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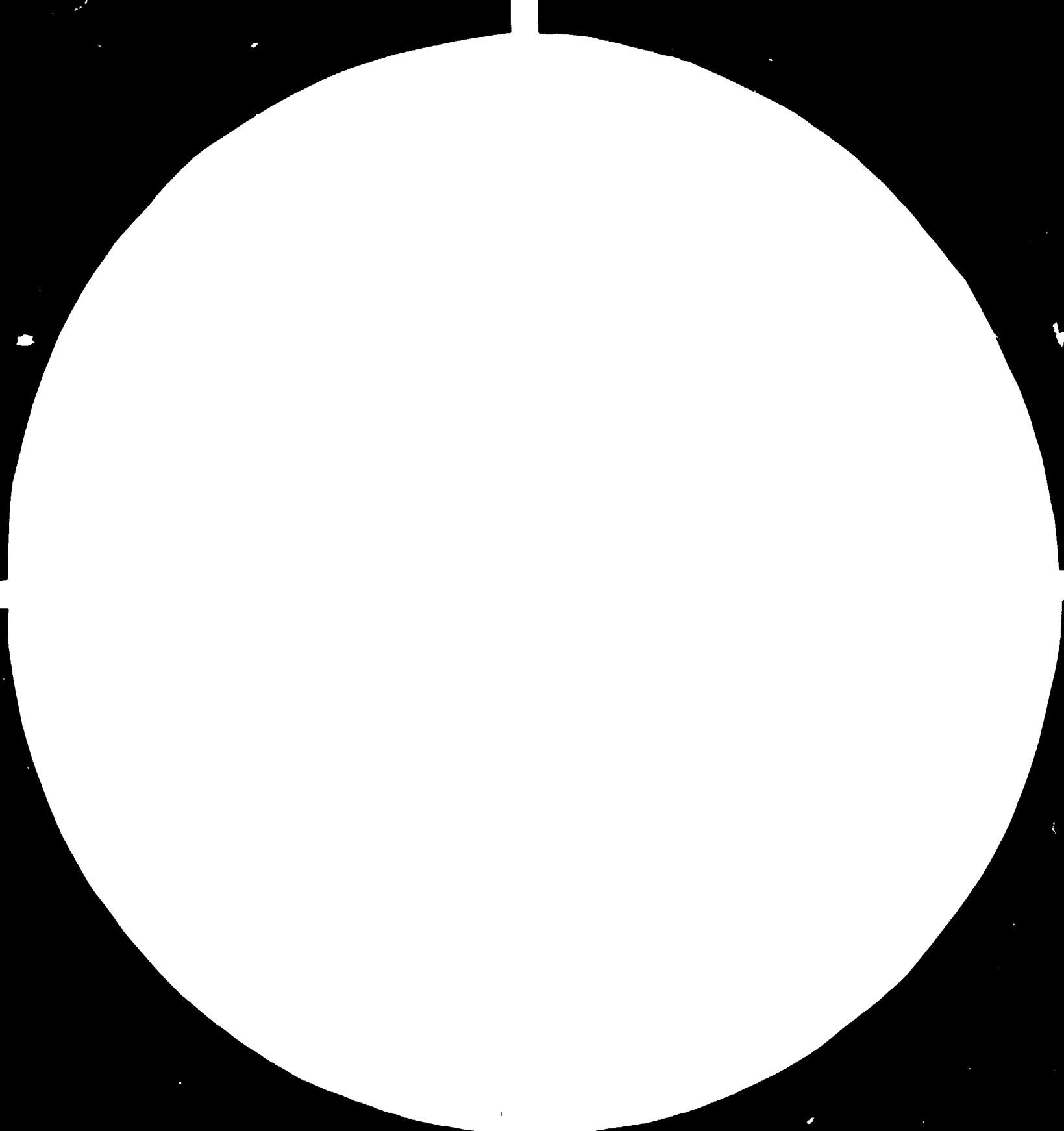
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THE SPARE PART REQUIREMENTS OF THE
VEGETABLE OIL INDUSTRY IN DEVELOPING COUNTRIES

