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EGYPT

Technical report: Survey of the rubber manufacturing industry in Egypt in order to find a basis for establishing a well functioning rubber product development institute*

Prepared for the Government of Egypt
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

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01. ABSTRACT

Goal of UNIDO mission DP/EGY/88/032/11-51/J19201 was to survey the Egyptian rubber industry, to find out the technological standards of rubber products and manufacture processes and to come to conclusions about possibilities of different aids for improvements, as by activities of a Rubber Development Center, of expert missions and/or license agreements.

In first part of present report, actual situations in Egyptian rubber industry are discribed in details, as they have been noticed in TRENCO, SEFCA, BATA and NARUBIN plants. No small or very small companies have been visited, as they represent less than 5% and there are no real development activities except in a few retreading shops, which are assisted by TRENCO.

General standard of visited companies is to use good material and busy operators, but on ways from material components to final products there generally are in many cases substantial reductions of material potentials by use of poor machinery processes, by rather big waste and also by inefficiency of labor operations. Although requirements of Egyptian market are less than those of West Europe for example, there are industrial processes on machines in industrial operation which scan conditions of last hundred years up to near past. Even newest machines out of DUNLOP-TRENCO license cooperation for radial steel belt passenger car tires, which are an intelligible proud, only represent technical standards of the 70th. In order not to spoil actual advantages of Egyptian rubber industry situation with low labor cost (about 10% of FRG level), it is positively necessary to develop industrial standards.

The development of industrial standards, which obviously also is not only a technical problem, cannot be performed in general by short missions of appointed experts, or is a short time job of other activities. But it means to reduce a lot of small and/or big mistakes and short-comings also in design, machinery and manufacturing processes of the rubber production in a long way of development operations. After clarification of general and of actual Egyptian rubber industry development requirements, a proposal of a product orientated rubber technology development is explained in second part of present report. Such activities can be institutionalized in a Rubber Product Development Institute as one of the most fundamential aids to overcome current technological deficiencies, when such activities are controlled and strictly efficiency orientated. An organization of such product orientated development is specified. Main goal of such organization is to provide personal and equipment capacities to cooperate directly with rubber industry in special or in constant missions of development cooperation. Also staff works, as documentation, library and technical education, can be performed by this institute.

Hints for following the starting and consolidating phases of institute establishment are also given. It is recommended to appoint professional and expert contractors to work for layout and establishment. For better control of this work, a well experienced general manager is to appoint soon. Beside this, also aids by missions of appointed experts and by utilisation of licenses and other professional help are recommended and listed in detail.

02. SYMBOLS AND ABBREVIATIONS

Here are the main symbols or abbreviations, used in this report. They are listed und explained to make them more understandable.

SYMBOL	EXPLANATION
AD	Aquisition and Design (of Institute)
ASME	American Standard of Mechanical Engineers
AUMA	Automatic (roll curing) Machine
CICMP	French Industrial Machinery and Equipment Company
CR	Cold or Chloroprene Rubber
CT	Consulting Team (of Institute)
DIN	Deutsche Industrie-Norm, German Standards
EMS	French Machinery Company
ERDI	Egyptian Rubber (Product) Development Institute, (new name)
FM	Financial Manager (of Institute)
FRG	Federal Republic of Germany (west)
GM	General Manager (of Institute)
IKT	Institut für Kunststoff-Technologie, German PDC
ISO	International Standardizing Organization
K7	Internal mixer (Kneter) type name
K'89	Kunststoff- & Kautschukmesse, Plastic & Rubber Fair 1989 in FRG
LCM	Liquid Curing Method, continious saltbath curing of profiles
M	Million = 10^6
MA	Manufacturing Assistant (of Institute in industry)
MRG	Molded Rubber Good
NRM	National Rubber Machinery, American company
PDC	Plastic Development Center
QC	Quality Control
RDC	Rubber Development Center
R&D	Research and Development
Rw	Roll width [m] of calender
SVIT	Czech Shoemaking Company
TE	Test Engineer (of Institute)
TQC	Total Quality Control, method to enforce QC
Vm	Volume [m^3] of operation in internal mixer

03. CONTENTS

04. GENERAL ASPECTS OF OF RUBBER DEVELOPMENT

04.1 NECESSITY OF PRODUCT DEVELOPMENT

During my visits of authority offices and manufacturing plants with discussions about the actual status of rubber technology in Egypt, FIGURE 09.01, sometimes the statement was given, that a real rubber product development never would be possible in Egypt. Here all plants are specialised in productions according to licence agreements, and requirements of the industry are not aligned to look for own actual process and product development in order to improve product quality and cost effectiveness of productions.

If there would be actual needs in rubber product development, the situations should be balanced by know-how transfer through consultants or special cooperations between Egyptian industry organizations and technology sources. The establishment and creation of own industrial product know-how would need too much technological capacity, which is not available or would cost too much money for providing and maintaining.

These are general arguments, which all development engineers in all industrial organizations all over the world have to meet. License lump sums and royalty percentages often are the guide line of own development costs. Of course, industrial development must be organized and controlled carefully in order to be effective. Goal of the following report is to outline the actual situation in the Egyptian rubber industry, to specify actual needs and to make a proposal to overcome these demands on a short and on a medium term basis in an expenditure or cost-effective manner.

But, before starting into investigation of rubber industry details, some specific development expressions and product development chacteristics have to be clarified, which are necessary for understanding of the relevant problems of present situations in Egyptian rubber industry.

04.2 PRODUCTS IN AN INDUSTRIAL ECONOMY

All manufactured products in any economy are following certain rules, regardless of state of civilization or industrialization. There is a must to adapt them to market requirements in order to sell and to achieve market attractivity. But it is also necessary to achieve good postions in market competition, and both of these properties can be influenced by technological development.

In modern industrial societies, the products often are investigated by the wellknown PORTFOLIO method, FIGURE 09.02, which gives areas of industrial products, defined as

(1) CROWN PRINCES at product start, to be supported by development,
(2) STARS in state of youth, still to be supported by adapting,
(3) CASH COWS during optimum of life, no effective support,
(4) DYING PRODUCTS or mummies near life end, no support anymore.

The PORTFOLIO areas are quantified by PRODUCT MARKET ATTRACTIVITY with component factors:

growth (33%), market volume (25%), economic trend dependency (6%), danger of substition (6%), capital loading (6%), labor costs (6%), degree of product know-how (12%),

and by PRODUCT COMPETITION POSITION IN MARKET with factors:

market share (15%), relative market share to main competitor (15%), R&D position of product (21%), Product productivity (21%), product's yield or earning (28%).

As shown here, nearby 50% of both market attractivity and of competitive position of industrial products can be influenced directly by the technological status, gained either by own technical or by license developments. So, the actual investigation of technological status in the Egyptian rubber industry in regard to an effective procurement of relevant know-how must also give an answer about technological standards, gained by actual or past licenses.

04.3 CENTRALIZED/DECENTRALIZED ORGANIZATION

Regardless of own technological development or license adapting, a certain standard of technical know-how for advanced products must be provided. This provision can be established either in a development center or in decentralized organization according to plant or product requirements. The advantage of a centralized organization is the minimizing of investments for the technical development equipment. The disadvantge of this kind of centralized organization is the danger to create an own technical center behavior, independent of product requirements, and to establish an own bureaucratic attitude. In respect to the rather different properties of the large variety of products of Egyptian rubber industry, it may be useful to find solutions of a certain kind of de-centralization for the rubber development activities.

04.4 RESEARCH OR INDUSTRIAL PRODUCT/PROCESS DEVELOPMENT

According to usage in English and American language, all more or less sophisticated technical development in any industry is called R&D, which means research and development. Also the present UNIDO job decription refers to the establishment of a well functioning "Rubber Research and Development Center" in Egypt. But anticipating already relevant results of the findings during actual visits of the Egyptian rubber industry, as given in next part of this report, there is no real demand for Rubber Research in Egypt, but a huge demand for an Industrial Product and Process Development and for Quality Behavior in the manufacturing plants. The establishment of such sources to provide these development and know-how capacity would be balanced easily by savings of rubber material components, which now are imported from hard currency countries, and also by becoming really competitive to rubber products of these countries in international markets.

05. ACTUAL TECHNICAL RUBBER INDUSTRY SITUATION

05.1 PUBLIC AND PRIVATE RUBBER MANUFACTURE INDUSTRY IN EGYPT

All rubber industry activities had been socialized during the Nasser period of recent Egyptian history. As these industrial situations have not been converted again, all elder rubber industry since is public or government owned in Egypt. But the actual policy of Egyptian government now is, to stimulate private industrial activities also for rubber products manufacture. Yet the portion of private rubber manufacturing industry activities is rather small in Egypt, as shown in FIGURE 09.03.

A stimulant for this field could also be the providing of relevant know-how for new private rubber activities or investments, given by a Rubber Development Center, as it been already established for plastic goods in the Plastic Development Center in Alexandria, Egypt. But industrial situations of plastic and of rubber manufacture are different according to the complicate rubber material production compared to a common simple plastic material production, which gives an easy independence from a material supply, provided for instance by another rubber company.

05.2 TRENCO: LICENSES FROM MANSFIELD, SEMPERIT, DUNLOP

As shown in data of FIGURE 09.3, TRENCO, [1], or EL NASR TIRE COMPANY is the faremost biggest rubber manufacturer in Egypt and produces tires for passenger car, semi-truck, truck and bus applications as well as also for bicycles and motorcycles. TRENCO covers about 50% of the Egytian tire home market and cannot follow the actual growth of the tire home market according to restrictions in relevant investments.

As TRENCO is a good example of the behaivior and potentials of the actual Egyptian rubber industry, four days of my mission had been spent in order to find out the typical Egyptian rubber industry attitudes and typical differences in regard to relevant West Europian rubber industry. The original know-how for the actual production of bias tires for passenger cars and for semi-trucks, truck and busses had been given by MANSFIELD, an American tire company, which does not exist anymore. This know-how has been evaluated in the 1950/60th.

Since only a few years, TRENCO is also producing all-textil radial tires for passenger cars according to a licence of DUNLOP DEVELOPMENT CENTER, Birmingham, Great Britain, and is just starting to introduce steel belted radials under same DUNLOP license. Basical machinery for relevant components preparations and tire production had been established by American industrial aid. Yet it also must be pointed out, that DUNLOP company had to sell its tire activities to SUMITOMO, Japan, in 1984. One of the reasons of selling these DUNLOP tire activities were certain leaks in development in the past. The bicycle and motorcycle tires are in TRENCO production according to an old and not anymore active license from SEMPERIT, Austria.

In co-operation with TRENCO, it is planned to establish also an all-steel monoply truck tire plant in Alexandria on a separate plant site. The know-how for this new production will be given by PIRELLI, Milano, Italy.

05.21 DETAILS OF VISITED PLANT FACILITIES

The layout of TRENCO buildings and plant site itself are quite modern and large-scaled. But the actual state of maintaince of buildings and also of elder machinery does not meet the requirements of West Europian industrial rubber facilities. Only in the new plants for radial passenger tire productions, these specific rules of modern rubber productions are or will be fulfilled.

05.211: NEW RADIAL TIRE PLANT

Basis of the new TRENCO radial tire plant was an US-aid, given in 1982, to allow to purchase machinery for radial tires. Product license is given here by DUNLOP DEVELOPMENT CENTER, Birmingham, Great Britain, already mentioned. All textil radial tires were tire technology standards in West Germany in about 1970. Mass production of steel belted radial tires started (with difficulties) there in 1972 and substituted all-textile design completely.

Main radial tire manufacturing equipment:

05.211.1: MONSANTO extrusion lines of 1982 for tread, sidewalls, apex and filler strips. Cold fed extruders with metal detectors on feeding conveyor. Conventional cold fed screw (1975). Reasonable performance but high shrink. Bad shaping of feed by single strip, stored on wrotten wooden pallets.

05.211.2: SPADONE bias cutter, normal design for preparation of cord sheets for tire carcass and textil belts.

