

RRIM

NATIONAL WORKSHOP ON LATEX AND LATEX PRODUCTS PROCEEDINGS

Rubber Research Institute of Malaysia



PROCEEDINGS OF THE
NATIONAL WORKSHOP ON LATEX AND LATEX PRODUCTS 1983
KUALA LUMPUR

A report of the Proceedings of the
National Workshop on Latex and Latex Products
held in Kuala Lumpur from 14 to 15 October 1983
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PREFACE

This first *National Workshop on Latex and Latex Products* held on 14 and 15 October 1983 for the benefit of latex suppliers, latex product manufacturers and R and D personnel of both the RRIM and the Tun Abdul Razak Laboratories in UK is in recognition of the growing importance of Malaysia as a manufacturer and exporter of all types of latex products. The significant increase in consumption of NR latex from about 6000 tonnes annually in the early seventies (largely for foam production) to a figure of about 25 000 tonnes in the early eighties represents a good start towards Malaysia achieving a state, perhaps in the nineties, when a significant portion of the 200 000 tonnes of latex concentrate exported would be consumed locally.

The two major objectives in holding the Workshop were:

- To bring together research, production and marketing personnel to identify existing problems and to increase the volume of NR latex consumed locally
- To promote the free exchange of information and ideas among the technical personnel in the latex industry.

The conduct of the Workshop and restricted attendance were designed to maximise discussions among the participants. Papers prepared were kept brief and authors, in presenting their papers, acted largely as discussion initiators. There were no separate sessions within the two-day Workshop and there was only one Chairman throughout in order to ensure continuity and facilitate informal discussions.

Joint-venture companies are a major component of the Malaysian latex products sector and they have been most successful in the export markets. However, in these joint-venture companies where the foreign partner is largely responsible for technology (developed in their home R and D units), marketing and in some cases capital, there is some reluctance on the part of the production personnel to engage in free discussions. Such an attitude may be beneficial to the individual company in the short-term, but there are surely long-term repercussions. The Malaysian raw rubber processing sector in the initial stages of development of the SMR Scheme was equally secretive but these attitudes changed quickly on discovering the common benefits of sharing technical improvements and discussing problems. The quantum of discussion contributed by the manufacturers is seen as a signal for a similar change leading to freer discussion on materials, process development and improvements which will lead to a healthy Malaysian latex products sector. The publication of these Proceedings will be a further contribution to uplift the state and improve exchange of information in this important sector of the Malaysian rubber industry.

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Opening Address

Y.B. TAN SRI DR B.C. SEKHAR

*Controller of Rubber Research and Chairman,
Malaysian Rubber Research and Development Board*

Ladies and Gentlemen, I was told this meeting was to be a workshop but when I look around at the arrangements, it almost looks as though we are having a second conference after the International Rubber Marketing Conference before moving on to the Planters' Conference. However, I am confident that you will have a very close and thorough discussion of the problems of the latex industry. The primary purpose of having this workshop must be clear to most of you. But perhaps I should mention a few of the factors which dictate the need to bring the three sectors together, *i.e.* the producing industry, the manufacturing sector and the R and D institutions.

The first of these factors is, of course, the identification of the industrialisation-drive based on the latex concentrate industry. In the past few years, there has been an almost explosive expansion in certain areas of manufacturing activities using latex in this country, leading to Malaysia becoming one of the world's top-most producers of gloves and a few other items. If you look at the handout-programme, there are no less than twenty-six manufacturers in this country - and this is a significant expansion. They are now demanding new technologies, new services and dictate certain requirements in terms of the types of concentrate that need to be produced. The government has, at the same time, declared this decade as a period where there should be concentration of efforts on resource-based industries. It is expected that the new budget for this year, when it comes through, will not in any way be a disincentive to manufacturers. In fact, it is likely that rubber product manufacturers will be granted more incentives. But, before such incentives can be considered and offered by the government, it is necessary for the manufacturers to review their operations, determine obstacles and inhibitions in expanding their own operations in this country; and with the help of the R and D institutes, and that of the producers, provide a blue print, if you like, for the government to consider.

