- **short duration courses (including courses outside Brazil)**
- **technical assistance in the areas of cotton spinning and weaving, knitwear and make-up apparel (study of raw material, production planning and control, quality control, maintenance of machinery and equipment, administrative organization).**
- **projects in the cotton fiber area**

INTERNATIONAL EXPERIENCE

IPT's experience outside Brazil includes several countries, among which are: Mozambique, Ghana, Angola, Kenya, Sudan, Algeria, Bolivia, Paraguay, Uruguay, Argentina, Jamaica, Trinidad-Tobago, Guatemala, Nicaragua, Costa Rica, Honduras.

INSTITUTO DE TECNOLOGIA DE ALIMENTOS - ITAL

(INSTITUTE OF FOOD TECHNOLOGY)

Address: Av. Brasil, 2880
13100 - Campinas - SP.
Brazil

Telex: (19) 1009

Telephone: (0192) 41-5222

Contact: Rogerio Tocchini

Facilities available

- Specialized laboratories
- Pilot plants in areas of:
  - . fruit and vegetable juices, pulps, concentrates and canned goods
  - . industrial fermentation processes
  - . grain storage
  - . refrigeration and conservation of fruits and vegetables
  - . flours and baking
  - . beverages (fermented, distilled and non-alcoholic)
  - . dehydrated foodstuffs
  - . sea food and sea resources
  - . meat and meat products
  - . dairy products
- Food Packaging Technology Center

Experience in developing areas/countries

- Project for rehabilitation, modernization and expansion of foods - tuffs industry in Angola, sponsored by UNIDO.
- Preliminary project for establishment of industrial units to produ ce bakery flour from cassava scrapings in Haiti.

- In past three years has received visitors from a number of diffe - rent countries, including: Ecuador, Ivory Coast (29 students and 3 instructors from the School of Agronomics), China (two missions, one by research workers interested in cassava and sweet potatoes), El Salvador, Peru, Trinidad-Tobago, Paraguay, Tanzania, Uruguay and Colombia.

- In the past three years, ITAL has provided guest study periods, training and courses to 27 technicians from Third World countries.

- In the past three years ITAL has provided technical consulting ser vices to a number of Third World countries, involving the work of 13 research technicians.

Cooperation offered

- Preparation of technical projects and economic feasibility studies
- Technical consultancy for evaluation of opportunities
- Information on tropical foodstuffs and beverages
- Training of guest students
- Miscellaneous courses

N.B.: Each proposed cooperation will be dealt individually in terms of costs.

CONSULTING FIRMS

CEREALTEC INTERNATIONAL

Address: Av. Santa Isabel, 698 (Barão Geraldo)
13100 - Campinas - SP.
Brazil

Telephone: (0192) 39-1119

Contact: L. Gentry

Field of activity

Flour and cereal processing

. milling of cereals (wheat, rice, sorghum, corn)
. production of starch and flour from cassava (manioc)
. thermoplastic extrusion of flours
. texturized soya bean protein (meat and milk substitu.)
. pre-gelatinized flours

Turbo drying of flours and other cereal derivatives.

Mixture of local available flours as a substitute for wheat flour.

Experience in developing areas and countries

Brazil (Northeastern Region)

- Instant "cuscuz" plant; capacity: 40 tons/day
- Corn milling plant; capacity: 60 tons/day
- Pastry unit; capacity: 10 tons/day

Egypt

- Thermoplastic extrusion plant for baby food production; capacity: 450 kilograms/hour

Occidental Africa

- Technical evaluation of milling facilities in six countries
- Thermoplastic extrusion plant for baby food production; capacity: 450 kilograms/hour

- Thermoplastic extrusion plant for the production of noodles, baby food, milk and meat substitutes, pre-gelatinized flours; capacity: 2 tons/hour

Cooperation offered

- Labor training in the matters of milling, baking, noodle production, thermoplastic extrusion, including quality control. Costs will be estimated according to specific proposed cooperation.
- Development of new products and/or improvement of existing ones in the area of cereals and its by-products. Costs will be estimated on a case by case basis.

CLEPLAN EMPREENDIMENTOS E PROJETOS INDUSTRIAIS LTDA.

Address: Alameda Campinas, 463 - 10º andar
01404 - São Paulo - SP.
Brazil

Telex: (11) 24622 CLEP BR

Telephone: (011) 288-8100

Contact: Manuel Castro

Field of activity

Turn key projects in the following industrial sectors:

- Cement (minimum economical capacity: 300 tons/day)
- Lime
- Manioc processing
- Soya bean processing (minimum economical capacity: 20 tons/day)

Experience in developing areas/countries

- Overall management and engineering for a grass roots cement plant, 450 tons/day capacity, in the State of Bahia, Brazil.
- Overall management and engineering for the expansion of 100 tons/day capacity cement plant in the State of Alagoas, Brazil.
- Overall management and engineering for a hydrated lime plant, 120 tons/day capacity, in the State of Espirito Santo, Brazil.
- Overall management and engineering for 3 manioc processing plants, 3 to 4 tons/day capacity, for Nigeria.
- Comprehensive study for a soya bean processing plant and other oil seeds, 600 tons/day capacity, for Trinidad-Tobago.

Cooperation offered

- In principle, company can send a technician abroad for preliminary evaluation, defraying travel costs free of charge.

CONSULTEC - COMERCIAL E SERVIÇOS TÉCNICOS LTDA

Address: Av. Anchieta, 173 - 12º andar
13.100 - Campinas - SP.
Brazil

Telex: 19-1413 CSRC BR

Telephone: (0192) 31-1077

Contact: Rodolfo Rohr

Field of activity

- Agro-industrial and agricultural development
- Energy conservation

Experience in developing areas and countries

El Salvador:

- Plant for the industrialization of tomatoes and local fruits. Location studies, equipment design, process and product engineering.
- Plant for the production of soya bean milk and soya bean flour. Construction supervision, labor training. Pilot plant installa - tion.
- Integrated unit for cassava (manioc) processing. Location studies, equipment design, process and product engineering.

CEAO Countries-Africa

- Technical development for bread production using mixed flours.

Sierra Leone

- Technical assistance for the installation and operation of a pilot plant for cassava (manioc) processing.

Guinea (Conakry)

- Technical assistance for an integrated agro-industrial cassava (manioc) project.

Brazil (Northastern area)

- Design of a plant to produce passion fruit juice.

Cooperation offered

- Company can send technician abroad for preliminary evaluation studies, subject to payment of travel expenses.

CONTEXTIL ASSESSORIA TEXTIL SC LTDA.

Address: Rua João Ramalho, 1203
05008 - São Paulo - SP.
Brazil

Telex: (11) 32723 TXTL BR

Telephone: (011) 864-5920

Contact: Mauro José Pereira

Field of activity

- Technical assistance and consulting services for the textile industry, including make up apparel and others.
- Product development
- Professional formation courses

Experience in developing areas/countries

The following projects have been developed for the Northeastern Area of Brazil:

- Garment industry , including knitwear, finishing and shirts fabrication.
  Capacity is 120 tons per month of knitted products. Approximate investment: US$ 5,000,000
- Textile industry, including cotton spinning, weaving and finishing.
  Capacity: one million square meters per month of cotton tissue for cloths. Approximate investment: US$ 7,000,000
- Towel industry. Capacity: 600,000 towels per month. Approximate investment: US$ 5,000,000

Cooperation offered

- Company can send technician abroad for preliminary evaluation studies. Travel expenses to be covered by client.

ENIPLAN INDÚSTRIA E PLANEJAMENTO LTDA.

Address: Alameda Santos, 2223 - 6º andar
01419 - São Paulo - SP.
Brazil

Telex: (11) 30282 ENIP BR

Telephone: (011) 853-8422

Contact: Antonio Curioni

Field of activity

Process design, engineering, procurement, erection supervision, start up assistance in the agro-industry sector.

Experience in developing areas/countries

Agro-industries projects developed in Brazil:

- Soya bean oil plant: continuous extraction, capacities starting with 300 tons/day of raw material and producing 55 tons/day of oil and 230 tons/day of soya bean bran.
  Approximate investment for 300 tons/day capacity: US$ 5,000,000
  Required manpower: 150 workers

- Frozen and concentrated citrus juice plant: capacities from 480 tons/day of oranges, lemons, etc. Approximate production: 43 tons/day of concentrated juice at 65° Brix and by-products (livestock feeds, essential oils, etc).
  Approximate investment for 480 tons/day capacity: US$ 6,000,000
  Required manpower: 240 workers

- Frozen and concentrated tropical fruits juice plant. Capacities in the range of 10,000 to 15,000 tons/month of fresh fruits (pineapple, passion fruit, mango,pawpaw, etc). Production in the range of 1,500 to 2,000 tons/month of concentrated juices ready for exporting.
  Approximate investment: US$ 4,000,000
  Required manpower: 250 workers

- Concentrated tomato juice plant. Capacity from 200 tons/day of fresh tomatoes and up. Production of 35 tons/day of double concentrated paste and by-products.
  Approximate investment for 200 tons/day capacity: US$ 3,000,000.
  Required manpower: 250 workers

- Dried fruit plant (fruit freeze-dry plant). Capacities from 20 to 30 tons/day of fresh fruits producing from 1,5 to 2 tons/day of freeze-dried fruits.
  Approximate investment: US$ 8,500,000
  Required manpower: 200 workers

Cooperation offered

- Company carries out pre-feasibility studies and can develop special process at cost, in a joint effort with client's own team.

- Company is opened to consider forms of cooperation submited by clients.

- Visitors are welcome for technical and commercial discussions.

- Campany can receive trainees, without paying costs of their stays.

- Campany can send technician abroad for preliminary evaluations, subject to payment of travel expenses.

NATRON CONSULTORIA E PROJETOS S.A.

Address: Rua Teófilo Otoni, 63
20090 - Rio de Janeiro - RJ.
Brazil

Telex: (21) 23510 NATR BR

Telephone: (021) 296-6171

Contact: A.L.M. Canavarro Pereira

Field of activity

Consulting engineering, process know how and engineering services for industrial and agro-industrial plants, on a turn key basis.

- Sulphuric acid plants using sulphur, pyrites or metallurgical gases as raw materials. Capacities in the range of 150 tons/day of acid (single absorption process) to 2,870 tons/day (double absorption process).
  Approximate investment for 150 tons/day capacity: US$ 2,200,000

- Phosphoric acid plants, using phosphate rock as raw material; capacities ranging from 360 tons/day to 800 tons/day of P_2O_5 at 54% (isothermic process, single vessel reactor).

- Phosphate fertilizer plants with capacities from 400 tons/day (single and triple superphosphate) to 1,000 tons/day (monoammonium phosphate) and 1,100 tons/day (single superphosphate).
  Approximate investment for 400 tons/day: US$ 5,300,000

- Chlorine, caustic soda and chlorine derivate plants. Mercury cell and membrane cell technologies. Capacities from 10 to 200 tons of chlorine per day.
  Approximate investment for 10 tons/day capacity: US$ 10,000,000.

- Alcohol distilleries using sugar cane. Capacities from 10,000 liters/day up to 150,000 liters/day (Alcon process).
  Approximate investment for 10,000 liters/day: US$ 1,700,000

Experience in developing areas/countries

- El Salvador - Sulphuric acid plant, "grass roots" project, 400 tons/day capacity, sulphur as raw material. Services provided: process design; detailed engineering; erection supervision; pre-operation , start up and operational assistance.
- Chile - Feasibility study for a mineral and industrial complex for the production of phosphate fertilizers using the phosphate rock from Mejillones region as raw material. Sulphuric acid to be produced using effluent gases from copper metallurgy.

Developing areas in Brazil:

- Turn key alcohol distillery, 150,000 liters/day capacity (anhydrous alcohol) from sugar cane. Location: Mato Grosso State.
- Utilities plant (generation of steam and electric power) using su - gar cane bagasse as fuel. Location: Alagoas State.
- Chlorine (35 tons/day) and caustic soda (40 tons/day) plant for Espirito Santo State.
- Aluminium (100,000 tons/day) and alumina (500,000 tons/day) plant for Maranhão State.
- Sulphuric acid plant, 360 tons/day capacity, for Bahia State.

Studies:

- Industrial complex planning for "Triângulo Mineiro" region. Identification of about 500 possible products to be produced using local raw materials.
- Preliminary study for a mineral and industrial complex in the Amazon region, using bauxite and rock-salt.
- Thermo-electric plant using fire-wood as fuel,for Maranhão State.

Cooperation offered

- In principle, company can send technician abroad at its own expenses for preliminary evaluations (opportunity, pre-feasibility and pre-marketing studies), as it has done before several times in Latin America and Africa.

PAULO ABIB ENGENHARIA S.A.

Address: Rua do Curtume, 625 - Bloco C - Lapa
05065 - São Paulo - SP.
Brazil

Telex: (11) 36617 ABIB BR - (11) 24788 ABIB BR

Telephone: (011) 864-6922 - (011) 262-8088

Contact: Eurico Corvo

Field of activity

Chemical and mineralogical analysis; technological characterization of ores; geology and evaluation of ore reserves; process development and design; feasibility studies and assistance in asking for funds ; mine engineering; (open pit and underground mines); basic and detailed engineering for the mining and metallurgical industries; project planning, scheduling and cost control; procurement (purchasing, expediting and inspection); construction supervision and equipment comissioning; start-up and inital operation of mines and plants; general project management.

Cooperation offered

- Raw material analysis.
- Company can send technician abroad to carry out preliminary evaluation if passages are provided. Trips may, in some cases, be made on company's account.
- Receives visitors and trainees.
- Develops products on bench or pilot scale.
- Company is equipped to carry out technical-economic feasibility studies, as well as product/market studies.

STC ENGENHARIA LTDA

Address: Rua São Pedro, 489 - Juvevê
80030 - Curitiba - PR.
Brazil

Telex: (41) 6627 STCG BR

Telephone: (041) 252-5861

Contact: Ivan Tomaselli or
Nelio M.A. Castro

Field of activity

Consultancy in forest and wood industries including:

- Forest management, photo interpretation, inventories, planning, data processing, soil usage;
- Logging: systems, mechanization, handling;
- Forestry experimentation: planning, experiments, follow-up, analysis and interpretation of results;
- Forest based industries: analysis, market studies, development and introduction of new technologies, industrial planning, quality control, optimization of results, drying technology, preservation, construction work, tenders for machinery and equipment.
- Forestry: implantation of forests, seedling production, maintenance and protection, ecology.
- Administration: organization of enterprises, production programming and control, quotations and costings, personnel training.
- Energy: alternative sources, selection of sources and processes, reduction of consumption.

Experience in developing areas/countries

STC Engenharia during the past 5 years, has developed in Africa and Latin America the following activities:

- People's Republic of Mozambique, Ministry of Agricultura, Department of Forests and Wildelife. Feasibility study of the technical and economical aspects of a timber project, including a sawmill for small diameter logs (1983).

- Banque Nationale de Dévelopment du Sénégal. Feasibility study on the possible operation of a plywood factory in Thiés (1984).

- Madebrás (Brazil)
  Market studies and evaluation of projects from 1982 to 1985 in the following countries: Nigeria, Sierra Leone, Ghana, Ivory Coast and Zimbabwe

- Colombia. Evaluation of the URRA 1 and Vera 2 forestry projects for a Brazilian client.

A partial list of services provided to Brazilian Clients follows:

- Inventory of forest resources (exotic species) (1982)
- Inventory of forest resources, photo interpretation and evaluation of forests (a number of studies)
- Evaluation of a plan to use small diameter logs (1984)
- Project for a sawmill to produce pre-fabricated houses (1982)
- Development of a Brazilian system for quality control of plywood (1982)
- Feasibility study for the use of the resin of Pinus eliottii and project of a resin distilling plant (1983)
- Selection of systems for drying sawn timber (several projects and studies)
- Evaluation of quality of timber frames (1984)

Cooperation offered

STC Engenharia is prepared to cooperate in all the areas it works. Each proposed cooperaration will be studied individually, however, international travelling and accomodation for our engineers and technicians are the at client's account. Trainees wishing to acquire work experience may be engaged in projects being developed, in our headquarters with free training being offered in day to day routines used by STC.

INDUSTRIAL COMPANIES

ALFA LAVAL EQUIPAMENTOS LTDA

Address: Av. das Nações Unidas, 14261
01051 - São Paulo - SP.
Brazil

Telex: (11) 21610 SALA BR

Telephone: (011) 548-1311

Contato: Walter Perricone

Field of activity

- Plants for processing of vegetable oils
- Plants for processing of manioc roots (production of starch)
- Plants for the production of toilet soap

Experience in developing areas/countries

- Plants supplied to developing regions within Brazil

Cooperation offered

- Raw material analysis, free of charge.
- In principle, can send technician abroad for preliminary evaluations, at its own expenses.
- Receives clients for technical and commercial visits, but does not cover cost of local travels and stays.
- Can develop projects and pre-feasibility studies at cost.
- Provides labor training and technical assistance, for plants and equipments supplied.

APV DO BRASIL INDÚSTRIA E COMÉRCIO LTDA.

Address: Rua João Daprat, 231
09700 - S. Bernardo do Campo - SP.
Brazil

Telex: (11) 44428

Phone: (011) 457-9222

Contact: Gilberto Laporta ou José Carlos Piçarra

Field of activity

Manufacture of heat transfer equipment especially for dairy indus - tries: butter, cheeses, powdered milk. Milk pasteurizing plants.

Experience in developing areas/countries

- Company has supplied dozens of units for the Northeastern Area of Brazil.
- Milk pasteurizing plants: from 1000 liters to 3000 liters/hour. Approximate investment in machinery and equipments, including control board: from US$ 10,000 to US$ 15,000 FOB Brazilian port.

Cooperation offered

- Raw material analysis, free of charge.
- In principle and subject to payment of travel expenses, company can send technician abroad for preliminary evaluations.
- Company develops opportunity and feasibility studies on client's specific needs.

ASVOTEC TERMOINDUSTRIAL LTDA.

Address: Rua Atica, 673
04634 - São Paulo - SP.
Brazil

Telex: (11) 22580 - (11) 25933

Telephone: (011) 542-4222

Contact: Ricardo Carlessi

Field of activity

- Complete plants for extraction of palm oil.
- Machines for processing fruit and vegetables (peeling, bleaching, cooking, chilling).
- Thermodynamic equipment and industrial processes.

Experience in developing areas/countries

- A number of items exported to Uruguay, Ecuador, Peru, Paraguay, Costa Rica and South Korea.
- A number of items supplied to clients located in developing regions of Brazil.

Cooperation offered

- Company will send technician abroad for evaluation and diagnosis of opportunities, subject to payment of expenses.
- Receives clients for technical visits without covering their expenses.
- Carries out opportunity studies at cost.

BRASHOLANDA S.A. EQUIPAMENTOS INDUSTRIAIS

Address: Caixa Postal 1250
80.000 - Curitiba - PR.
Brazil

Telex: (41) 5386 BHEI

Telephone: (041) 266-3522

Contact: Tony Bruinjé or Vera Bruinjé

Field of activity

1. Manufacture of packaging machinery for liquids, pastes and vis - cous products: a) cup filling units; b) plastic bag filling units.

2. Manufacture of equipment for the dairy, foodstuffs and beverage industries.

   - Pasteurization plants
   - Yoghourt manufacturing p..nts
   - Cheese processing equipment

3. Mini-plants for milk processing: 1,000 liters per hour (in four-hour shift).

Experience in developing areas/countries

A number of machines for filling cups and bags have been sold for the following countries: Paraguay (11 units), Chile (3 units), Peru, Dominican Republic (3 units), Colombia, India, Mexico, Argentina, Uruguay (2 units).
The following products were used: yoghourt, fruit juices, butter and processed cheese.

Various machines were also sold for developing areas within Brazil.

Cooperation offered

- Raw materials analysis, free of charge.
- Subject to payment of travel expenses, company will send technician abroad for preliminary evaluation.
- Receives visitors to inspect plants. Will cover only costs of local travel.
- Can receive trainees and cover their expenses (accomodations and meals) subject to a case-by-case analysis.
- Subject to prior inquiry can run bench or pilot scale tests.

CALDEIRARIA SÃO CAETANO S.A. INDUSTRIAS MECANICAS

Address: Rua Piratininga, 653
09500 - São Caetano do Sul - SP.
Brazil

Telex: (11) 44665

Telephone: (011) 442-5099

Contact: José Ricardo Sukadolnik

Field of activity

- Hydrolyser of sugar cane bagasse for livestock feeds production
- Drier of sugar cane leaven for livestock feeds production
- Wood preservation plants
- Soap plants
- Steam boilers: 7 to 80 tons/hour
- Thermo-electric units: 300 to 500 KVA

Experience in developing areas/countries

- A number of units supplied to Northeastern area of Brazil

Cooperation offered

- Company is opened to consider forms of cooperation submited by clients, on a case by case basis.

CASP S.A. INDÚSTRIA E COMÉRCIO

Address: Rua Sebastião Gonçalves Cruz, 477
13900 - Amparo - SP.
Brazil

Telex: (11) 25138 CSCO BR

Telephone: (011) 227-4911

Contact: Ayrton Haynal

Field of activity

Poultry line: - complete projects for incubation, breeding and slaughtering of poultry.

Feed plant: - with capacities from one ton up to fifty tons per hour.

Grain storage: - ventilated silos, smooth and corrugated; bucket and screw elevators; pre-cleaning units; continuous and intermittent driers.

Seed processing: complete design of processing units.