05.211.3: BERSTORFF 3-roll calender for rubber sheet calendering, very old design, soon to be replaced by a new COMERIO 4-roll calender, now under construction.

05.211.4: NRM 2-stage tire building machines (1980), now (1988) updated by MITSUBISHI in small extend. 3 operators performance of assembling in about 5 minutes/tire. Re-organizing of plant layout.

05.211.5: MACNEIL twin curing mechanical presses (1980), now (1988) also up-dated by MITSUBISHI. Semi-automated, conventional controls, steam curing pressure: 190 [psi] = 13.4[bar] => 195.4[°C].

05.211.6: STEELASTIC/NRM steel cord belt manufacturing unit and cutter with air conditioned bobbin racks, now under construction and test production conditions.

05.211.7: DUNLOP tire force variation messuring machine in air conditioned room for statistical final inspection of tire uniformity performance, 3 places. Also static balance tests (5 tires per seize, shift) by separate equipments.

05.211.8: MANSFIELD roll load wheel tester, old design (1930), now replaced by a modern KOBE combined passenger and truck tire test machine (1985), for design and quality control. 4 tire test places.

Actual radial tire plant output: 1800 tires/3 shift now,
2000 tires/3 shift (end '89).

05.212: MILLROOM

Main equipment of the millroom are three FRANCIS SHAW internal mixers, old design (1959), and two K7 mixers of W&P in a more modern (1980) design. Two stage mixing. Compound components weighing semi-automated for main components. Rubber out-let by energy and temperature control on open mills before air cooled batch-off. Non uniform wigwag on wooden pallets. Transportation of rubber by fork-lift trucks.

Generally speaking, the millroom is, also in modern parts, in no good shape. Dust of spread carbon black, oil leakage, lots of rubber and compound scrap give a rather bad view. One K7 mixer was out of operation due to fire accident. A new mixer is under preparation. As all quality problems are starting in millrooms, here would be a big capacity of improvements.

05.213: CHEMICAL/PHYSICAL LABORATORY

The TRENCO lab activities can be divided into 5 different parts, which are:

(1) Rubber components property control for purchasing assistance,
(2) Fabric, textil cord and steel wire control for purchasing assistance,
(3) Power station water inspection for maintenance/production assistance,
(4) Green rubber quality control, especially of millroom,
(5) Compound development and process adaption for purchasing/production.

The equipment of labs was very old in general. Some of the laboratory test equipment was even really antique. As an exception, only a few Rheometers and a small INSTRON tension tester fulfill modern requirements.

The green rubber quality testing is a 24 hour, cord adhesion an 8 hours service. The activity of the laboratory personnel was outstanding, also the laboratory documentation of quality test results as an information service to production and management. Quality tolerances had been adapted according to DUNLOP license. Yet, respection of slight exceeding of quality control tolerances sometimes seemed to be a general problem and more like that of street traffic lights in Egypt. Only big exceeds were subject of rework, rejection or scrapping.

05.213: CORD DIP AND CALENDERING PLANT

According to the great importance of this cord manufacturing process step to the safety of tires, this plant was maintained and operating in a good shape, comparable with that of a PIRELLI plant for instance. After drying the fabric, it was dipped, tensioned and precured. Same cord fabric then is calendered in train by symmetrical rubberizing.

Dip pick-up testing, cord density and sheet thickness tests during process for quality control. Handling of cord, MEHLER licence, could be improved in storage and transportation.

05.214: TUBE MANUFACTURING PLANT

This old MANSFIELD tube plant was not in operation due to leak of buthyl rubber compounds, which could not be made according to mixer breakdown. Basic machineries of this tube manufacturing plant were old American NRM extruding, cutting and assembling facilities as well as also old MACNEIL curing presses. It could be noticed a rather high consumption of zinc stearics as white powder all over in the plant, but especially on the booking trolleys.

The Egyptian market requires tubes for automotive tires according to customers demands. Tubeless tires are not favorites in Egyptian tire market, so TRENCO stopped production of tubeless bias and radial tires.

05.214: BICYCLE AND MOTORCYCLE TIRE PLANT

Tires for these bicyle applications are made according to machinery and know-how from a past SEMPERIT license. Standards of these special rubber sheet and fabric calenders, fabric cutters, tire assemblers with sliding servers and tire curing presses were moderate.

But accordingly, also the quality requirements of Egyptian market, especially for motorcycle tires, are not as high as in West Germany, for example.

05.215: BIAS TIRE PLANTS

These plants are the faremost biggest part of TRENCO plant. Basis of plant layout and machinery for these plants of bias passenger, semi-truck, truck and bus tires is know-how and equipment according to old MANSFIELD licenses. The relevant plants are located in rather large-scaled plant halls. Outstanding characteristics of these plants had been the busy activities of the operators, the "old"-age of most of the manufacturing machines, but also the mishandling of material components and green tire sleeves in certain areas of the production plants. Results of these careless and disciplineless operations were huge deformations, aging and sticking together of sleeves. This latter never could have been noticed in my professional career before. Such mistakes in plant operation and plant management should be avoided.

Main machineries for assembling passenger tires are old AKRON STANDARD building machines with moving servers, and for assembling truck tires also old AKRON STANDARD building machines with stock torrets. But also simple antique one-spindle NRM building machines without any servers are in use. Curing is performed in old mechanical MACNEIL twin presses. These old design presses are now rebuild according to old MACNEIL standard by machinery suppliers of India, as to be seen in TRENCO plant.

05.216: INDUSTRIAL ENGINEERING AND MAINTENANCE

TRENCO activities for industrial engineering generally are not development of new production machinery and equipment, but adapting imported facilities to the specific TRENCO plant requirements. Also the preparatory works for new machinery precurements and work for tenders are parts of this activity.

But main part of internal technological service is the maintenance of machinery and equipment under specific conditions of old facilities, leak of original spare parts and of service of suppliers. Replacement of tire curing molds and procurement of new molds always is a matter of importing from abroad according to license or service agreements.

05.217: PRODUCT DESIGN AND DEVELOPMENT

General rules of product design and development up to now are:

(1) No own product development, only adapting of license requirements.
(2) Use of best available material, imported from Western Europe.
(3) Chemical development only for replacement of material components.
(4) Adapting of license quality control standards, also when Egyptian requirements fulfilled by wider tolerance ranges.

05.218: MATERIAL COMPONENTS STORAGE

The storage of imported compound components is relatively very good in special and good conditioned storehouse facilities. There is no confusing storage. First-in and first-out is applied. All materials are QC-labeled.

Natural rubber sheets are stored in simple wooden storehouses with high storage temperatures according to sunshine radiation on roofs. Rather bad conditions were noticed at storage of carbon black packages.

05.219: QUALITY CONTROL

Quality control in TRENCO is a cooperation of the chemical lab, which is responsible for control of purchased material, storage and millroom and of the quality control department, which controls production from calender operation up to final product inspection.

Product inspections are jobs of the manufacturing department. Here sometimes 100% control (tubes, radial tires) are necessary. Quality control as a super-inspection is performed according to statistical regulations. Some of the quality control data tables, all given in English language version, only had fixed machinery function or process property data without any tolerances. So a quality control is more a real qualitative, not a quantitative operation and a subject to individual production experts judgements.

The table of FIGURE 09.04 gives some manufacture quality data of TRENCO production of August 1989. These data are to be balanced by the claims data from the customers markets. Analyzing of these customer claims is another important job of the TRENCO quality control department.

05.3 PDC: INDUSTRIAL DEVELOPMENT CENTER FOR PLASTIC GOODS

Although the Plastic Development Center in Alexandria, Egypt, was not in charge with development of elastomeric or rubber-like plastics and will not be in charge with rubber, this facility was visited as a part of my mission to find out the possibilities of an UNIDO (0.9 MUS$) and government (3 MLE) supported institute to operate as a know-how source in Egyptian economy.

05.31 MAIN GOALS OF PDC, ALEXANDRIA

The PDC, Alexandria, Egypt, was established by aid of UNIDO as a quality control institute to assist standardization of plastic products for the Egyptian economy. According to this initial subject of establishment, main goals are:

05.311: Standardization of plastic goods properties in co-operation with Egyptian standardization authorities.

05.312: Quality control of plastic raw materials and of plastic goods according to Egyptian standards and standards of other countries or organizations as DIN, ISO, ASME for private and public customers.

05.313: Operation of pilot plant facilities for
(#1): training of technical and engineering personnel,
(#2): demonstration of plastic facilities in R&D operation,
(#3): assisting in making pilot production in co-operation.

05.314: Promotion of plastic activities in Egypt, as for example,
(#1): Plastic in agriculture (1982-1986), [2], with test facilities in Egytian desert to test plastic film houses and dip imigration,
(#2): Plastic in construction bussiness (1986-now) with development of production equipment for profiles for windows, doors, sealing, and all kinds of plastic tubes, household products.

05.315: Training-programs in co-opertion with UNIDO and other plastic development centers, like IKT Aachen, FRG, and preparations for national and international plastic fairs, like K'89 in FRG this year.

05.316: Specialized or adapted plastic R&D with goals:
(#1): Changing the materials or material components,
(#2): Replacement of imported by homemade materials,
(#3): Reduction of trial, tuning and adapting costs,
(#4): Application trials for known plastic polymeres, but no R&D for new polymeres/manufacturing techniques.

05.32 OPERATION OF PDC

At the time being, the PDC takes its money out of a public budget at about 70%, the rest of it must be earned by orders out of the customers market. All PDC works are performed by assignments of the Egyptian government or by individual service contracts with the customers.

05.33 PERSONNEL, BUILDINGS AND EQUIPMENTS OF PDC

05.331: PERSONNEL. The actual PDC team consists of 70 persons, which are

(1): 25 Engineers (chemical, mechanical, physical) and chemists,
(2): 15 Technicians and drafts people,
(3): 12 Administrative and finance personnel,
(4): 18 Operators, watchmen, a.s.o.

05.332: BUILDINGS AND SITE. The site of PDC is within Alexandria city on a rather small area. It consists of a large-scaled building with a small court and court house in front, leading to a small side road of a typical Egyptian city dwelling area. Groundfloor of main building has

(G.1): one large test field as the center of the hall,
equipped with one blowing machine,
one injection molding press,
one tube extrusion line.
(G.2): one rather small, air conditioned physical laboratory,
equipped with several modern test facilities,[3].
(G.3): one meeting and conference room just near entrance,
equipped with instruction means like projectors, recorders, microphone, simultanious translation facilties, a.s.o.
(G.4): rather small and poorly equiped workshops for mechanical, electrical test construction and maintenance,
(G.5): store rooms, wardrobes and washing rooms for personnel,

and consists on first floor mainly of

(F.1): several offices for management and administration,
(F.2): one very small chemical laboratory.

The PDC personnel was busy in its operational works, as it could be noticed during short time of visit.

05.4 BATA SHOES: FORMER SVIT COOPERATION

In order to survey not only typical rubber plant facilities, it also was decided to visit an industrial plant, where rubber runs to be substituted by other materials like plastic and where rubber is only one possibility of material. BATA is a shoemaker, which covers production of leather, textil, plastic and rubber in its production processes. BATA products are almost only made for the Egyptian home-market.

BATA plant site is within Alexandria city. The plant is remarkable clean, is very busy and all over crowded with male and female workers. BATA started operation as a licensee of SVIT, Gottwaldow, Czechoslovakia, and adapted from SVIT typical rubber production facilities also in use there. This SVIT co-operation had been finished already. BATA now only gets support by the BATA DEVELOPMENT CENTER, Toronto, Canada, for shoe design and for development of special manufacturing procedures on request.

