PROSPECTS FOR ESTABLISHING EXAMINATION GLOVE PLANTS IN INDIA

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Introduction

It will not be wrong to term examination gloves the 'blue chip' among rubber products going by the glove rush witnessed all over the world.

We have come across any number of advertisements in the local newspapers and magazines asking for large supplies of examination gloves made out of natural rubber latex. The requirements of these are in millions of pieces, and the price at which one could conclude bulk containerised export orders is apparently attractive.

Several well-established business houses in India and a few individuals are in the process of establishing project facilities to manufacture examination gloves especially meant for the markets in America, Europe and other industrially developed countries.

This article aims to give a broad outline of the various aspects of the gloves market, manufacturing process, plant and machinery, specifications etc.

Product Description

A variety of gloves--surgical, industrial, household, postmortem, electricians, examination—are produced out of rubber and other materials.

Examination gloves (EG) are made out of natural rubber latex, synthetic rubber latex, and vinyl plastics. But the most preferred raw material for examination glove manufacture is natural rubber latex.

EGs find use in medical and non-medical application areas. These products could be sterilised or non-sterilised. However, they are produced and packaged with care to ensure that they are clean and hygienic. EGs are normally ambidextrous, and are available in three sizes—large, medium and small, and are invariably disposable after one use.

In the medical field, EGs are used for diagnostic and therapeutic procedures by physicians, surgeons, nurses etc. Chemists and druggists are also using EGs in large quantities. In the non-medical areas, EGs are being widely used in the food processing, packaging, catering industries. EGs are also being used by policemen who handle accident victims, criminals, suspects etc.

It would appear that the areas of usage of examination gloves are expanding, and hence there is no sure way one could accurately project the demand growth for this product.

Product Specifications

The basic specification requirements of examination gloves are given below—

Size	— Small, Medium, Large
Thickness	— 0.08 to 0.11 mm
Colour	— Translucent white
Packing	— In PVC or PE bags, bundled in cartons of one hundred gloves, or as specified by the purchaser.

TABLE–1
Physical Requirements

	Before Ageing	After Ageing
Tensile Strength	21 MPa min.	16 MPa min.
Ultimate Elongation	700% min	500% min.

TABLE–2
Dimensions & Tolerances

Designation	Size							Tolerance,
	6	$6\frac{1}{2}$	7	$7\frac{1}{2}$	8	$8\frac{1}{2}$	9	mm.
Width by size, mm	76	83	89	95	102	108	114	±6
Width, mm								
Small	80							±10
Medium			95					±10
Large					111			±10
Length,mm	230 for all sizes							min.
Thickness, mm								
Finger	0.08 for all sizes							min.
Palm	0.08 for all sizes							

Texture — Smooth and elastic, powdered inside.
Sterilisation — Optional

The American Society for Testing and Materials (ASTM) standards specify dimensional tolerance and other physical requirements for examination gloves in ASTM D 3578-77 (Reapproved in 1982). They are summarised in Tables 1, 2 and 3.

On visual examination, the gloves should be of uniform colour and thickness, free from bubbles, pin holes, and embedded foreign matter.

Plant and Machinery

To achieve the desired economy of scale of production, it would appear important to go in for at least a semi-automatic dipping plant. In this all the manufacturing operation—except the stripping of the

TABLE–3

Performance Requirement

Characteristics	Related Defects	Inspection level	AQL
Sterility	Fails sterility		N/A
Watertight	Holes	S-4	2.5
Dimensions	Width, length and thickness	S-2	4.0
Physical Properties	Before ageing, after		
	accelerated ageing	S-2	4.0

gloves from the formers which is done manually—is automated.

There are several companies in Taiwan, Malaysia, UK, USA etc. who offer the complete plant and machinery for the production of gloves. The production capacity of machines differs anywhere between 3000 and 9000 pieces of gloves per hour.

Indicative costs of the machines are available. The Taiwan/Malaysian plants cost in the region of US$350,000 and US$400,000 for capacity between 3500 and 5000 pieces per hour. The plants from UK cost about £750,000 for a capacity of 5,400 pieces per hour. The cost of an American made plant is about US$1,350,000 for a capacity of 9,000 pieces per hour.