Experience in developing areas/countries

- A number of units exported to Argentina, Uruguay, Paraguay, Bolivia and Mexico.
- A number of units supplied to Amazon region and Northeastern area of Brazil.

Cooperation offered

- Company can send technicians abroad for preliminary evaluation. Is prepared to cover international travel to Latin America. For other continents, clients are required to provide transportation.
- Company offers hotel accomodations for visitors to their plant in the city of Amparo, in the state of São Paulo.

CIA. LILLA DE MÁQUINAS INDÚSTRIA E COMÉRCIO

Address: Rua Constancio Colalillo, 477
07000 - Guarulhos - SP.
Brazil

Telephone: (011) 209-9566

Contact: Luiz Gonzaga Chaves

Field of activity

Equipments for coffee roasting.

Experience in developing areas/countries

- Equipments exported to Venezuela (more than 30 units installed), Chile, Ecuador, Colombia, Panama and Peru.
- A number of equipments supplied to developing regions within Brazil.
- A coffee roasting equipment with a capacity up to 500 coffee bags per month (60 kg of coffee per bag) would cost approximately from US$ 24,000 to US$ 27,000, depending whether fire wood or diesel oil is used as fuel.

Cooperation offered

- Product analysis, free of charge.
- Can send technician abroad for preliminary evaluations if traveling expenses are covered by client.
- Receives visitors for technical and commercial discussions, paying local travel costs for visiting plants using their equipments.
- Develops coffee roasting projects.

CONSERVIT S.A. FÁBRICA DE CALDEIRAS A VAPOR

Address: Rua Americo Vespucci, 432
03130 - São Paulo - SP.
Brazil

Telex: (11) 35764 CFBV BR

Telephone: (011) 914-0422

Contact: Hildo Pera - Luiz Celso Pera

Field of activity

- Plants for the extraction and refining of vegetable oils.
- Plants for the recovery of mineral oils.

Experience in developing areas/countries

- Plants located in developing regions within Brazil.

Cooperation offered

- Subject to payment of travel expenses can assign technician abroad for preliminary evaluations.
- Receives visitors paying their expenses in Brazil.
- Provides labor training in existing plants in Brazil or in client's plant.
- Provides technical assistance during plant pre-operation.

EQUIPAMENTOS INDUSTRIAIS COCCO LTDA.

Address: Rua Barão de Monte Santo, 388
03123 - São Paulo - SP.
Brazil

Telex: (11) 30002

Telephone: (011) 273-5900

Contact: Natalino Sergio Mauri

Field of activity

- Machinery and equipment for selecting, classifying and packing the following fruits: apple, pineapple, orange, lemon, mango, papaw, avocado, peach, etc.
- Machinery and equipment for manufacture of concentrated orange, pineapple, lemon, passion-fruit, cashew and other fruit juices.

Experience in developing areas/countries

- Exports to Chile (apple processing machinery), Uruguay, Argentina, Colombia, etc.
- Clients located in developing areas within Brazil.

Cooperation offered

- In principle, company can assign technician abroad for preliminary evaluation. Payment of international travel and costs of stay required, but these costs will be discounted if business results.
- Receives visitors and covers costs of local travel for visiting plants using their equipments.
- Subject to prior consultation, can receive trainees.
- Provides training for labor and technical assistance for equipment supplied.
- Feasibility studies can be prepared pending on previous discussions with client.

HERMANN INDUSTRIA E COMERCIO LTDA.

Address: Rua Salvador Leme, 334
01124 - São Paulo - SP.
Brazil

Telex: (11) 22212 HERM BR

Telephone: (011) 227-3411
439-2146 (Factory)

Contact: Erwin Becker Jr. / Luis Faria

Field of activity

Units on a turn key basis for slaughtering and processing of cattle, hogs and goats.

Experience in developing areas/countries

- A number of units exported to South American countries.
- Several units supplied to developing areas within Brazil.
- In principle, the smallest economic unit would have the following capacity: 50 heads of cattle per day or 100 heads of hogs or goats per day.
- Brazilian experience indicates that municipal slaughter houses with a capacity of 30 head of cattle per hour, including building and refrigerating chamber, requires investment of about US$ 280,000.

Co-operation offered

- Subject to payment of travel expenses, technician can be sent abroad for preliminary evaluation.
- Subject to payment, will develop projects, cost of which will be refunded to clients in case of equipment purchase.
- Receives visitors, without paying their expenses.
- Subject to inquiry, can receive trainees.

HOLSTEIN-KAPPERT S.A. INDUSTRIA DE MAQUINAS

Address: Av. Franz Liszt, 200 - Parque Novo Mundo
02151 - São Paulo - SP.
Brazil

Telex: (11) 22814 HOLK BR

Telephone: (011) 201-3244

Contato: Sergio H. Nascimento
Wagner Rodrigues

Field of activity

- Complete facilities for beverage industry (turn key projects)
- Turn key projects for juice extraction of fruits and vegetables
- Equipments for pharmaceutical, chemical and foodstuff industries
- Mini-plant for "soya bean milk" production

Experience in developing areas/countries

- Facilities and equipments exported to El Salvador, Costa Rica, Belize, Cuba and Mozambique
- A number of units supplied to clients in developing areas within Brazil

Cooperation offered

- In principle, company can send technician abroad for preliminary evaluations, at its own expenses.
- Receives clients for technical and commercial visits.
- Subject to prior inquiry can receive trainees.
- Develops projects on client's specific needs.
- Provides labor training and technical assistance for plant start up

INCOMAF S.A. INDÚSTRIA E COMÉRCIO

Address: Av. Industrial, 977
08580 - Itaquaquecetuba - SP.
Brazil

Telex: (11) 39358

Telephone: (011) 464-3177

Contact: Pedro C.M. Cruz

Field of activity

Complete facilities for manufacture of meat by-products.

Experience in developing areas/countries

- Exports to Paraguay and Colombia.
- Clients located in developing regions within Brazil.

Cooperation offered

- Can send technician abroad for preliminary evaluations, with expenses at client's account.
- Receives clients for technical and commercial visits.
- Provides labor training and technical assistance for initial operation.

INDÚSTRIAS MACHINA ZACCARIA S.A.

Address: Rua Laranjal, 180
13480 - Limeira - SP.
Brazil

Telex: (19) 2120 ZACC BR

Telephone: (0194) 41-5026

Contact: Valdemar Guidi

Field of activity

- Machinery for processing of rice and coffee
- Driers for grains and coffee

Experience in developing areas/countries

- Machinery exported for Bolivia, Argentina, Peru, Ecuador and Paraguay.
- Clients located in developing areas within Brazil.
- A complete unit for rice processing with a capacity of 3 tons/day will cost approximatelly US$ 50,000.

Cooperation offered

- In principle, company can send techinician abroad for preliminary evaluations, at its own expenses.
- Receives visitors paying local travel costs in the city of Limeira and neighborhood.
- Suject to prior inquiry, can receive trainees.
- Develops projects in its sector of activity.
- Provides labor training and technical assistance for machinery supplied.

IRMÃOS FISCHER S.A. INDÚSTRIA E COMÉRCIO

Address: Rua Gregorio Diegoli, 35
88350 - Brusque - SC.
Brazil

Telex: 55 - 473 - 519 IFIS BR

Telephone: (0473) 55-1544

Contact: Edemar Fischer

Field of activity

Machinery and equipment for processing fish, poultry, beef, other meats and by-products.

Experience in developing areas/countries

- Exports to Argentina, Paraguay, Ecuador and Haiti.
- Clients located in developing areas within Brazil.

Cooperation offered

- Can send technician abroad for preliminary evaluations subject to the payment of travel costs.
- Receives visitors paying for their internal travel costs.
- Receives trainees but does not pay their stay costs.
- Develops projects for client's specific needs.
- Provides labor training and technical assistance for equipment supplied.

LAREDO S.A. INDÚSTRIA E COMÉRCIO

Address: Rua Primeiro de Agôsto, 11-67
17013 - Bauru - SP.
Brazil

Telex: (142) 253 LRDO BR

Telephone: (0142) 22-5111

Contact: Roberto Simonetti

Field of activity

Machinery for processing of grains:

- Harvesters for any kind of fodder: sugar cane (including ratoon), "Cameroun", "Napier" and "Colonião" grasses, corn, sorghum, etc.
- Grain threshing unit with feeder device - for beans, rice, corn, soya, wheat, sunflower seed and other grains. *
- Corn husker. *
- Disintegration unit - fodder storage unit for dry and fresh fodder. *

* These machines can be supplied with implement for coupling to the three points of tractor's hydraulic system.

Experience in developing areas/countries

- More than 1,200 machines have been sold to the following countries: Angola, Bolivia, Chile, El Salvador, Ecuador, Ghana, Guatemala, Haiti, Honduras, Iran, Mexico, Mozambique, Nigeria, Panama, Paraguay, Porto Rico, Peru, São Tome, Trinidad-Tobago, Venezuela.
- About 50,000 machines sold in Brazil.

Cooperation offered

- Subject to prior inquiry, company can send technician abroad for evaluation of local problem. In certain cases, depending on mutual interest, company can ship one of its machines together with the trip by the technician for on-the-spot demonstrations. Portion of expenses to be reimbursed by client will be studied on a case-by-case basis.
- Company receives visitors and, subject to prior inquiry, can also receive trainees.

MÁQUINAS INDIANA LTDA.

Address: Rua Bom Jesus, 302 - Água Raza
C3344 - São Paulo - SP.
Brazil

Telephone: (011) 294-8099 - (011) 296-7020

Contact: Walter De Biasi

Field of activity

- Machinery and equipment for manufacturing noodles, including drying for packaging purposes.
- Machinery and equipment for production of fresh noodles (tagliarini, lasagne, canelloni, etc).

Experience in developing areas/countries

- Supply of a noodles plant to Bolivia. Capacity: 1,200/1,500 kg / day. Approximate cost: US$ 70,000.
- Identical capacity plant supplied to Paraiba State, in the North eastern area of Brazil.
- A number of individual machines supplied to developing areas within Brazil.

Cooperation offered

- Receives clients for technical and commercial visits.
- Subject to prior inquiry, receives trainees.
- Provides training for labor and technical assistance for machinery and equipment supplied.

MÁQUINAS PIRATININGA S.A.

Address: Rua Rubião Junior, 234
03110 - São Paulo - SP.
Brazil

Telex: (11) 22481 MPIR BR

Telephone: (011) 291-8922

Contact: Fernando L. Pinczowski / Nelson S. Palitot

Field of activity

- Installations for cotton processing and baling
- Equipment for oil seed processing
- Hydraulic presses, etc.

Experience in developing areas/countries

- Exports to Paraguay, Uruguay, Nicaragua, Sudan, Angola and Nigeria.
- Clients located in developing regions within Brazil.

Cooperation offered

- Company sends technicians abroad for preliminary evaluation. Requires payment of international travel and stay.
- Subject to prior inquiry, can receive visitors, covering cost of stay and local trips to visit plants using their equipment.
- Receives trainees.
- Provides labor training and technical assistance for equipment supplied.

MÁQUINAS SUZUKI S.A.

Address: Rua José Zacura, 223
18900 - Santa Cruz do Rio Pardo - SP.
Brazil

Telex: 182-477 MASU BR

Telephone: (0143) 72-1533

Contact: Walnei Pimentel

Field of activity

Machinery for processing of rice.

Experience in developing areas/countries

- Machinery exported to Ecuador, Peru, Chile, Bolivia, Colombia and Panama.
- A number of machinery supplied to developing regions within Brazil.

Cooperation offered

- Receives visitors paying local travel costs to visit plants using their machineries.
- In principle can receive trainees and offers their meals at plant site.
- Develops projects in their field of activity.
- Provides labor training and technical assistance for the supplied machineries.

MARTINEZ, TABOADA & CIA. LTDA.

Address: Av. Alcântara Machado, 2073
03101 - São Paulo - SP.
Brazil

Telex: (11) 22331 MTBA BR

Telephone: (011) 264-4811

Contact: Hamilton Galan Taboada

Field of activity

Machinery and equipment for pharmaceutical and packaging industries:

- machines for filling and closing ampules, flasks and vials
- machines for manufacturing ampules
- engraving machines
- powder proportioning machines
- dispensing heads
- labelling machines

Experience in developing areas/countries

- Exports to Mexico, Argentina, Uruguay, Paraguay and Chile.
- Clients in developing regions within Brazil.

Cooperation offered

- Develops projects for the specific needs of clients.
- Provides labor training and technical assistance for the supplied equipments.

M. DEDINI S.A. METALÚRGICA

Address: Av. Limeira, 222
13400 - Piracicaba - SP.
Brazil

Telex: (191) 032 MDMN

Telephone: (0194) 34-5455

Contact: Szaya L.E. Seifert

Field of activity

Machinery and equipment for alcohol distilleries and cane sugar mills

Experience in developing areas/countries

- Alcohol distilleries exported to the following countries: Bolivia (two units: 15 and 30 cubic meters per day), Paraguay (two units: 12 and 120 cubic meters per day), Venezuela (60 cubic meters per day), Costa Rica (2 units of 120 cubic meters per day), Peru (two units:10 and 20 cubic meters per day), Haiti (90 cubic meters per day), Guatemala (120 cubic meters per day), Pakistan (30 cubic meters per day).
- Dozens of distilleries supplied to clients located in developing regions within Brazil.

Cooperation offered

- Assignment of technicians for trips abroad, at its own expenses.
- Receiving of visitors, with possible payment of trip and stay, subject to prior inquiry.
- Receiving of trainees, with remuneration in line with company's standards.
- Development of pre-feasibility and pre-marketing studies.

MOINHOS - INDÚSTRIA E COMERCIO TECMOLIN LTDA.

Address: Rua Conselheiro Nébias, 217 - 2º andar
01203 - São Paulo - SP.
Brazil

Telex: (11) 23578 MICT

Telephone: (011) 222-9344

Contact: Ari Bergé

Field of activity

- Complete units for wheat, corn and other grains mills.
- Livestock feeds plant
- Silos

Experinece in developing areas/countries

- Exports to Paraguay, Uruguay, Argentina, Chile and Panama.
- A number of units supplied to developing areas within Brazil.

Cooperation offered

- Subject to payment of travel tickets, the company can send technician abroad for preliminary evaluations.
- Can develop preliminary projects at cost, on client's specific needs.

NIRO ATOMIZER IND. E COM. LTDA.

Address: Av. Indianópolis, 379
04063 - São Paulo - SP.
Brazil

Telex: (11) 24275

Telephone: (011) 549-2466

Contact: Mauro Terracini / Rintalo Tiba

Field of activity

Turn key projects for plants to make soluble coffee, powdered milk, powdered tannin, powdered eggs and powdered tomatoes.

Special equipment for dairy, foodstuffs and chemicals industries (vacuum descending film evaporator/concentrator, fluidized bed driers, flash driers, atomizing driers).

Experience in developing areas/countries

- Soluble coffee plants exported to Bolivia and Ecuador.
- A number of plants and equipments supplied to developing areas within Brazil.

Cooperation offered

- Supplies data for feasibility studies.

NORDON INDÚSTRIAS METALÚRGICAS S.A.

Address: Av. Brigadeiro Luiz Antonio, 849
01317 - São Paulo - SP.
Brazil

Telex: (11 21410 - (11) 34266 NORD BR

Telephone: (011) 229-1611

Contact: Ricardo Cesar Delleva

Field of activity

- Breweries
- Cryogenic plants
- Miscellaneous equipment for beverage and foodstuff, chemicals, pharmaceuticals, paint and resin and other industries.

Experience in developing areas/countries

- Brew houses and cellars for breweries supplied to Chile, Bolivia Paraguay and Mexico.
- Miscellaneous equipments for breweries supplied to Argentina and Bolivia.
- Cryogenic equipments supplied to Colombia and Venezuela.
- Breweries supplied to Amazon region and Northeastern area of Brazil.

Cooperation offered

- Subject to prior inquiry, company can send technicians abroad for preliminary evaluations at its own expenses, as well as receiving visitors and trainees.
- Can develop feasibility and product studies specific for the needs of clients.

ORGANIZAÇÃO INDUSTRIAL CENTENÁRIO LTDA

Address: Av. Major José Levy Sobrinho, 1946
13480 - Limeira - SP.
Brazil

Telex: (19) 2791

Telephone: (0194) 41-6710

Contact: João Biosiano Errada

Field of activity

- Complete units for the production of: orange juice, juice and oil of lemon, coconut milk and grated coconut, pineaple jam.
- Machinery for the extraction and processing of juice of fruits.

Experience in developing areas/countries

- Orange juice extraction units supplied to Paraguay, Argentina and Uruguay. Passion-fruit juice extraction to Trinidad-Tobago.
- Dozens of units for extraction and processing of fruit juice supplied to the Northeastern Area of Brazil.
- Equipment to produce raw orange juice and oil at a capacity of 4 tons per hour of fresh oranges would cost about US$ 210,000.
- Equipment to produce raw juice from 5 tons per hour of fresh tropical fruits would cost about US$ 180,000.

Cooperation offered

- Can send technician abroad for preliminary evaluation, subject to payment of travel expenses.
- Receives visitors, paying costs of local travels for visiting plants using their equipment.
- Receives trainees, without covering their expenses.
- Can carry out projects for specific client's needs.
- Provides labor training and technical assistance for machinery supplied.

TNL INDUSTRIA MECANICA LTDA.

Address: Rodovia Raposo Tavares, Km 381
19900 - Ourinhos - SP.
Brazil

Telex: (0182) 243 TPAI BR

Telephone: (0143) 22-2544

Contact: Diógenes Machado

Field of activity

- Complete units for extraction of vegetable oils on a turn-key basis, with capacities from 50 to 2,000 tons per 24 hours (based on soya bean).
- Expanders, breaker mills, rolling units, granulators, horizontal driers for expanded mass and granulated bran, cleaning screens and grain driers, vertical and horizontal conveyors of all types.

Experience in developing areas/countries

- Complete units on a turn key basis exported to Argentina, Bolivia and Paraguay.
- Equipments exported to Venezuela, Turkey and Thailand.
- 15 units on a turn key basis supplied to Brazilian clients loca - ted in small towns.

Cooperation offered

- Technical consulting services for expansion of plants in operation and operational improvements.
- Development of projects for specific client's needs.
- Subject to payment of travel expenses, can send technician abroad for preliminary evaluations.
- Will receive visitors to get acquainted with plants using their equipments.

TREU S.A. MÁQUINAS E EQUIPAMENTOS

Address: Av. Brasil, 21.000
21.510 - Rio de Janeiro - RJ.
Brazil

Telex: (21) 21089

Telephone: (021) 372-6633

Contact: José Roberto P. Correa

Field of activity

Equipment for pharmaceutical and chemical industries.

Complete units for:

- production of margarine, vegetal fats and mayonnaise
- processing of coconut and tropical fruits
- production of hydrogen for hydrogenation of comestible and other oils.

Experience in developing areas/countries

- Equipments supplied to Argentina and Ecuador.
- 3 complete plants for coconut milk and grated coconut production supplied to Northeastern area of Brazil.
- 1 margarine plant supplied to Ceará State (Northeastern Brazil).
- Various equipment supplied to developing areas in Brazil.

Cooperation offered

- Has large number of pilot units at laboratory permitting experi - ments of interest to clients to be run before contract is signed.
- Receives visitors and provides technical assistance.
- Provides technical assistance for starting up of plants.

VANGUARDA MECÂNICA - IND. COM. E EXPORTAÇÃO LTDA.

Address: Rua Mario Sampaio Ferraz, 111
13100 - Campinas - SP.
Brazil

Telex: 55-191-290 VAME BR

Telephone: (0192) 42-5444

Contact: Renata Peixoto Ferreira

Field of activity

- Complete units for soya bean milk and soya flour production.
- Complete units for animal and vegetal extracts production.

Experience in developing areas/countries

- Complete facilities exported to Costa Rica, Paraguay, Cuba, Guyana, Panama, Ecuador, Bolivia, Argentina, North Korea and Ghana.
- A number of units supplied to developing regions within Brazil.
- A plant with a capacity of 200 liters/hour of soya bean milk would require an investment of about US$ 62,000.

Cooperation offered

- Receives visitors paying their local travel costs for visiting plants using their equipments.
- Develops pre-feasibility studies and projects for the "mechanical cow" (soya bean milk production) and for people's food.

VOMM EQUIPAMENTOS E PROCESSOS LTDA.

Address: Rua Manoel Pinto de Carvalho, 161
02712 - São Paulo - SP.
Brazil

Telex: (11) 30555 VOMM BR

Telephone: (011) 266-9888

Contact: Manfredo Arns

Field of activity

Equipment for foodstuff and other process industries (turbo-driers, granulators, homogenizers, pasteurizers, cookers).

- drying of fruit and vegetables
- pasteurization of flour
- alternate livestock feeds

Experience in developing areas/countries

- Equipments exported to Argentina, Mexico and Bolivia.
- Supply of plants and equipments to developing areas within Brazil.

Cooperation offered

- Raw material analysis, free of charge
- Testing of products on a pilot scale
- Receives clients for technical and commercial visits

ZANINI S.A. EQUIPAMENTOS PESADOS

Address: Av. Paulista, 460 - 18º andar
01310 - São Paulo - SP.
Brazil

Telex: (11) 21550 ZANI BR

Telephone: (011) 285-5122

Contact: Ivan Vichiesse

Field of activity

Complete facilities for sugar mills and alcohol distilleries (turn-key projects).

