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## New applications can boost demand for NR

**Non-conventional applications of rubber normally get promoted by 'producer push' or 'consumer pull'**

Natural rubber (NR), owing to its wide range of beneficial properties, is the basic industrial raw material which finds use in the manufacture of a broad spectrum of products. The rubber products conventionally find application in various sectors such as transportation, communication, industry, agriculture, health and family planning, sports and games etc. Consumption of NR had been steadily increasing since the setting up of the first rubber goods manufacturing unit in India in 1921 and the rubber goods manu-

facturing industry had been showing reasonably good performance. It is important to note here that the Indian rubber goods manufacturing industry is inward oriented in the sense that it predominantly caters to the domestic market. Also it is worthwhile to point out that the lion's share of the manufacturing units are in the small scale sector which is mainly identified as having low investment, producing low quality products, of low output and with minimum management and marketing capabilities.

However, after 1997, the Indian rubber industry had been passing through difficult times. As a result of the general economic recession in India, the consumption of rubber products decreased substantially, but the NR production did not drop that heavily. When the attempts to export the surplus NR as well as to procure and store the rubber did not produce the targeted results, there was surplus rubber available in the market resulting in the fall in price of NR. It is gratifying to note that the situation now shows signs of improvement. However, the recently announced amend-

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One of the earliest rubberised roads in India

ments in the Exim Policy of the Union Government can make definite impact on the situation if appropriate and timely actions are not taken to avoid the possible adverse effects. The Exim Policy which aims at substantially increasing the exports also has lifted the quantitative curb on import of 714 items which include rubber goods like footwear and cushions. The Indian rubber goods manufacturers should rise to the occasion and take advantage by exporting more of the rubber products. The usual constraints such as comparatively low output, inferior technology, high cost of production, lack of awareness of prospective markets, etc. of the units have to be sorted out by appropriate management and technology back up in a time-bound manner. The Rubber Board will be able to provide technical assistance and testing facilities and organise need-based training programmes for the manufacturers and also for entrepreneurs for the above purpose. In the above context it is important to note that during 1998-99, about 65,000 tonnes of NR was consumed in India for the manufacture of footwear and rubber cushions. If the Indian manufacturers of the rubber products are unable to improve the performance of the industry in terms of cost, quality and output, more and more import of the products will take place. This will result in decreasing the consumption of NR for footwear and cushions and increasing the surplus of NR in the domestic market unless other appropriate and time-bound measures are taken.

One way to overcome the crisis is to considerably increase the consumption of NR in non-conventional applications or to promote 'new uses' for rubber. Interest in new uses for rubber waxes and wanes according to the economic development of a country. A new

use of rubber may arise in the following manner. The system for use of rubber itself may be new. Or the system may have existed earlier, but the need for a particular function may be new. To cite an example, bitumen was in use as the binder for metal and sand in road construction for quite a long period. However, to increase the service life of roads and to provide safer ride, bitumen is modified by incorporating 2-4 per cent rubber into it. From laboratory studies as well as commercial trials, it has been established that modification of bitumen by incorporation of NR and use of NR modified bitumen in road construction produced very good results.

Another 'new use' may be by replacing an existing material by a rubber product with definite techno-economic advantage. One typical example is the replacement of the conventional steel bearings in bridges by rubber bearings. If the above type of non-conventional or 'new uses' can be effectively promoted, it will definitely lead to more consumption of NR. Some of such applications are discussed below:

- (a) Rubberisation of roads
- (b) Rubber-based bridge bearings and
- (c) Irrigation canal lining.

#### **Rubberisation of roads**

Incorporation of 2-4 per cent NR into bitumen improves the properties of the latter substantially and rubberised bitumen is found to be an excellent binder for metal and sand. Use of rubber modified bitumen in road construction is found to confer the following advantages compared to the use of ordinary bitumen for the purpose.

- \* Useful service life of rubberised roads increases at least by 100 per cent and in many cases more.

- \* Better resistance to fattening under hot conditions.
- \* More resistance to cracking under cold conditions.
- \* More resistance to skidding and hence, more safe journey on rubberised roads.
- \* Repair and maintenance cost of rubberised roads is considerably low. About 33 per cent saving in maintenance cost is possible.
- \* Extra cost for rubberisation of road comes to only 15-20 per cent.
- \* Saving in fuel and lesser repair and maintenance cost for vehicles.

Extensive rubberisation of roads combines savings with safety and will increase the consumption of NR in a non-conventional application. Rubberisation of roads has become a routine practice in developed countries like USA, UK, France, Australia and Malaysia. The Government of India has now decided to go in for rubberisation of at least 10 per cent length of periodical renewal programmes starting from 1990-2000 in every state and based on the results, to take appropriate steps for popularising the technology. To facilitate rubberisation of extensive stretches of roads, the Cochin Refineries Ltd., Cochin has started production of NR modified bitumen at the refinery. The Indian Roads Congress has come out with specifications for the modified bitumen.

