TOWARDS LARGER NR CONSUMPTION IN INDIA

by

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India has achieved remarkable progress in the field of natural rubber (NR) cultivation. There has been a phenomenal growth in area under rubber production and productivity during the last two decades. Currently India is the fourth largest producer, next to Thailand, Indonesia and Malaysia sharing about nine per cent of the world's NR output. The current average productivity of 1563 kg per ha in the country is the highest among the major NR producing countries. The cumulative effect of the research and development programme and the well-coordinated extension schemes initiated by the Rubber Board, a positive price policy followed by the government since independence and the enlightened outlook of the growers have enabled the country to make these significant achievements.

One of the most important features of the Indian rubber industry is the fact that the entire rubber produced was being consumed by the products manufacturing sector in the country. The two distinct features of the rubber products manufacturing sector in the country, compared to the other three major NR producing countries, are a comparatively wider and larger manufacturing base and the inward market orientation. India is the fourth largest consumer of NR in the world and it also occupies the fourth rank in total rubber consumption. In fact, the rubber products manufacturing sector has played a pivotal role in the growth of the production sector by absorbing the steadily increasing production of rubber.

This comfortable position has changed during the last three years and the growth in production has surpassed that in consumption resulting in a glut in the rubber market. The significant decline in the growth of rubber consumption is mainly rooted in the industrial recession in the country as is evident from the key economic indicators related to the Indian economy and partly due to the structural characteristics of this industrial sub-sector.

The evolution of the Indian rubber products manufacturing sector as a supplementary segment catering to the requirement of the large industrial base in the country rather than as a relatively independent export oriented sector as in the case of countries such as Malaysia, is the most important structural characteristic of the industry. This strong linkage between the Indian industrial sector and the rubber products sub-sector appears to be the major factor behind the steep decline in the rate of growth in NR consumption in the country.

HOW TO RAISE RUBBER CONSUMPTION?

The most important factor influencing rubber consumption in any country is its overall economic development. There appears to be a direct relation between the per capita income and the per capita rubber consumption in the country. Therefore, it may not be reasonable to bring about growth in rubber consumption in isolation from the overall industrial growth in the country. However, keeping the overall economic development more or less at the same level it is possible to increase consumption at least marginally by giving more emphasis to export of value added products, particularly identifying products which are having locational advantages and which are rich in rubber. Modification of NR with the broad objective of tailoring it for specific applications where synthetic materials are being presently used, is another alternative. It is also possible to

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TEA IN PLUCKING - CONTAF 5E (HEXACONAZOLE) SCHEDULE

Month	Fungicide (dosage / ha.), Contaf (ml.)#	Fungicide (dosage / ha.), C O C* (g.)	NW A** (ml.)	Spray interval (days)	Probable dates	No. of rounds
June	200	210	35	10	10, 20, 30	3
July	200	210	35	10 / 7	10, 20, 27,	3
August	200	210	35	7	3, 10, 17	3
August	200	210	35	10	27	1
September	200	210	35	10	6, 16, 26	3
October	200	210	35	10	6, 16	2
October	200	210	35	7	23, 30	2
November	200	-	35	7 / 10	7, 14, 21 / 24	2 - 3
						19 - 20

TEA RECOVERING FROM PRUNING - CONTAF 5E (HEXACONAZOLE) SCHEDULE

Month	Contaf (ml.)#	COC (g.)	NWA (ml.)	Spray interval
May pruning	200	210	35	5 days
July pruning	200	210	35	5 days

* COC = Copper Oxychloride ** NWA = Non-ionic wetting agent at 0.05% for 70 litres of spray volume / ha with mist blowers

The dosage of Contaf 5E could be reduced to 100 ml. with effective results, at the discretion of the manager, based on the pattern of infection & environmental factors - to reduce costs.

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develop new uses for NR thereby enhancing rubber consumption. Some of these aspects are being discussed in the presentation.

A comparison of the rubber products manufacturing sector in India with that in Malaysia indicates that our product manufacturing sector is mostly catering to the larger industrial sector of the country and products are being manufactured mostly for captive consumption. Therefore, the role of rubber products in the overall export performance of the country has been negligible. However, in Malaysia, they have given more emphasis to products having export orientation and also which are having specific locational advantages. It is also found that the bulk of the export of rubber products from Malaysia is in the form of latex goods whose rubber content is much higher than that in other products. In other words, value addition of rubber and export of value added forms has been very well taken care of by Malaysian manufacturers. Any attempt to enhace NR consumption in the country shall take into account this important aspect.

