

LATEX CONCENTRATE IN SOUTH EAST ASIA: DEVELOPMENT, PRODUCTION AND SHIPMENT

BY

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MALAYSIA

There has always been an interest in latex as a source of liquid rubber. Malaysia first started to export liquid latex as a 38%wt DRC concentrate in the early 1930s in 4 gallon flat tins. This production was achieved by reducing the tapping intensity of high DRC areas to give a 38%wt DRC latex. After the war the major plantation companies (Guthrie, Dunlop, Harrison and Crosfield, Ulu Tiram Manufacturing, MAP, Kulim, Sime Darby, Kuala Lumpur/Kepong and some years later Lee, Latex, Tropical Produce, MARDEC and FELDA) established the much more technical procedure of making latex concentrate and the factories producing the concentrate were all managed by the leading technologists available from the RRIM and from industry. Almost all of these companies established bulk installations and had facilities to export in bulk or in drums, most from Port Kelang and a few from Singapore and Penana.

The RRIM carried out continuous development of the creaming process, the centrifuging process and particularly on latex preservation. They also negotiated latex specifications with consumers through the ASTM and BSI before SIRIM, the Malaysian Standards Institute was formed. This work led to the identification of preservation problems and to many new preservatives. High Ammonia latex was developed, using 0.7%wt ammonia (not less than 1.6%wt on the water phase) followed by low Ammonia latices 0.2%wt ammonia plus 0.2%wt of SPP (sodium pentachlorophenate) 0.24%wt ammonia with 0.2%wt Boric acid as the ammonium salt; Sodium diethyl dithio carbamate (SDC); ZDC - the zinc salt; literally hundreds of different preservatives were tested covering accelerators, rubber chemicals, bacteriacides etc. Many bacteriacides have harmful side effects and their use has been discontinued under the stringent present day health rules of the FDA and their counterparts in Europe. Nadarajah supplied an impetus to the use of TMTD/Zno which has become the most widely used secondary preservative with ammonia. This work of identifying preservatives which do not give rise to nitrosamines or other noxious breakdown products has continued and at anytime new compounds may be brought into use.

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Malaysia produces creamed latex, centrifuged latex, vulcanized latex and others. This is done on various scales and only when the producer is in direct contact with the consumer.

You will note from the production statistics that Malaysian production has continued to increase steadily but they do not give full details of its diversity. There has been a Latex Sub-Committee of the Rubber Producers Council which has met monthly for thirty years to discuss and formulate views on technical matters for the industry as a whole. Shipment in bulk and more recently in large bags in containers and crates in containers have been developed to avoid the need for drums and to cheapen distribution costs.

Malaysian production increases at a rate of about 20,000 t per year with an increasing amount being directed into local production plants. The average Malaysian latex concentrate factory has about 20 centrifuges and can process field latex from up to 60 miles from the factory. Exceptionally it may be brought from much further afield but Malaysian practice does not match that in Thailand where field latex may be carried by road for as much as 1000km and kept, frequently for ten days and often for more, before centrifuging. This long storage is not recommended but it illustrates the possibilities when using the newer preservatives.

In Malaysia concentrated latex is matured in the producing factory for ten days before shipment to port installations and one major company has sufficient storage for 30 days production. At the port installation, after a period of at least 21 days the concentrate is shipped or drummed. Thus the overseas consumer receives a matured latex which does not change its properties after compounding. This leads to knowledgeable local consumers requesting storage of 28 days before delivery to their factory, although 21 days is sometimes acceptable.

Last year when prices rose under pressure from shortages and speculation Malaysian producers supplied latex against low price contracts but when prices fell large scale defaults occurred to nearly 100,000 t DRC. This has thrown the market into disarray, not only for latex, but for other grades also. Marketing is the weakest aspect of Malaysian production but even so it is far ahead of Indonesian, Thai and Sri Lankan procedures.

INDONESIA

The latex industry in Indonesia is split between estates and smallholders. The estate sector consists mainly of Indonesian Government Estates (ex Dutch estates) with some private estates of US, British and French ownership. From a total of 3,075 thousand hectares planted with rubber in 1988, 287 thousand hectares are managed by Government - owned estates, 241 thousand hectares by large private estates and the balance of 2,547 thousand hectares (82.8% of the total) are smallholdings of 1 - 5 hectares owned by small farmers.