Rubber for own BATA application, as a supply to other plants and for the repair market is used for soles and heels, boots and in special compounds for soft-rubber mats of shoes production. Rubber was up to 40% of business of BATA in the past, but covers to-day only about 10%. During the visit, also the leather, plastic and textil activities of BATA could be surveyed. But the main interest was spent to rubber material and rubber production. The rubber facilities and plants of BATA are:

05.41 MILLROOM AND SOFT-RUBBER MATERIAL PRODUCTION

Main equipment of BATA millroom are two medium FRANCIS SHAW internal mixers with conveyor-less hand feeding. Weighing of oils and fillers semi-automated. Weighing station of small components by moveable weighing equipment before storage. One of these two mixers was broken and out of operation. Same situation with sheet extruder of soft-rubber preparation. Sheeting was done by open mill operation.

Crépe-rubber, rubber compound content = 40%, vulcanizing by multiple curing presses. Same kind of curing also for hard-rubber soles and heels, but also by use of MAPELLI and MACNEIL injection molding presses. Rubber boots curing in multi-part molds in simple presses. Small production of rubber sport shoes. Millroom, rubber preparation and curing in same building without any room separation between rubber processing plants.

05.42 CHEMICAL/PHYSICAL LABORATORY FOR RUBBER/PLASTIC

Equipment of lab rather poor. Old machines for rheological tests, tension and hardness tests. Only one fatigue tester, this of more modern Czech design. Material strategy of BATA also is to purchase only from approved suppliers. Quality control of supplied material by statistical methods. No development of material. Testing of new material only after advice from outside sources.

05.5 SEFCA - A SPECIAL SITUATION OF A PRIVAT COMPANY FOR MRG

A very special situation in many aspects was found in SEFCA company, Tanta in the center of the Nile delta, and just in the middle between Alexandria and Cairo. This company, the Société Egypto-Francaise du Caoutchuc, [4], is a rather modern installation, is established in 1980, and can use quite modern manufacturing know-how of HUTCHINSON, France, TRELLEBORG, Sweden, and CICMP, France.

So, SEFCA just could be a typical example for actual economical policy to encourage foreign or privat investors to create new industrialization in Egypt. But actual result were not according to official expectations, and there now is no real license co-operation anymore due to financial or commercial reasons or quarrels in the past, which had not been explained.

05.51 GENERAL SITUATION

It was not the mission job to investigate the economical non-success of this company (about 200 MLE debts after 8 years of operation and encreasing losses), but it was evident to notice such a great collection of rather modern rubber manufacturing equipment in Egypt, either never used or working at poor and unsufficient capacity. There was more the impression of an experimental laboratory or of a showroom than of a manufacturing plant.

There also has been a discussion with the management about this actual plant production situation. The information was given that first of all leaks of liquid money shall restrict the success of this company. But out of my professional experience, there are tremendous doubts about this simple explanation. Obviously, main reason of this situation is a bunch of severe management failures on sales, economical, financial and personal developments.

Technical or technological reasons are of minor importance. Although, leaks of simple technical acquisition and development know-how had been noticed, but these could also be originated from the depressive company situation just to beleave in wonders or engineering marvels.

The plant itself was very clean compared to medium Egyptian rub. . plant environment. This may be, because there was only 5-10% loading of production capacity. May be also that cleaning was a kind of labor procurement. On the other hand, water for cleaning and air conditioning on plant floor may be good for the operators and inspection people, but is not good for a rubber production with its great absorption of humidity as reasons of scrap and minor product quality.

It has been noticed, that some of the production seem to be just for show for the mission visit, as these productions did run under bad conditions. Some manufacturing equipment was poorly used for real commercialized production. Various products had been shown on display in several places in the plant, but some pieces obviously had been out of pilot productions only.

05.52 SEFCA PRODUCT PROGRAM

The SEFCA product range, [4], is rather wide, scanning

(1): Dip products as laboratory gloves, covers,
(2): Battery cases out of rubber,
(3): Floor mats for construction and automotive business,
(4): Extruded profiles, sealings of solid and sponge rubber, also flocked,
(5): Hoses for medium and high pressure, also equipped with fittings,
(6): Radiator and gasoline hoses for automotive application,
(7): Molded rubber goods for various applications,
(8): Engine mounts and other metal bonded rubber parts.

05.53 DETAILS OF SEFCA MANUFACTURING FACILITIES AND PLANTS

The SEFCA plant layout is quite large-scaled and also fulfilling modern manufacture requirements. Details of various plant facilities will be highlighted:

05.531: DIP PLANT

Modern equipment for latex dip preparation, dipping and curing. No operation of dip plant due to non availibility of latex materials for financial reason. Dip products, gloves of good quality, were shown on display. Plant capacity: 7000 [pairs of gloves/d] for instance.

05.532: BATTERY CASES PLANT

The only really working plant of SEFCA. Know-how from TRELLEBORG license. Battery cases made out of hard-rubber compound and rubber reclaim, supplied by NARUBIN. This kind of battery case production is obsolete in international markets, (substitution by plastics), but still in use in Egypt as a demand of customers. Main plant equipment: EMS compression molding presses. 10% of battery cases are controlled in final inspection for electrical non-conductivity in special test machines.

05.533: PROFILE EXTRUSION AND SEAL FRAME PLANT

This part of plant obviously was not in operation quite long ago on commercial basis, due to traces of manufacture. Main plant facilities are EMS extrusion lines working with salt bath curing, (LCM), and hot air tunnels. The LCM method is already obsolete due to pollution reasons in Western Europe. One line of the plant was shown in operation producing a big profile for railroad application. The lines can also produce metal reinforced profiles with special equipment, sponge rubber profiles and profiles with polyester flocks to reduce friction to automotive window glasses. Extruded profiles also can be processed to frames by cure-finishing in special edge presses.

05.534: HOSE MANUFACTURING PLANT

There are at least three different lines for different hose productions for low, medium and high pressure applications. Spinning and weaving methods for cord reinforcement. Vulcanzing in modern autoclaves on curing tables or on curing racks.

This kind of production was in commercial operation on the day of visit for medium pressure water hoses and for gasoline hoses and radiator hoses for automotive application. Pressure test equipment for final inspection has been shown in operation. No production was to be seen in the hose fittings plant, only some finished products on display.

05.535: MILLROOM AND COMPONENTS PREPARATION

Size of three EMS millroom internal mixers with Vm= 70 to 200 [dm^3], and calenders for components preparation were much too big for the actual small productions. Mixers with semi-automated feeding of fillers and oil. Exhausting and pumping facilities to fill mixer silos. No batch-off equipment for the cooling of compound material after mixing, only rather long shrinking conveyor. Calender of big seize, roll width Rw about 2 [m], was in use to produce small rubber sheets for hose wrapping. BARWELL extruder for rubber portioning for compression molding. Mechanical and chemical cleaning equipment for metal parts of metal to rubber bonding.

05.536: MOLDED RUBBER PARTS PLANT

One long street of about 10 MACNEIL injection molding presses (no modern design) was not in operation, due to injection mold restrictions, as informed. Only a small production on EMS compression molding and transfer molding presses. Products were small bushings, seals and covering caps for mechanical application. There was also a small production of a special metal bonded rubber part, but no automotive engine mount production.

It has been found out in discussion about product and process development, that here are rather big leaks of product know-how, starting from market application, product design and ending for production of sophisticated MRG.

05.537: PHYSICAL AND CHEMICAL LABORATORY

Compared to wide range of SEPCA products, the labs are rather small, but well equipped by a small amount of modern test facilities. The labs performs quality control tests for purchsed rubber and reinforcement material components and for millroom control constantly. Rheometers, rubber viscosity-meters and INSTRON tension meters are main QC test facilities. Also a small amount of equipments for restricted chemical investigations in a chemical laboratory was to be seen.

05.6 NARUBIN - DEVELOPMENT OF OLD HUTCHINSON KNOW-HOW

NARUBIN or the EL NASR CO. FOR RUBBER PRODUCTS is a public company and has two plant sites in Shoubra, Cairo, within an industrial area nearby dwelling zones. Plant #1 is a bigger site with very old buildings and one modern manufacture hall with millroom and belting manufacturing facilities, while plant #2, the so-called foam factory, is a very old and narrow site nearby Shoubra fish market. NARUBIN also has a commercial and administration headquarter in Cairo downtown.

05.61 GENERAL SITUATION

NARUBIN has a stiring past with licence agreements of HUTCHINSON (1970), just the same like SEFCA (1980), and severe commercial losses. NARUBIN started very much earlier with rubber productions. The starting conditions can be investigated in some of very obsolete manufacturing plants. But now, after changing in management and finding a way to improve products position in market recently, turn-over and earning are improving again. NARUBIN is a good example for successful industrial management in Egypt even under heavy re-start conditions.

According to PORTFOLIO method, there is a bunch of dying products or dying technologies in NARUBIN company. Management method was to concentrate all efforts and promotions on stars of the product program.

05.62 DETAILS OF VISITED PLANT FACILITIES

The plant sites itself have the typical Egytian rubber company look, looking like more as a combination of construction site and scrap yard in many places than as an industrial plant of West Europian style. But also the fear, that some of the parts of old scrapped machines may be useful as spare parts or at least spare-part material can be understood. On the other hand, the situations changed tremendously for relevant more advanced production sites in NARUBIN company. Design philosophy of NARUBIN also is to use best available imported material components, to control the supply of these purchased material and then to control mixing process quality. The process quality during manufacturing has a range from moderate conditions for star products like belts up to lousy conditions for dying products.

05.621: V-BELT MANUFACTURING PLANT

Basis of this plant are production machines and old know-how of HUTCHINSON company, France, which obviously had sold its old machinery for wrapped V-belts to NARUBIN. The HUTCHINSON product design with the basis of NR compounds has been changed to CR by NARUBIN chemists according to BAYER recommendation, and also the cushion compound has been improved by some % of fiber to stabilize neutral axis cord layer in the belts.

Main V-belt production machines are:

05.621.1: REPIQUET calender for frictionating fabric with CR rubber and CR rubber sheet calendering. Cooling and shrink section not OK. CR calendering at rather low roll temperature -> high shrink.

05.621.2: REPIQUET fabric cutter. Fabric strip splicing on seperate lathe.

05.621.3: ZELANT GAZUIT V-belt assembling machines, very old design. Cord spin un-uniform -> layer deformation of MEHLER soft-cord.

05.621.4: ZELANT GAZUIT wrapping machines, very bad and labour time consuming performance. Machine design really obsolete.

05.621.5: Sleeve pot heaters for mold curing of V-belts. Normal design.

05.621.6: BERSTORFF vertical AUMA rotating curing machines for small dimensions. AUMA vulcanizing is risky in respect to fatigue, but a mold-saving curing method.

05.621.7: BERSTORFF horizontal AUMA curing machines for long technical V-belts for agricultural application or power drives.

05.621.8: Home-made dead load ASME fatigue tester for quality control of V-belts. 4 test places available, but only 2 in operation.

Wrapped V-belts are standard demand of the Egyptian market, but NARUBIN intends to install also a raw-edge V-belt plant in order to improve fatigue and to modernize the production method. Raw-edge V-belts, [5], are the standard for automotive application in Europe, although poly-V types are improving automotive market shares. Other important belt types of automotive application are timing belts, CR rubber and glass fiber cord, especially used for engine valve control.

05.622: CONVEYOR MANUFACTURING PLANT

The length of the plant hall is designed for the installation of conveyor belt manufacturing machines. But only rather small fabric reinforced conveyor belts were in production. Doubling of coated fabric layers is provided on assembling racks. Covering of reinforcement layer with rubber is performed in calender in two steps. Curing in conveyor belt presses. Repairs in train on separate small vulcanizing presses. Finishing and cutting by hand.

Main conveyor belt manufacturing machines are:

05.622.1: REPIQUET fabric assembling rack with servicers. Bad performance with liners in general, also in calendering process.

05.622.2: REPIQUET calender for coating fabric of conveyor belt. Same as for V-belt components preparation.

05.622.1: REPIQUET conveyor belt curing presses. Two pieces. Maximum width = 1.6 [m]. Machine in good shape, although 20 years old.