Experience in developing areas/countries

- Alcohol distilleries exported to Argentina (60 cubic meters per day), Costa Rica (150 cubic meters/day), and Ecuador (30 cubic meters/day).
- Machinery, equipments and spair parts exported to Argentina, Bolivia, Colombia, Costa Rica, Dominican Republic, Ecuador, Guatemala, Indonesia, Ivory Coast, Mexico, Panama and Paraguay.
- More than 40 alcohol distilleries sold for developing areas within Brazil; capacities ranging from 90 to 270 cubic meters per day.

Cooperation offered

- The company will assign technicians abroad for preliminary evalua - tions, subject to payment of costs of travel and stay.
- Visitors are welcome for technical and commercial conversations.
- On prior consultation, can develop projects for specific client's needs.
- Provides training of labor and technical assistance for units supplied.

CBC INDÚSTRIAS PESADAS S.A.

Address: Rua Manoel da Nóbrega, 1280
04001 - São Paulo - SP.
Brazil

Telex: (11) 30253 - (11) 37767

Telephone: (011) 284-5755

Contact: Riuton Terada

Field of activity

- Complete plants for production of granulated fertilizers, cement and lime.
- Steam boilers and equipments for chemical, petrochemical, steel, metallurgical, minning industries.

Experience in developing areas/countries

- Exports to Mexico, Bolivia, Uruguay, Colombia, Argentina, Ecuador, Nicaragua, Venezuela, Paraguay and Peru.
- A number of clients in developing regions within Brazil.

Cooperation offered

- Subject to company's prior evaluation, it is possible:

  . to send technicians abroad for preliminary evaluations, at company's own expenses;

  . to receive trainees;

  . to receive visitors for technical and commercial conversations;

  . to carry out feasibility studies and preliminary projects on specific client's needs.

CERAMATEC INDUSTRIA E COMERCIO DE MAQUINAS LTDA

Address: Av. Brigadeiro Faria Lima, 1238 - 4º andar
01452 - São Paulo - SP.
Brazil

Telex: (11) 22386 ESEL BR

Telephone: (011) 813-5646

Contact: Ubiratan Morassutti
Salvador Ucha Filho

Field of activity

Turn key projects for the red clay ceramic industry (roofing tiles, bricks, floor tiles, sewer pipes).

Experience in developing areas/countries

- Supply of an extruded enameled roof tiles plant for Bolivia. Capacity: 3000 square meters per day. Approximate investment: US$ 2,400,000.
- Supply of an drain pipe plant for Maranhão State, Brazil. Capacity: 100 tons per day. Approximate investment: US$ 2,500,000.
- Supply of a perforated bricks plant for Rio de Janeiro State, Brazil. Capacity: 80,000 bricks per day. Approximate investment: US$ 1,000,000.

Cooperation offered

- Can send technician abroad for preliminary evaluation, subject to the payment of travel expenses.
- In principle can provide analysis of raw materials, free of charge.
- Receives visitors for technical and commercial purposes.
- Provides labor training for units supplied.

CIBI - COMPANHIA INDUSTRIAL BRASILEIRA IMPIANTI

Address: Av. Paulista, 2001
01311 - São Paulo - SP.
Brazil

Telex: (11) 30076

Telephone: (011) 283-2366

Contact: Maurizio Bianchi / Fabio Cintra do Prado

Field of activity

Machinery and equipment for concrete mixing plants.

Experience in developing areas/countries

- Clients located in developing regions within Brazil.

Cooperation offered

- In principle company can send technicians abroad, at its own expenses.
- Develops projects on specific client's needs.
- Can organize training at plant or on site, subject to prior agreement.

INSTALAÇÕES CERÂMICAS DE ITU S.A. - VERDÉS

Address: Av. Tiradentes, 2600
13300 - Itu - SP.
Brazil

Telex: (11) 33652 VERD BR

Telephone: (011) 409-1211

Contact: Sebastian Oller Blanch

Field of activity

Machinery and equipment for red clay ceramic industry (roofing tiles, bricks, floor tiles, sewer pipes). Turn key projects.

Experience in developing areas/countries

- One turn key plant supplied to Bolivia. Also various machines and equipments supplied to Bolivia, Argentina and Chile.
- Six turn key plants supplied to the Northeastern Part of Brazil (developing area of the country). Also supplied various individual machines and equipments to the same region.

Cooperation offered

- Analysis of raw materials, free of charge.
- In principle, can send technician abroad for preliminary evaluation at its own expenses.
- Receives clients for technical visits, covering cost of local travels for visiting plants using their machinery and equipment.
- Subject to prior inquiry, can receive trainees.
- Can carry out projects and feasibility studies for specific client's needs.
- Provides labor training and technical assistance for units supplied.

MÁQUINAS CERÂMICAS MORANDO S.A.

Address: Av. Paulista, 1499 - Conj. 304
01311 - São Paulo - SP.
Brasil

Telex: (11) 23683 MCMO BR

Telephone: (011) 288-2288

Contact: Giulio Lattes

Field of activity

Machinery for the clay ceramic industry (roofing tiles, bricks, floor tiles, sewer pipes).

Experience in developing areas/countries

There are aboub 500 red clay ceramic plants in Latin America sucessfully using machinery and equipment manufactured in Brazil. Countries where exist a concentration of such machinery and equipment are: Bolivia, Peru, Paraguay, Ecuador, Panama, Honduras, Costa Rica, Nicaragua, Guatemala, Argentina, Uruguay, Colombia, Venezuela, Mexico and Chile. Ghana and Iran also have experience with such Brazilian machinery.

Cooperation offered

- Analysis of raw materials, free of charge.
- In principle the company can send technicians abroad for preliminary evaluations , at its own expenses.
- Offers technical assistance during erection and starting up.
- Provides labor training and technical assistance for machinery supplied.
- Receives visitors for technical conversations.

MECÂNICA BONFANTI S.A.

Address: Rua João Arrais Seródio, 17
13610 - Leme - SP.
Brazil

Telex: (19) 1774 MBTI BR

Telephone: (0195) 71-2210

Contact: Deodato Braga

Field of activity

Machinery, kilns and driers for red clay ceramic industry (roofing tiles, bricks, floor tiles, sewer pipes). Turn key projects.

Experience in developing areas/countries

The company has supplied machinery and equipment to all South American countries. Also has experience in supplying turn key projects to developing areas of Brazil.

A plant with a combined capacity of 156,000 bricks and 24,000 roofing tiles per month would require an investment of about US$ 630,000.

Cooperation offered

- Analysis of raw materials (clays), free of charge.
- Company can send technician for preliminary evaluation of project opportunity subject to payment of travel costs.
- Subject to prior negotiation company can prepare preliminary design for clay ceramic industries.
- Covers costs of stay by visitors for up to three days in the town of Leme, São Paulo State.
- Provides training in plant, with costs of stay for trainees on client's account.

METALÚRGICA ERWINO MENEGOTTI LTDA.

Address: Rua Pres. Epitácio Pessoa, 2147
89250 - Jaraguá do Sul - SC.
Brazil

Telex: 474-153 ERWI BR

Telephone: (0473) 72-0433

Contact: Ricardo Feldens or Hilário Stephani

Field of activity

- Machinery and equipment for the production of cement-based products (lampstandards, drain pipes, cement blocks, cement floor tiles)
- Civil construction machinery

Experience in developing areas/countries

- Exports to Ecuador, Bolivia, Paraguay, Trinidad-Tobago and Irak.
- Clients in developing regions within Brazil.
- Plant with a daily capacity to produce the following items: 10 lampstandards, 50 drain pipes (diameters from 200 up to 800 mm), 200 m^2 of cement floor tiles and 3,000 cement blocks might cost about US$ 70,000 only for equipment.

Cooperation offered

- Develops projects on specific client's needs.
- Provides labor training and technical assistance for machinery supplied.
- Clients are kindley asked to present their specific inquiries which will be considered on a case by case basis.

SITI S.A. SOCIEDADE DE INSTALAÇÕES TERMOELÉTRICAS INDUSTRIAIS

Address: Rua Maranhão, 598 - 8º andar
01240 - São Paulo - SP.
Brazil

Telex: (11) 22422 SITI BR

Telephone: (011) 826-8966

Contact: Piergiulio Romano

Field of activity

Complete facilities for the fabrication of:

- ceramic coatings (floor and wall tiles, etc)
- sanitary ceramic (white clay ceramic)
- porcelane tableware and decorations

Experience in developing areas/countries

- One plant of floor tiles exported to Ecuador.
  Capacity: 3,000 sq.meters/day. Approximate investment: US$ 2,500,000
- Clients in developing regions within Brazil.
- Minimum recomended plant capacities and related investments are shown below:
  - . floor and wall tiles plant. Minimum capacity: 1,000 sq.meters/day; approximate investment: US$ 2,000,000
  - . sanitary ceramic plant. Minimum capacity: 500 pieces/day; approximate investment: US$ 3,000,000
  - . porcelane tableware plant. Minimum capacity: 1,000 pieces/day; approximate investment: US$ 250,000

Cooperation offered

- Company will send technician abroad (South America and Africa) to make preliminary evaluations, at its own expenses.
- Receives visitors at its industrial plant located in the town of Mogi-Guaçu, São Paulo State.

INDUSTRIA MECANICA CAVALLARI S.A.

Address: Rua Professor Alves Pedroso, 452
03721 - São Paulo - SP.
Brazil

Telex: (11) 34679 MPAP BR

Telephone: (011) 957-5011

Contact: José Eduardo C. Zanetti

Field of activity

Machinery and equipment for paper manufacture (turn key projects)

Experience in developing areas/countries

- Company already exported machineries and equipments to Argentina, Mexico, Peru, Uruguay and Chile.
- Clients in developing regions within Brazil.

Cooperation offered

- Company can send technician abroad for preliminary evaluations, subject to payment of travel expenses.
- Receives visitors and covers local trips for visiting plants using their machinery.
- Can receive trainees, subject to prior inquiry.
- Can perform opportunity and pre-feasibility studies on client's specific needs.
- Provides training of labor and technical assistance for machinery supplied.

MAQUINAS IKEMORI LTDA.

Address: Rua Antonio Lindoro da Silva, 408
03506 - São Paulo - SP.
Brazil

Telex: (11) 34311 SPIM BR

Phone: (011) 295-5522

Contact: Luiz Ikemori

Field of activity

Paper and pulp machinery (turn key projects)

Experience in developing areas/countries

- Plant for the production of sanitary paper and other types of paper for Peru. Capacity: 20 tons per day (24 hours).
- Sanitary paper plant for Dominican Republic. Two paper machines each one with a capacity of 12 tons per 24 hours.

Brazilian Northeastern Area:

- Plant for the production of sanitary and packing papers for Rio Grande do Norte State. Capacity: 10 tons per 24 hours.
- Sanitary paper plant for Ceará State. Capacity: 8 tons per day (24 hours).

Minimum technically feasible plant capacity is 3 tons/24 hours, with an estimated investment of US$ 1,100,000. However, with about the same investment it is possible to have a 8 to 10 tons per 24 hours capacity plant.

Cooperation offered

- Raw material analysis, free of charge
- Subject to payment of travel and stay, company will send technician abroad for preliminary evaluation,
- Can develop client's projects, subject to prior agreement.
- Subject to prior agreement, can receive trainees.
- Company can organize technical visits to operating plants in Brazil, subject to requests far enough in advance.
- Company provides labor training and technical assistance for machinery supplied.

FASA ZINSER INDUSTRIAL S.A.

Address: Rua Manoel Heitor, 80
13900 - Amparo - SP.
Brazil

Telex: (11) 25595 FAZI BR

Telephone: (011) 852-2100

Contact: Alfredo A. Tobler

Field of activity

Textile machinery and accessories: ironing units, spinning frames, twisting units, bobbin winders.

Experience in developing areas/countries

- Machinery exported to Mexico, Argentina, Chile, Ecuador and Colombia.
- Machinery supplied to clients located in developing areas within Brazil.

Cooperation offered

- Receives visitors for technical and commercial conversations.
- Can carry out opportunity and feasibility studies subject to payment.

HOWA S.A. INDUSTRIAS MECANICAS

Address: Rua Senador Feijó, 69 - 2º andar
01006 - São Paulo - SP.
Brazil

Telex: (11) 22467

Telephone: (011) 258-6022

Contact: Jorge Fujisawa

Field of activity

Machinery and equipment for spinning and weaving.

- High speed card with 106 flats, 1016 mm wide, with rigid frame, web or flock feeder system, for production rates up to 35 kg/hour.
- Single headstock draw frames for cans 508 mm x 1067 mm, with rate of production of 500 m/minute.
- 56-, 76- or 96-spindle roving machines with draw system to handle 4 lines with PK 1500 (SKF) pendular arm, bobbins 6" x 16" with fly frame speed of 1,200 r.p.m. (maximum).
- Spinning frames for cotton, man-made, cut or mixed fibers for fine, medium and coarse titre ranges, with PK 225 (SKF) pendular arm, and spindle speeds up to 15,000 r.p.m. (maximum).
- Spindle changing loom system, available in widths of 46" to 100" for cotton, rayon and polyester and mixed goods, with 125 to 180 strokes per minute.
- Looms with system for inserting weft by means of positive grips , available in widths of up to 68", for 240 stokes per minute.

Experience in developing areas/countries

- Machinery exported to Uruguay and Bolivia.
- Various machinery and equipment supplied to developing areas within Brazil.

Cooperation offered

- Assistance in preparing preliminary design for spinning and weaving industry.
- Technical and mechanical courses for spinning and weaving equipment.

LUWA CLIMATÉCNICA S.A.

Address: Rua Verbo Divino, 1207
04719 - São Paulo - SP.
Brazil

Telex: (11) 22914 LUWA BR

Telephone: (011) 247-0144 - (011) 247-7239

Contact: Antonio Del Priore Filho

Field of activity

Air cooling, cleaning and filtration systems, etc., for textile industries.

Experience in developing areas/countries

- Clients in developing regions within Brazil.

Cooperation offered

- Subject to payment of expenses, can send technician abroad for preliminary evaluation.
- Receives visitors, and covers local expenses.
- Receives trainees.
- Develops projects and feasibility studies for client's specific needs.

TEXIMA S.A. INDÚSTRIA DE MÁQUINAS

Address: Av. Marechal Tito, 6765
Itaim Paulista
08160 - São Paulo - SP.
Brazil

Telex: (11) 22883 TEXM BR

Telephone: (011) 297-1433

Contact: Walter Gibello

Field of activity

Machinery for finishing of cloth.

- singeing machines for piece goods and tubular knits
- mercerization machines for chain and roll operations and for tube knits
- washing units for dyed and printed goods and knits
- continuous dyeing by Pad-Steam and Thermosol systems
- drum-type dryers and knit product dryers
- printing machines (rotary and flat bed)
- frames for thermo-setting, drying and finishing

Experience in developing areas/countries

- Machinery exported to Paraguay, Uruguay, Chile, Argentina, Venezuela and Peru.
- Machinery supplied to developing areas within Brazil.

Cooperation offered

- Subject to prior inquiry and payment of travel costs, can send technician abroad for preliminary evaluation.
- Receives visitors, covering costs of stay and local travel.
- Can receive trainees.

WUPPERTAL INDÚSTRIA DE MÁQUINAS LTDA.

Address: Av. Uberaba, 1111
08580 - Itaquaquecetuba - SP.
Brazil

Telex: (11) 39347 WUPP BR

Telephone: (011) 293-8799

Contact: José Abs Sobrinho

Field of activity

Finishing machines for textile industry.

- thermo-transfer printing machines
- for tubular knits: thermal calenders, upsetters and mercerization units
- dyeing equipment
- pneumostractors for squeezing tubular knits; dryers
- hydraulic winding and unwinding units
- cloth pre-shrinking units

Experience in developing areas/countries

Company has exported machines for Argentina, Paraguay, Bolivia, Chile, Peru, Colombia, Venezuela and Uruguay.

A complete unit for cotton knit finishing, at a capacity of 10 tons/month would require an approximate investment of US$ 70,000.

Cooperation offered

Subject to inquiry, company can prepare projects for the textile finishing sector, on client's specific needs.

DAMBROZ S.A. INDÚSTRIA MECÂNICA E METALÚRGICA

Address: BR 116 Km 148, nº 17806
Caixa Postal 345
95001 - Caxias do Sul - RS.
Brazil

Telex: 54-2245 DIMM BR

Telephone: (054) 222-4355

Contact: Luiz Carlos Dambroz

Field of activity

Machinery for wood processing: carpentries and cabinet making (band saws, shapers, tenoning machines, circular saws, squaring circular saws, straightening machines, drilling machines, band sanders, roughing planers, planers, wood lathes, etc).

Experience in developing areas/countries

- Machinery exported to Mexico, Ecuador, Peru, Chile, Trinidad- Tobago, Suriname, Argentina, Uruguay, Venezuela, Kenya.
- A number of machinery supplied to clients located in developing areas within Brazil.

Cooperation offered

- Company sends technician abroad for contacts with prospective clients, at its own expenses.
- Receives visitors paying for their local travels and stay.
- Develops projects in the wood processing field, on client's specific needs.
- Provides labor training and start up assistance.

FEZER S.A. INDÚSTRIA MECÂNICA

Address: Estrada Rio Bugre, Km 01
89500 - Caçador - SC.
Brazil

Telex: (493) 397 FEIM BR

Telephone: (0496) 62-0273

Contact: C.A. Fernando Fezer

Field of activity

Equipment for veneering of wood and manufacture of plywood and wooden shapes.

Equipment for production of mechanical wood pulp.

Experience in developing areas/countries

- Equipments exported to Argentina and Chile.
- A number of equipments supplied to plywood and other industries in the Amazon Region, Brazil.
- Minimum recommended capacity for a plywood plant is in the order of magnitude of 300 to 400 square meters per month. For such capacity, investments would be in the range of US$ 600,000 to US$ 700,000, ex-works.
- If good quality wood is available, this will be used for the external part of the plywood, thus obtaining a better product. Otherwise, using only ordinary wood, a popular product will be obtained.
- Labor for the above mentioned capacity will be 6 skilled workers and about 30 to 40 semi or non-skilled workers. An experienced manager and some clerks will fulfill plant labor needs.

Cooperation offered

- Company can send technician abroad for preliminary evaluation, provided expenses are paid by interested parties.
- Receives foreign representatives for technical visits but does not cover their travel expenses.

INVICTA MÁQUINAS PARA MADEIRA LTDA.

Address: Av. Major José Levy Sobrinho, 2500
13480 - Limeira - SP.
Brazil

Telex: (19) 1107 INMD BR

Telephone: (0194) 41-1500

Contact: Jair de Sampaio Barros

Field of activity

Machinery for wood processing: carpentries and cabinet-making (band saws, shapers, tenoning machines, circular saws, squaring circular saws, straightening machines, drilling machines, band sanders, roughing planers, planers, wood lathes, etc).

Experience in developing areas/countries

- Machinery exported to almost Latin American countries and to Nigeria.
- A number of machineries supplied to developing areas within Brazil.

Cooperation offered

- In principle can send technician abroad for preliminary evaluations at its own expenses.
- Receives visitors and trainees without covering cost of stay.

METALÚRGICA SCHIFFER S.A.

Address: Av. Ernesto Vilela, 1701
84100 - Ponta Grossa - PR.
Brazil

Telex: (422) 157

Telephone: (0422) 24-5644

Contact: Roberto Schiffer

Field of activity

Complete line of machinery and equipment for sawmills.

Experience in developing areas/countries

- Company has sold machines to all countries in Latin America.
- For logs of small diameter, the basic unit with an average capacity of two cubic meters per hour of planks, would require about US$ 12,000 for machinery.
- Till the moment about 3,300 units have been fabricated and supplied to clients.

Cooperation offered

- Can send technician abroad for preliminary evaluation and/or preliminary projects, subject to payment of international travel expenses.
- Receives visitors, without covering their expenses.
- Provides training courses without covering their expenses.
- Provides labor training and technical assistance for machinery supplied.

COMACC - MÁQUINAS PARA COUROS E CALÇADOS LTDA.

Address: Rua Julio de Castilhos, 351
93.300 - Novo Hamburgo - RS.
Brazil

Telex: (51) 5093 IDER BR

Telephone: (0512) 93-2038

Contact: Ivo Mayer Milbrath

Field of activity

- Machinery for leather processing and footware manufacture.
- Turnkey projects for footware manufacture plants.

Experience in developing areas/countries

- Factory for Argentina: 5,000 pairs of "mocassin" per day.
- Factory for Colombia: 2,000 pairs of "mocassin" per day.
- Factory of woman footware for the Northeastern region of Brazil. Capacity: 4,000 pairs per day.
- A factory to produce 1,000 pairs per day (8 hours) of man footware would require an investment of about US$ 450,000.

Cooperation offered

- Receives visitors and trainees not covering their expenses.
- Develops projects for specific client's needs.
- Provides labor training and technical assistance for machinery supplied.

INDÚSTRIA DE MÁQUINAS ENKO LTDA.

Address: Av. Pedro Adams Filho, 795
93.320 - Novo Hamburgo - RS.
Brazil

Telex: (051) 1369

Telephone: (0512) 95-3566

Contact: Ruy R. Engelmann

Field of operation

Complete machinery line for "Tannery Plants" (leather processing).

Experience in developing areas/countries

- Machinery exported for Peru, Colombia, Ecuador, Venezuela, Uruguay, Paraguay, Bolivia, Mozambique.
- Minimum tannery plant capacity: 100 leathers/day cowhide.
  Approximate investment (only equipment): US$ 130,000.