A Review and Summary*

US/INT/78/073

This document was prepared by the UNIDO Secretariat based on study and evaluation work carried out by UNIDO experts in Paraguay, Peru, Indonesia, Korea, Nigeria, Egypt and Syria

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Introduction

A considerable percentage of the oilseed and vegetable oil processing factories in developing countries are operating under capacity. In many cases only fifty per cent and less of the installed production capacity is utilized. This unsatisfactory situation has been caused by many factors such as lack of raw materials, insufficient product distribution and marketing facilities, the qualification of production personnel and others but to a very high extent also by the lack of spare-parts and serious repair and maintenance problems resulting therefrom.

The spare-part problem in close context with the repair and maintenance problem the vegetable oil industry is faced with has been made a point for discussion in the first UNIDO Consultation Meeting on the Vegetable Oil Industry held in Madrid on 12 to 16 December 1977 and the UNIDO Secretariat was asked to carry out relevant studies and evaluations and to come forward with meaningful proposals for international co-operation with the aim to improve the spare-part situation of the developing countries' vegetable oil industry.

The UNIDO Secretariat on this basis had initiated a review of the particular spare-part situation in seven selected developing countries under the project US/INT/78/073. These countries were: Paraguay, Peru, Indonesia, Korea, Nigeria, Egypt and Syria.

The results of this evaluation study supplemented by further discussions with representatives of the vegetable oil industry and relevant consultations are laid down in this summary report.

The vegetable oil industry

The oilseed processing industry in principle makes use of two different processing technologies, namely mechanical pressing (expellers) and solvent extraction. While the solvent extraction technology is a continuous, normally fully automatic process closely following the economy of scale, the mechanical pressing technology can be applied also in small and medium capacity plants.

The wear and tear problem a solvent extraction plant has to deal with are hardly substantial and the required spare-parts basically consist of control and measuring instruments, valves and fittings, certain piping material and (explosion-proof) electric motors and installations. The lack of these particular type of spare-parts does not normally influence a factory's production efficiency (product losses etc.) but more often cause the need for a production stop. The breakdown of one explosion-proof (solvent) electric motor causes the entire factory to stop production as the continuous technological production system cannot be maintained.

The situation is different with the mechanical pressing process. There, the wear and tear problem is very substantial. A mechanical press requires a new complete set of inner metal linings every six to eight months. The worn out lining does not necessarily cause the stand-still of the machine but greatly decreases the throughput capacity, results in steadily increasing production losses and very unfavourably effects the overall production efficiency.

The solvent extraction technology and/or a combination between solvent extraction and mechanical pre-pressing is predominantly used in developing countries with a higher level of development. The mechanical pressing system is dominating in the least developed countries and developing countries with a lower level of development.

This fact is very significant as the spare-part supplies and maintenance costs for mechanical pressing plants are unproportionately higher. The generally poorer developing countries with mechanical pressing plants in operation have to spend more money on spare-part supplies and efforts on maintenance and repairs in order to efficiently operate their oilseed processing industries.

The factory management

The organization of the timely correct supply of the required types of spare-parts is one of the important duties of the technical factory management. The plant management, therefore, has to exactly know the special technical features of the factory and the special machinery items that are particularly liable to wear and tear. A relevant repair and maintenance plan has to be elaborated of which the provision and required spare-part stocks play a particularly important part.

Appropriate factory management, however, is not only a question of technical competence but also of financial responsibility. The funds blocked in spare-part stocks normally are a rather significant item in cost calculations. The appropriate balance has, therefore, to be found between the real spare-part requirements and the costs involved in spare-part stocks. On the other hand, the management should be aware of the fact that the closing down of a vegetable oil factory for lack of spare-parts causes unproportionately higher financial losses than unusually large spare-part stocks can possibly bring about.

Vegetable oil factories in developing countries

There are only about ten large engineering companies specialized in the manufacture and supply of complete vegetable oil factories (solvent extraction and mechanical pressing plants).