The policies guiding the industry in Indonesia are:

- a. Rubber development is emphasized with regard to the smallholder and estate development is directed to support smallholders.
- b. Rubber development is implemented through the main activities of rehabilitation, replanting and expansion.
- c. The entire chain of activities from planting through processing and marketing are integrated in a package.
- d. Rubber processing is done on the farm or in the villages in order to realize a higher return for the farmers and villagers outside the project areas.

Much of this work is financed by the World Bank under the Nucleus Estate and Smallholder (NES) Scheme. This scheme unifies farm activities with the improvement of the socio - economic status of the participants and is supported by a management system which integrates production, processing and marketing activities by utilising estate companies as nuclei in a cooperative undertaking mutually beneficial to both the farmers and the estate companies. The scheme is used in various projects -- foreign assisted NES and purely government funded NES for local farmers and for transmigrants.

There is also an Estate Companies Scheme, this scheme is directed at enhancing the role of investors to develop large scale companies which may take the form of government owned enterprises, private national companies or foreign joint venture companies.

In 1988 the percentage production in Indonesia was as follows: Smallholders 71.4%, Government Owned estates (PTPs) 17.1% and Large Private Estates 11.5%

Production facilities are mostly block rubber factories but the Government and Private Estates do produce latex concentrate. There has been considerable progress in Indonesia and the hectareage under rubber has increased over the past ten years as follows:

	1979	1988	1989
Smallholders	1 926 000	2 236 000	2 547 000
Government estates	187 000	241 000	287 000
Private estates	271 000	231 000	241 000
Total	2 284 000	2 708 000	3 075 000

The 1989 values are an estimate, possibly optimistic but still impressive. The increase in production is as follows - in 'Thousand Tonnes'

	1984	1988*
Smallholders	704	835
Government estates	208	200
Private estates	121	135

* Not final but substantially correct.

The number of factories producing rubber in Indonesia is as follows capacities in thousands of tonnes.

	Sheet Factories	Capacity	Crumb Rubber Factories	Capacity	Centrifuged Latex Factories	Capacity
Govt.owned Estates	129	737	25	458	9	182
Private Estates	164	660	129	2 817	4	129
Processors (Remillers)	42	1.45	85	2 948*	-	-
Total	335	1 398.45	239	6 223	13	311†

* Licensed capacity

† This is a maximum capacity assuming unlimited supplies of field latex.

Thus the total capacity is 7,932,450 t which indicates the degree of flexibility in the Indonesian industry which can cope with considerable variation in requirements. It has recently taken a considerable step forward in upgrading specifications (which are now more severe than the SMR specifications) and implementing their strict enforcement to prevent poor quality rubber being produced. It remains to be seen how well this can be implemented but standardisation of factories under World Bank guidance is taking place rapidly.

Returning to latex concentrate the very active steps taken with dry rubber will undoubtedly be applied to latex concentrate - where all producers have increased the number of their centrifuges during the past year. Centrifuged latex is produced on 9 Government owned estates and by 2 private producers - Goo-dyear Plantations and Bakri Brothers (late Uniroyal) PTP XI and IX, one in Sumatra and the other in Java plus 7 others produce concentrate and the production figures show a steady increase. A new latex factory is being built in Kalimantan.

In Indonesia almost all field latex is preserved with ammonia only and is a good source of TMTD/ZnO free concentrate. The quality is good and except for local consumption in Java almost all is exported in bulk through 3 installations in Belawan - the port for Medan in North Sumatra. Bakri Brothers produce mainly creamed latex. Shipment of latex from Belawan is mainly to USA and to a lesser extent to Europe.

Thus we see that Indonesia has not suffered from the overproduction of 1988 but on the other hand there has been no manufacture of dipped goods for export because of a lack of incentives for such manufacture such as are given in other countries. However with production increasing at a rate of about 50,000 t a year Indonesia, together with Thailand, is poised to overtake Malaysia as the major rubber producer and could also easily increase its production of latex concentrate.

THAILAND

In 1983 there was no export of latex concentrate from Thailand. There were six factories all of which sold ex factory gate and did not know where in Thailand it was used. The factories in operation were.