Actual design problem of conveyor belts are caused by minor heat resistance of NARUBIN belts for special Egyptian application. This problem may only be solved by development of new cover compound. DNI has been asked for know-how. Belt design and specification details will be sent to Hamburg.

05.623: MILLROOM, MATERIAL STORAGE AND PREPARATION

General problem of millrooms in Egypt seems to be repair of broken installation. Also in NARUBIN, one of the 2 FRANCIS SHAW internal mixers was not in operation due to repair problems. Besides, also the batch-off facilities of both mixers were defect. Cut-off of rubber was performed by hand with small rubber puppets. For handling, these puppets had been powdered all over with zinc stearide, risky. Internal mixer was only used for master batch. Accelerator, sulfur, is added in open mill process as second stage. Here it has been noticed, that adding of sulfur was done in a rather generous manner without restricting limits, obviously.

Transportation and storage of puppets also made some problems. Also floor storage of old puppets was to be seen, with workers climbing up the rubber to bring other compound puppets to the mills and to the calender. Storage of compound components in store house. Rubber sheet storage of master batches on wooden pallets nearby mixer let-off in separate rooms.

Main facilities of millroom, store and material preparation:

05.623.1: 2 FRANCIS SHAW internal mixers, semi-automated, with silos for carbon black, fillers and oil. Monitoring on large scales, weighing systems with difficult access, so calibrating problems. Silo filling out of packages by hand. Batch-offs defect. Separate control room for mixer operation documentation.

05.623.1: REPIQUET open mills for final batch mixing. No good storage facilities for stock and compound components. Transportation of stock unperfect, mostly done by hand.

05.624: CHEMICAL/PHYSICAL LABORATORIES AND QC

Laboratories of NARUBIN have typical Egyptian standard outfit. Simple rooms with very old test and lab machines, updated by some few modern equipment for rheometer, viscosity and tensil strength tests, INSTRON. Laboratory job and division similar to TRENCO, as given in paragraph 05.213. Control activity for mixer quality performance around the clock.

Very restricted development activities for new materials or products. No product test facilities, only for plain physical data control of rubber, rubber components and reinforcement material as purchasing and suppliers control.

Quality control, QC, of belt productions rather complete, that of other products more poor. QC of mixing for all compounds by heat and power, output temperature for CR = 80[°C], for example. QC after mixing by rheometer, viscosity, tension and elongation, hardness and flex according to standards or to customer requirements.

QC steps of V-belt production, as an example, by control of

(1): Calander roll temperature, ->40[°C],
(2): Weight of frictionated fabric and
(3): Thickness of calendered sheets,
(4): Number of [cord/cm] at assembling stage,
(5): Weight and dimension of green cut belt,
(6): Weight and dimensions of wrapped green belt,
(7): Temperature of cure, weight and dimension of cured belt,
(8): Belt finish by super-control of final inspection,
(9): Dead load fatigue according to necessities.

No dimension control by length measuring machine, which is a standard test in West European manufacture, is performed in NARUBIN V-belt production.

05.625: COVERING OF ROLLS AND TANKS

This covering production is performed in a very old and rather small NARUBIN manufacturing hall, crowded over and over and round-about with rubber material, sprays, raw metal parts, semi-finished products, cleaning and grinding-machines in operation, autoclaves with stream outlets, finished products in storage and between all climbing and productive operators. It was a bazar-like mixed-up of manufacturing activities, remarkable in its behavior. As rubber covering and rubber coating is one of promoting NARUBIN products, such production facilities and operation must be improved substantially up from the basis. Planning of it is under consideration.

05.626: RECLAIM FACTORY

This production is also one of the old NARUBIN activity, performed in old machines. It is a good business at moment, and covers regenerating of old tire treads and out-of-tolerance rubber compounds as a substitute material for battery cases, minor quality rubber good, but also as a filler portion for new tire production (TRENCO). This market decreases by encreasing quality. The reclaim machines have not been in operation during time of visit.

05.627: MEDIUM AND LOW PRESSURE HOSE MANUFACTURE

This production is performed in two different procedures:

(1): Lining or strip pressure method, and
(2): Lead cover method.

The production facility for (1) is very obsolete, looked like a mass by rubber solution material spread all over and by poor maintained machinery equipment. The machinery for (2) at different location is better, also layout of plant, although the machinery also is old and obsolete. Here it could be noticed, that there was some activity for reconstruction of plant.

Both plants were in operation during visit time, and not for show. But this kind of medium and low pressure business affords a certain maintenance of technology, is critical because there is a great danger of substitution by the faremost cheaper plastic material and technology. This kind of rubber products must be supplemented by high pressure and hydraulic hoses in order to justify technical expenditures of hose manufacture.

05.628: MOLDED RUBBER GOODS AND FLOOR MATS

This plant, located in an apsis to main plant hall, also manufactures using old machinery. Material preparation is done by old BERSTORFF 3-roll calender with doubling equipment. Also an old COMERIO rotorcure was under repair or maintenance. Both production activities for floor mats and molded rubber goods are in same plant room.

Curing of floor mats and molded rubber goods by old COMERIO multiple presses of different seize. Molded rubber speciality goods in molds of one to three beds, done by compression molds of own NARUBIN production. The plant for MRG was performed by only a few presses, so it was very small.

During visit, a special non-quality treatment of obviously old and therefore stiff sheet material could be observed: An operator had layed down a roll of liner and rubber sheet on dirty floor, stood with his feet on the green rubber sheet material and de-rolled the ply by use of one of his feet. This operator was of course insulted by the accompanying manager and rubber was placed on a table, but there was no additional reaction by a foreman.

05.629: MAINTENANCE AND ENGINEERING WORKSHOPS

This plant facility gave a good impression about the maintenance and other technical problems in an operating Egyptian rubber company. Basical machines of the mechanical workshops have been simple and old lathes, milling, planing and drilling machines and melting equipment, most of Russian or of Eastern Block origin. The shops for mechanical and electrical maintenance and production of manufacturing tools were very busy.

The range of these workshop productions scanned from spare parts for electrical switches, molds, for production equipment, chairs for operators accommodation up to spare parts for the spare part machines itself.

Some of the raw material did come out of those stores of scrap machinery, scrap busses and scrap equipment parts, already mentioned in chapter 05.2, and which may give some strange impressions to visiting peoples.

05.6210: NARUBIN FOAM FACTORY

This NARUBIN plant #2 is located in same part of Cairo town, but far away from location of plant #1. This plant also was a special experience in the range of my mission visits. The site is very small and very difficult to survey. It looks just like a small pre-industrial workshop, always supplemented in very small parts all over, up and down and also aside. In between in courts and small gangways trees, flowers and climbing green bushes as in a garden. The plant was an old Italian foundation, so the main outfit is represented by really antique COMERIO presses, extruders, mills.

The only new and accordingly modern plant was an DUNLOP foam equipment, which never had been in industrial operation. This plant was implemented after consideration according to public (army) demands for latex foam mattresses. After plant installation, the army swifted over to cheaper polyurethene foam material and this new outfit is a monument since. Latex foam matresses can not be sold in Egyptian market due to high material prices, and other material, like polyether, had not been in operation. There is also an old foam plant in operation for producing some few parts of automotive seats, most spare parts. But nearby 95 % of NARUBIN plant #2 production are typical non-automotive rubber goods. The product range compiles:

(1): Molded Rubber Goods as seals, bushings,
but also railroad suspension mounts for metro,
(2): Rubber Shoe articles as sole, heels,
(3): Rubber Boots,
(4): Gaskets for water, oil and gas,
(5): O-rings,
(6): Rubber Rings for package,
(7): Elastic Strips for clothing,
(8): Foam Parts for automotive application.

The plant personnel is rather high aged, but is very busy and set all over in small rooms, performing different production steps. Chemical service is made in NARUBIN plant #1. As lot of rubber compounds have to be processed under special conditions of antique machinery, they have to be adapted more to these handicap process requirements than to product properties. The NARUBIN plant #2 and its old machinery should be replaced soon.

05.63 SEARCH FOR PRODUCT LICENSE

For reduction of technical problems, NARUBIN is looking for a source of license for all relevant products to be promoted in future. To convince the Egyptian government for approval, this license giver should have a big name in market. One of NARUBIN favorites is CONTINENTAL, [5], FRG. But this company is not ready for license. Another is PIRELLI, [6], Italy. This company is license giver for the planned all steel radial truck tire plant to be erected in Alexandria. So it may be ready. DNI provided with name and address of relevant PIRELLI administration and can also look for other technology sources like PHOENIX, FRG, or ROLOUNDS, Denmark, if necessary. But also other technical support may be possible by assistance of DNI.

05.7 DISCUSSION WITH AUTHORITIES AND IN FINAL MISSION MEETINGS

Important goal of my mission was not only to realize the technical standards of Egyptian rubber industry and their needs for technical services, which may come out of a R&D center, as originally planned and background of job task, but also to find out different considerations and ideas of the herein engaged people about the technical aid, possible or necessary. It is of principal importance to find a way accepted by most of the people in charge. Sources of such kind of information were the discussions of briefing and debriefing in UNIDO, UNDP and in Egyptian Ministry of Industry. During mission visits, also two general special meetings were held in Alexandria and in Cairo with participation of UNDP, in which standpoints of view were cleared. Here now will follow a list of considerations, ideas and also fears or anxities.

UNIDO supports establishment of a Development Center, but will only give money to basical measuring and product test machines. The tire development should be excluded. Also appointment of experts is supported for start aid.

UNDP does not favorite R&D center ideas, as there are lots of intellectual centers established in Egypt since, but nothing happened thereout in many cases. UNDP favorites the missions of experts on a short-time basis to solve the industrial problems within 2 or 4 weeks. Relevant forms had been distributed, [7]. UNDP also fears whether it has "chosen the right expert for actual mission and new report will be only for shell like the other one", [8].

The MINISTRY of INDUSTRY, [9], wants to help to solve the development problems of public companies, but also to give promotion to private manufacture, and also smallest companies, which could be retreading workshops.

TRENCO has different ideas. One is to support and to promote rubber development and also rubber science in general by collecting know-how and to give them to companies in charge. The other is to improve test facilities to make better actual chemical and process engineering development. The third is favoriting the education of managers and technical personnel in respect to better quality production. Also a rubber library with documentation of international rubber literature will be useful.

BATA wants better laboratory possibilities and improvement of aid in special industrial improvements. On other hand, rubber is only a production part.

SEFCA wants first of all financial support to be able to purchase the right material for production. On the other hand, technical support is wellcome to promote products like brake hoses, gasoline station hoses, engine mounts and specialities for high and very low temperature ranges.

NARUBIN wants to have effective longterm technical support, in order to be able to solve the basical industrial problems of its production, regardless of organization of this support. It could be by license, by longtime expert aid or by assistance through a development center. Goal must be real effectiveness of industrial support, which is not tricky turning of a magic switch.

06. REQUIREMENTS OF INDUSTRIAL RUBBER DEVELOPMENT

06.1 GENERAL REMARKS

Industrial rubber development never is a small item problem and never depends on only one discipline of excecution. In order to show this, the preceding report about my findings during the mission had been given in such detailed manner. If the leak of technology would be the only reason of non-success, SEFCA must be #1 in Egyptian rubber industry and may be even on relevant fields in whole Near and Middle East. But real results are different.

Out of my professional experience, industrial products in a free market are successful, when there are, as a whole, sufficient

06.11: CONTROLLED PRODUCT DEVELOPMENT,
06.12: ADEQUATE INDUSTRIAL ENGINEERING,
06.13: DEVELOPMENT OF PERSONNEL IN CHARGE,
06.14: DEVELOPMENT OF QUALITY BEHAVIOR,
06.15: PROFESSIONAL MANAGEMENT,
06.16: CONCENTRATION TO #1-PRODUCTS,
06.17: CONTROLLED MARKETING,
06.18: SPECIFIC PRODUCT SALES.