Cooperation offered

- The company can send a technician abroad for preliminary evaluations, subject to payment of travel costs.
- Receives visitors not covering their expenses.
- Subject to prior inquiry can receive trainees.
- Develops projects for complete tannery plants, on client's specific needs.
- Provides training of labor and technical assistance for machinery supplied.

L.P. COPÉ & CIA. LTDA.

Address: Rua Major Luiz Bender, 1
93300 - Novo Hamburgo - RS.
Brazil

Telex: (051) 1742 LPCO BR

Telephone: (0512) 93-1077

Contact: Luiz Frohlich or Carmen Helena Kauer

Field activity

Machinery and equipment for rubber industries (technical parts), leather (finishing units) and plastics (finishing units).

Experience in developing areas/countries

- Machinery and equipment exported to Argentina and Mexico.
- A number of machinery supplied to clients located in developing regions within Brazil.

Cooperation offered

- **In principle and at the clients' expense, the company can send technicians abroad for preliminary evaluation.**
- **Receives clients' representatives for technical and commercial visits.**
- **Receives trainees, without taking responsibility for their expenses.**

INDUSTRIA E COMERCIO MOTOTEST LTDA.

Address: Rua Madre Emilie Villeneuve, 265
04367 - São Paulo - SP.
Brazil

Telephone: (011) 246-0388 - (011) 522-6453

Contact: Guido Wunderlich

Field of activity

Machines for internal combustion engine boring (recuperation).

Experience in developing areas/countries

One machine exported to Bolivia.

Cooperation offered

The company, which is a relatively small outfit, can provide limited assistance subject to prior inquiry.

INDÚSTRIAS JOÃO MAGGION S.A.

Address: Rua José Campanella, 501
07000 - Guarulhos - SP.
Brazil

Telex: (11) 39384

Telephone: (011) 209-8266

Contact: José Maria Melendez Aguero

Field of activity

- Machines for re-treading tires
- Machines for manufacturing tires and inner-tubes for motorcycles and agricultural and industrial vehicles

Experience in developing areas/countries

- Units have been exported to Uruguay, Paraguay, Chile and Argentina
- Machines supplied to developing regions within Brazil
- One machine with capacity for re-treading up to sixty tires per month, using the conventional system, would cost approximately US$ 25,000

Cooperation offered

- Analysis of raw materials
- In principle, and subject to prior analysis, the company can assign a technician abroad for preliminary evalutions, at its own expenses
- Receives visitors without covering their expenses
- Can develop projects for specific client's needs
- Provides training of labor and technical assistance for machinery supplied

NORDEQ - EQUIPAMENTOS INDUSTRIAIS DO NORDESTE S.A.

Address: Via Centro nº 4364
43700 - Simões Filho - BA.
Brazil

Telex: (71) 1426

Telephone: (071) 594-9051 - (071) 594-8611

Contact: Jurandy Ferreira Alves

Field of activity

- Plate working industry; metalic structures.

Cooperation offered

NORDEQ is a company located in the Northeastern Area of Brazil (developing region) and can offer the following assistance:

- design of plate working shops
- work shop organization assistance
- can receive trainees in supervising and managing of work shops. Travel expenses at client's account.

SCHMUZIGER INDUSTRIA E COMERCIO DE MAQUINAS LTDA.

Address: Alameda dos Arapanés, 310
08170 - São Paulo - SP.
Brazil

Telex: (11) 24353 INDM BR

Telephone: (011) 241-6642 - (011) 533-6821

Contact: Hans Werner Schmuziger

Field of activity

Complete plants for producing polyurethane foam mattresses.

Experience in developing areas/countries

- Paraguay: plant with a daily capacity of 100 mattresses, 400 pillows and 400 furniture cushions. Approximate cost of machinery: US$ 40,000
- Bolivia: 3 plants supplied
- Colombia: plant with a daily capacity of 50 mattresses and 200 pillows. Approximate cost of machinery: US$ 25,000
- Chile: plant for a 50 mattresses per day capacity. Approximate cost of machinery: US$ 22,000
- Belize: plant for a 70 mattresses per day capacity. Approximate cost of machinery: US$ 32,000
- Zaire: plant for 100 mattresses per day capacity. Approximate cost of machinery: US$ 36,000

Cooperation offered

- Company can send technician abroad to evaluate opportunities, with cost of air travel for account of client.
- Company receives clients representatives for technical visits, without covering their expenses.
- Company is also prepared to receive trainees, without supporting' costs of their stay.
- In certain cases company is prepared to consider establishment of joint ventures.

INDUSTRIAL PROFILES

RED CLAY CERAMIC PLANT

1. INTRODUCTION

Red clay ceramic products comprise bricks, blocks, tiles, floor tiles and drain pipes.

Clay ceramic plants are interesting industries for developing regions for the reasons mentioned beneath:

- the products afford sound characteristics of heat and sound insulation, besides being fireproof;
- the factories are labor-intensive;
- the raw materials and fuels can be obtained on the spot;
- the equipment is strongly built and requires little maintenance

Clay ceramic products generally cannot stand the added cost of transportation to long distances, hence these plants should serve the local market.

The raw material (clay) also needs to be obtained in the vicinity of the plant. Clay must, moreover, be properly selected for manufacture of brick and especially roof tiles of good quality.

The furnaces or kilns can use as fuel lumber, coal, charcoal, gas or oil.

Normally, subject to inquiry, equipment manufacturers offer:

- analysis of clays and recommendations on their use;
- assistance by specialists for preliminary evaluation and aid in preparing feasibility studies.
- technical assistance during erection and start-up of the machinery;
- training of labor on the spot and/or in Brazil;
- technical assistance after start-up.

In accordance with this profile the factory produces only brick and roof tiles.

2. CHARACTERISTICS

Perforated brick (with 8 holes) measuring 10x20x20 cm, with unit weight of 3.7 kg (raw) and 2.8 kg (after roasting).

Colonial type pressed roofing tile, 50 cm long by 20 cm wide, with unit weight of 3.0 kg (raw) and 2.3 kg (roasted).

- Capacity: 1,872,000 bricks per year
  288,000 roofing tiles per year

3. PROCESS FLOW SHEET AND LAY-OUT

See appended drawings

4. EQUIPMENT

- Box feeder
- Clay disintegrator (or disintegrator and separating mill)
- Mixer, with or without filter (to add water to paste).
- Lamination unit (to homogenize paste)
- Vacuum extruder
- Manual (or automatic) cutter
- Conveyor belts
- Roofing tile press
- Equipment for artificial driers:
  - . blowers;
  - . hot air generators;
  - . exhaustor;
  - . metal cocks;
  - . electric switchboard;
  - . shelving for brick.

- Equipment for furnaces
  - . burners (if fuel is coal, charcoal, gas or oil)
  - . exhaustors
  - . nozzles, valves, etc.
  - . metal cocks.
  - . hardware

- Hand-drawn transporting pipes
- Wooden lattices for supporting tiles

5. INVESTMENT

Civil works and facilities

	US$
- Shed and floor (*)	222,800
- Machinery bases	4,400
- Electric control house and water tank	3,500
- Furnaces, stacks and drying chamber	101,700
- Offices	10,500
- Electrical network and distribution wiring	65,000
- Maintenance workshop	15,000
	422,900

Machinery and equipment:

- Charge preparation and extrusion	76,400
- Drying	30,000
- Firing (using lumber as fuel)	10,400
- Handling	
1 tipping truck	25,000
1 loading shovel	50,000
1 light truck	10,000
T O T A L	624,700

(*) Local construction, amount involved being subject to considerable variations from area to area.

Area required:	general plot (170 m x 100 m)	17,000 m²
	plant (120 m x 73 m)	8,760 m²
	roofed-over area (75 m x 45 m)	3,375 m²

6. TECHNICAL COEFFICIENTS OF PRODUCTION

- Raw materials 33.3 tons/day (240 days per year)
- Lumber 7.03 m³/day (360 days/year)
- Energy 700 KWh/day

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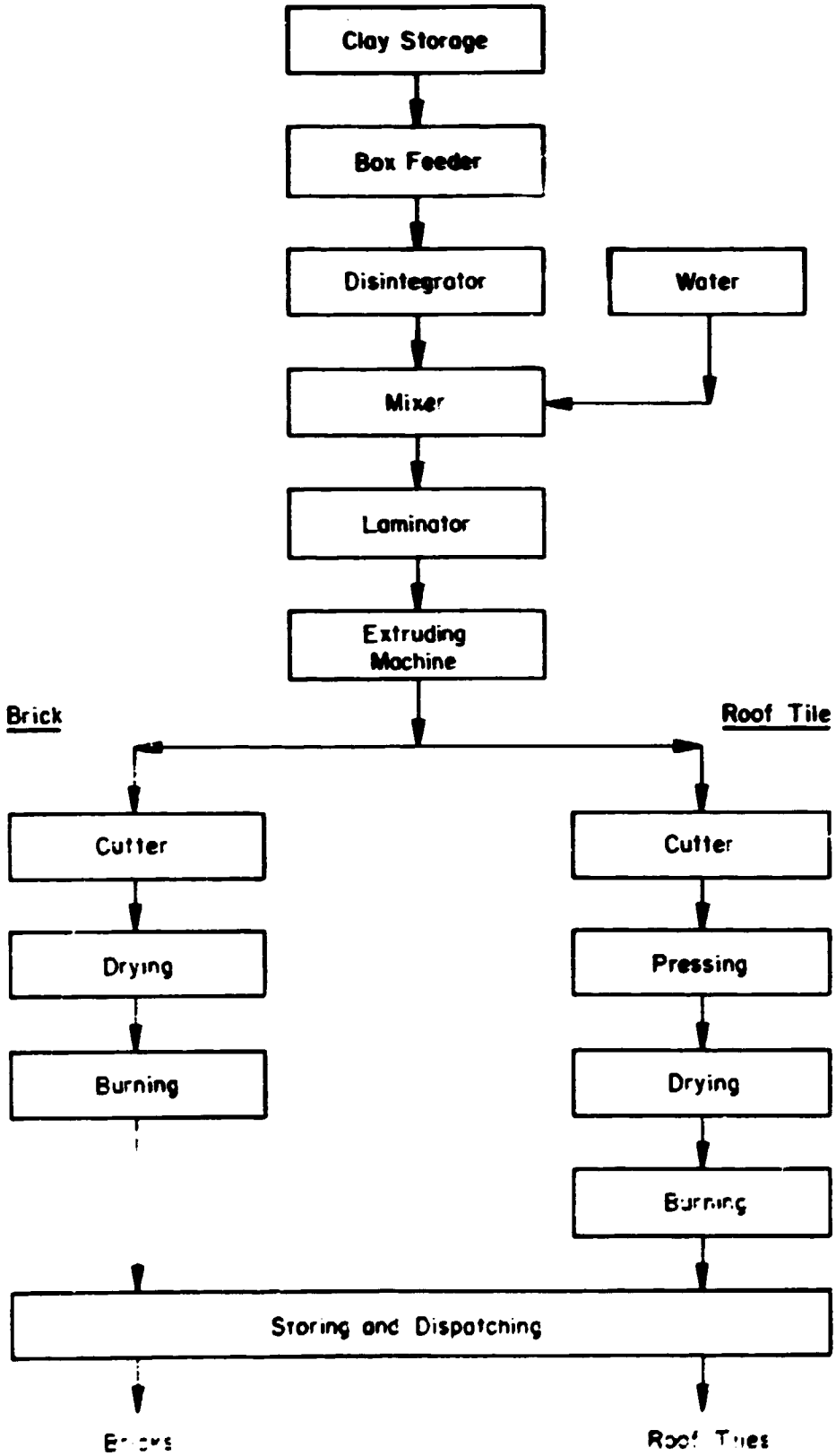
7. LABOR

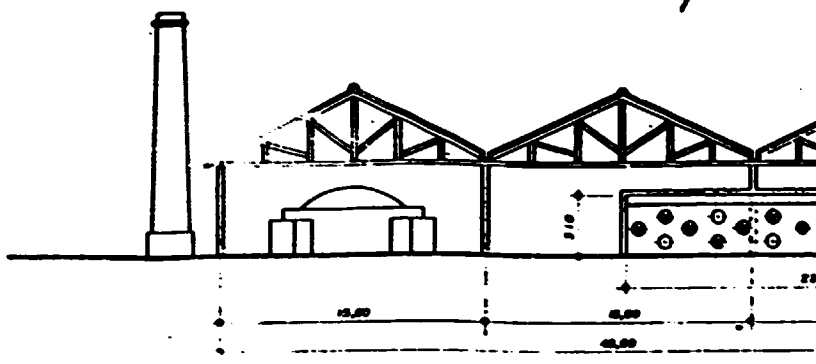
Skilled	8 workers
Unskilled	35 workers
Management	5 workers
Total	48 workers

8. EXPERIENCE

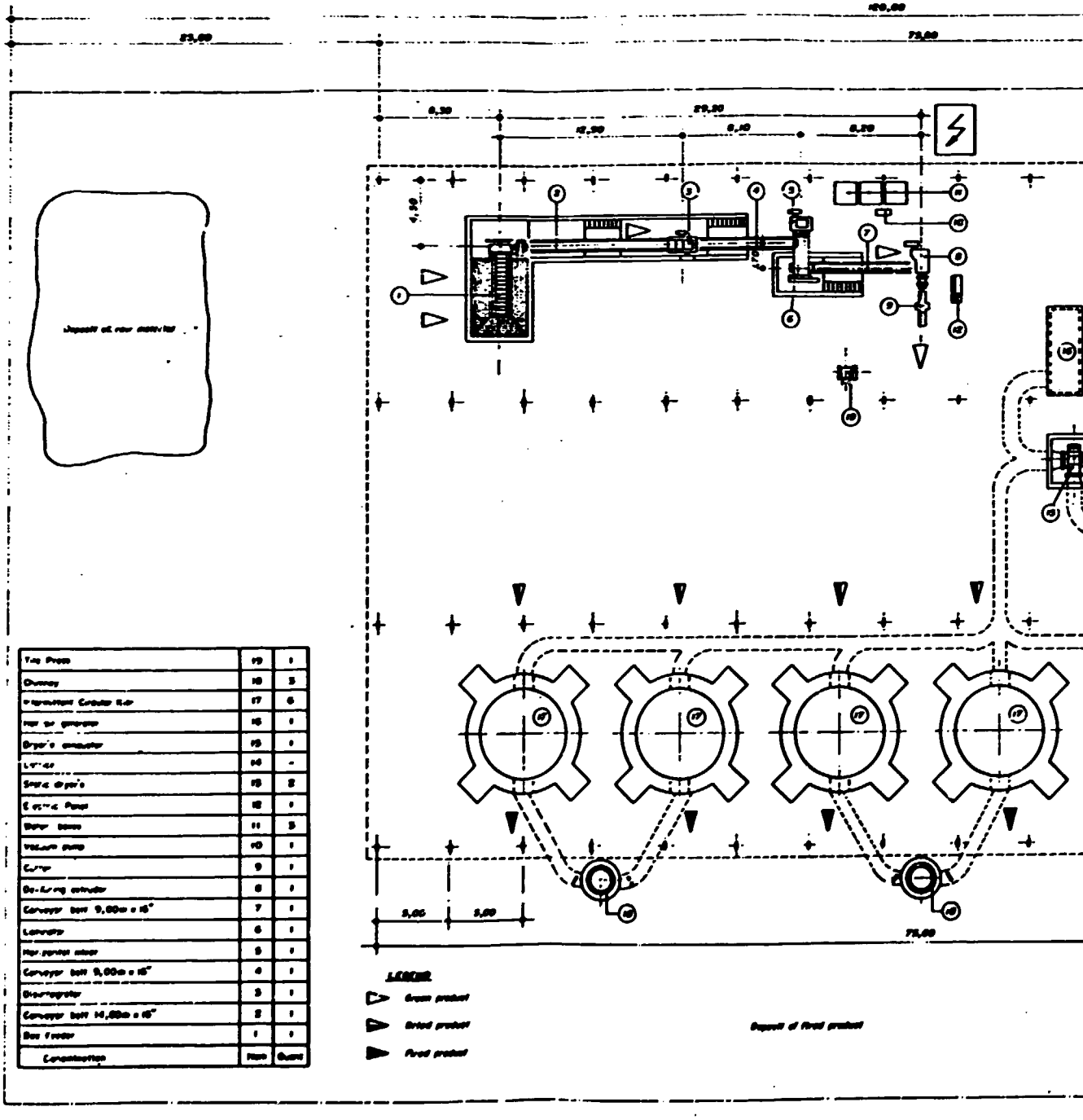
There are about 5,000 brickmills in Brazil operating with machinery and equipment produced by local industry. Machinery and equipment manufactured in Brazil are also in operation in a number of countries in Latin America and in certain African nations as well.

PROCESS FLOW CHART





SECTION A.A.



Tray Press	19	1
Chimney	18	1
[illegible]	17	6
[illegible]	16	1
[illegible]	15	1
[illegible]	14	-
[illegible]	13	2
[illegible]	12	1
[illegible]	11	5
[illegible]	10	1
[illegible]	9	1
[illegible]	8	1
[illegible]	7	1
[illegible]	6	1
[illegible]	5	1
[illegible]	4	1
[illegible]	3	1
[illegible]	2	1
[illegible]	1	1
Designation	Nos	Quant

LEGEND

- Green product
- Dried product
- Fried product

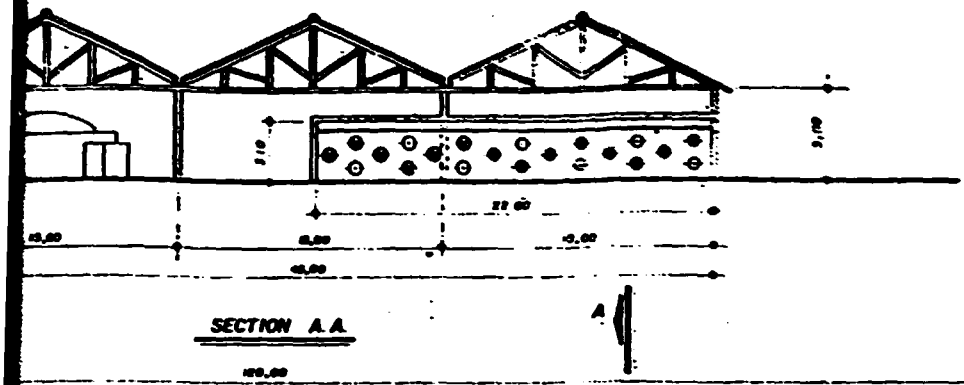
Deposit of fried product

SECTION 1

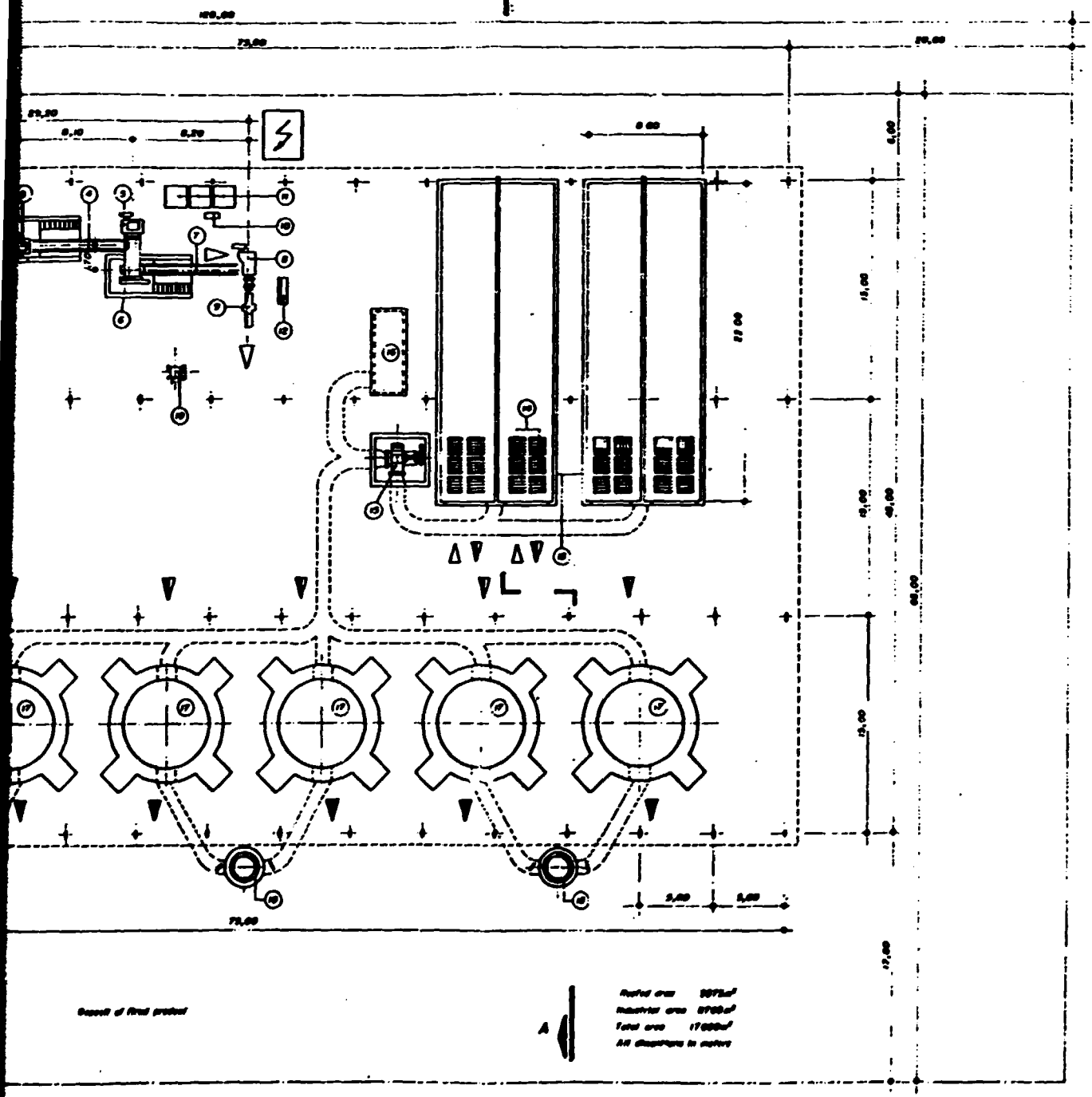
112 /- 113 - /114

RED CLAY CERAMIC PLANT

LAY OUT



SECTION A.A



SECTION 2

SAWMILL

1. CHARACTERISTICS

Capacity: 40 m^3 of hardwood logs or 80 m^3 of softwood logs

Output: 20 m^3 of sawn hardwood lumber or 56 m^3 of sawn softwood lumber per day.