Raw Materials

Rubber alone accounts for about 95 percent of the weight of a glove. 60% centrifuged latex is available in adequate quantities in India. There are at present 27 units engaged in the processing of centrifuged latex in the country, and the production of centrifuged latex during 1987/88 was 26,688 tonnes.

Assuming that about 40 units with single production line will go into production of examination gloves during 1989, the additional requirement of centrifuged latex will be approximately 9,000 tonnes. The existing latex centrifuging units in India are at present producing far below their installed capacities, and are in a position to produce enough to meet the eventual added requirement of 9,000 tonnes. If necessary, at a later date, the Rubber Board may consider issuing licences to establish new centrifuging units.

For the manufacture of examination gloves, many Indian companies are understood to be planning to use pre-vulcanised latex which is reported to improve the finish of the gloves and also reduce rejection rates. Pre-vulcanised latex is not at present produced in sufficient quantities in India. However, the Rubber Board has the necessary knowhow which can be made available to those interested in establishing pre-vulcanised latex units.

Almost all the compounding ingredients necessary for the manufacture of examination gloves are indigenously made. Only very few special chemicals may need be imported.

Manufacturing Process

The manufacturing process essentially begins with the compounding of latex. 60% centrifuged latex is the main raw material

required for the manufacture of examination gloves. It is preferable to use latex with low volatile fatty acid (VFA) and reasonably high mechanical stability. Latex with VFA content upto 0.08 and MST in the range of 600–800 seconds may be suitable for the purpose.

Good quality latex (preferably with ISI marking) is compounded with the addition of the required chemicals. Water soluble chemicals are added as aqueous solutions, insoluble powders as dispersions, and immiscible liquids as emulsions. The quality of dispersions and emulsions has to be checked before compounding with latex. After compounding, the latex is kept for maturation, normally for 18–24 hours at about 25–30°C. Alternatively, prevulcanised latex may also be used for gloves manufacture.

Compounded latex has to be tested to ascertain its suitability for the manufacture of the gloves. Since the total solids content and viscosity of the latex affect the thickness of gloves to a large extent, these parameters have to be necessarily tested.

Dipping operation can be done by batch process (manual) or continuous process (automatic). For the manufacture of EGs, manual process is not recommended as there are likely to be batch-wise variation in the thickness of the gloves, and the quantity that can be produced will be rather small. In most of the EG manufacturing plants, all operations except the stripping of the latex film (gloves) from the former are done automatically (mechanically) so that the output is enhanced and the product uniformity is maintained.

A typical manufacturing flow chart is given in Figure 1.

Dipping process generally consists of two basic operations—dipping the clean dry formers into a coagulant, and then into the latex compound.

The process starts with the cleaned and dried formers being pre-conditioned to a suitable temperature and then dipping them into a coagulant solution. On emerging from the coagulant bath the formers are subjected to drying when a thin film of coagulant gets uniformly deposited on the formers. Thereafter the formers are dipped in the latex compound and withdrawn at controlled speeds when a film of latex compound gets deposited on the formers. The thickness of the film is controlled by factors such as the strength of the coagulant, length of dipping time of the formers in the latex compound, rate at which the formers are withdrawn, viscosity of the latex, solids content of the latex, and the temperature of the formers and latex.

The deposited latex film is dried, bead rolled, subjected to leaching in water to remove residual chemicals, and vulcanised. To remove the tackiness of the glove powdering (fine powders such as corn starch) is done. The gloves are then stripped from the formers, put through quality control inspection procedures, and packaged for the market.

Process Training

The selection of a qualified and experienced latex technologist to take care of the production and quality control aspects is an essential factor for the successful functioning of an EG plant. The machinery suppliers normally provide the basic training with regard to the operation and maintenance of the plants that they make.

Training is also being given by the Department of Training at the Rubber Board, Kottayam-9 to the technical hands. Close liaison with the Rubber Board will also help the entrepreneurs in updating the technology and getting their products more acceptable in the markets.

Companies getting machinery from abroad may also be receiving the production technology as part of the services offered by the supplier of the plant. Detailed instructions also may be made available by the plant supplier on running the unit and in the maintenance of the machinery.