An anyhow organized know-how creating and spreading facility would be able to assist such industrial development. This could be done by a center or by an institute, but could also be performed by the company organizations themselves. Necessary is to motivate personnel for such jobs and not to surpress controlled creativity. One of the requirements is not to look for possibilities, which can not be fulfilled, or to concentrate only on #1-products.

06.2 RUBBER PRODUCTS AND MANUFACTURING TO BE SUPPORTED

As a result of last final discussion in Cairo, it has been decided to classify the rubber products for promotion or as actual Egyptian #1-rubber-goods. These products are ranked by visited rubber companies

TRENCO: Radial steel passenger car tires, radial all steel truck tires, speciality truck tires, bicyle/motorcycle tires, tubes, retreated radial and bias truck and passenger car tires.

BATA: Rubber soles and heels, rubber boots, rubber shoe mats.

SEFCA: Engine mounts, injection molded rubber goods, battery cases, high pressure hoses, brake hoses, fitted hoses, gasoline station hoses, extruded profiles, latex dip products, silicone rubber seals, radiator hoses.

NARUBIN: Conveyor belts, V-belts, roll covering, solid tires, tank lining, medium pressure hoses, floor mats.

A supporting development program should include all these products, which scan more or less a large portion of possible rubber production itself and includes advanced technology know-how of big international rubber companies. Creating and professional spreading of such know-how is a serious business.

06.3 LICENSES AND DEVELOPMENT ATTITUDE

A solution of technical problems could be procurement of relevant licenses as performed by TRENCO and actually aspired by NARUBIN. This of course is a good aid and a big advantage to overcome the start problems, if the company personnel is capable to understand the new technology and to adapt it to local conditions. Main requirement is to understand and to know to ask right questions, which is a matter of know-how. Disadvantage of plain consumption of license know-how implements danger, that licensee companies reduce creativity in development and that a license giver does not want to establish a potential competitor. This attitudes have been noticed in my professional carreer even in license contracts of big international companies. At least just after license start, it is necessary to start own development activity to become independant and capable to meet own market requirements.

06.4 PROBLEMS OF CREATING KNOW-HOW

Creating needs creativity. This is a problem of personal development and also of creative management. Both can be surpressed in big and bureaucratic companies as well as in sleeping institutes. So, it is a serious business to find the right organization and the right personnel for developments of all kinds and to motivate this personnel in the right manner. And industrial rubber product development is no exception of this rule. Industrial rubber product engineering is a combination of art, of handicraft and of precise industrial performance altogether.

It will last a rather long time to become independant, but also a rather short time to loose the independance again when being not active enough. So the expectation should not be too high when starting a development of development activity. This needs experience of industrial experts, and real success within a medium short time period can only be achieved by concentrated activity for only a few products at the beginning.

On other hand, there must be also sufficient manufacturing equipment to make prototypes of future productions, to care for the relevant production facilities in their conditions and to test product prototypes under real application conditions. Industrial product development only grows within the field of tensions between market requirements, product creativity and industrial possibilities of actual or future manufacture machineries.

There is a must of actual information about the product and its production situation. There it is also necessary not to disturb the development activity in its creative phases. The location of development activities must be adequate, which does not mean as sterile as an university office or a hospital,

but good enough to fulfill also personal requirements of development engineers or chemists. It must also be possible to be informed about possibilities of neighbouring technologies in order to find other ways, if there is any breakdown in the chosen development way. This means, that there should be no secrecy behavior in development departments.

06.5 PRODUCT QUALITY AND TECHNICAL EDUCATION

To make rubber product quality is to take good material, to have a good product design, not to spoil and not to scrap material and to produce precisely. This statement implements easy looking rules, but is a difficult job, as pointed out in the preceding chapters of this report.

In Egyptian rubber companies, mainly the production starts with best available, which are imported, materials. Product designs are taken in general from licenses and not transcribed to highest possible level. But lot of the material potential and even the material itself is spoiled on its way to finished product. It is a big problem to teach and to convince plant management and operators to behave in the right way to find an optimum production effectivity and optimum quality solution, although these are not contradictory goals, [10], as often argued and explained by semi-experts.

It is a matter to become conscious about the right way of industrial product quality, which needs know-how, mental capacity and also discipline in production performance. This is a big program for internal company education and effort. But this quality effort can also be balanced by company savings through material reduction and profit increase by better products and better potentials in the markets. And the work of quality education can of course also be assited from outside of the companies.

06.6 PRODUCT DEVELOPMENT AND COMPANY COMPETITION

Development of advanced industrial products results into advantages in the markets, which give more profit or money. So development is an important tool to shelter in company competition fights in markets. And development results are not free of charge and are restricted to buyers of such results.

On the other hand, development also needs know-how about the requirements of the product in relevent market applications, in order to find out the optimum of technical response or of product application fatigue. This gives fundamential restrictions to an open product development in, lets say, independently operating development institutes or R&D centers. Here the know-how transfer from the market applications can become poor on the one side, and on the other side, the development result transfer itself later can become unrestricted and so therefore valueless or useless if competition has access.

Here must be found way-outs by compromise. This can be achieved by secrecy agreements between contractors and by implementing the development experts into the know-how buying company organizations.

07. ORGANIZATION OF INDUSTRIAL RUBBER PRODUCT DEVELOPMENT

In preceding report chapter 06., the requirements and conditions of industrial rubber product development have been described or sketched. So it has been indicated, that relevant requirements to be fulfilled "for a well functioning rubber product development institution", as outlined in the actual job DP/EGY/88/032/11-51/J19201-description, are not plain. According to my industrial experience, it will afford controlled, concentrated and rubber product minded co-operation of all partners to achieve a success in all development objectives, which can be rather extensive, [11].

07.1 PROPOSAL OF A PREVIOUS SURVEY, MADE BY P.MACLEAN SWIFT

P. MacLean Swift made in 1982 a survey about same subject like present job. In his report, as already mentioned, [8], a brief comment is given about rubber consumption in Egyptian industry, a forecast of future rubber activities and about the fact that the Egyptian industry produces at lower labor cost levels. Thus it is obvious, that the Egyptian rubber industry has advantages in international competition if products and productions are developed to real competetive standards. This results in demands for technology and product development, which is to perform by a Rubber Development Center, RDC, with ultimate responsibility of Egyptian Ministry of Industry.

07.11 STRUCTURE, LOCATION AND OBJECTIVES OF SWIFT-RDC

Swift gave a detailed layout of structure, location and main objectives of his considerations about the operative fields of a development center, which can be found in many places of the world and which are links between Technical Universities and relevant industry or industry divisions. Swift also gave a detailed report about topics or actual fields of basic developments of rubber research and of possibilities to standardize rubber technology and compounds to make them easily accessable. He also gave specifications how to procede in planning and construction of RDC building and equipment, FIGURE 09.05. Some of therein given details may be adapted also today, but there should be a change in the organizational way in order to find another access to the developing products and production procedures.

07.12 NORMAL DEVELOPMENTS OF DEVELOPMENT CENTERS

In most cases, like in UK or FRG, [12], such institute structures tend towards their own specific attitudes to be more a center (of rubber science or at least rubber technology) then of industrial product development. Even in bigger industry organization, this tendency can be observed when there is no demand or no possibility to get the feet to ground, or better to have right and even sometimes bothersome links to market pressure and requirements. At actual situations, as detailed in chapter 05. of my present report, the Egyptian rubber industry and also the Egyptian economy should, in this case, not afford such rather luxery technology item.

07.2 SUPPORT BY UNIDO, EGYPTIAN GOVERNMENT, RUBBER INDUSTRY

As reported in Swift-report already, there will be a general support for rubber development activities by UNIDO, by the Egyptian government and by the Egyptian rubber industry. In final discussion of present UNIDO mission in 1989, it was decided, to release the first amount of 0.5 MUS-$ out of UNDP budget to support first steps of initiating rubber development activities and to give further aid in providing expert missions for special services in rubber product development.

TRENCO is ready to give the ground for a development institution and would be also ready to assist in construction of the necessary buildings for housing of the Rubber Product Development Institute.

These are some highlights, but they will not lead undoubtly to an anyhow structurated and well functioning rubber development institution for the improvement of technology and products in an effective manner and to have comercialized success within short time. This is, for example, the conception and demand of UNDP. Actual rubber development in Egypt shcuild be product-orientated. Problem is here, to find an institutional organization for such a combination of individual technical groups, which collect and create advanced technology know-how, and aslo use this know-how more or less only and directly to promote and to develop industrial products for specific market requirements to be ready for industrial sales of today and tomorrow.

07.3 DNI PROPOSAL OF A PRODUCT-ORIENTATED DEVELOPMENTS

Such product-orientated institution should be divided into operational and staff functions just like an advanced industrial organization, FIGURE 09.06. This kind of organization has been tested and gave the very best results in solving actual problems in product design and manufacture in my professional past. The most important activities of this organization are performed by the operational product teams or relevant operational product group teams.

07.4 OPERATIONAL GROUP ACTIVITIES

The operational groups should be organized as teams specialized to, or better, responsible for technical standards of special industrial products within certain product groups. Such product teams are headed by one

07.41 PRODUCT MANAGER,

who has ultimate responsibility of the "welfare" of products in charge. The groups have responsibilitiy for whole development ranges from technical acquisition and product design according to market requirements up to manufacturing of new products. Such teams are expert groups for chemical and mechanical engineering, testing, technical acquisition and manufacturing assistance. Grouping is according to product requirements. But it includes also

07.42 SPECIAL OPERATIONS of at least 3 members

which should here be outlined in detail, because these are different to normal structures. These changed responsibilities are for the

07.421: Manufacturing Assistant, (MA), of the teams of the rubber product development institute: MA has a desk in the relevant rubber industry and is responsible for manufacture development of new products, runs relevant pilot productions and gives technological assistance in day-by-day manufacture trouble shooting.

07.422: Design and Aquisition Engineer/Chemist, (AD):AD has one of desks in relevant design or sales department of rubber industry and is responsible for the external and internal information transfer from the market to the product design.

07.423: Test Engineer, (TE), of the teams: TE should have the writing desk near to institute labs, and is responsible for collection and obtainment of specific product test results, which can come out of chemical or mechanical lab up to results out of tests of market. TE has access to all test facilities without restrictions, procures new test equipment and has to operate the test facilities or to instruct relevant operators, if necessary.

07.5 OPERATIONAL PRODUCT GROUP ACTIVITIES

The actual and foreseeable future industry requirements result in different product group activities. They have been listed in paragraph 06.2 of present report and follow actual conceptions of the Egyptian rubber industry companies. These can be arranged in following team activities for

07.51 RADIAL STEEL PASSENGER CAR TIRES,
07.52 ALL STEEL RADIAL TRUCK TIRES,
07.53 SPECIALITY TIRES AND TIRE RETREATING,
07.54 TUBES AND MEDIUM PRESSURE HOSES,
07.55 MOLDED RUBBER GOODS, (COMPRESSION,TRANSFER),
07.56 ENGINE MOUNTS AND INJECTION MRG,
07.57 HIGH PRESSURE AND SPECIALITY HOSES,
07.58 EXTRUDED PROFILES AND PROFILE FRAMES,
07.59 CONVEYOR AND V-BELTS,
07.510 SPECIAL MRG, (ROLLS, MATS, SILICONE PARTS),
07.511 RUBBER COATED PRODUCTS AND EXOTICS.

These activities of the operational groups are direct. The main advantage of such a product orientated organization is the direct responsibility for the product, which also creates a certain family member feeling between team and relevant products. The team members have to feel pain, if there is any trouble with their products (kids). This characteristic and the possibility to be active independently, is one of the best motivation, which is necessary to be able to fulfill all the requirements of industrial development jobs.

In order to optimize effectivity of the structure and to combine the relevant experiences, the product team experts should follow also jobs coming out of general industrial rubber problems. These jobs are according to structures of MATRIX organization, which gives a second and differently orientated individual responsibility.