The second factor is, of course, the market for latex concentrate abroad. There has been an expansion in the production of latex concentrate. There has been increased competition among the producers of latex concentrate, and this quantum of latex is moving into the world market when consumption is in fact shrinking. We have more or less lost the race as far as the foam rubber market is concerned. The use of latex concentrate in carpet backing is diminishing. The freight

cost as far as rubber is concerned has been multiplying in the last few years and is now likely to be increased again by January next year. All these have put latex concentrate producers at a distinct disadvantage. Coupled with this, we have new legislation in relation to what can be added and what cannot be added to exports of latex. The industry was highly enthusiastic in finding a new low ammonia latex in the form of the LA-TZ preservative system. But now suddenly in Europe, there have been questions as to whether this could be problematical because of the nitrosatable amine levels permitted. This undue emphasis on detecting residues in parts per billion is largely the result of pressure from instrument manufacturers who have developed new and highly sensitive detection systems. Fortunately, the data to date shows that the problem is not too serious and that most products made from LA-TZ preservative systems can meet the legislated requirements.

The third factor of importance is the establishment of the RRIM Technology Centre as the main arm of the MRRDB system to provide the back-up R and D services for the latex industry both for the producers and the manufacturers. It has now become necessary to co-ordinate and offer the combined latex and technology efforts of both the MRPRA and the RRIM to the industries in this country. So, we are moving into the next phase of combining the units in UK and units here in the Technology Centre and see how this total effort can be not only co-ordinated but oriented towards the requirements of both the producing and the manufacturing sectors. Now, this cannot be done by the R and D units sitting away from the industry and planning forward. It can only be done by a thorough discussion on what the problems are, what the challenges are, and what the obstacles are. This Workshop should also consider how these problems can be resolved and identify particular services, specific innovations that the two sectors are looking for. This is what is demanded of this Workshop. After the deliberations, it will be necessary for the organisers to prepare a blue print of activities for the next three years for the total R and D system we have under the MRRDB. It will then be evaluated and we shall accordingly arrange our efforts to meet the industry requirements. We will continue to ensure that the back-up services will be adequate to provide dynamism in the move forward towards ensuring that the latex based industry will be one of the foremost leaders of the industrial drive in this decade. There is no reason why this should not be so; our glove manufacturers have already proven this in one field. I believe many of them have experienced returns on investment that may almost be considered vulgar in these times of recession. However, in time, I believe, profits will become more reasonable as competition increases. This is therefore a profitable area that Malaysia must move into in a very effective and a dynamic manner and the R and D should be able to back such efforts.

Opening Address

Having mentioned the factors why this Workshop must be held, particularly at times when the economic climate does not entirely appear attractive, we felt that the urgency of the situation warranted this even at the risk of inconveniencing a lot of people. So, you have a job cut-out at this Workshop and it is important that you sit around the table, put your heads together and explain and convey your facts in their most basic and native form with no 'holds barred' so that everybody understands each other clearly. We could then come out at the end of it with a series of recommendations and these series of recommendations, I can assure you, will be given the utmost consideration by the Board and, I am sure, by the government. If you fail to grasp this opportunity, I suggest that the producing sector will have only itself to blame and so will the manufacturing sector because the Board now acts as the eyes, ears and brain's trust of the government whether it is the Treasury, Trade and Industry, or any other government department which impinges upon the affairs of the rubber producing and manufacturing industry.

I do not wish to expand any further, except to wish you every success in your deliberations. I hope you will find this Latex Workshop not only interesting and stimulating, but that new ideas will also emerge for the benefit of the total industry. With these words, I have the greatest of pleasure in declaring this Workshop open. Thank you.

Closing Address

Y.B. DATO' HAJI (DR) ANI BIN AROPE

Director, Rubber Research Institute of Malaysia

It is indeed an honour and a privilege to deliver this closing address to the first Workshop on Latex and Latex Products held in Malaysia. It seems apparent from the free discussions during lunch and at the Workshop sessions that one of the main objectives in holding this Workshop has largely been achieved *i.e.* that of bringing together and establishing some 'rapport' among the component sectors that have been responsible for making Malaysia pre-eminent in the field of latex production and manufacture. Being the first Workshop the topics of discussion have ranged very widely. Some of the topics discussed were

- Advantages and limitations of using fresh latex concentrate in the manufacture of products. In this I am a little disappointed that there has been no one who has been able to use field latex without going through the expense of centrifuging, creaming or evaporation.
- Likely problems of the newly established LA-TZ latex system. Here the RRIM has another alternative but at a slightly higher cost.
- The threat from synthetics.

One interesting but old subject that was deliberated upon was that of foam products from NR latex. It was generally felt that a promotional campaign in Malaysia extolling its virtues over synthetic foam materials could be productive. There was however not much point in conducting any similar campaign in the developed countries to uplift any lingering demand for NR foam products.