TABLE–4

Glove Manufacturing Units in Malaysia

Types of Gloves	Number of Manufacturing Units			
	In operation	New Projects	Total	%of total
Examination gloves	18	119	137	66.8
Surgical gloves	0	3	3	1.5
Household gloves	7	6	13	6.3
Industrial gloves	3	3	6	2.9
Examination & Surgical	0	3	3	1.5
Examination & Household	3	9	12	5.8
Examination & Industrial	1	1	2	1.0
Surgical & Household	0	1	1	0.5
Surgical & Industrial	0	0	0	0.0
Household & Industrial	5	4	9	4.4
Examination, Surgical & Household	0	2	2	1.0
Examination, Surgical & Industrial	0	0	0	0.0
Examination, Household & Industrial	0	10	10	4.9
Surgical, Household & Industrial	2	2	4	2.0
Examination, Surgical, Household & Industrial	2	1	3	1.5
Total	41	164	205	100.0

Demand and Supply

The world demand for EG is estimated to be in the region of some 30 billion pieces for 1989, and 40 billion pieces for 1990. When the legislation for using EGs becomes mandatory in the food industry, the demand for EGs is estimated to touch the 60 billion mark per annum.

Against these demand estimates, the world production of EGs is now in the region of 20 billion pieces.

In view of the growing demand, the governments of almost all the natural rubber producing countries are encouraging the establishment of glove plants, especially EGs meant for the export markets.

Countries like Malaysia and Thailand have quickly awakened to the situation to produce and export EGs in bulk. According to the present statistics, licences have been already issued to 205 units in Malaysia for setting up glove units. The distribution of glove manufacturers in Malaysia according

to the types of gloves manufactured is given in Table 4.

At present, there are forty one units producing various types of gloves in Malaysia. Many of the EG producers—with an eye on making a quick buck—bothered little about the quality aspects of their products which resulted in their gloves being rejected by the overseas buyers.

Several companies who bought cheap machinery could not produce the high quality gloves required in the overseas markets. In certain instances, the process loss was as high as 30 or 40 percent.

A couple of years ago when EGs were enjoying virtually a seller's market, almost all the producers were able to make good money, and fast. However, the situation has now changed. With more and more units going into production, and with products becoming available in bulk, the buyers are tightening the product specifications. It won't be long before only those who produce high quality gloves would be able to survive and thrive—in a highly competitive market environment.

Prospects for EG Units in India

For the successful operation of examination glove producing plants, the following aspects are important.

1. The raw materials—60% centrifuged latex and other compounding ingredients—should be made available in adequate quantities and of acceptable quality.
2. The formulation selected should be such that the products made out of it should meet the international standards, with the minimum process loss.
3. The plant and machinery selected should be of excellent design and constructional perfection which require minimum maintenance. Periodic maintenance is important so that the plant does not break down resulting in stoppage of production.
4. The expertise of a qualified and well experienced latex technologist is very important. Skill of the workers manning the production line is also important.
5. A well-equipped laboratory to check the quality of raw materials and the finished products should be established.
6. Arrangements for constant technological up-date are to be made either with the plant and machinery suppliers, or well-established R&D organisations.

Concluding Remarks

When we look at the future prospects of the examination glove manufacturing industry, there are two lines of thinking.

There are those who strongly believe that "the good times are gone", and there are others who hold the view that "the prospects are very bright."

The pessimists try to substantiate their arguments by pointing out that the market for EGs is steadily coming down with the entry of more and more producers. They also point to advertisements of existing glove manufacturing companies offering to sell their machinery to any interested buyers; this situation was unthinkable just a few months ago.

The optimists, on the other hand, quote Surgeon-General C. Everett Koop, the top brass U.S. health official, to have said "that the vaccine for AIDS may never be found". The present drop in the price for EGs, they contend, is created by the US buyers who want to put a check to the mushroom growth of the glove units and weed out unscrupulous glove manufacturers who solely aim at quick money and care the least for quality.

Whatever be the arguments for and against the market prospects for examination gloves, to be able to produce high quality gloves (to meet FDA regulations) is perhaps the only way to survive and thrive in the market.