07.6 OPERATIONAL MATRIX ACTIVITIES

The operational matrix activities follow special jobs or problems of general rubber control, manufacture, testing and pocessing aspects, which are such as, FIGURE 09.07:

07.61 TOTAL QUALITY CONTROL (TQC),
07.62 COMPOUNDING AND MIXING,
07.63 CALENDERING AND EXTRUSION,
07.64 PRODUCT ASSEMBLING AND CURING,
07.65 PRODUCT TESTING,
07.66 PRODUCT DATA PROCESSING.

Also for these activities, a specific manager, chosen out of the expert teams of operational groups, is ultimately responsible and coordinates the matrix group activities. But the requirements of product development, the jobs of direct operational work, listed in paragraph 07.22, must have #1-priority.

07.7 STAFF ACTIVITIES AND SPECIAL SERVICES

The staff should run the administration and provide laboratories, test fields and facilities of documentation, library, conventions, technical education and public relations. It should also give assistance in special services to the industry, such as assistance in

07.71 TECHNICAL SALES BROCHURES,
07.72 TECHNICAL LICENSING, (ACTIVE, PASSIVE),
07.73 SALES AND PURCHASING OF EXOTIC RUBBER EQUIPMENT,
07.74 INTERNATIONAL TECHNICAL LINKS.

The staff activity groups should be headed by a responsible and experienced person. Very much important is here to have the right financial control by a good financial manager and controller, (FM), either to find ways to be cost-effective or to look for right budget support from Egyptian government or for other donation givers, like UNIDO or the partners of rubber industry.

07.8 GENERAL MANAGEMENT OF DEVELOPMENT INSTITUTE ACTIVITIES

Last, but not least, it is necessary to run the development institute internally and to represent it towards outside and to hold representative outside connections. These activities have to be performed by an ultimate responsible and in rubber, personal and financial development well experienced

07.81 GENERAL MANAGER, (GM),

who has to coordinate institute activities as a whole, shows and interprets the development guide lines and has to represent the institute in "foreign affairs". But GM is not responsible for the already mentioned "welfare" of developing products, as outlined before. This general management of the Rubber Product Development Institute should be supported by a

07.82 CONSULTING TEAM, (CT),

of leading representatives of the Egyptian rubber industry, of relevant Egyptian government authorities and of other supporting authorities as UNDP, etc. CT and GM shall also initiate the start of work of the new Egytian Rubber Product Development Institute, (ERDI), and shall decide expansion or reduction of activities, changes of development objectives or of the development institute organization itself.

As the product orientated team work organization of ERDI operates as a normal industrial development department, it could be, that parts of ERDI will be transfered from or adopted by the rubber industry, if necessary. This is a real advantage and allows good adjustment to actual situations.

07.9 PROGRESS STEPS OF INSTITUTE AND ORGANIZATION SET-UP

Swift, [8], gave a detailed schedule in his second part of terminal report and how to procede in establishment of the RDC. In principle there is no fundamential change regardless of kind of organization. But I recomend to make a serious and very precise layout of the start phase and about expected final and optimum situations.

07.91 PLANNING PHASE

Here it must be clarified finally, what should be the main objectives, how can it be performed and how are the initial finance and expert power requirements and their performances. As reported in chapter 05.7, there are principle but different considerations in mind about the way to success. Also some components of starting aid have been stated.

I would recommend to convoke a team of experts, as defined in chapter 07.82 as Consulting Team, to define and to sketch the range of organized rubber development again and finally, may be on the basis of present and of Swift reports. Out of this work, it should follow to appoint professional contractors to make the archictural layout of the institution in cooperation with adequate experts of rubber development and rubber machinery, as well as for test equipment for the product orientated institute work. Also the appointment of a Potential Expert as GM must be decided soon. This post can be a transition or a final post, but the expert must be capable to manage planning, erection and delicate starting phases of the project, which also implements to clarify personal and financial situations.

07.92 STARTING PHASE

In the starting phase of the rubber development institute work, the construction of buildings and site must have been finished in order not to give the impression of an only pure construction site than of a serious advanced professional technical rubber site. Also some of the necessary development and test equipment must be really ready and active as well as the organizational control of finances and of development work.

It is very much important in this starting phase, to concentrate the development work only on a few, relative simple but spectacular items to motivate the development team members, to convince the financial supporters and also the unavoidable critics. Out of the list of operational product group activities, as given in chapter 07.5, only

2 or 3 OPERATIONAL GROUP activities

should start. And it must be avoided in any case to develop and to build ladders for climbing the moon, although such items may be very much interesting for some peoples phantasy.

07.93 CONSOLIDATING PHASE

This may be the easiest part of the job, but it must be a controlled situation in any case in order not to deviate and to forget the initial and main objectives of the Rubber Product Development Institute. It is very much important, to concentrate to the original jobs and not to digress from the main roads. Also the personal development of the teams and the adaption of organization to the actual requirements are very important management items. The structuring of further teams as a completion of the institute with all its supplementary equipments is a fultime business.

On the other hand, the management must be able also to reflect on the achievement of its output and must be ready, also to allow big organizational changes or adaption to actual situations even with resignation of some development activities.

07.10 FUTURE POSSIBLE TRANSITIONS OF THE EGYPTIAN RUBBER PRODUCT DEVELOPMENT INSTITUTE, (ERDI)

As already mentioned, the product orientated organization of a rubber development institute is somewhat special, but is capable very much to respond on the actual and basical development problems of the Egyptian rubber industry. Goal of the work of this Rubber Institue also is, to create development attitude in the industry companies. So the basical conditions of the institute work may change in future. Then there would be no requirement anymore to do this kind of jobs. Also it may possible, that the work of the Rubber Institute has become useless according to personal shortcomings.

In all this cases, there are lots of possibilities of changes and balancing critical situations. This also reduces the risks of actual initiating of the Rubber Product Development Institute. According to the rubber product orientation of the organization, it is easily possible, to transfer work and relevant teams to the relevant industry companies.

So there could be the following possibilities of changes of attitute or range of work of the Rubber Product Development Institute in future:

07.101: TRENCO takes over the ground and building of the Rubber Institute and provides adequate replacements at another site in another way. The development teams for tires and the relevant equipment form the start of a TRENCO tire development department.

07.102: NARUBIN, SEFCA, BATA, a.s.o. decide to continue the cooperation of product development work with the Rubber Institute and now form it only for MRG. The kind of principal work will not change at another institute site.

07.103: NARUBIN, SEFCA, BATA, a.s.o. decide also to do the product development work for themselves and take over the relevant product teams to fit to their own organization and the Rubber Product Institute work will be terminated at all.

07.104: The CONSULTING TEAM as control authority of the Rubber Institute decides to establish another kind of Egyptian Rubber Institute in the more conventional way, as outlined in chapter 07.12, [12], with orientation to rubber research and education as a link to the Technical University studies.

08. CONCLUSIONS

There is no doubt, that development of products and technology in Egyptian rubber industry companies is necessary in order to improve quality of products, not to waste material and that the even cheap Egyptian labor to become more competetive in international markets. The ways to achieve these activities are different and also not excluding each other.

As outlined in present report, the establishment of a special kind of Rubber Product Development Institute is recommended. But also the application and recreation of license agreements to potential rubber componies must be done. These activities should be assisted by relevant appointments of experts to overcome of special product or process bottle-necks. Proposals for such working fields are given in the list of FIGURE 09.08.

DNI also is able to assist all these projects on a professional basis, is ready to give more explanations to this present report in special meetings in Egypt and can also provide further technological and management help in this special rubber business in order to meet the requirements of all partners.

09. FIGURES AND DATA TABLES

First mentioning of FIGURES in this report is indicated by underlining.

00	DATE	COMPANY OR/AND ORGANIZATION	MAYOR SEEN/ACCOMPANYING 8) PEOPLE	GOAL/REASON OF VISIT AND/OR OF MEETING	RELEVANT RESULTS/IMPORTANT DETAILS OR ITEMS OF VISIT
01	25.09.89 MONDAY	UNIDO VIENNA	MR. V.N. KOLIAKINE MR. S.DYSIUK	JOB BRIEFING. DISCUSSION AND CLEARING OF UNIDO CONCEPTION	SURVEY INTEREST. UNIDO AIDS BY LAB EQUIPMENT AND EXPERTS
02	27.10.89 WED'SDAY	UNDP/MINISTRY OF INDUSTRY, CAIRO	MR. THARWAT SABRY/ MR. FAROUK RIAD SAAD	JOB BRIEFING. CLEARING OF JOB CONSIDERATIONS AND ASSISTANCE	UNDP PREFERS EXPERT MISSIONS, N.I. WANTS INDUSTRIAL R&D AID
03	30.09.89 SATURDAY	TRENCO ALEXANDRIA	MRS. RASHIDA EZZET MR. MANSOUR MOHAMED	GENERAL DISCUSSION, SCHEDULE OF JOB VISITS, NEW TIRE PLANT	STANDARD BY (LICENSE), VISIT OF MAIN COMPANIES, (DUNLOP)/US AID
04	01.10.89 SUNDAY	TRENCO ALEXANDRIA	MR. HASSAN ISSA MR. M.KABEL	MIXING, LABORATORIES, TEST LAB BICYCLE/MOTORCYCLE TIRE, TUBES	MACHINERY/LAB EQUIPMNT IN POOR SHAPE, (SEMPERIT), BUTYL LEAKS
05	02.10.89 MONDAY	TRENCO/PDC ALEXANDRIA	MR. SABER M.KHADRAWY /MR.HASSAN S.MAHMOUD	QUALITY CONTROL, COMPNT STORE /DEVELOPMENT CENTER OPERATION	LAB-QC COOPERATION, LC STANDARD UNIDO QC START, CUSTOM DEVLPMT
06	03.10.89 TUESDAY	TRENCO ALEXANDRIA	MR. AMIN A.EL SAADAT MR. AHMED KANDIL	TRUCK AND PASSENGER BIAS TIRE MAINTENANCE, INDUSTR ENGINEERING	(MANSFIELD) STANDARD, BIG PLANT IE= MAINTENANCE+LICENCE ADAPTN
07	04.10.89 WED'SDAY	DATA ALEXANDRIA	MR. NORSI MAHMOUD 8) MRS.RASHIDA EZZET	RUBBER MIXING AND PROCESSING IN PUBLIC SHOE MAKING PLANT	(SVIT) STANDARD, RUBBER SUBSTITUTION, POOR LAB/DEVELOPMT
08	05.10.89 THURSDAY	SEFCA TANTA	MR. RASHAD A.ATTIA 8) MRS.RASHIDA EZZET	OPERATION OF PRIVATE COMPANY FOR MOLDED RUBBER GOODS	"(HUTCHINSON)"/EMS, 6000 PLANTS POOR PRODUCTIONS/SHAPE/IMAGE=?
09	08.10.89 SUNDAY	TRENCO/MARUBIN/ UNDP, ALEXANDRIA	MR.EL FIKKY/MR.ATEEBA MR.SABRY/MRS.RASHIDA	SEMI-FINAL DISCUSSION OF JOB, DEVELOPMENT OF RUBBER PRODUCT	NO RESEARCH, DEVELOPMENT AID + INDUSTRIAL ENGINEERG EDUCATION
10	09.10.89 MONDAY	MARUBIN CAIRO	MR. M.K. ATEEBA MR. SHERIF MAHMOUD	GENERAL OPERATION, BELT PLANT, MIXING, COMPONENTS PREPARATION	-//+ MANAGEMENT BY CONCEPTION, BELTING PLANTS OK, RD HANDLING
11	10.10.89 TUESDAY	MARUBIN CAIRO	MR. SHERIF MAHMOUD MR. HAMDA A.SELIM	GENERAL MOLDED RUBBER GOODS, RECLAIM, LABS, QUALITY CONTROL	MRG PLANTS BUSY BUT POOR SHAPE LAB/QC COOPERATION, BEST MATERL
12	11.10.89 WED'SDAY	MARUBIN/TRENCO/ SEFCA/UNDP, CAIRO	MR.ATEEBA/MRS.RASHIDA MR.R.ATTIA/MR.T.SABRY	MARUBIN FOAM PLANT /8/ FINAL DISCUSSION MARUBIN HEADQARTER	NO LATEX, OLD PLANT /8/ CONSFAT ABOUT ERBI+EXPERTS,->0.5M DS-8
13	10.11.89 MONDAY	UNIDO VIENNA	MR. KOLIAKINE/DYSIUK MR. KR.KALINOWSKI	DEBRIEFING DISCUSSION OF MISSION RESULTS	RUBBER TECHNOLOGY DEFICITS IN EGYPT, LONGTERM PROCESS->ERBI+?