These supplier companies are situated in developed countries only and most of these companies are offering their own special processing technology and naturally competing each other in the international market. Some of these companies have issued manufacturing licenses also to established engineering companies in some developing countries for example India and Brazil. Licencing agreements have, however, predominantly been entered into for cost reasons and in order to improve the donor company's position in the international competitive market.

It is for this reason that the majority of the vegetable oil factories set up and in operation in developing countries are imported based on predominantly turn-key contract arrangements. The buyer developing country in this connexion has normally to supply the civil engineering work and facilities and the land, water, energy, etc. in line with the supplier company's technical specifications and drawings. Upon completion of the installation work and test operations carried out under the supervision of the supplier company's expert personnel, the factory is handed over by the supplier to the buyer company which takes over the operation responsibility by issuing a relevant certificate to this effect.

The solvent extraction and mechanical pressing equipment and machinery of a modern vegetable oil factory is very specialized and generally of high quality based on very precise workmanship. This fact naturally also applies to the spare-parts, the specifications of which foresee special alloy metals (inner lining of mechanical presses) requiring special tools for appropriate and precise machining.

Normally but often also only on the special request of the buyer company one set of spare-parts is supplied along with the factory. Further spare-parts supplies are subject to special orders to be placed by the buyer company to the equipment producer.

At this point the question of efficient management becomes evident. This system functions well under the condition that the factory management has no limitations necessarily imposed on it by the special economic conditions the developing country is faced with and other circumstances very unfavourably effecting the management's dispositions.

The difficulties and constraints

In most developing countries the effective action a vegetable oil factory management can take with regard to the timely correct supply of spare-parts is limited. The placement of orders with the factory supplier company depends on the issuance by the authorities of an import licence which again is dependent on the countries foreign exchange situation and the import priorities set by the authorities on this basis. Even if an import licence has been granted, it very often is not available at the appropriate time and long delays occur completely outside the factory management's influence.

Even if a spare-part supply order can be placed at the appropriate time in line with the management plan, very long delivery times usually occur. Although spare-part production and sales are a rather important business for the supplier company, relevant orders are usually piled up until the quantity of spare-parts resulting from more different orders justify the fabrication at reasonable production costs. The fabrication of small quantities normally also result in higher prices. To the normally long delivery time other delays are usually added, namely customs clearance in the recipient country and the transport from the harbour to the factory.

Further constraints often also lie in the vegetable oil factory's own repair and maintenance department and in this context particularly in the relevant personnel's professional qualification.

As mentioned before, the factory has normally been installed by the supplier company's technicians the work of whom was concentrated on the pure equipment assembling and installation work and hardly any time is normally devoted to the training of the factory staff. It is the factory staff, however, who have to operate the factory and in this context carry out the required repair and maintenance work, the details of which the factory technicians cannot be expected to know in the absence of an intensive training period. The often frequent change of technical factory personnel for many reasons adds to the problem.

The resulting situation

For the reasons as mentioned above most of the vegetable oil factories in developing countries are in a technically unsatisfactory condition. This fact is particularly evident in small and medium size factories predominantly using mechanical presses. As a result of technical inefficiencies rather high production losses occur and the residual oil content in the press cakes are considerably higher than conceived and originally guaranteed by the equipment producer and supplier.

Although the technical production efficiency is very negatively effected by the lack of spare-parts, small and medium scale factories are hardly taken out of production for this reason and are normally operated with lesser and lesser efficiency as long as production cost calculation and edible oil domestic market price structures permit.

After the production economy has become very negative, technical improvisations are made that permit a continuing operation but are often bound to add to the forthcoming complete technical break down of the equipment in question. It may than happen that one or more expeller presses have to be taken out of production in order to be disassembled. Certain parts of the one expeller have to be used to facilitate the continuing operation of the rest. It is at this point where the underutilization of the factory's installed capacity becomes factual.