The lower density species (soft wood) are generaly straighter and more cylindrical, making for a higher degree of utilization.

Sawn planks and boards as put out by the sawmill find a ready market and can also be stored in the open air.

Kiln-drying, however, betters the physical properties of the lumber and is a preliminary operation essential to proper processing.

Better prices are obviously obtained for the dried lumber, quite apart from the resultant savings in transportation.

It is possible to generate captive energy setting up a thermo-electric plant (steam engine unit). The unit basically consists of a furnace, a boiler, a steam engine and a generator. The furnace burns as fuel sawmill residues and even rice husks.

2. EQUIPMENT

- Sawmill
  - . band saw unit with drive wheel 1.35 m in diameter (1)
  - . Capstan jack for logs (1)
  - . Circular edging saw (1)
  - . Circular saw, for processing odd pieces of lumber (1)
  - . Pendulum trim saw (2)
  - . Blade sharpening unit with accessories (1)
- 240 HP steam engine unit
- Kiln

(Figures in brackets indicate required amount of equipment).

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3. LAYOUT AND FLOW-SHEET

(see appended drawing)

4. LABOR

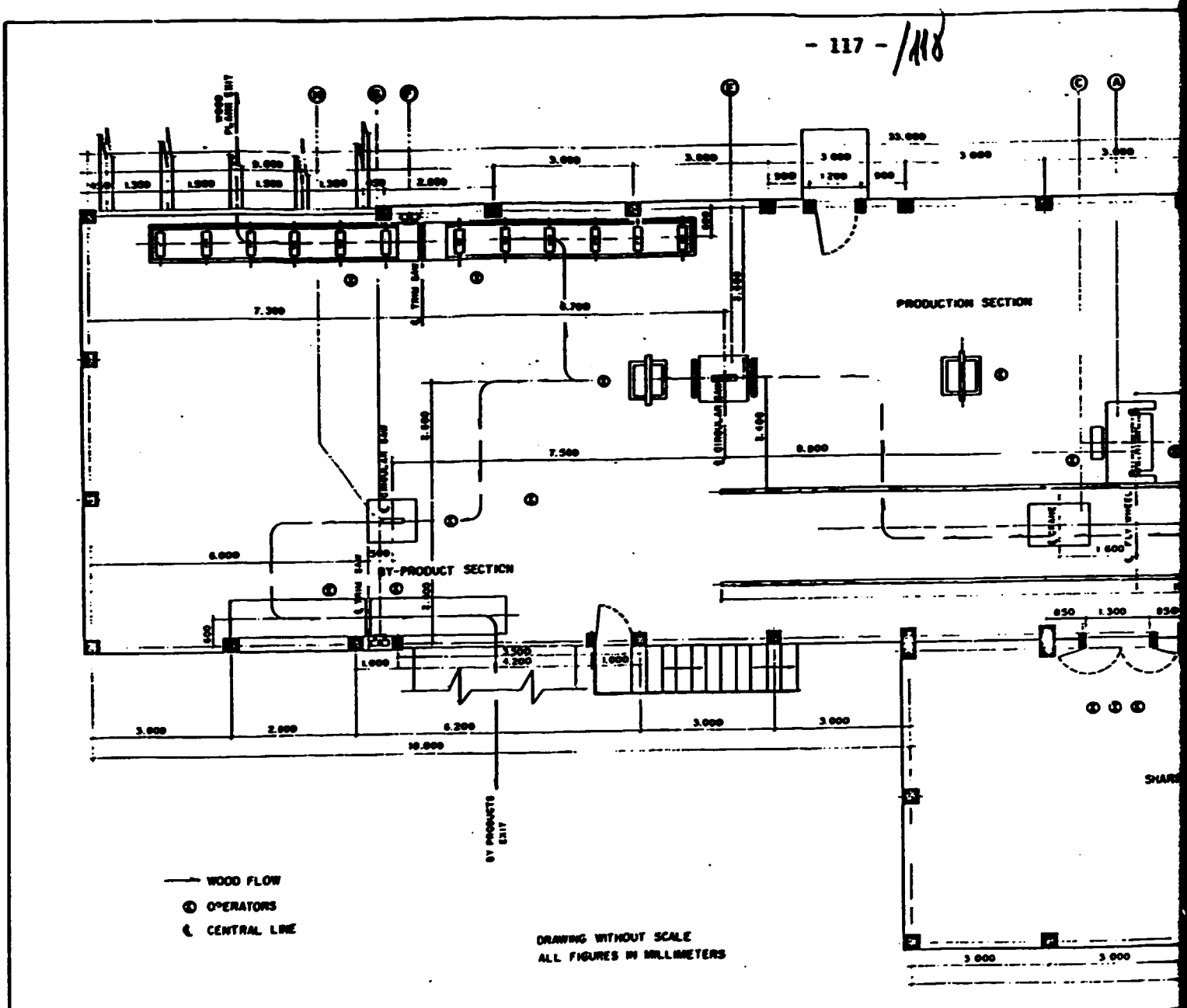
- sawmill	14 workers
- Log and plank handling yard	10 workers
- steam engine and kiln	6 workers

5. OTHER INFORMATION

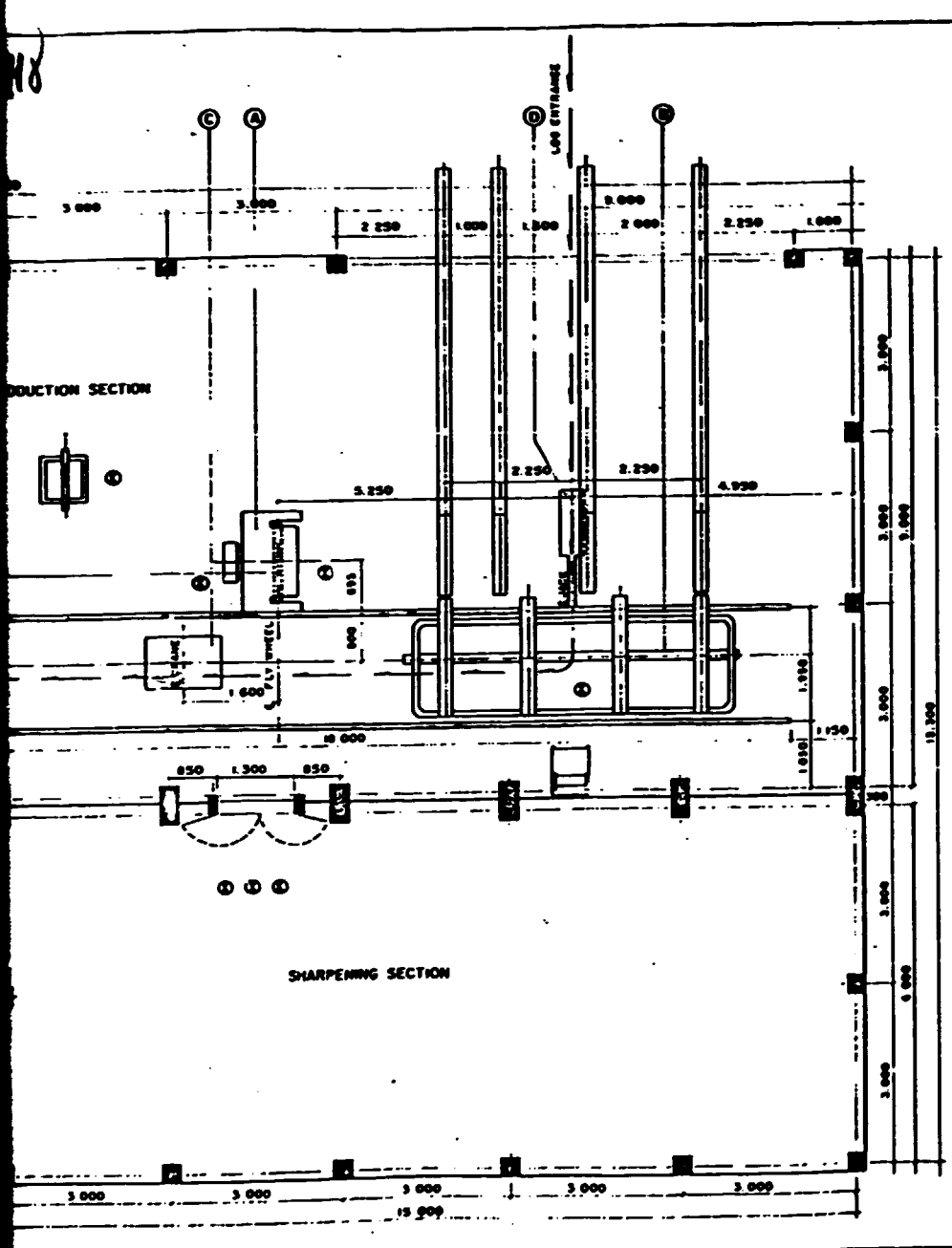
- Installed power required:	200 KVA
- Areas:	
. Sawmill	500 m²
. Other departments	500 m²
. Log yard	1,000 m²
. Sawn lumber yard	1,000 m²
- Operating shift:	10 hours per day

6. INVESTMENT (FOB port of shipment)

- Sawmill equipment	US$ 43,000
- Steam engine (optative)	US$115,400
- Kiln	US$ 35,000


PRODUCTION SECTION
BY-PRODUCT SECTION
WOOD FLOW
OPERATORS
CENTRAL LINE
DRAWING WITHOUT SCALE
ALL FIGURES IN MILLIMETERS

SECTION 1



SAW MILL
LAY OUT

LEGEND

- (A) BAND SAW, 1,35m FLY WHEEL
- (B) LOG CAR
- (C) REVERSIBLE FEEDER CRANE
- (D) CAPSTAN JACK FOR LOGS
- (E) CIRCULAR TABLE WITH SUPPORT
- (F) PENDULUM TRIM SAW (12m TABLE)
- (G) PENDULUM TRIM SAW (6m TABLE)
- (H) CIRCULAR TABLE WITHOUT SUPPORT

SECTION 2

NOODLE FACTORY

1. CHARACTERISTICS

Production capacity: 1,200 to 1,500 kg of noodles per eight-hour day.

Approximate production: 50% of "cut" type noodles (spaghetti)and 50% "long" type noodles.

2. EQUIPMENT

Pneumatic flour feed unit
Flour mixing unit
Automatic extruder
Dough extrusion moulds (ten units)
Vaccum station
"Trabato" (preliminary drying of cut dough)
Dough extender bench
Dough pre-drying gallery
Automatic drying units (four units)
Trolleys for extended dough batches (16 units)
Trolleys for cut dough batches (16 units)
Seives for cut dough batches (600 units)
Rods for extended dough batches (800 units)

3. INVESTMENT

Equipment (FOB port of shipment) US$ 75,000

Figure does not include shed, foundations, electrical and plumbing networks, furniture and fixtures. Erection supervision alone is included.

Roofed-over area: 225 m²

4. LAY-OUT

(see drawing).

5. LABOR

Manufacture:	**2 workers**
Drying:	**1 worker**
Packaging:	**3 workers**
Dispatching:	**2 workers**

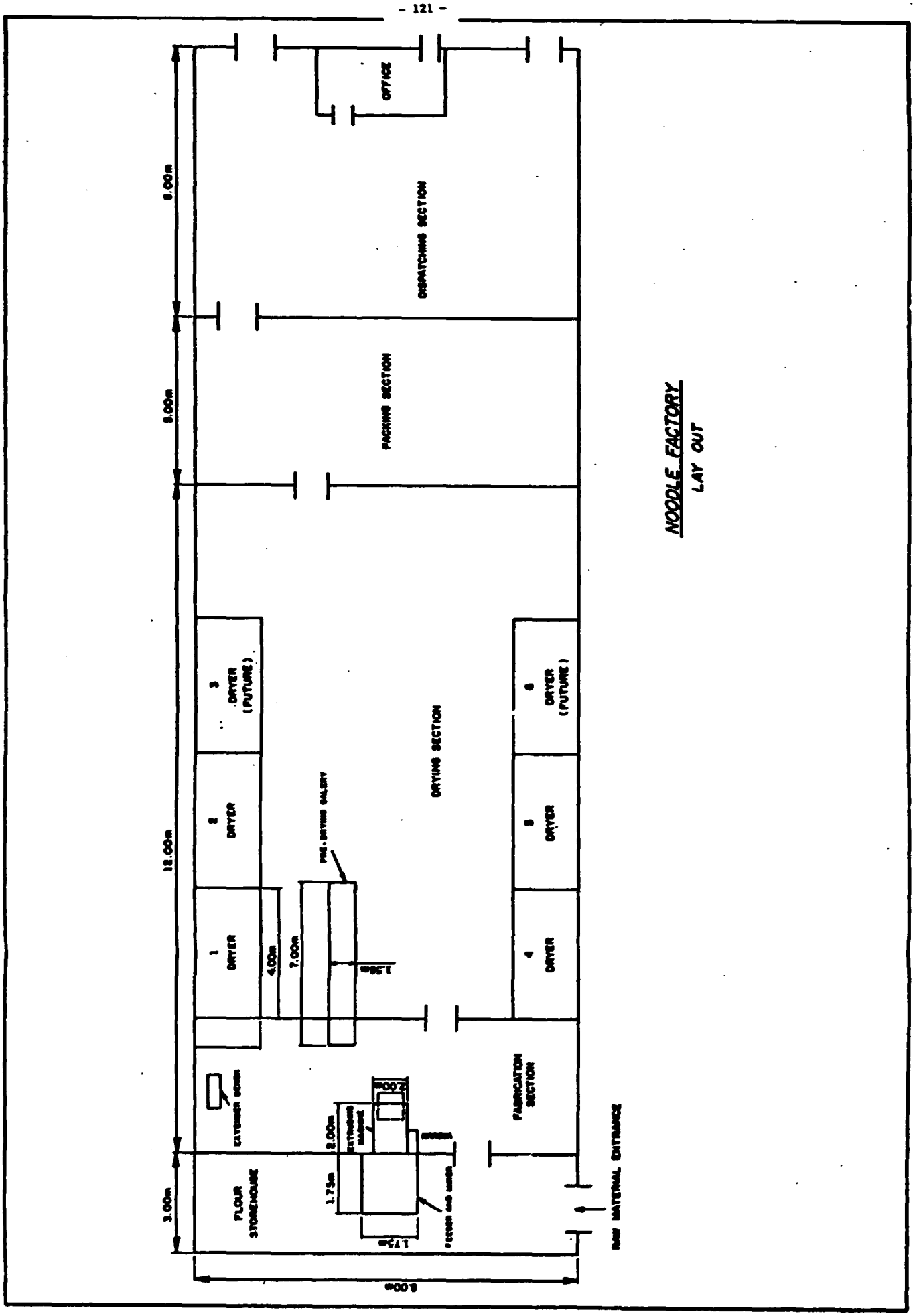
6. CONSUMPTION OF UTILITIES

Energy for motors and heating resistors: about 100 KVA of installed power required.

Heating can alternatively be provided by means of steam or hot water.

7. COMMENTS

Noodle factory can be an interesting project for developing countries when using mixed flour (defated soya bean flour, corn flour, manioc flour, etc). Therefore, this project can be coupled with a manioc or corn flour mill, or with a soya bean milk plant, in which soya bean flour is a by-product.


OFFICE
DISPATCHING SECTION
PACKING SECTION
DRYING SECTION
FABRICATION SECTION
FLOUR STOREHOUSE
RAW MATERIAL ENTRANCE
1 DRYER
2 DRYER
3 DRYER (FUTURE)
4 DRYER
5 DRYER
6 DRYER (FUTURE)
PRE-DRYING GALLERY
8.00m
9.00m
12.00m
3.00m
4.00m
7.00m
2.00m
1.75m
NOODLE FACTORY
LAY OUT

PAPER FACTORY

1. CHARACTERISTICS

Small capacity (8 to 10 tons per day) paper plants are aimed at serving the local market. Such plants can produce both plane paper, used mainly for packing, or toilet paper.

They are easy to install, do not require skilled labor for their operation and produce at competitive prices, since they do not need raw materials to be hauled from long distances (consuming paper trimmings and scrap paper). These plants have no unfavorable impact on the local ecology.

The raw material is recycled paper. If the paper plant is to be the first of its kind in the locality, a system will have to be set up for collecting paper scrap, mainly from government offices, printing plants and homes.

2. PRODUCTION PROCESS

The process of paper manufacturing comprises the following basic operations:

a) receiving and stock-piling of paper scrap
b) screening of paper scrap
c) preparation of paste
d) manufacture of sheets in jumbo rolls
e) re-winding into rolls about 10 cm in diameter
f) cutting and packaging rolls
g) storing rolls
h) distribution

(See attached flow sheets)

Lay-out

(See appended drawing)

3. INVESTMENT

Fixed investments for equipment to prepare paste, papermaking machine and ancillary units (excluding erection) amounts to approximately US$ 1,050,000.

4. TECHNICAL FACTORS

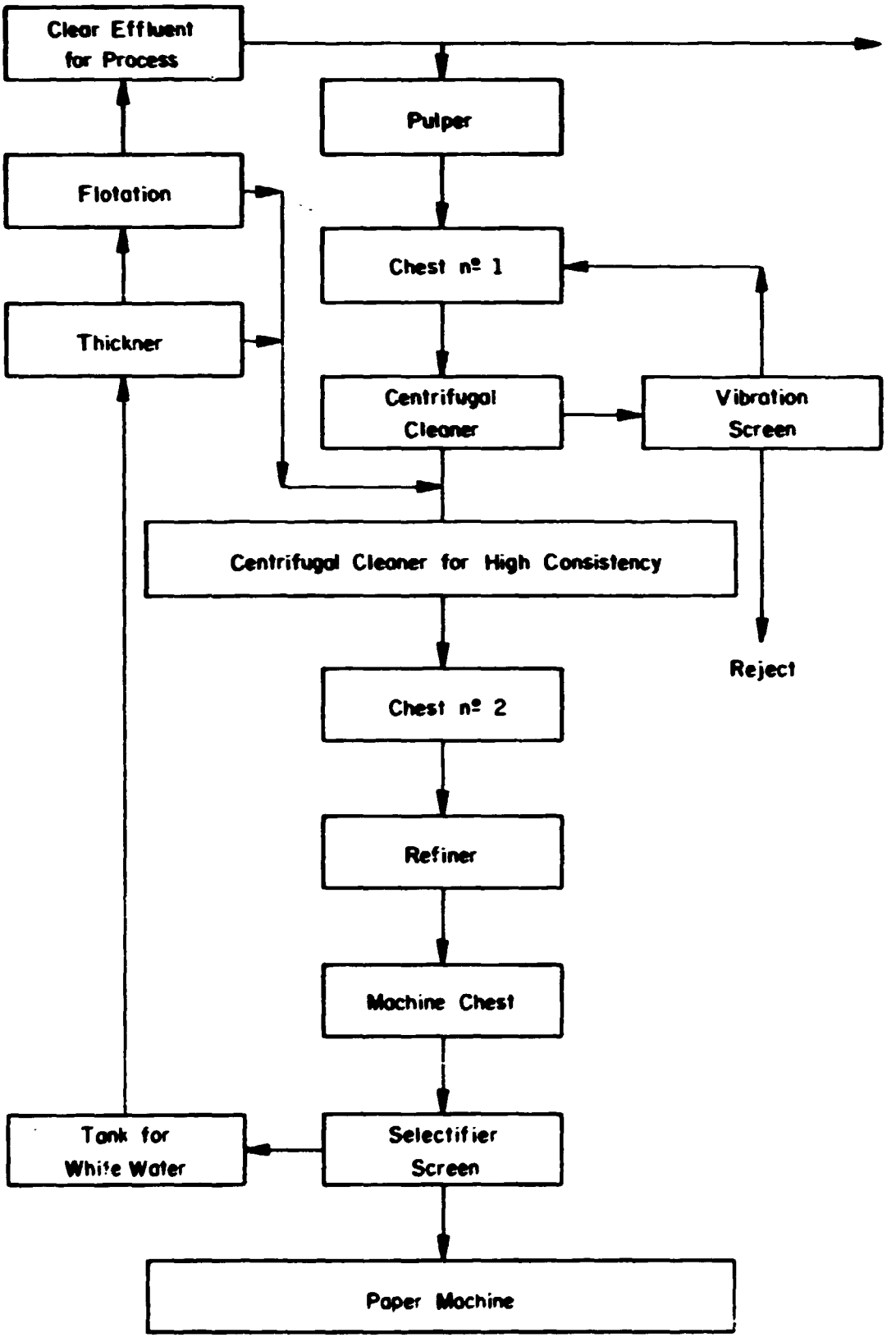
Electric power	400 KVA
Water	50 - 70 m^3/hour
Steam	1000-1200 kg/hour