FIGURE 09.01: VISIT ITINERARY/RESULTS OF UNIDO MISSION FOR EGYPTIAN RUBBER INDUSTRY DEVELOPMENT

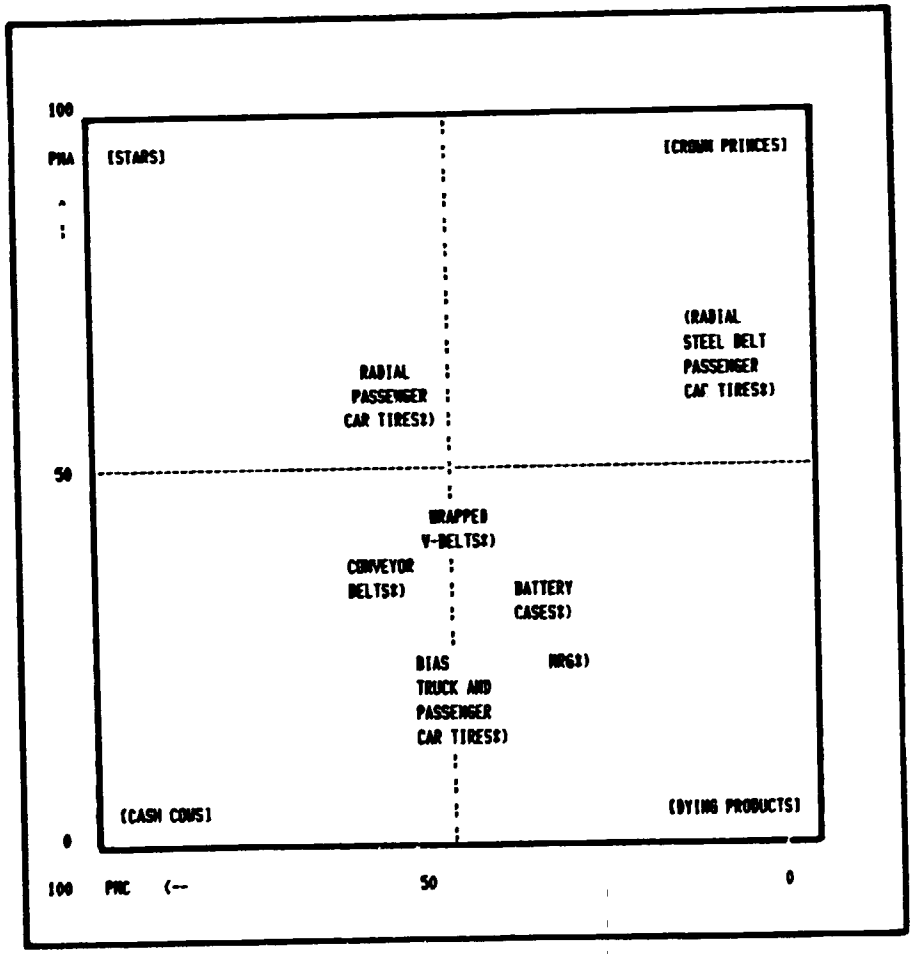
LOAD FACTORS FOR:

PRODUCT MARKET ATTRACTIVITY PMA:

GROWTH: 33%
MARKET VOLUME: 25%
TREND DEPENDENCY: 6%
SUBSTITUTION: 6%
CAPITAL INVEST: 6%
LABOR COSTS: 6%
PRODUCT KNOW HOW: 12%

PRODUCT MARKET COMPETITION PMC:

MARKET SHARE: 15%
M.S. TO MAIN COMPET.: 15%
R&D POSITION: 21%
PRODUCTIVITY: 21%
PRODUCT YIELD: 28%



*) = AS EXAMPLES OF ACTUAL EGYPTIAN RUBBER PRODUCTS, POSITION NOT CALCULATED, BUT ESTIMATED OUT OF EXPERIENCE.

PORTFOLIO-PROCEDURE: TURNOVERS OF PRODUCTS ARE PROPORTIONAL TO CIRCLE AREAS. POSITIONS OF CIRCLE CENTERS WILL BE FOUND BY MPA/MPC-COORDINATES. LOAD FACTORS ARE TO ADAPT ACCORDING TO PRODUCT PROPERTIES IN MARKET. IT MUST BE PREVENTED TO HAVE MOST PRODUCTS IN ZONE 4. ZONES 2+3 ARE BEST AREAS FOR COMPANY POTENTIALS.

FIGURE 09.02: PORTFOLIO DIAGRAM OF INDUSTRIAL PRODUCTS TO SURVEY COMPANY POSITION IN MARKETS

NO	COMPANY / SITE IN	MAIN PRODUCT PLANTS FOR	TURNOVER (%)(MLE)	AD CONSP (kt/a)	MAIN PRODUCT CUSTOMER	EMPLOYEES (p) TOTAL	ADMINS	WORKER	TE/PSN	OC/INS
01	TREXCO	RADIAL ALL TEXTIL								
		PASSENGER CAR TIRE	10 21.9		) PRIV MARK 30%					
	PUBLIC	BIAS TIRE SEMI/TRUCK	49 61.3		) PUBL CONP 22%					
	TIRE	BIAS T PASS'GER CAR	10 22.7		) PUBL MARK 19%					
	PLANT	BICYCLE TIRE (BIAS)	2 2.6		; EL NASR CR 8%					
		MOT'CYCLE TIRE	- 0.5		) SERV CONP 8%					
	ALEXAN-	TUBES FOR ALL TIRE	12 15.0	1.2	) PUL TRANSP 8%					
	DRIA	SEMIFINISHED PRODUCT	: 1.5		) PRIV CONP 5%					
	TOTAL:	1988	124.0	12.9		-)3600	-)800	-)2800	-)70	-)120
		PLAN 1990	146.0	14.5						
02	BATA	ALL LEATHER SHOES			LOCAL MARKET					
		TEXTIL/PLASTIC SHOES			LOCAL MARKET					
	PUBLIC									
	SHOE	TEXTIL/RUBBER SHOES			LOCAL MARKET					
	PLANT	RUBBER SHOE/ACCESSRS			LOCAL MARKET					
	ALEX.									
	TOTAL:	1988								
		PLAN 1990								
03	SEFCA	BATTERY CASES	50 4.3		SHAFFER,NATIONL					
		LATEX DIP PRODUCTS	5 0.4		LOCAL MARKET					
	PRIVATE	HOSES MEDIUM/HIGH PR	15 1.3		LOCAL MARKET					
	NRG	RADIATOR HOSES	5 0.4		LOCAL SPARE MT					
	PLANT	HOSE FITTINGS								
		EXTRUDED PROFILES	10 0.9		EL NASR C,LOC M					
	TANTA	MOLDED RUBBER GOODS	10 0.9		EL NASR C,LOC M					
		ENGINE MOUNTS/WTRGS	5 0.4		EL NASR CAR,GM					
	TOTAL:	1988	8.7			-)600	-)300	-)290	-)10	-)45
		PLAN 1990	16.0							
04	NARIBIN	CONVEYOR BELTS	40 8.8	0.4	STEEL,CEMENT CO					
		V-BELTS,WRAPPED	6 1.3	0.1	REPLACMT MARKET					
	PUBLIC	ROLL/TANK COVERS	6 1.3	0.1	PAPER,TEXTIL CO					
	NRG	NRG	20 4.4	0.3	AUTOMOTIVE APPL					
	PLANTS	HOSES MED/LOW PRESS	16 3.5	0.2	AGRICULTURAL AP					
		FOAM	- -	-						
	CAIRO	RECLAIM	12 2.7	0.2	RUBB,RETREAD CO					
	TOTAL:	1988	22.0	1.1		-)2100	-)1100	-)1000		
		PLAN 1990	25.0	1.3						

FIGURE 09.03: MAIN PRODUCTS/OUTPUTS/CUSTOMERS/EMPLOYEES OF MAYOR EGYPTIAN RUBBER PROCESSING COMPANIES

QUALITY	PRODUCTS								
STATE ACCORDING MARKET REQUIREMENT	AUTOM. TIRE			AUTOM. TUBE		BI/MOT'CYCLE TIRE		BI/MOT'CYCLE TUBE	
	BIAS TRUCK	BIAS PASS'GER	RADIAL PASS'GER	TRUCK	PASS'GER	BICYLE	MOT'CYLE	BICYCLE	MOT'CYCLE
OK 1.CHOICE	95.8	97.5	96.0	93.5	94.5	87.9	91.8	95.0	93.0
OK 2.CHOICE	2.4	1.2	2.5	3.0	3.0	10.0 *)	2.3	0.9	1.7
REPAIRS OF REJECTS	0.4	+)	+)	+)	+)		+)	+)	+)
SCRAP	1.3	1.3	1.5	3.5	2.5	2.1	5.9	4.1	5.3

+) = NO REPAIRS ALLOWED
*) = REPAIRED REJECTS + 2.CHOICE
AUGUST IS A HIGH HUMIDITY MONTH IN EGYPT

FIGURE 09.04: PRODUCTIVITY OF LEADING EGYPTIAN RUBBER COMPANY: AUGUST '89-OK/REPAIRS/SCRAP % OF TRENCO PRODUCTION

LAYOUT:

MAIN BUILDING
WITH MILL ROOM, LIBRARY, PHYSICAL TEST LAB. OFFICES, SMALL MEETING ROOM
AND TEST FIELD:
EXTRUDER 50[mm], INJECTION MOLDING PRESS, SMALL SEIZE.
LAB BANBURY MIXER, 3 MILLS, 4 PRESSES. COMPOUND STORAGE.
SEPARATE STORAGE ROOMS FOR CARBON BLACK, FILLERS, RAW RUBBERS.
PHYSICAL TEST EQUIPMENT, LOCAL CONSTRUCTION SPECIFIC TEST JIGS.

LIBRARY, SUBSCRIBING ABSTRACTING SERVICE OF RRRA, UK.

MAINTENANCE AND WORKSHOP JOBS MADE
IN COOPERATION WITH TRENCO BY TRENCO STAFF.

UNIDO EXPERTS: (#1) TECHNICAL ADVISOR ON CHOICE OF EQUIPMENT, DEVOLOPMENT PROGRAMME.
(#2) PHYSICAL ADVISOR TO ASSIST TO START TEST LABORATORY.

TOPICS:

SURVEY:
SOLUTION POLYMERES, THERMOPLASTIC RUBBER, POWDERED RUBBER.
POLYURETHANE POLYMERES, SYNTHETIC POLYISOPRENE.

SUPPORT OF EGYPTIAN MACHINERY COMPANIES TO MAKE RUBBER EQUIPMENT.

RESEARCH AND DEVELOPMENT:
RADIAL VS BIAS TIRE, TREAD COMPOUNDS, STANDARD COMPOUNDS,
STANDARD QUALITY TESTS.

TECHNICAL SERVICE TO MANUFACTURERS AS:
COMPOUNDING, FACTORY EFFICIENCY, TROUBLE SHOOTING AND
INSTRUMENTAL CHEMICAL ANALYSIS TO IDENTIFY:
QUANTITY OF RUBBER, FILLER, PRITECTIVE AGENTS, COMPONENTS OF VULCANIZING SYSTEM.