During the Workshop proceedings it was painfully obvious that while the concentrate producers were willing to discuss freely, the manufacturers were less forthcoming. The reluctance on the part of the manufacturers to contribute to the same extent may be ascribed to their fear of divulging too much. In this respect I am reminded of a similar feeling among SMR producers in the early stages of wanting to be secretive about their processes. This attitude was very quickly altered to one of open discussion among themselves and with the RRIM; and I believe this has contributed in no small measure to the strong leadership position that Malaysia has and continues to enjoy in respect of new technologies and quality in the field of technically specified rubbers (TSR).

Leadership particularly in the field of latex concentrate production is something which Malaysia has taken for granted for a long time. The move towards establishing leadership in the production for export of latex products such as gloves, catheters and latex thread is however more deliberate and planned and is now relished fully. With leadership goes a certain sense of responsibility and a 'price'. The responsibility encompasses such aspects as

- Strong and innovative R and D efforts
- Ensuring product quality in existing and new applications.

The 'price' of leadership is the constant pressure to move into higher technology in up-market products while the lower end of the market is eroded by competitors. The strong incursion of Thailand and Sri Lanka into the field of rubber bands (once Malaysia's stronghold) is but one such example.

The ability to cope and progress in the light of constantly changing circumstances is another test for the Malaysian NR industry. The changes that I am referring to are in structure and attitudes and some of these are

- The increasing smallholder contribution to NR production in Malaysia
- Changes in the equity and control in the Malaysian plantation sector
- Demands of a strongly emergent manufacturing sector
- The desire of other NR producing countries to also industrialise and provide competition to Malaysian manufacturers
- The technical challenges in the form of legislation for all sorts of rubber products in terms of toxicity requirements
- The opportunities presented by new innovations such as epoxidised natural rubber (ENR).

Workshops such as this are but one avenue for weathering changes and for emerging stronger as a result of taking advantage of opportunities.

Much has been said and rightly so about the importance of the tyre sector to the Malaysian NR industry. Yet in terms of export revenue from rubber products, it is the light-weight items made out of NR latex that have overtaken the mighty tyre sector. More is expected of this sector and in this respect I can assure the audience that the RRIM and all the related units such as MRPRA are fully committed towards helping you. With these words I declare this Workshop officially closed.

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Availability of Different Types of Latex Concentrates and their Special Characteristics

SHUKRI BIN HJ. AB. WAHAB

Rubber Research Institute of Malaysia, Kuala Lumpur

Concentrated latex accounts for about 14% of Malaysian natural rubber (NR) production. Over 93% of this latex is concentrated by centrifuging. About 3% is produced by creaming and the remaining 3% is produced by other processes such as evaporation. Different types of preservatives are used to preserve these concentrates. Ammonia is by far the most popular preservative for NR latex. Ammonia, however, has several important disadvantages, e.g. smell and pollution. Not surprisingly, the trend is to reduce the level of ammoniation and to incorporate a secondary preservative. The low ammonia preservative systems that have been commercially adopted are sodium pentachlorophenate (SPP), zinc diethyldithiocarbamate (ZDC), boric acid and a composite consisting of tetramethyl-thiuram disulphide (TMTD), zinc oxide and ammonia. Generally, the properties of the different types of latex concentrates are the same but with certain differences reflecting the different methods of concentration and preservation.

TYPES AND PRODUCTION OF CONCENTRATED LATEX IN PENINSULAR MALAYSIA

Standard NR latex concentrates are categorised according to their methods of concentration and preservation. The types of concentrates which are commercially produced in Malaysia are shown in *Table 1*. Centrifuged latex concentrates are readily available from a large number of Malaysian latex concentrate producers (*Appendix A*). Evaporated concentrate is solely produced by the Revertex Co. and creamed latex concentrate is produced mainly by Uniroyal Malaysian Plantations Bhd.