MODIFICATION OF NR

The purpose of modification is to tailor NR for specific areas of application where synthetic materials are presently being used. Both physical and chemical methods are available for modification. Physical methods include incorporation of compounding ingredients resulting in the production of modified forms such as oil extended natural rubber (OENR), masterbatches (incomplete rubber compounds) of rubber with materials such as carbon black, precipitated silica, etc. and latex stage full rubber compounds. Blends of NR with other polymers also is a physical method of modification. NR can be blended both with most synthetic rubbers and with plastics. Blends with thermoplastic materials are generally accepted in the industry for various applications. The soft grades containing high proportions of NR are known as thermoplastic NR and hard grades containing high proportions of plastics are called impact modified plastics. These are produced by melt blending of thermoplastics such as polypropylene and/or polyethylene with NR in appropriate proportions. Both the soft and hard grades find applications in areas such as footwear, auto parts, electrical goods, etc. These materials possess the distinct advantage of easy processability and recycling which leads to lower material and product cost.

Chemical modification of NR involves changes in the chemical structure of the rubber molecule resulting in materials having entirely different properties compared to NR. Many of the chemically modified forms of rubber have been commercialised including halogenated rubber, graft copolymers and depolymerised liquid NR. Two of the modified forms which have great potential under Indian conditions are discussed in detail in the presentation. These are styrene grafted natural rubber (SGNR) and expoxidised natural rubber (ENR).

SGN RUBBER

When styrene is polymerised in the presence of natural rubber under suitable conditions, a part of the polystyrene formed gets chemically linked to the rubber molecule, resulting in a graft copolymer of styrene and natural rubber. The product is a blend of free NR, free polystyrene and the graft copolymer. The ratio of NR : Styrene can be varied as per requirement. SG 50 contains NR and styrene in the ratio of 1 : 1. The reaction is best carried out by irradiation. A chemical method also is possible but is found to be expensive.

The main physical properties of SGNR include its self-reinforcing character, its capacity to impart high hardness, tear resistance, modulus, tensile strength and abrasion resistance of rubber products, high impact strength and glossy finish to mouldings.

The most important application of SGNR is in footwear compounds. Products such as M.C. and Hawai soles and Banwar (Kattai) sheets are presently being made by blending NR with a special grade of styrene-butadiene rubber (SBR 1958). It is found that SBR 1958

can very well be substituted with SGNR in the manufacture of these products. The properties of Hawai soles made with SGNR are found to comparable to, if not better than, those prepared using SBR 1958.

The present consumption of SBR 1958 in India is estimated as 30000 tonnes per annum, most of which is being imported. The prevailing price is in the range of Rs. 70 per kg. while the cost of production of SGNR at the prevailing prices of raw materials and using the radiation process is only around Rs. 56 per kg. Even with taxes and duties, the price of SGNR could be lower than the prevailing price of SBR 1958. As SGNR contains 50 per cent of NR it is possible to increase consumption of NR by 15000 tonnes if the entire quantity of SBR 1958 is replaced with SGNR. Apart from achieving savings in foreign exchange we could also promote export of footwear from the country, by making available a critical raw material at a price advantage.

EPOXIDISED NATURAL RUBBER

Reaction of unsaturated organic compounds with peroxycarboxylic acids results in the introduction of a three membered ring structure known as epoxide. When NR reacts with performic acid under suitable reaction conditions, part of the isoprene molecules is converted into epoxide and the resulting product is called ENR. The properties of the material depend very much upon the extent of epoxidation and the level of side reactions, which could be controlled by regulating the reaction conditions.

The most important properties of ENR are improved solvent and oil resistance, reduced air permeability and high strength. Apart from this, this modified form of NR possesses the unique combination of low rolling resistance and high wet grip, which is not normally observed in any single rubber. Because of this unique characteristic, it is believed that ENR with about 25 per cent of epoxidation could function as the best rubber for making tyre treads. It can also be used in products such as cycle tubes, pharmaceutical and food contact applications and high damping engine mounts. Of late, it is observed that ENR can also act as a modifier in rubber compounds reinforced with precipitated silica.

NEW USES FOR NR

Various new applications where NR could be considered, include rubber in roads, as binder in paper, for soil stabilisation, manufacture of slow release fertilisers and also as speed bumps in roads. An area of application which has immediate potential under Indian conditions is rubberisation of roads. This has been attempted in the country on an experimental scale right from early 1970s. But the process was used mostly by small contractors and the process of mixing rubber with bitumen was carried out at the work site. When rubberisation is done at the work site, it is very difficult to maintain consistency in quality. It also leads to high energy and labour cost apart from problems such as resistance from workers and necessity for adding kerosene for viscosity control. The best way to implement the programme is to make rubberised bitumen in the refinery itself so that the process could be attempted in a much larger scale under strict technical supervision and with a number of other technical advantages. If premixed bitumen is available to road engineers, the material could be used just like normal grades of bitumen. As the quality of bitumen currently being used for road making is inferior and as rubberisation improves critical quality, parameters of bitumen including elastic recovery, penetration value, etc. the process of rubberisation will improve the performance of roads significantly and the average life of the road surface is observed to be higher by at least 50 per cent. The total quantity of bitumen produced in the country is approximately 1.4 million tonnes and if the entire quantity is rubberised with 2 per cent rubber, the consumption of NR will be raised by 28000 tonnes.

– **Paper presented at the 106th UPASI Annual Conference held in Coonoor in September, 1999.**