	Place	No. of Machines	Type of Machine
Thai Rubber & Latex (TRL)	Klong Ngae	5	1977 Alfa Laval or older
Thai Rubber & Latex (TRL)	Ban Kratchet	5	...ditto....
Rubber Estates Organisation (REO)	Nabon	3	Alfa - Laval LRH 410
Two factories	Rayong	2 each	V. small Japance units
Teck Bee Hang	Rayong	1	1977 - Alfa Laval

Total annual production ca 400 tonne

After Ansell initiated the building of their factory near Bangkok production of latex concentrate increased in some of the above factories but also

many new factories were set up. At the present time there are at least 49 centrifuge factories in Thailand. Money was made available for the construction of these factories, particularly by the Thai Farmers Bank, almost overnight and certainly within a week of application. Many of the people granted loans had insufficient knowledge of centrifuge operation and the determination to build factories - although laudable at first - led to over construction and excessive competition for field latex.

Thailand is fortunate in having established first class planting and replanting programmes, helped by Mr Lim Poh Loh who was previously the manager of the RRIM Experiment Station and the manager of Malaysian Rubber Development Sendirian Berhad. Mr Lim initiated the highly successful method of collecting smallholders' latex in Malaysia but otherwise MRD was less satisfactory and was taken over when the Malaysian Rubber Development Corporation (MARDEC) was formed. The ORRAF organisation in Thailand is largely responsible for the average annual increase in rubber production of about 50,000 t. This year (1989) production in Thailand has reached about 1,000,000 t. 80% of the new plantings are RRIM 600 - a dangerously high percentage - but other clones are available including GT 1 and some of the newer PB clones. The difference between Thailand and other producing areas is that all Thai production is from smallholders except for a few estates. The Rubber Estates Organisation (a Government organisation under the Ministry of Agriculture) has three approximately 5,000acre, estates in Nabon and Klung Yan in Nakhon Sri Thammarat Province and a small estate of less than 1000acres in East Thailand near the Kampuchean border. Chin Teck has estates in Phuket and Pnangngah of about 10,000acres otherwise estates are mostly family groups of about 20 - 50 acres with the occasional larger estate up to 2,000acre. By Malaysian standards the latter would not be considered large enough to have their own factory. Latex is collected from the smallholders by agents who use second hand drums (200:1)

latex drums (200:1) and all field latex is preserved with Tetra Methyl Thiuram Disulphide (TMTD) and Zinc Oxide (ZnO) 50:50 at a level of 0.025%wt on field latex together with 0.4%wt ammonia added as a 10% solution or as gas. The preservative is added to the drum (or bowser) in the factory and the agent fills the drum with latex and brings it back to the factory. The drum is rinsed out and re-used after adding the preservative. The drum is discarded once about 15kilo of coagulum builds up. Despite these horrifyingly bad

conditions latex can be stored for several days before centrifuging and still obtain a 0.01 - 0.02 VFA No provided. the field latex is added to the drum very soon after tapping. It is perhaps significant that the factories that collect in bowsers are still operating while many of those collecting in drums have ceased operation during the present period of over production. The filled drums are usually taken to the factory in small pick-ups operated by one man who drives, loads and unloads etc.

The Volatile Fatty Acid Number (VFA No) is an index of deterioration by bacterial action which has taken place in the latex. In latex there are not only bacteria which produce VFAs (e.g. acetic, propionic, butyric obtained mainly from sugars) but others which 'chew up' proteins and other non-rubbers so that the VFA No is only an indication of total bacterial activity and not an end in itself. VFAs do mechanically destabilize latex but they and other compounds produced by bacteria also have a considerable effect on the chemical stability of the latex which in glove manufacture is even more important. There are a number of chemical stability tests but none sufficiently universal for an ISO standard to have been established, despite discussions over 40 or more years. Each consumer has his own methods which depend upon his process. However a low VFA No indicates a low degree of bacterial activity and a low variability.

Magnesium (Mg) ions in the serum (not bound magnesium) as well as enhancing bacterial activity are destabilising agents in their own right. In Malaysia, and particularly in Thailand, there are many outcrops of calcium/magnesium limestone (Dolomite) and in general their soils have a high magnesium level. Magnesium fertilizers are rarely, if ever, used in Malaysia these days and their use has been curtailed in Thailand subsequent to the investigations into magnesium levels in field latex intended for use as latex concentrate. The original use of magnesium as a fertilizer arose from an observation that the Glensiel 1 clone grew well in coastal soils and it had dark green leaves and a high Mg level in the latex. Some planters said that clone liked magnesium and should be given extra, others said not, because it had too much. The argument was solved by replanting with oil palm and Gl 1, like PB 86, is no longer seen in Malaysia. Magnesium increases bacterial action in latex possibly because it may be a desirable nutrient. Latex, flowing down a tree into a none-to-clean cup, collects bacteria to about 1,000,000 per millilitre and these bacteria double every 20 minutes. Thus we have:

TAP

In the cup:		In the bucket:	
Initially	1 million	After 260min	8 192 million
After 20mins	2 million	280min	16 384 ,,
40min	4 ,,	(5hr) 300min	32 768 ,,
(1hr) 60min	8 ,,	320min	65 536 ,,
80min	16 ,,	340min	131 072 ,,
100min	32 ,,	(6hr) 360min	262 144 ,,
(2hr) 120min	64 ,,		
140min	128 ,,		
160min	256 ,,		
(3hr) 180min	212 ,,		
200min	1 024 ,,		
220min	2 048 ,,		
(4hr) 240min	4 096 ,,		

At the collecting point add preservative.

LIFT

It can be seen how much damage may be done by leaving the latex without adding the preservative - this is the most common cause of a high VFA No in the final concentrate.

It would be best to add the preservative to the tapping cup but the tapper cannot be controlled. Also, addition before the Metrolac DRC is measured is resisted by the tappers. We need a new field method for measuring DRC which is accurate and not subject to variation with variable DRC and with variable viscosity.

Let us return now to magnesium levels in latex concentrate. We find that good latex contains, in the serum 30 ± 10 parts per million (ppm) on total solids (TS) i. e. 20 ± 10 ppm on TS tested by the normal titration method. This method estimates Ca^{++} as Mg^{++} hence the positive level of Mg. The Mg is controlled by the addition of DiAmmonium Hydrogen Phosphate (DAHP) which has the formula $(NH_4)_2 HPO_4$



1 part of Mg^{++} requires the addition of 5.5 parts of DAHP to precipitate it completely

If the magnesium content is above the level given earlier then instability from an excess of Mg ions occurs and if below and if DAHP is added then instability from an excess of PO_4 ions occurs in the same way as for Mg. Thus the necessity for controlling the amount of DAHP added is obvious. In Thailand field latex commonly contains 200—400ppm of Mg and exceptionally 1500ppm. In fact it was thought that the latex from this latter supplier would not be suitable for the manufacture of gloves. However the correct treatment was worked out and applied and controls initiated and this supplier is now a major supplier to the glove industry in Thailand.

It has also been found that if rain follows a dry period then on the next tapping a large increase in the Mg content of the latex occurs - often in excess of 50%. A latex which normally has 500ppm Mg in the serum will be found to have a Mg content of 700 - 800ppm. Hence continued vigilance and control of the addition of DAHP is necessary to give a uniform product. Those who do not exercise this control go out of business. This has happened in Thailand when a period of over-supply occurred, the unsatisfactory producers have stopped production or become bankrupt.

The technical assistance given to the first 20 or so producers in Thailand enabled those truly interested to make good quality latex from smallholders rubber - despite difficulties with collection of smallholder latex and with the high magnesium levels which are probably far in excess of the worst levels found in Sri Lanka. There are still problems in Thailand, mostly centred around marketing and in DRC stock control in the factories where losses of up to 4% can occur. This is one of the main causes of factories shutting down in Thailand. However, have no doubts, Thailand will bounce back and overcome these problems and it will remain a major producer of latex concentrate. Another major problem in Thailand is in tapping, when too much bark is taken off (20inches/year), here in Sri Lanka you do not have this problem.

SRI LANKA

In his paper "The Production of High Quality Centrifuged Latex in Sri Lanka for Dipped Products Manufacture" Nadarajah gives the history of latex concentrate in Sri Lanka, In 1954, 1955 and 1956 Dunlop produced and exported 5,088, 4437 and 3158 tonnes of centrifuged latex. They purchased the field latex based on RSS 1 but the RSS price was artificially high

(about 30 rupee cents over world prices) due to the special arrangement whereby Sri Lanka sold RSS 1 to China at rates above the world price. The Dunlop factory closed in early 1957.

Concentration of latex by evaporation was carried out by Revertex at Nakiadeniya Estate for a number of years but this ceased in 1968 when the factory was closed. Revertex has expanded elsewhere and their most recent factory, commissioned about a year ago, is not far from Medan in Sumatra, Indonesia.

Nadarajah points out that there has been no significant export of latex concentrate from Sri Lanka since 1968 although there has been a steady increase in production to meet local demand. Production of latex concentrate since 1970 is shown in Fig together with the drop-off in total NR production. The projected increase in demand for latex concentrate after 1989 should be noted - this increase is due to established small industries expanding and to the presence of a major multinational glove producer. It could be noted here that the same company was the first major glove manufacturer to start production in a major rubber producing area namely Malaysia. Within a few years thereafter eight other multinationals established themselves in that country.