5. LABOR

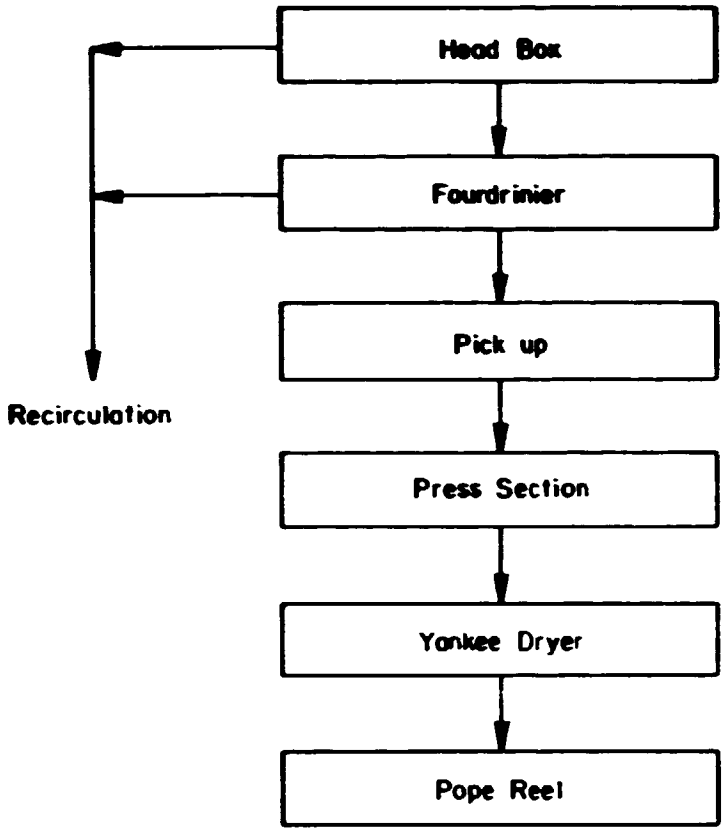
Process phase	Labor qualification	Number of people	Number of shifts	Total Labor
1. Paste preparation	Operators, helpers	3	3	9
2. Paper machine	Operators	2	3	6
3. Finishing	Cuters, packers	20	1	20
4. Boiler	Operator	1	3	3
5. Maintenance	Mechanic, electrician	2	1	2
6. Plant Manager	Supervisor	1	1	1
7. Sales	Salesman	1	-	1
8. Supply	Purchaser	1	1	1
9. Accounts Dep't	Accountant	1	1	1
10. General Services	Helper	1	1	1
11. Secretary	Typist	1	1	1
12. Helpers	Helper	1	1	1
13. Main entrance	Helper	1	3	3
T o t a l				50

SIMPLIFIED PROCESS FLOW CHART

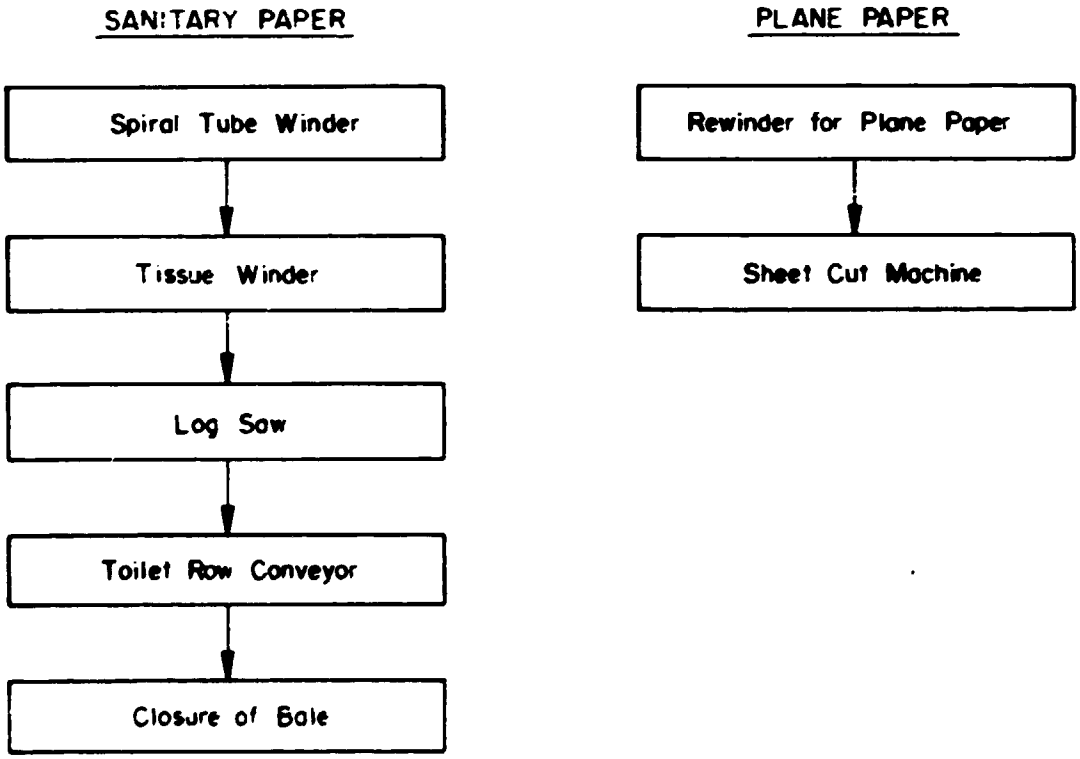
1-STOCK PREPARATION

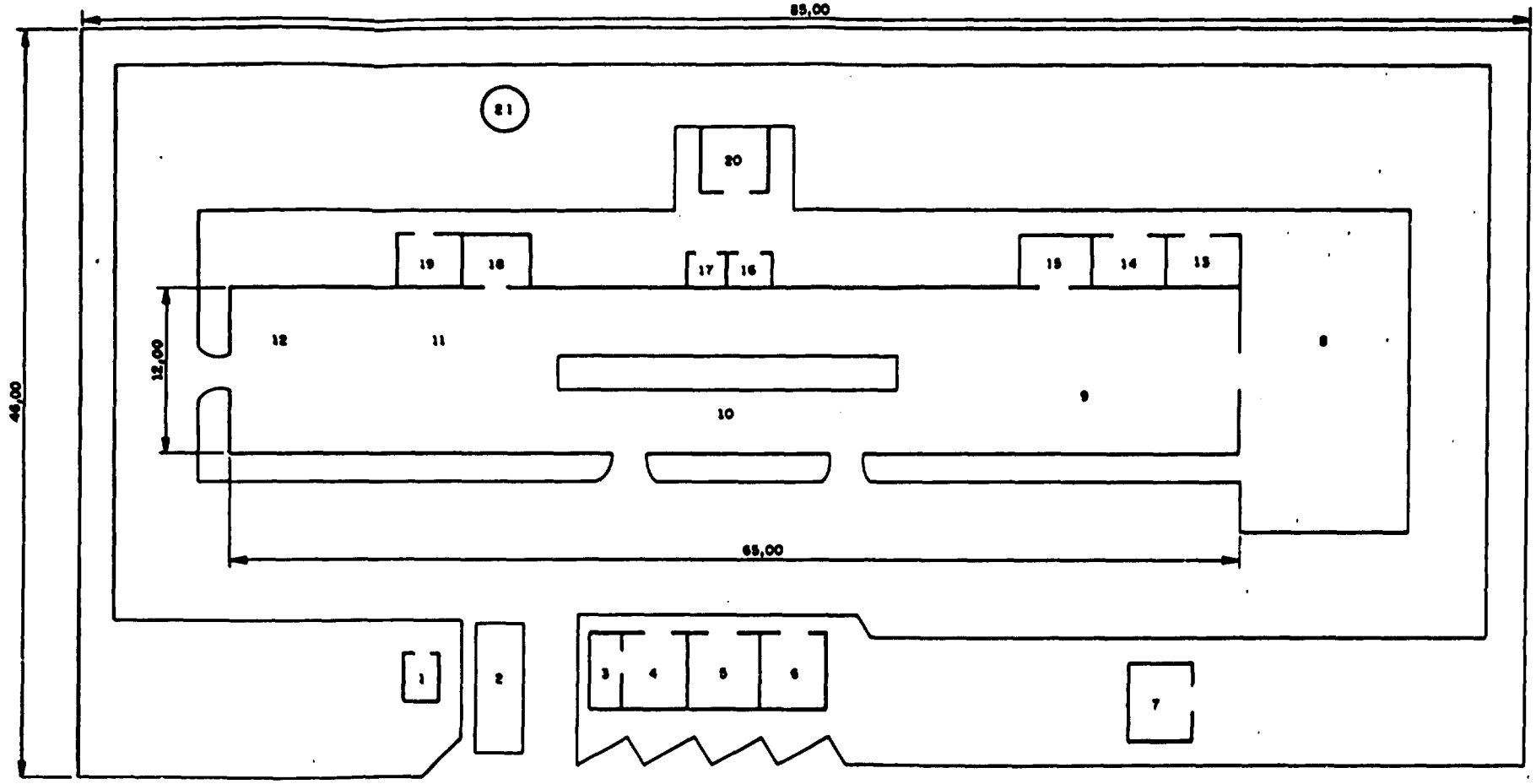


2 - PAPER FABRICATION



3 - PAPER FINISHING





Nr	BUILDING	APPROX. AREA m²
1	Main Entrance	6
2	Scale	24
3	Toilet	-
4	Administration	16
5	Purchase/Sales Dep't	16
6	Plant Manager	16
7	Sub-Station	-
8	Scrap Paper Deposit	200
9	Stock Preparation	150
10	Paper Machine	150

11	Finishing	150
12	Final Product	150
13	Maintenance Shop	15
14	Warehouse	15
15	Laboratory	10
16	Compressor	4
17	Vacuum Pump	4
18	Toilet (men)	-
19	Toilet (women)	-
20	Roller	20
21	Oil Tank or Fire Wood	-

PAPER FACTORY

LAY OUT

SOYA BEAN MILK PLANT

(THE "MECHANICAL COW")

1. Introduction

Soya beans stand out as one of the most important and least expensive sources of protein. Production costs are low, the product is easy to grow, and regular harvests, with a rapid growing cycle, are available around the entire year. The percentage of protein exceeds that of most known foods, and the main vitamins and mineral salts required for human nutrition are also present.

Soya beans disintegrate in boiling water and afford a protein extract easy to obtain and of nutritive value equal to that of the original beans. Soya bean milk affords considerable similarities with cow's milk and human milk, in terms of composition. The taste is pleasant, due to the elimination of the enzyme lipoxide.

2. Characteristics

Capacity: soya bean milk: 200 liters/hour
soya bean flour: 15.4 kg/hour (4% humidity)

Yield: 8 liters of milk/kg of soya

Raw materials: Soya: maximum humidity 14%
beans harvested up to 1 year previously

Water: potable, suitable for human consumption

3. Production process

(See lay-out)

a) Preparation of raw materials

Basically comprises the operation of husking the beans.

b) Maceration

This is done in macerating tanks, in which the beans absorb water and swell up to about three times their original size.

c) Crushing

The macerated beans are treated with hot water (at 95°C) and are crushed in the trituration unit, in which separation of the solids soluble in water takes place, i. e., of the soya bean milk itself. From the trituration unit tank, fitted up to receive ingredients such as aromatic essences, bicarbonate, salt and sugar, the soya bean milk is transferred to the filter.

d) Filtering or centrifuging

In this stage the soya bean milk is separated from the residue not soluble in water. The humid residue is what gives rise to the soya bean flour, as will be seen later in this report. The soya bean milk may then be fed into a reserve tank.

The filter consists of a metallic basket supporting a 100 mesh nylon screen, in which the insoluble solids are separated by centrifuging.

e) Ultra-pasteurization

From the reserve tank the milk is pumped to the ultra-pasteurizing unit, in which it is subjected to heat treatment at 125°C for two minutes.

The heat treatment ensures total destruction of the micro-organisms normally present in the milk.

f) Pre-chilling

The milk is pre-chilled, and the temperature goes down from 125°C to 25°C. At that temperature the milk can be packaged for immediate consumption (up to 20 hours after packaging).

The heat given off during the pre-chilling phase is utilized to heat the water that will be used in the crushing phase, thus saving energy.

The entire process, up to this point, with the exception of the husking, takes place in a compact unit called the "processing unit" or the "mechanical cow".

g) Cooling

If the milk is to be held for a longer period, it must be cooled to about 8°C to 10°C, in which case it has a shelf life of up to five days.

h) Packaging

In the packaging unit the milk is processed without contact with workers' hands.

Soya bean flour

During the centrifuging of the crushed soya beans, the liquid phase gets to be separated from the solid phase. The solid phase, at 77% humidity, gives rise to the soya bean flour.

The humid flour is removed from the basket of the centrifuge, and pressed by hand, and then dried at 100°C, after which it can be stored at ambient temperature for a period of up to one year.

The flour can be used as a livestock feed or for human consumption (even in bakeries).

4. Equipment

- Processing unit, comprising:
  - . water heater with capacity of 60 liters
  - . trituration unit, capacity: 300 kg/hour
  - . centrifuge, capacity: 1000 liters/hour
  - . ultra-pasteurizer, capacity: 200 liters/hour
  - . pre-chilling unit
- Cooler
- Drier, consisting of drying chamber, cyclone, hot air generator, hydraulic press and electric switchboard
- Soya bean peeler, capacity: 200-300 kg/hour of soya beans
- Packaging unit

5. Investment

- Major items of equipment (listed above), plus spare parts, packaged for shipment by sea, FOB port of shipment	US$ 55,000
- Auxiliary equipment (compressor, freezers)	US$ 2,000
- Electrical networks and plumbing	US$ 3,000
- Building	US$ 12,000

Building lot for plant and costs of erecting equipment not included.

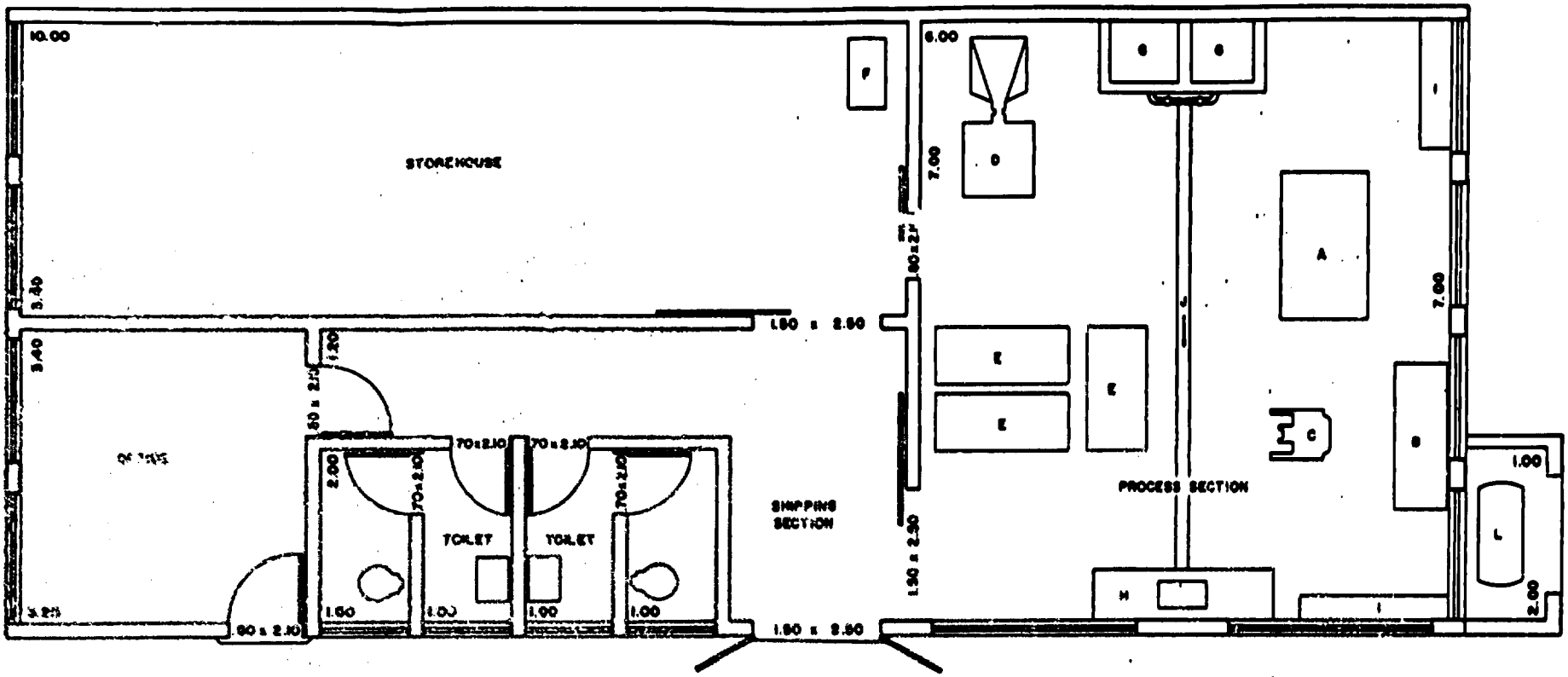
6. Technical factors

Water: 1.5 liters/liter of soya bean milk

Energy: 0.14 kw/liter of soya bean milk

Labor: 1 supervisor
2 operators
1 assistant

Covered area:	processing:	44 m^2
	storage of inputs:	34 m^2
	shipment:	7 m^2
	administration:	27 m^2
	T o t a l:	112 m^2



LEGEND

A PROCESS UNIT (machine set type)	G MACERATION TANK
B COOLING UNIT	H TROUGH
C PACKING MACHINE	I SHELF
D SOYA FLOUR DRYER	J DRAIN CHANNEL
E FREEZERS	L AIR COMPRESSOR
F SOYA PEELER	

ORS: ALL DIMENSIONS IN METERS

SOYA BEAN MILK PLANT ("MECHANICAL COW")

LAY OUT

TANNERY

CAPACITY: 100 to 150 skins per day

PROCESS DESCRIPTION: (see lay out)

Tanning starts with the liming tan pit, purpose of which is to strip the hair from the hide and destroy the hair. The liming operation, from which the hides emerge in a swollen state, is followed by the fleshing operation, purpose of which is to eliminate the greasy material adhering to the hide. This is done in the fleshing machine.

After fleshing, the hides are split. The respective operation consists of separating the hide into two layers parallel to the grain. Two separate layers are generally obtained, the upper one being known as the "grain" (or, more usually, "full grain") while the lower one is termed the "crust".

The above operations are followed by tanning, purpose of which is to render the material stable and immune to decay. This is done in tan pits.

This sequence entails drying (by wiping), on the drying machine. This is a mechanical operation intended to remove excess liquid from the tanned leather. After drying, the leather must be left at rest for normalization of the fibers. After the period of rest, a start is made on reducing or calibrating. This is done on calibrating machines which ensure uniform adequate thickness over the entire area of the respective pieces of leather.

At this stage the material is known as "wet-blue leather".

The skins then go to the retanning units. Operations on the finished leather may also take place in these same tanning pits.

Retanning consists of consolidating and rectifying the leather grain. After this operation the leather goes back again to the drying machine, as described above.

After the drying process is completed the leather is stretched, the purpose being to open up the folds of the skin and reduce excess

water. The skins then go to the plate dryers, eliminating further water ang giving a better appearance to the grains, besides elimina ting any defects caused by ticks. The skins are then sent to the toggling stage, purpose of which is to complete drying. Use of this unit is extremely valuable in tanneries, when properly applied, because it permits a considerable increase in the size of the pieces.

The dry leather is now ready to be painted in the painting tunnel and then printend in the printing machine. It is then in a state for storing and shipment.

A sole leather section can be added to the plant.

Sole leather hides are processed in the Sole Section. Here the hides are tanned, greased and stretched, and then dried in the drying oven. Sole leather also passes through the sole calander before being sent to the shipping department.

EQUIPMENT

Section for cowhide under chrome (for 100-150 skins per day)

- Liming drums
- Fleshing machine
- Splitting machine
- Drying machine
- Tan pits for tanning (2 pieces)
- Calibrating machines
- Tan pits for retanning
- Plate dryers (Secotherm) (3 pieces)
- Samming machine
- Toggling
- Sanding machine
- Painting tunnel (with manual pistols)

Section for sole leather (for 100-150 sole leathers per day)

- Tan pits for sole leather (3 pieces)
- Pits for greasing (2 pieces)
- Stretching machine
- Drying oven
- Calander for sole leather

CHEMICAL CONSUMPTION

An average figure, only for cowhide under chrome, would be US$ 36,000 per month.