The situation is different with solvent extraction plants. The breakdown of certain important measuring instruments or pressure/vacuum indicators would not necessarily cause the stand-still of the production process but makes the production controls impossible. The lack of process control in turn may necessarily cause eventually unmeasurable production losses (solvent) and high residual oil contents in the extracted meal. The break down of motors, however, that cannot be replaced with regular explosion-proof equipment would cause the immediate production stop of the entire factory. Any production stop of a solvent extraction plant is very costly as such plants are designed for continuous operations over 300 days a year. Each stand-still of a solvent extraction plant may further cause explosion risks as inflammable solvent/air mixtures may develop. For the same reason no other but explosion-proof electrical equipment can be used. From these results it becomes clear that the lack of suitable spare-parts very heavily influence the capacity utilization factor of a solvent extraction plant.

The spare-part problem from the geographical situation view point

The more developed the developing country, the better is the overall technical (spare part) situation of the vegetable oil industry. The situation, however, becomes more and more problematic along with the decreasing level of development. On the other hand, the availability of foreign exchange is no guarantee for a developing country's vegetable oil industry's appropriate technical condition.

The situation in Asia differs considerably from country to country but shows signs for general improvement. In Korea, for example, a large scale modern oils and fats industry exist predominantly based on either imported equipment or locally produced machinery based on licencing agreements with established engineering companies in possession of the necessary "know how". In the first

instance it is the licenced local fabrication that meets the oils and fats industries' requirements. The available facilities and high qualification of the local personnel is an additional advantage. From this view point, the situation in Korea is rather similar to the situation in developed countries. The spare-part and repair problems the vegetable oil industry is faced with in Indonesia is different but can be considered characteristic for Asian developing countries. Some of the factories and particularly larger capacity plants (palmoil) are rather well maintained. Such plants represent a traditional industry partly operated with foreign participation or expert personnel. Smaller capacity production units and mostly expeller plants, however, face considerable difficulties in their spare-part supplies. Technically sophisticated modern factories hardly exist but are bound to come up in the near future and in this context the spare-part and equipment replacement problems will increase.

The African region can be divided into three zones, namely the North, the West and the rest of Africa. The special situation in the south of Africa and perhaps Zimbabwe is not considered in this connexion. The situation in the north of Africa is somewhat similar to Indonesia. Reasonably good spare-part supply and maintenance systems exist with regard to larger capacity factories. The bigger problems occur in the small and medium scale sector. The West African developing countries have no real problems with spare-part supplies, perhaps because of their generally good relations with the European Community of which they are associated members. Problems, however, came up in connexion with plant management questions which often also result in short supplies of spare-parts and inadequate repair and maintenance operations. The situation, however, is most problematic in other African developing countries and particularly the least developed ones. The dominating small and medium scale production plants are hardly technically up-to-date and lack an appropriate practical spare-part supply and repair and maintenance system.

Except only in a few countries the situation in Latin America is generally more satisfactory. A comparatively well functioning engineering industry exists that to some extent has been established with the assistance of developed countries the traditional engineering industry of which is well represented. A rather high percentage of the oils and fats industry consist of larger scale processing plants with the required organizational settings. But still quite a number of the traditional small scale factories continued their production and it is this particular production sector which also faces the spare-part supply problem for different reasons.

The engineering industry in developing countries

In some of the developing countries rather efficient smaller or larger machinery and equipment manufacturing industries exist. Such manufacturing industries are mostly specialized on either sheet metal works or the production of certain machines or parts of them. During the course of time a specialization also took place in particular fields of the engineering industry mostly oriented towards the production of consumer goods or the supplies of special services. Some of such existing manufacturing industries would in principle be in a position to also fabricate spare-parts for the vegetable oil industry. The incorporation of a particular spare-part series in its manufacturing programme, however, is a most difficult decision for the manufacturing industry's management.