NR modified bitumen is being used in many countries world over for the construction of runways even though it is yet to be tried out in India. The Airstrip at Guildford near Perth in Western Australia, Essendon Airport on the outskirts of Melbourne, Salisbury Airport in erstwhile Rhodesia, and Dunedin's Momoma Airport in New Zealand are a few of the airports having rubberised runways. The Federal Aviation Administration of the US Department of Transportation sponsored a study on 'Durability Criteria for Airport Pavements'. The results of the study indicated that rubber-modified bitumen will prevent the ther-

mal cracking of the runways. The Rubber Board has taken up the matter with the airport authorities in India.

## **Bridge bearings**

The primary function of a bridge bearing, placed between the bridge deck and its fixed support, is to allow the movement of bridge deck on its supporting pier when changes in length occur due to thermal expansion and contraction. Bearings should also support the weight of the bridge and moving traffic. For meeting these functions, the bearing should be very stiff in the vertical direction and be soft in the lateral direction and in rotation. Prior to 1950, this was achieved by steel roller bearings or sliding plates and these needed constant maintenance to perform satisfactorily. Moreover, the mechanical bearings which roll or slide are expensive and difficult to install. Also, it has to be pointed out that corrosion and wear of the steel bearings adversely affect their performance.

R&D work to overcome the drawbacks of the steel bridge bearings culminated in the development of synthetic rubber-based bridge bearings by the French in the 1950s. It was established that a rubber pad loaded on its major surfaces will meet the combined requirements of high vertical stiffness with softness in lateral direction and in rotation, essentially required for the successful performance of a bridge bearing. Instead of simple rubber pads, steel laminated rubber bearings perform quite well and are cost-effective, easy to install and require no maintenance. Steel laminated rubber bridge bearings are now in use world over. Only two types of rubbers viz. natural rubber and polychloroprene are recommended for the manufacture of bridge bearings. Whereas the American and British Standards specify the use of either natural rubber or polychloroprene for the manufacture of rubber bridge bearings, the standard prescribed by the Indian Roads Congress specifies the use of only polychloroprene rubber for the purpose. Polychloroprene rubber

is not manufactured in India and has to be imported for the manufacture of rubber products whereas natural rubber is indigenously produced. Considering the large requirement of rubber for the manufacture of rubber bridge bearings, inclusion of natural rubber in the specifications as the basic raw material for the production of rubber bridge bearings needs immediate consideration and the matter has already been taken up by the Rubber Board with the Indian Roads Congress.

## **Canal lining**

Irrigation is the application of water to soil with a view to supplying moisture essentially required for plant growth, especially during stress periods. Irrigation helps to boost productivity, usu-

nals, lining of canals is generally recommended. Even though concreting the canals is effective in reducing seepage of water, it is found to be much expensive.

With a view to developing more cost-effective canal lining techniques, especially using indigenously available materials, an applied R&D work was undertaken by the Rubber Board and the Kerala Engineering Research Institute (KERI), Peechi, using natural rubber latex as a material for lining canals.

The choice of NR latex as the lining material is based on the following aspects.

a) NR latex can produce continuous, flexible, strong and water-imperious film.

## **Laboratory trials and preliminary model studies showed promising results indicating that NR latex can be used as a cost-effective and efficient canal lining material**

ally by 2 to 5 times or sometime more. Though it is a costly proposition, it provides an insurance against short duration drought.

Of the different methods used for irrigation, the one using irrigation canals is of paramount importance in our country. Reports indicate that of the net area under irrigation by sources, irrigation canals account for about 33 per cent. Making the most efficient use of irrigation by minimising losses in conveyance by lining is a very important aspect to be considered. Published information reveals the loss of water during conveyance by irrigation canals is in the range of 30 to 50 per cent and the loss is mainly on account of percolation and seepage. Suitably designed irrigation canals consisting of main and sub-branches and distributories are constructed for achieving the objective. To minimise loss of water through seepage from the ca-

b) NR latex is a cost-effective and indigenously available material.

c) NR latex is non-toxic and easy to apply as a lining material.

Laboratory trials and preliminary model studies showed promising results indicating that NR latex can be used as a cost-effective and efficient canal lining material. However, further large scale trials are being planned to evaluate the usefulness of NR latex as an irrigation canal lining material. If the final results of the study are promising, it will also open a new outlet for the consumption of NR.

Non-conventional applications of rubber normally get promoted by 'producer push' or 'consumer pull'. It is gratifying to note that the Rubber Board is taking the lead role and providing the required impetus to the Indian rubber industry. ■