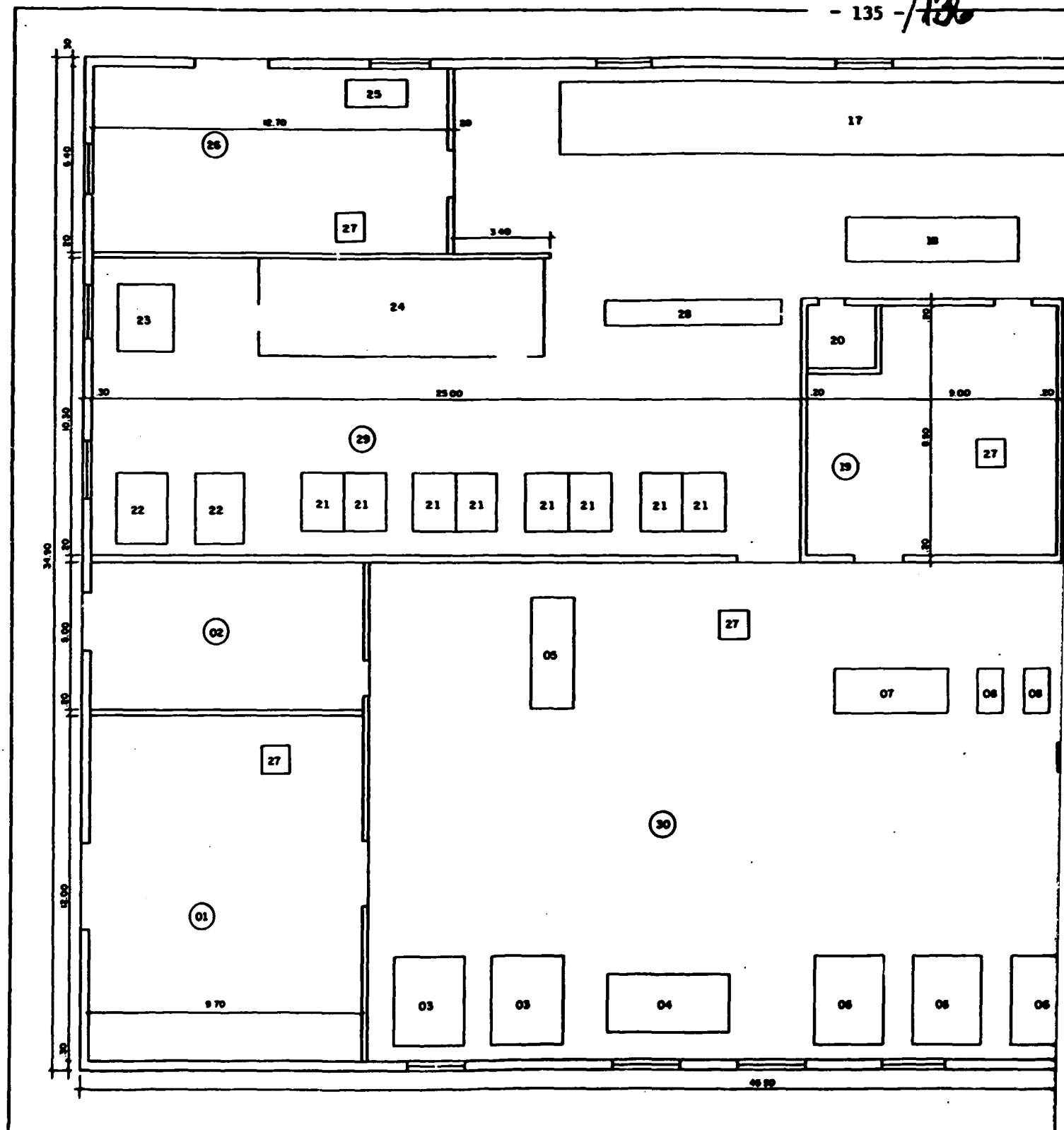
INVESTMENT

Machinery and equipment (FOB port of shippment)

- Section for cowhide	US$ 186,000
- Section for sole leather	US$ 73,000

Man Power

50 workers in 8 hours/day shift (60 workers if sole leather section added).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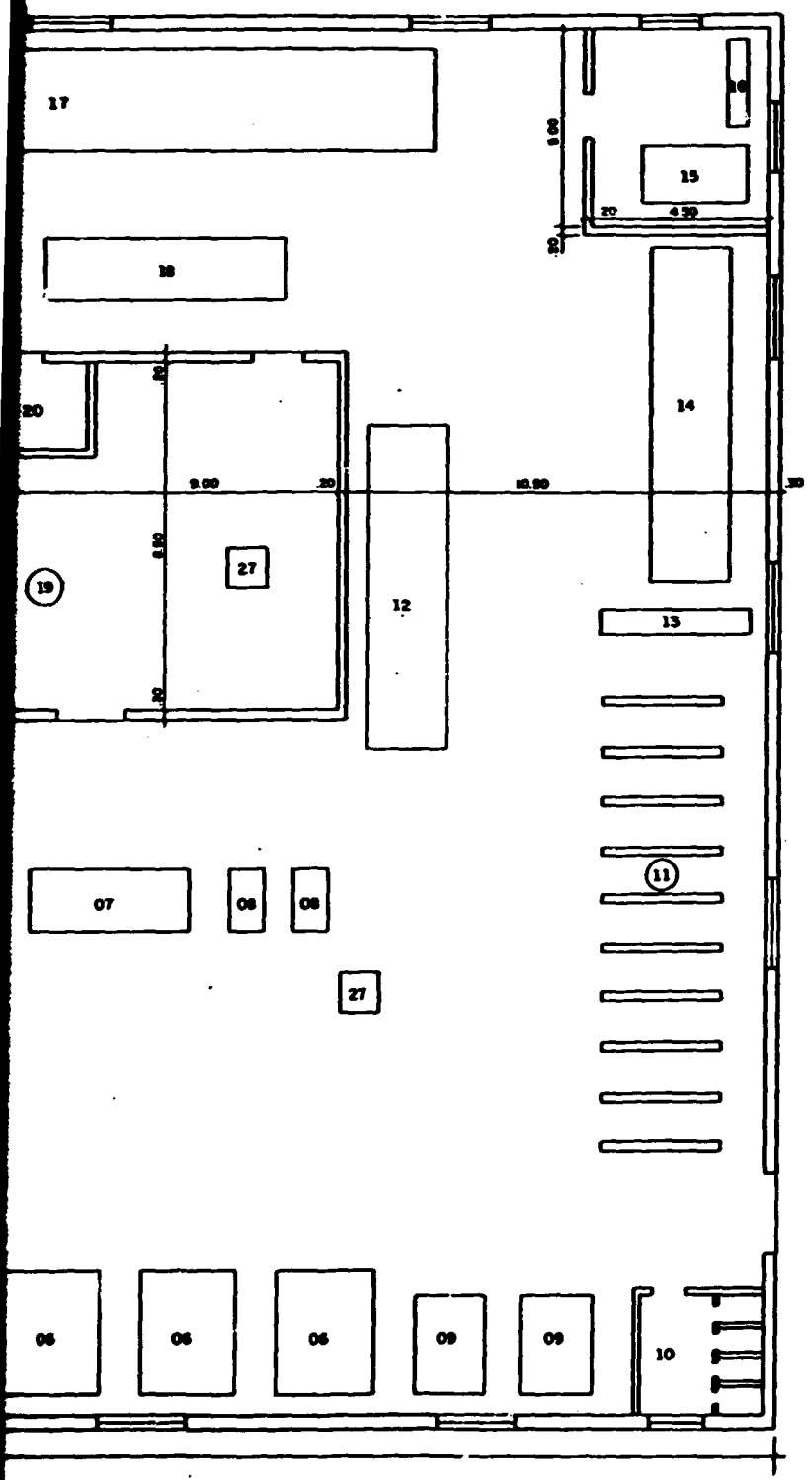
SECTION 1



LEGEND

01 HIDE HOUSE
02 STOREHOUSE (Raw)
03 LIMING DRUMS
04 FLESHING MACHINE
05 SPLITTING MACHINE
06 TAN PITS
07 DRYING MACHINE
08 CALIBRATING MACHINE
09 TAN PITS (retanning)
10 TOILET
11 PLATE DRYERS (Secotherm)
12 DRYING TUNNEL (OPTIONAL)
13 SAMMING MACHINE
14 TOGGLING
15 SANDING MACHINE
16 DUST COLLECTOR
17 PAINTING TUNNEL
18 PRINTING MACHINE (OPTIONAL)
19 STOREHOUSE (chemicals)
20 COMPRESSOR
21 TANNING TANKS (sole leathers)
22 TAN PITS (greasing)
23 STRETCHING MACHINE
24 DRYING OVEN
25 MEASURING MACHINE
26 SHIPPING SECTION
27 SCALE
28 CALANDER FOR SOLE LEATHERS
29 SOLE LEATHER SECTION
30 SECTION FOR COWHIDE UNDER CHROME

(ADDITIONAL PITS ARE FOR FUTURE EXPANSION)

NOTE: ALL DIMENSIONS IN METERS

TANNERY

LAY OUT

SECTION 2

ALCOHOL MICRO DISTILLERY

1. CHARACTERISTICS

Capacity: 5,000 liters of alcohol (ethanol) per day

Raw material: sugar cane

TFS (min.) 14% (total fermentable sugars)

Fiber content: (max.) 12.5%
(78 to 83 tons of cane to produce 5,000 liters of ethanol)

Product: hydrated alcohol (96°G.L. at 15°C) (first grade alcohol)

Specific gravity at 20°C: 0.8073 to 0.8150

Alcohol content at 20°C, % by weight: 93.2 ± 0.6

By-products: second grade alcohol (2 to 5% of output of first grade alcohol)

fusel oil (1 to 2 liters per 1,000 liters of ethanol)

stillage (2,800 to 3,000 liters per hour, to be returned to ground as fertilizer)

cane bagasse (1,500 kg/hour, 51% humidity, to be used as livestock feed supplement)

2. DESCRIPTION OF PROCESS (see simplified flowsheet)

A - EXTRACTION AND GRINDING

A four-roll mill is used with complete imbibition, wich permits extraction to the extent of some 85%.

The sugar cane is fed in by means of a fixed feed table and cane chopper, with semi-mechanized feed arrangements. The juice obtained is collected in a bin made of stainless steel sheet, located underneath the mill, and is screened to separate the finely divided bagasse and then sent for fermentation.

B - FERMENTATION

The process used is the conventional type of open vats, cooled on the outside with water, the ferment being decanted off to separate it from the fermented juice (wine).

The "wine" thus obtained is pre-heated by means of stillage in a counter-current arrangement, within a liquid/liquid heat-exchanger and then pumped to the distillation column.

C - DISTILLATION AND RECTIFICATION

The required steam is obtained by using a direct flame heater, in which the stillage derived from the distillation process is circulated and the fuel being the sugar-cane bagasse.

The main advantages of this system are high energy efficiency, with consequent reduction in consumption of fuel and reduction in the ultimate volume of stillage produced.

The reason is that since the boiler drum is fed with stillage at 105°C, fuel has to be consumed merely to produce the latent heat of vaporization, and since the steam supplied to the columns is produced from the stillage itself, the volume involved is greatly reduced.

The fermented juice, known in the trade as "wine", is pumped through the liquid/liquid heat exchanger to the distribution tray at the top of the distillation column.

The wine emerges from the liquid/liquid heat exchanger at boiling point and descends the column in counter-flow with the arising stream of steam that goes up through the perforated plates.

On reaching the bottom of the column, the wine, now converted into stillage by evaporation of the alcohol, circulates through the heater, where a part of the water is evaporated, thus producing the steam required to run the column.

The surplus stillage passes through the heat exchanger in which it is cooled, thus pre-heating the "wine", and is discharged at practically ambient temperature.

The mixture of alcohol vapor and steam passes from the top of the distillation column to the base of the rectification column along the flegma tube. This mixture of vapor and steam rises through the filler rings of the rectification column on counter-current with the flowing down alcohol and condenses in the condenser mounted at the top of the column.

In the rectification column, the hydrated alcohol with a minimum boiling point, corresponding to the azeotropic mixture of alcohol and water, is collected in the alcohol intake tray, from which a part is removed through the alcohol cooler for the tanks.

The remainder, consisting of about 80%, goes back to the column and runs down through the filler rings.

The water and a part of the alcohols, transferred to the rectification column as "flegma" are collected at the base of the column and return to the "wine" tank, being recirculated in the process.

The "wine" feed flow and alcohol production flow are controlled by two valves mounted on the control panel, so as to obtain the kind of alcohol required.

The liquid is withdrawn continuously at two collection points at suitable locations and this liquid is then diluted and sent to the fusel oil decanting unit. The fusel oil is removed continuously and the remaining mixture is recirculated together with the "wine".

The equipment provides for collecting second grade alcohol as well as products from the head of the column and fusel oil.

3. EQUIPMENT

- 01 Fixed feed table
- 01 Sugar cane feed conveyor
- 01 Sugar cane knife (chopper)
- 01 Four-roll sugar cane mill
- 01 Imbibition unit
- 01 Centrifugal pump (for transfer from the cush-cush to the static screening unit)
- 01 Centrifugal pump (for transfer from the screening unit to the vats)
- 01 Juice screening system
- 01 Static screening unit
- 08 Vats (capacity 14 m^3 each), with accessories
- 01 Distillation column
- 01 "Wine" purification sector

- 01 Rectification column
- 01 Alcohol condenser
- 01 "Head fraction" concentrating column
- 01 "Head fraction" condenser
- 01 "Wine"/stillage heat exchanger
- 01 Cooler for first grade alcohol
- 01 Switchboard
- 01 Heater/evaporator (reboiler)
- 01 Automatic column pressure controller
- 01 Fusel oil separation/decanting unit
- 01 Tank for circulation of caustic soda
- 01 Centrifugal pump for transferring "wine" to column
- 01 Centrifugal pump for cooling vats
- 01 Centrifugal pump for transferring alcohol to storage tank
- 01 Blower for furnace
- 02 Alcohol measuring tanks
- 01 Water cooling tower
- Laboratory instruments
- 01 Electric switchboard
- 01 Tank for storage of alcohol (100 m^3 capacity)
- Supporting and roofing structures

4. LABOR

5 workers per eight-hour shift

- 01 foreman
- 01 fermenter/distiller
- 03 assistants

5. INPUTS

Processing water: 2 m^3/hour

Cooling water (closed circuit): 12 to 14 m^3/hour

Electric energy: installed power 50 KVA

Chemical products:

- Ammonium sulphate: 1.5 g/liter of alcohol
- NPK 0.75 g/liter of alcohol

- Sulphuric acid: 0.30 ml/liter of alcohol
- Penicillin: 0.006 mg/liter of alcohol
- Yeast (at start of operation)

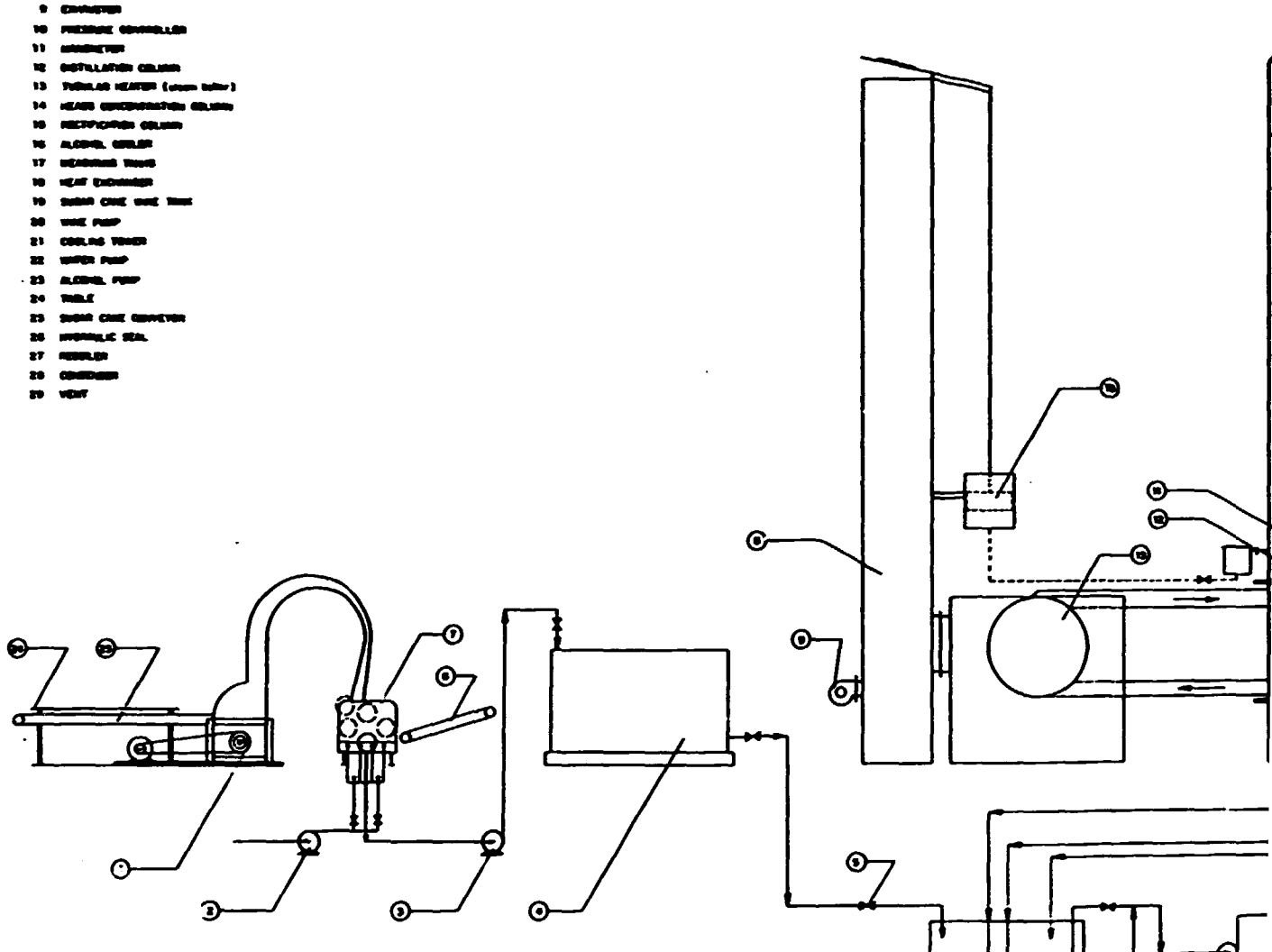
6. INVESTMENT

	US$
- Equipment (F.O.B. port) (includes mechanical erection)	222,000
- Erection (labor)	8,000
- Transformer, refractory bricks	11,000
- Industrial shed	10,000
Estimated total	251,000

- Built-up area 320 m^2
- Total area 10,000 m^2
- Sugar cane planting area: 240 hectares (2.4 million m^2)

LEGEND

1 CANE MAPE
2 WATER ADDITION PUMP
3 SUGAR CANE JUICE PUMP
4 FERMENTING VAT
5 VALVE
6 BAGASSE CONVEYOR
7 SUGAR CANE MILL
8 CHIMNEY
9 CONDENSER
10 PRESSURE CONTROLLER
11 MANOMETER
12 DISTILLATION COLUMN
13 TUBULAR HEATER (steam boiler)
14 HEADS CONDENSATION COLUMN
15 RECTIFICATION COLUMN
16 ALCOHOL COOLER
17 MEASURING TANK
18 HEAT EXCHANGER
19 SUGAR CANE WINE TANK
20 WINE PUMP
21 COOLING TOWER
22 WATER PUMP
23 ALCOHOL PUMP
24 TABLE
25 SUGAR CANE CONVEYOR
26 HYDRAULIC SEAL
27 REBOILER
28 CONDENSER
29 VENT



SECTION 1

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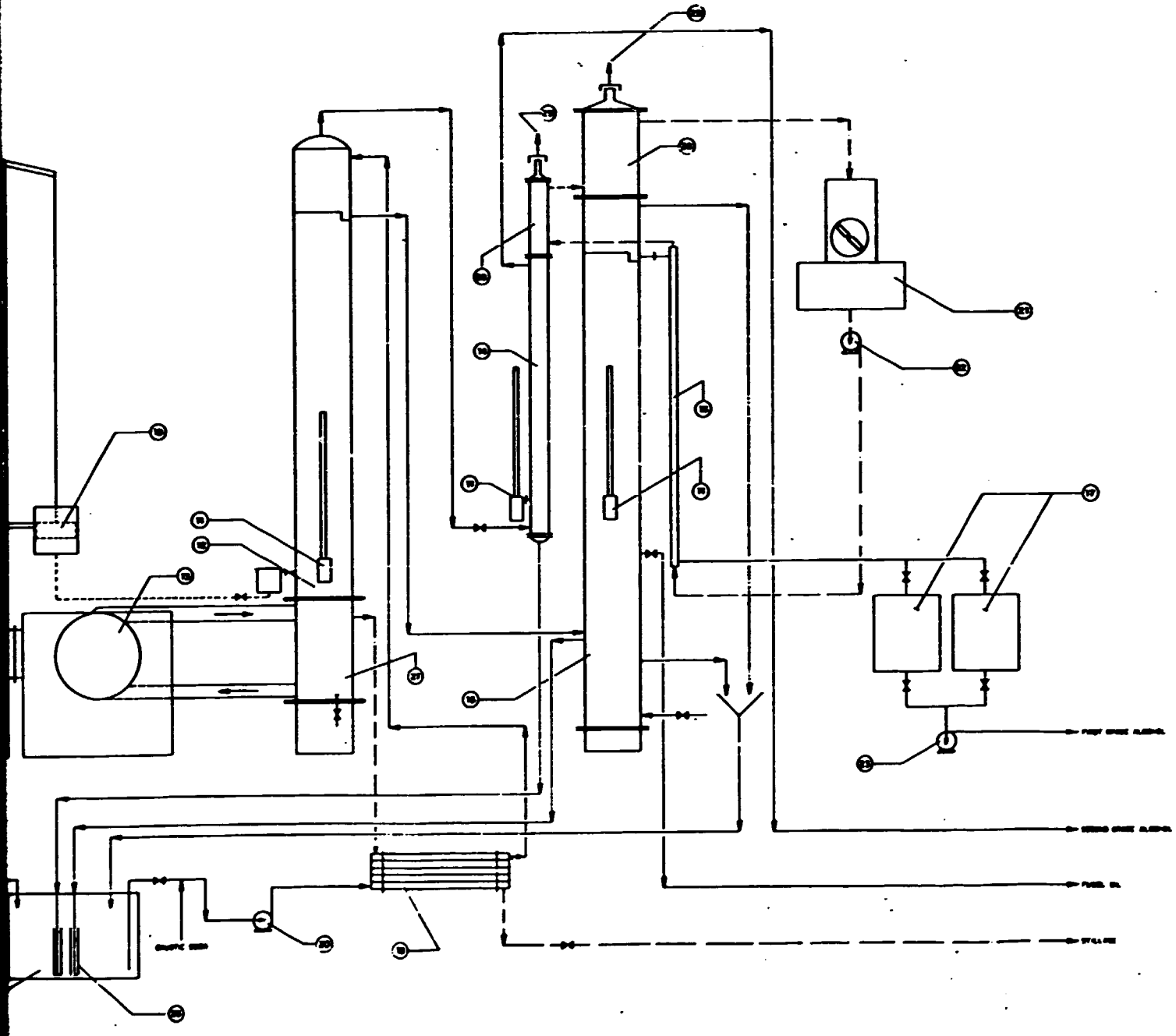
ALCOHOL MICRO DISTILLERY

SIMPLIFIED FLOW CHART



SECTION 2

VEGETABLE OIL PLANT

Characteristics

The profile presented here is for a vegetable oil plant running merely on a basis of mechanical extraction (no solvent extraction). The unit is therefore indicated for processing grain with a high oily content, such as peanuts, cotton, sunflower, castor seed, pal - miste, etc. It could also process various different types of seeds each one during a certain period of the year and hence reach a high level of utilization. In this case, of course, crude oil tanks would have to be provided for the various types of oilseeds processed.