TABLE 1. TYPES OF NATURAL RUBBER LATEX CONCENTRATES
PRODUCED IN MALAYSIA

Type of latex concentrates	Preservatives
Centrifuged concentrate, min. 60% d.r.c.	
High ammonia (HA)	0.7% ammonia
Low ammonia-Santobrite (LA-SPP)	0.2% ammonia + 0.2% sodium pentachlorophenate
Low ammonia-boric acid (LA-BA)	0.2% ammonia + 0.24% boric acid + 0.05% lauric acid
Low ammonia-zinc diethyl-dithiocarbamate (LA-ZDC)	0.2% ammonia + 0.10% ZDC + 0.05% lauric acid
Low ammonia-tetramethyl-thiuram disulphide/zinc oxide (LA-TZ)	0.2% ammonia + 0.013% TMTD + 0.013% ZnO + 0.05% lauric acid
Creamed concentrate, min. 60% d.r.c.	
High ammonia (HA)	0.7% ammonia
Low ammonia-Santobrite (LA-SPP)	0.2% ammonia + 0.2% sodium pentachlorophenate
Low ammonia-boric acid (LA-BA)	0.2% ammonia + 0.24% boric acid + 0.05% lauric acid
Low ammonia-zinc diethyl-dithiocarbamate (LA-ZDC)	0.2% ammonia + 0.10% ZDC + 0.05% lauric acid
Low ammonia-tetramethyl-thiuram disulphide/zinc oxide (LA-TZ)	0.2% ammonia + 0.013% TMTD + 0.013% ZnO + 0.05% lauric acid
Evaporated concentrate	
High solids (min. 72% TSC)	250 m-equiv. KOH + soap
Low solids (about 68% TSC)	250 m-equiv. KOH + soap
High ammonia (about 62% TSC)	0.7% ammonia

All chemical additions are based on weight/weight of whole latex.

Several types of speciality NR latex concentrates are also produced in Malaysia. These are summarised in *Table 2*. Each of these concentrates has certain special characteristic properties which are suitable for specific applications.

TABLE 2. SPECIALITY NATURAL RUBBER LATEX CONCENTRATES

Type	Latex description
High d.r.c. latex concentrate	It is a centrifuged latex with a d.r.c. of 64% - 67%.
Purified (or multiple centrifuged) latex concentrate	It has a low non-rubber content and is prepared by diluting once-centrifuged latex to 30% d.r.c. with water containing ammonia and then recentrifuging to 60% d.r.c.
Prevulcanised latex concentrate	It is prepared by heating a stabilised latex concentrate with dispersions of sulphur, zinc oxide and an ultra-fast accelerator at temperatures of <i>ca.</i> 70°C for about 2 h.
Freeze-thaw stabilised (FTS) latex concentrate (not produced now)	It is prepared by adding small amounts of sodium salicylate and lauric acid to standard latex. The additives enhance the stability of the latex during freezing which regains its colloidal stability on thawing.
Methyl methacrylate-grafted (MG) latex	It is prepared by grafting methyl methacrylate onto NR in latex form. Two such graft polymers (trade names, Heveaplus MG 30 and MG 49) containing respectively 30% and 49% by weight of polymethylmethacrylate, are produced. This type of latex has a reinforcing effect and provides a means of substantially improving the tear and puncture strength of dipped goods.
Low constant viscosity (LCV) latex	It is prepared from specially selected clonal latices and treated with 0.15% (w/w) of hydroxylamine. The increase in rubber Mooney viscosity is reduced during subsequent storage of the latex.

The production and stocks of concentrated NR latex in Peninsular Malaysia from 1978 to 1982 are shown in *Table 3*. The percentage production of centrifuged latex concentrate has remained fairly constant at about 94% over the last five years whereas that of creamed latex concentrate has increased slightly over that of evaporated latex concentrate.

PROPERTIES OF STANDARD LATEX CONCENTRATES

The differences in basic properties between the three types of NR latex concentrates are summarised in *Table 4*. For the majority of latex applications, centrifuged latex gives the best compromise in terms of cost and technical performance. Creamed latex has the advantages of high d.r.c., low content of non-rubbers and high strainability - these properties are useful in latex thread manufacture. Foam from creamed latex showed less fatigue loss and superior tensile strength and elongation at break, but lower compression modulus than similar foam from centrifuged latex. It also blends physically with SBR more satisfactorily than does centrifuged latex. The main advantages of evaporated latex are its high TSC and stability, which make it suitable for highly-filled carpet backings, rubberised coir, adhesives and rubberised roads.

SOME CHARACTERISTICS OF SPECIALTY NATURAL RUBBER LATEX CONCENTRATES

Prevulcanised Latex

Three grades of prevulcanised latex are available. They are classified as low-, medium- and high-modulus grades. Prevulcanised latices are widely used in dipping processes. The principal reason for prevulcanising NR latex for use in dipping processes is convenience - it is easier to vulcanise the latex in bulk than to vulcanise innumerable latex films. In order to optimise physical properties, it is customary to prevulcanise only partially, and then complete the vulcanisation after dipping and drying. Typical vulcanisate properties of prevulcanised latices are shown in *Table 5*. These latices also have low toxicity property.

Multiple Centrifuged Latex

Typical properties of twice-centrifuged latex of the low-ammonia TMTD/ZnO type are shown in *Table 6*. The difference between TSC and d.r.c. is less than half the extent of difference in once-centrifuged latex. Destabilising constituents - non-