Returning to Sri Lanka Nadarajah gave details of present producers as follows:

Organisation	100g/hr Centrifuges	Potential tonne DRC/yr	Source
JEDB Vincit Estate	3	1 500	Estates
Dipped Products Sri Lanka Corporative	3	1 500	Estates & Smallholders
Industries (Union-Ltd)	1	200	Smallholders
Sri Lanka Rubber Manufacturing Co	1	200	Smallholders
Glenross Co Ltd	1	200	Estates & Smallholders
Totals	9	3 600	

It is probable that in the next 12 months production of latex concentrate will double thus, confirming Nadarajah's view of the great potential for expansion in local dipped goods manufacture. He points out that the best latex for producing latex concentrate is that from estates and this was generally accepted elsewhere until the establishment of MARDEC in Malaysia in 1971.

This government rubber development corporation, run as a business enterprise, showed that smallholders latex was equally as good as estate latex if processed correctly. This can be done in Sri Lanka if an understanding of the proper procedures can be taught to the primary producers and control methods instituted. It took about ten years for the system to be completed and entirely accepted by smallholders in Malaysia. Lower DRCs and higher sugars, while serious, can be overcome as also can adulteration, by strict control coupled with fair prices. In 1954 Martin Collier reported that the clone PB 86 can give 5 to 8 times the Mg content normally found in Malaysia and at that time it was thought that the concentration of magnesium in the latex was a clonal property. Our experience in Thailand has thrown much light on this problem and the levels encountered here would not be expected to cause problems if proper treatment is carried out. PB 86 is very variable as far as Mg content is concerned but all that is required is an understanding of the problem and the correct daily treatment of the field latex. There have been several failures in the latex consuming industries in Sri Lanka, due to a lack of understanding of the properties of fresh latex concentrate compounded by the selection of less than satisfactory processing equipment and methods. It is hoped that these problems will be overcome from now on. It may also be said that Sri Lanka has not had to face the trauma of massive expenditure on centrifuges and factories followed by overproduction and slump-conditions as has happened in Malaysia and Thailand during the past two years - these problems were compounded by excessive glove production and failure to produce to accepted reject levels.

In Sri Lanka an increase in production should now continue and in a regulated manner. It will be interesting to come back in one year's time and see if our progress has not been substantial over the intervening year.

MARKETING OF LATEX SINCE 1987

Until 1987 latex concentrate usually gave a return to estates of a few cents better than RSS 1. On one occasion in 1977 I examined all the accounts of a large plantation group for the period 1971 - 1976 and I found that Latex concentrate was 5 cents/kilo more profitable than other latex rubber types and grades (i. e. SMR 5L, 5CV, RSS, RSS TM, ADS, Thin Pale Crepe (TPC), Sole Crepe (white and honey) and others) Only on one occasion, and then only for a brief spell, had latex become less profitable than RSS until 1987.

Production in Malaysia continued to increase steadily, production continued in Liberia and Indonesia and the increase in Thai production was taken up without problems.

At the end of 1986 world conditions showed two major changes. The first was the spread of the AIDS virus which caused alarm in the USA and concern in many other areas. Large orders for rubber gloves were placed with producers world wide and a temporary shortage developed. China received large orders from the USA and inspection was not overstrict on the premise that gloves with holes were better than no gloves. A typhoon struck Hainan island in late 1986 and blew down a large area of rubber trees. Field latex in China is used to produce latex concentrate - total production being some 300,000 t. Outside China it was not immediately apparent that a severe Latex shortage was developing there and production and marketing carried on smoothly until late February 1987 when China entered the market to buy large quantities of latex. It so happened that stocks in Malaysia were somewhat lower than was normal in February but not abnormally so for that time of year. In Malaysia and Sumatra production usually falls to about 40% of average for two months at that time and stops altogether for a month in Thailand, Vietnam and China. China offered to buy 1000-2000 tonne per month for 12 months when there was only a very reduced quantity of concentrate available for the next 2-3 months. The only possible place that could have supplied the extra production was Java but the State Plantations were unable to change their production quickly enough to take advantage of the situation. Then the speculators descended and all kinds of orders were signed at excessive prices. Prices only go up to those heights (as much as \$5 premium) when there is no latex available for sale. The prices held up until latex began to flow again in May, June and July and once it became available prices tumbled, accelerated by defaults on contracts which in Malaysia alone reached 95,000 t dry weight. These defaults were mainly from Taiwan, Japan and Korea.