OBJECTIVES:

#1: COLLECT AND DISSEMINATE TECHNICAL INFORMATION TO RUBBER INDUSTRY.
#2: GENERATE INFORMATIONS ON COMPOUND AND COMPONENTS.
#3: ADVICE RUBBER MANUFACTURERS TO IMPROVE PRODUCTION OR QUALITY.
#4: OVERSEE QUALITY CONTROL IN RUBBER INDUSTRY.
#5: TRAIN JUNIOR STAFF IN RUBBER TECHNOLOGY AND ACT AS SOURCE OF TECHNOLOGISTS.
#6: COOPERATE WITH OTHER RUBBER RESEARCH CENTERS, LIKE RPRA, UK, MRRDB, MALAYSIA.

MANAGEMENT:

DIRECTOR
+ ADMINISTRATOR +

4 SENIOR TECHNOLOGISTS FOR DEVELOPMENT AND TECHNICAL SERVICE + 4 GRADUATE ASSISTANTS *),
1 SENIOR TECHNOLOGIST FOR PHYSICAL TESTING + 1 GRADUATE ASSISTANT,
1 LIBRIAN OR INTELLIGENCE OFFICER + 1 GRADUATE ASSISTANT,

*) TO BE TRAINED IN RAPRA, UK.

+ MANAGEMENT COMMITTEE
WITH MEMBERS OF INDUSTRY, GOVERNMENT, AND ECONOMY.

ULTIMATE RESPONSIBITY FOR RDC: **MINISTRY OF INDUSTRY.**

FIGURE 09.05: DETAILS OF LAYOUT, TOPICS AND ORGANIZATION OF THE RUBBER DEVELOPMENT CENTER OF MACLEAN SWIFT REPORT

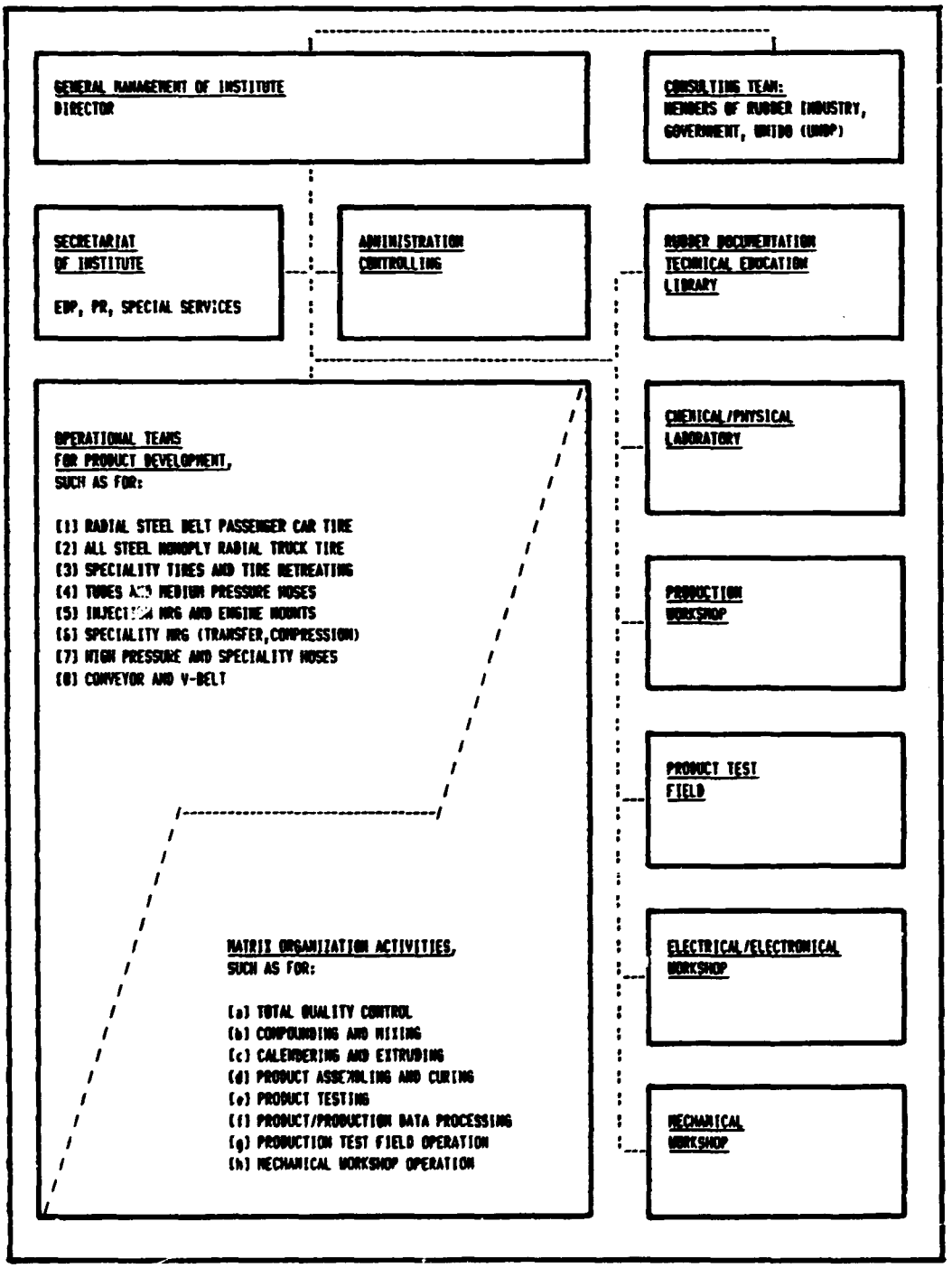


FIGURE 09.06: ORGANIZATION CHART OF ERDI, THE PROPOSED PRODUCT ORIENTATED EGYPTIAN RUBBER PRODUCT DEVELOPMENT INSTITUTE

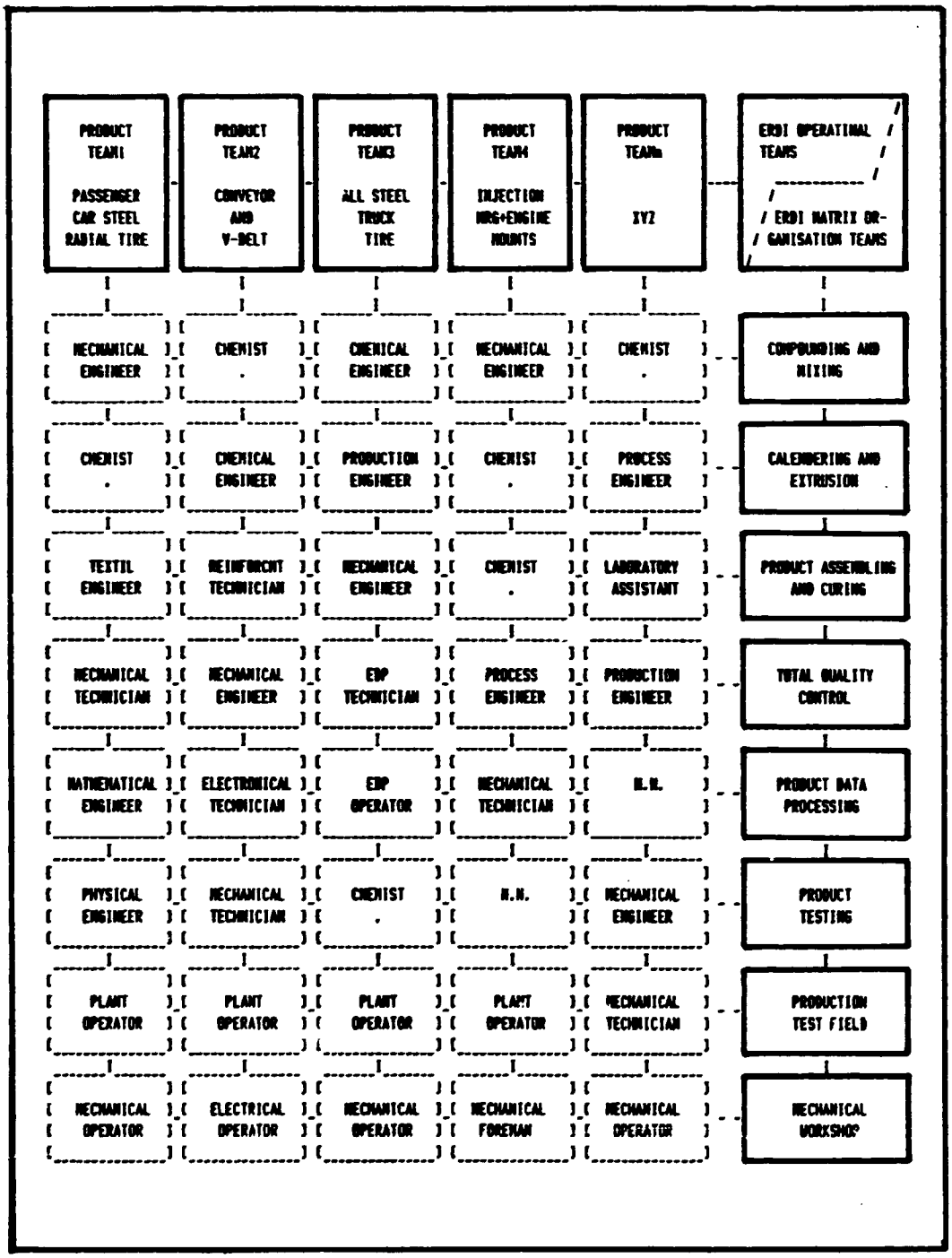


FIGURE 09.07: EXAMPLE OF MATRIX ORGANIZATION ACTIVITIES TO IMPROVE TO COVER IMPORTANT FIELDS OF RUBBER DEVELOPMENT BY ERDI

ACCORDING TO MISSION FINDINGS AND RESULTS OF DISCUSSIONS, THE HERE LISTED PRODUCTS, PRODUCT GROUPS OR RUBBER TECHNOLOGY FIELDS CAN BE SUPPORTED EFFECTIVELY BY TECHNOLOGY TRANSFER OF EXPERT APPOINTMENTS*), ALSO TO ASSIST LICENSE ADAPTION WORK, IN NEAR FUTURE AT

TRENCO:

(1): PRODUCT QUALITY AND GREEN RUBBER PROCESSING.
(2): STEEL BELT PASSENGER TIRES PRODUCTION START.
(3): MILLROOM REORGANIZATION.

NARUBIN:

(4): CONVEYOR BELT DESIGN FOR SPECIAL APPLICATIONS.
(5): V-BELT MACHINERY IMPROVEMENTS, WRAPPED TYPE.
(5): RAW EDGE V-BELT DEVELOPMENT AND MACHINERY.
(6): MOLDED RUBBER GOODS AND ADVANCED MACHINERY.
(1): PRODUCT QUALITY AND GREEN RUBBER PROCESSING.

SEFCA:

(7): EXTRUDED PROFILES AND MARKET APPLICATION.
(8): ENGINE MOUNTS, METAL BONDED, AND MARKET APPLICATION.
(9): INJECTION MOLDED GOODS AND RELEVANT MOLD DESIGN.
(10): BRAKE HOSES FOR AUTOMOTIVE APPLICATION.
(10): HOSE DESIGNS FOR SPECIAL APPLICATION.

ERDI:

(11): INSTITUTE LAYOUT AND PRODUCT DEVELOPMENT MACHINERY EQUIPMENT.
(1): EDUCATION OF PRODUCTION MANAGEMENT FOR PRODUCT QUALITY AND MATERIAL SAVINGS IN RUBBER PRODUCTION(TQC).

*) = APPOINTMENTS ARE NOT CLEARED IN ANY CASE AND MUST BE COORDINATED WITH PLANT OR ORGANIZING MANAGEMENT.

FIGURE 09.08: WORKING FIELDS FOR APPOINTMENTS OF EXPERTS TO SUPPORT EGYPTIAN RUBBER INDUSTRY AND ESTABLISHMENT OF ERDI

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