Normally, the required work-shop drawings are not available and so are the necessary raw material specifications. A manufacturing work-shop has to prepare its own drawings based on original spare-parts collected from the vegetable oil industry. But this is hardly sufficient as special processing and machining techniques have often to be applied which are mostly not known and which are most difficult to be carried out with the available machine tools.

Last but not least in most cases the required special type of metal raw material is not available and has to be imported. It is not only the import licence that has to be obtained in this connexion but - which is even more important - imports are most difficult if the quantity of such special metal raw materials are small. Small quantities also normally go along with higher prices and the cost/price calculations of a machinery manufacturing work-shop are a decision making factor for the commercial work-shop management. A solution to this problem might be the production of larger quantities of special spare parts once in a year or in two years. The ready made parts will, however, have to be sold to the vegetable oil industry which would have to arrange their storage in its own interest. Such proceedings will, however, have to be calculated on a case by case basis, and require a well based organization and meaningful co-operation between the vegetable oil industry and the engineering work-shop involved.

Needless to mention that the production of spare-parts without appropriate and legal co-operation agreements between the original manufacturer and exporter and the local engineering industry can only be a very inefficient compromise. In very many cases the imported machinery and parts of it are patented or otherwise legally safeguarded against unauthorized fabrication and sales.

Attempts have been made by some vegetable oil factories to have certain important spare-parts manufactured by their own repairs and maintenance department. The attempt was bound to fail as the "home made" spare-parts did not resist the wear and tear of the production process and had to be removed again in a usually short span of time.

The local manufacturing of other more sophisticated spare instruments, gauges and explosion-proof electrical motors and equipment in many developing countries is a problem that cannot be solved in the absence of legally acknowledged production quality standards and specifications. As mentioned earlier, the entire electrical installation and motors have to have a special explosion-proof

design which is standardized and subject to controls by the authorities. In many developing countries, however, such official specifications do not legally exist and a relevant manufacturing company will, therefore, be theoretically unable to responsibly meet with the standards and obtain the required legal backing.

The local fabrication of special measuring instruments, for example, and similar equipment would hardly be a feasible task for domestic manufactures. Such instruments require very special manufacturing techniques which cannot normally be applied for the fabrication of the rather small quantity required by the local vegetable oil industry. Certain special instruments, therefore, are typical import items for developing and developed countries and should, therefore, not be locally manufactured but have to be obtained the best possible way either by the vegetable oil industry itself or by local importers in case one and the same instrument can universally be used.

The step-wise solution for the spare-part problem

The local manufacturing of vegetable oil industry spare-parts that belong to imported equipment and machinery is a much more complex problem than usually envisaged. Many factors play a role in relevant decisions to be taken by both the vegetable oil industry and local engineering companies.

Basically the management of an imported vegetable oil factory has to be aware of its spare-part requirements over a foreseeable production period. The exporting company, therefore, should draw the buyer company's attention to the technical spare-part requirements and the financial implications involved. The supply of several sets of imported spare-parts should also form part and parcel of the turn-key factory supplies.

An assessment should be made by the authorities or other suitable organization of the developing country concerned of the number and types of vegetable oil factories and the equipment used by them. The results of such an assessment will show the variety and quantity of spare-parts the industry might annually require in order to ensure its uninterrupted production.

Based on the actual annual spare-part requirements existing engineering companies will have to be evaluated in view of their technical capability to undertake the fabrication of the required quantity and variety of spare-parts in acceptable quality. Depending on the results of such an evaluation certain arrangements might have to be made in order to enable one or more local engineering companies to take up the required spare-part production. UNIDO might be in a position to assist in the detailed evaluation work.

Having created the pre-conditions as mentioned above, negotiations will have to be entered into by the authorities in co-operation with the relevant local engineering company with one or more of the supplier companies of the vegetable oil factories presently in operation. The negotiations should be aimed towards reaching an agreement for the local fabrication of specific spare-parts based on the original specifications and designs. Such an agreement - in several cases - might also include specific export rights for the local spare-part manufacturer in the developing country concerned. UNIDO is in a position to actively assist the authorities and/or industries in developing countries to this effect.