Because, when concentrate prices were high, latex was diverted from other latex grades such as RSS, ADS and SMRL and CV the premiums on these grades went up and consumers normally using them to cheaper grades or to synthetics. They have not yet come back and may never do so.

With concentrate prices high everyone wanted a latex factory and the number of centrifuges delivered or irrevocably committed from 1st January 1987 to 31st December 1989 are capable of doubling world production of latex concentrate from about 350,000 t to almost 700,000 t. The utilisation of these machines

has been calculated as being about 50% in Malaysia, that is actually producing 10hrs/day 360 days/year and 33 1/3% (6 2/3hrs/day) in Thailand. Thus the potential increase given is a conservative one.

In Malaysia and Thailand the only thing better than a centrifuge factory was a glove plant and salesmen from China, Taiwan and Japan descended selling glove plants to many people who should have known better. The Malaysian Industrial Development Authority licensed 400 new glove plants 200 of these never got under way and of the remainder 100 never found a market and 70% of the rest have equipment which will not compete with established producers and so inevitably face bankruptcy. At an estimate the efficiency of new glove producers in Malaysia and Thailand is only 95% and new latex concentrate producers in Thailand ran with a loss of some 4% of rubber. Of 49 new concentrate factories in Thailand only 8 are operating at present.

To continue the story, the large numbers of glove factories springing up in Malaysia and Thailand did not receive their expected orders and consequently reneged on their latex contracts thus increasing stocks of concentrate still further making it uneconomic to continue selling field latex in Thailand and smallholders went back to RSS production. In Malaysia crepe production has almost ceased-I know of only two producers and of the possibility of one major producer restarting production. In Thailand the interest in producing crepe as an alternative to concentrate is considerable. The increase in production of RSS tends to depress the price of RSS and meanwhile, in Malaysia, the larger estates no longer have an alternative to concentrate production and so have continued to produce and with storage full (and there is very considerable storage capacity for shipment in bulk) a 'must sell' situation developed during recent months Drummed latex sold as low as 8cents over RSS-1 and the drum costs some 38cts/kg nowadays, production costs are about and the loss on skim some 36cts/kgDRC. Thus latex has sold down to 43cts/kg below break even point compared to RSS 1 at a production cost of 24cts/kg.

We can see that, at present, prices on the rubber market are still in disarray but are slowly re-establishing the traditional ratios between grades. Once again, as producers, to a greater or lesser degree we have fallen victim to the speculator, our own greed and particularly to an inefficient marketing system.

VARIABILITY

The main problem with natural rubber and natural rubber latex is its variability of behaviour. We are considering latex at present and in Malaysia about half the latex concentrate used and exported is in bulk and half in drums.

The minimum size for concentrate storage tanks for producers in Malaysia is 20,000 gallons (100,000 litre) and at a port installation tanks of up to 60,000 gallon horizontal and 500 tonne vertical are in use - this gives additional room for blending. Blending occurs again when loading a ship and tanks of 500 tonne capacity are becoming common. Bulking in the shore installation also ensures blending. With drum latex the small size of the lots requires more control in the producing factory. At the IRSQ this year the keynote speakers all dwelt on uniformity and the panel discussion highlighted the need for a meeting of minds on the quality of elastomers required and a decision to convene meetings of appropriate interested bodies from both producing and consuming areas. The aim of these meetings would be to try and resolve the vexing questions of quality, consistency and processability of elastomeric materials.

Here in Sri Lanka we are probably one of the last major producers to understand this need for uniformity and for taking steps provide uniform products to consumers. This must change or the rubber industry will slowly slide into oblivion.

CONCLUSIONS

The production and marketing of rubber is going through a period of considerable change. Latex concentrate production has received more attention in recent years because of the advent of AIDS. The attention of large dipped products manufacturers has been drawn to the latex producing areas in order to avoid high transport costs. There is also the availability of relatively cheap labour in some producing countries and they also provide incentives to attract new manufacturers.

There have been considerable strides in production of latex concentrates suitable for modern processing in some countries and knowledge of these new materials is spreading rapidly.

Sri Lanka is poised to expand its manufacture of latex products and it is to be expected that advances will be made in improving the competitiveness of Sri Lankan rubber over the next few years.