There is another source of flexibility, namely that the cake may contain as much as 5% to 12% of residual oil. Cake with 5% of oil can be used for livestock feeds (except that from castorseed, which is used as fertilizer), whereas cake with 12% of oil can be extracted with solvent to provide additional quantities of oil.

Extraction by solvent can be carried out in centralized units receiving rich cake (12% of oil content) from a number of smaller plants. The latter alternative, however, calls for careful planning, because some rich cakes (those from cottonseed and castorseed) have to be processed within a short period of time, being liable to spoil (become rancid).

Capacity

The plant has capacity for processing 60 tons a day of oil seeds, giving a cake that contains 5% of oil.

Capacity can, however, rise to 100 tons a day, if the cake produced still contains 12% of residual oil.

As will be seen later in this study, provision has been made for four presses. The plant might possible start operations with just one or two presses. But the reduction in the initial investment would not be very considerable because the equipment downstream of the presses is not amenable to splitting up; in other words, the mills, filters, pumps, etc., do not vary much in price as a function of the capacity, so they would have to be designed to cover the full ultimate capacity of the plant.

In terms of oil seeds processed, crude oil and cake obtained, capacity would be as indicated beneath:

Capacity of plants for various oilseeds

Raw materials	Oilseed, tons/day		Crude oil, tons/day		Cake, tons/day	
	cake, at 5%	cake, at 12%	cake, at 5%	cake, at 12%	cake, at 5%	cake, at 12%
Peanuts	60	100	24.0	22.0	36.0	38.0
Cottonseed (1)	60	100	16.8	15.6	43.2	44.4
Sunflowerseed(2)	60	100	22.8	21.2	37.2	38.8
Castor seed	60	100	25.6	23.6	34.4	36.4

(1) Pulp only

(2) Based on cold climate sunflower seed (about 40% of oil content)

Description of process (see diagram)

The raw material is transported direct from the warehouse by a screw conveyor to a cleaning screen. After cleaning, the seeds go to a hammer mill from whence they are taken to the cooking unit, and afterwards drop onto the press. The oil obtained by pressing runs into the floor tank and is then pumped to the homogenization unit. From there it is taken to the filter-press, and subsequently goes to another floor tank, being finally pumped to the storage tanks.

A bucket conveyor takes the cake from the press to a hammer mill where it is crushed and then goes to the bagging department.

Investments

Equipment and materials:

- screw conveyors
- continuous-operating expeller press units, with individual cookers (4)

- hammer mills (2)
- floor tanks (2)
- storage tanks, 100,000 liter capacity (2)
- gear pumps
- homogenizer
- filter-press
- mechanical bucket conveyor
- silo for bagging cake
- steam boiler (1,000 kg/hour of steam)
- all necessary electric motors
- all necessary steel structures

Each group of expeller presses has capacity for processing 15 to 25 tons per day, dependent on whether the residual cake contains 5% or 12% of oil.

The equipment is strong, easy to operate with semi-skilled labor and requires little maintenance.

The cost of the equipment and materials, as described above, is US$ 300,000 (F.O.B. port of shipment).

That figure does not include civil works or erection.

Roofed over area: 2,000 m^2

Total area: 35,000 m^2

Labor

Production: 38 workers (*)

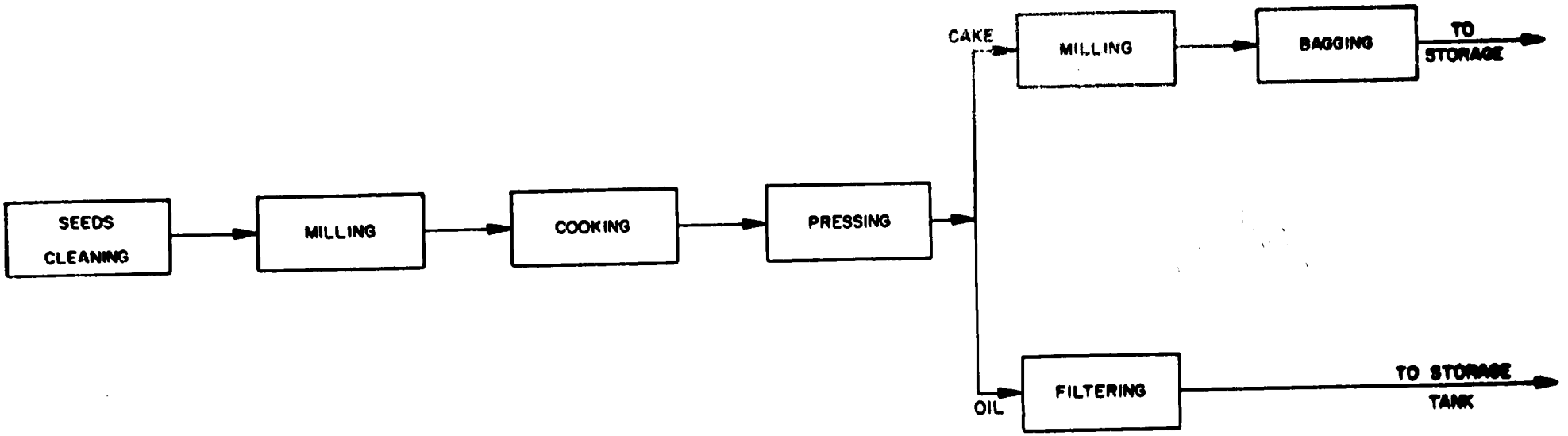
Administration: 7 workers

Total: 45 workers

(*) The factory manager, chemist (technical level) and the head of the maintenance workshop would have to be of the skilled labor category.

VEGETABLE OIL PLANT

SCHEMATIC FLOW DIAGRAM



MILK PASTEURIZATION PLANT

Capacity

The plant described can process 1,000 liters of milk per hour.

Description of Process (see simplified flowsheet)

The raw milk from the intake tank flows to the equilibrium tank (1), in which it is maintained at constant level by the float valve (2) inside the tank.

The pump (3) then pumps the milk to the regeneration section (5) of the plate heat exchanger, passing first of all through the flowmeter (4) which is used to hold the flow rate constant.

In the regeneration section, also referred to as the heat recovery section, the raw milk entering into the plate heat exchanger receives heat from the pasteurized milk emerging from the apparatus and, as a result, is pre-heated; the pasteurized milk emerging from the plate heat exchanger transfers heat to the raw milk just entering the device and is conversely itself cooled down.

On leaving this section the milk is standardized in a centrifuge (not indicated on the flow sheet) and proceeds to the final heating section (6) where it is heated up to the pasteurization temperature established by law.

As pasteurization implies the action of the binomial temperature plus time, the milk is sent to the retarding unit (7) in which it is held for the period of time also established by law (usually 15 seconds).

After the retarder comes the flow return valve (8), which automatically returns the milk to the equilibrium tank if it does not happen to be at the proper temperature (an underheated batch might otherwise contaminate milk already pasteurized). If this does not occur, the already pasteurized milk is chilled first in a counter-current process in section (5) as described previously, and later by means of cold water in section (9); final chilling is effected by iced water in section (10). The milk, on emerging from the plate heat exchanger, has its temperature indicated by the thermometer (11) and then goes to the storage tanks which in turn feed the packaging units.

The temperature of pasteurization and the possible operation of the return valve (8) are recorded on the instrument panel (15) on a continuous and automatic basis.

The switchboard contains not only the temperature recorder but also the switches for the pumps handling milk, hot water, cold water and iced water, and may also contain the protective switches and start-up devices for the pump electric motors.

The hot water for final heating is generated in tank (13) and circulated through the plate heat exchanger by pump (12). The temperature of the hot water is maintained by injecting steam via a diaphragm valve (14) that is controlled in turn by an automatic temperature controler mounted in the switchboard (15).

Equipment

- Plate heat exchanger for raw milk;
- Insulated tank for storage of cooled raw milk, with accessories;
- Sanitary centrifugal pump;
- Pasteurization unit:
  . Equilibrium tank
  . Sanitary centrifugal pump
  . Flow control valve
  . Plate heat exchanger
  . Vertical tubular retarding unit
  . Automatic return valve
  . Hot water generating unit
  . Platform for supporting the unit
- Instrument panel (switchboard)
- Piping (pipes, connections and gate valves)
- Isothermal tank for storing pasteurized milk
- Sanitary centrifugal pump for packaging unit
- Sanitary centrifugal pump for cleaning operations

Besides the above-mentioned processing equipment items, the following items are also required:

- Complete system for generating iced water with capacity for 5,000 liters per hour at a temperature of 1°C.

- Generator for saturated steam at 105°C or generator for hot water at 80°C, with capacity for 3,000 liters per hour.

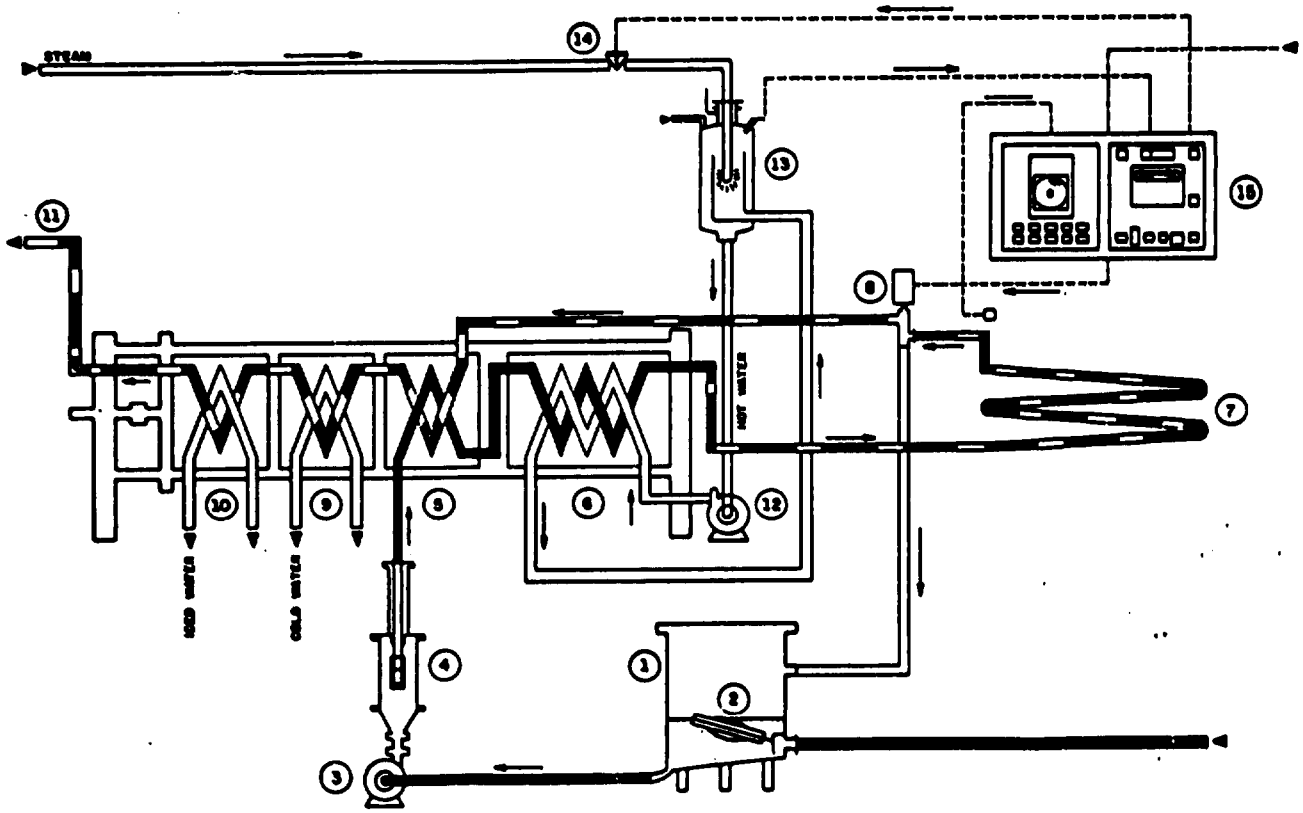
There will also be a need for a small air compressor (140 li - ters per minute at a pressure of 8 kg/cm^2) and possibly a step-down transformer for electric current to drive the motors (220/380 volts).

Investment

Process equipment	US$ 47,000
Iced water generator	US$ 18,000
Hot water generator	US$ 15,000

MILK PASTEURIZATION PLANT

SIMPLIFIED FLOW SHEET



01 EQUILIBRIUM TANK
02 BUOY VALVE
03 CRUDE MILK PUMP
04 FLOW CONTROL
05 HEAT REGENERATION SECTION
06 HEATING SECTION
07 RETARDER
08 FLOW RETURN VALVE
09 COLD WATER SECTION
10 ICED WATER SECTION
11 THERMOMETER
12 HOT WATER PUMP
13 HOT WATER TANK
14 DIAPHRAGM VALVE
15 CONTROL BOARD

PASTEURIZED MILK
CRUDE MILK
OTHER LINES
CONTROL INSTRUMENT LINE

CONCENTRATED CITROUS JUICES PLANT

CHARACTERISTICS

Capacity: 5.5 tons per hour of fresh fruit (oranges)

Product: 418 liters per hour (528 kg/hr) of concentrated juice at 58° Brix

By-products: 22 kg/per hour of essential oil and
545 kg/hour of livestock feeds

DESCRIPTION (see simplified flow-sheet)

The industry is composed of the main sections listed beneath:

1. Receiving and stockpiling of raw materials
   - Weighing
   - Discharging, analyzing and storing in silos

2. Preparation of raw material
   - Discharging of silos, pre-selection, washing and calibration into different sizes
   - Extraction and refining of juice

3. Concentration
   - Concentration, pasteurization and recovery of aromas

4. Freezing
   - Freezing and final packaging

5. Recovery of by-products
   - Recovery and refining of essential oils
   - Recovery (drying) of residues to obtain pelletized livestock feeds

6. Utilities

OTHER INPUTS (for one twenty-hour day)

Drums for juice, (200-liter capacity)	unit	40
Bags for livestock feeds	unit	240
Lumber or compressed sugar cane bagasse	ton	15
Water, m^3		80
Electric energy, kwh		3300

LABOR

	Number of workers
Administration and general services	28
Production, including laboratory	178 (1)
Utilities	25 (2)
Maintenance	10
Total	241

(1) 138 workers on shift
(2) All on shift

INVESTMENTS

	US$ 1,000
Equipment:	
- for concentrated and chilled juice	1,550
- for recovery of oil	155
- for recovery of livestock feeds	725
- for utilities	380
Total	2,810

The above figures do not include electric materials, or piping for water.

Roofed-over area	5,000 m^2
Total area	20,000 m^2

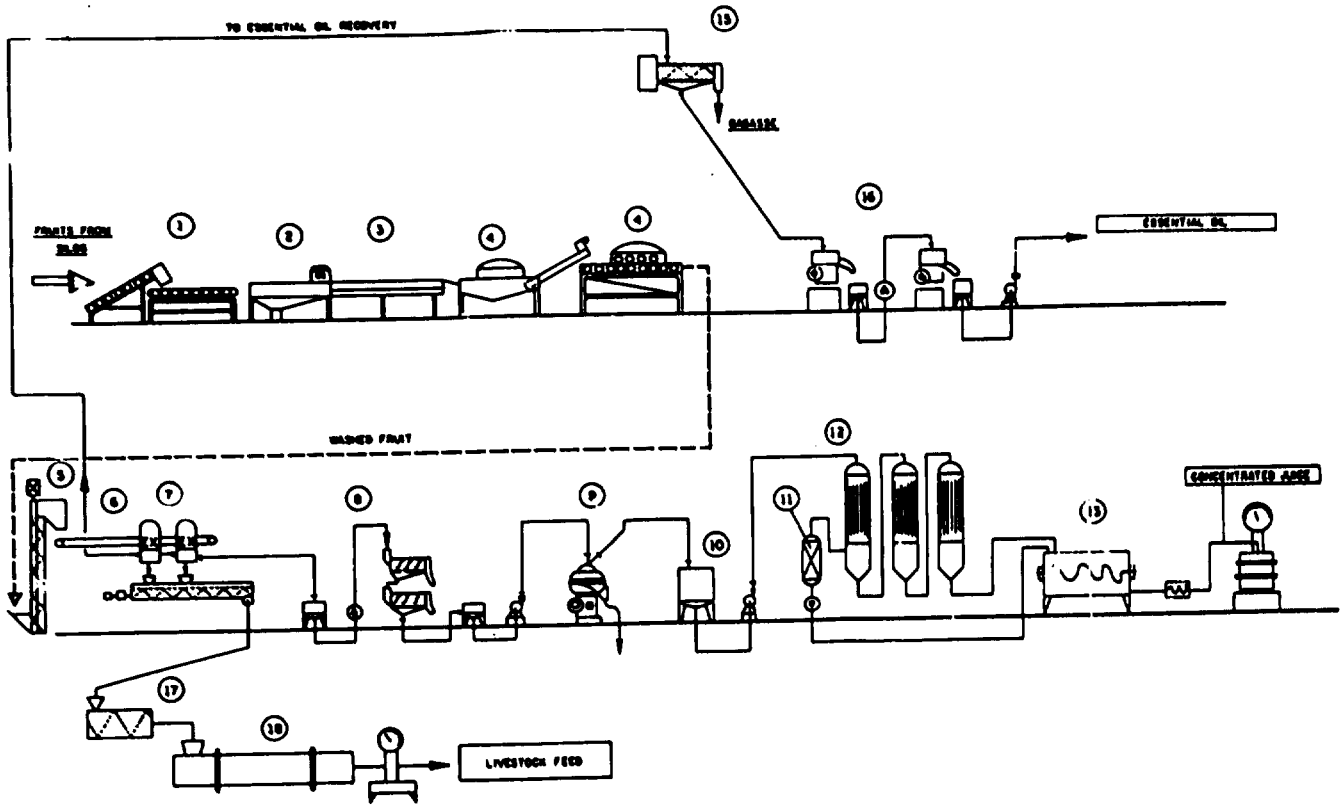
Comments

1. The above-mentioned plant could also produce, in a blocked - in operation, lemon juice (Tahiti type).

2. Investment is usually rather high because the equipment is built of stainless steel.

3. The concentration and cooling sections also represent a large share in the total investment. If the purpose was to produce merely plain juice (not concentrated), bottled for the local market, the necessary equipment would amount to about US$ 600,000.

4. This kind of plant is highly sensitive tc economies of scale. For the capacity assumed in this profile study, (5.5 tons per hour of oranges), total fixed investments would be about US$ 4 million. For a capacity about four times as large, on the other hand, fixed investments would not even be as much as twice the above figure.



LEGEND

01 RECEPTION CONVEYOR
02 FRUIT WASHER
03 SCREENING CONVEYOR
04 FRUIT WASHER
05 ELEVATOR
06 SIZING CONVEYOR
07 JUICE EXTRACTORS
08 ROTATING SCREENERS
09 JUICE REFINING CENTRIFUGE
10 TANK
11 SMELLING RECOVERY
12 JUICE CONCENTRATOR
13 HOMOGENIZER-CHILLER
14 SCALE AND DRUM FILLING
15 ROTATING SCREENER
16 OIL REFINING CENTRIFUGE
17 SCREW PRESS
18 ROTATING DRIER

CONCENTRATED ORANGE JUICE PLANT

WITH BY-PRODUCTS RECOVERY