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IMPROVEMENTS TO BE DONE IN THE RAW RUBBER INDUSTRY TO IMPROVE OCCUPATIONAL SAFETY AND HYGIENE

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Main steps involved in the manufacture of all grades of raw rubber namely RSS, Latex/Scrap Crepe, TSR and Concentrated latex, are:

1. Stabilization of latex
2. Fractionation and bleaching
3. Acid coagulation
4. Milling
5. Drying/Smoking
6. Bailing and packaging

There are hazardous chemicals used in first 3 steps of manufacture of both RSS, Crepe rubber and Centrifuged latex. Among them the commonest chemicals used are;

(a) Ammonia, Sodium Sulphite and TMTD/ZnO as stabilizers for latex.
(b) Sodium bisulphite and Metabisulphite as inhibitors of enzyme action.
(c) Sodium Paratoluene thiophenate and Tolyl Mercaptan as bleaching agents.
(d) Formic Acid as coagulant (Oxalic and Sulphuric Acid too in very small scale).

It is very important to educate factory personnel with regard to precautions to be taken in handling of each of these chemicals, because it has been seen very often that, without knowing bad repercussions, factory personnel handle these chemicals in careless manner and fall into difficulties quite often.

Chemicals like the bleaching agents are highly toxic and cause many health problems, when the vapour of it is inhaled. In order to eliminate this problem, RRI has converted it into a stable, non-volatile salt which is much more safer to handle. Moreover, there are isolated instances of the use of dangerous oil based chemicals purely due to the low price of it. Bleaching Agent is one of the most expensive chemicals used in the rubber industry and hence the factory personnel try to keep it in their office room for safety. As a result unknowingly they get exposed to the fumes of the thiol. Inhaling over 50ppm of its vapour is injurious to human health.

However, if the factory personnel are convinced that it is a carcinogenic chemical and inhalation of vapour of it can cause severe damage to their health, they will not do so.

The formic acid used in the rubber industry is 85% strong and hence bad handling of it can cause burns and blister formation on the skin. Oxalic Acid used in the sole crepe industry on the other hand looks very harmless; but it causes dermatological problems to the people handling it. However, because of its harmless appearance, people use bare hands to mix it with warm water, which leads to several problems.

In order to minimise the damage done to factory personnel due to inhalation of vapours and chemicals and fillers in rubber products industry, gas masks and gloves are provided in some of the factories. But due to lack of knowledge of the possible repercussions, workers keep away from wearing them in the factory. As a result, there are several cases of health problems often reported from the raw rubber and finished products factories.

Use of highly inflammable solvents in gums without adequate precautions is also a common scene in rubber product factories. Due to a spark generated in the electrical system or elsewhere can cause terrible explosions and fires in such places if precautions are not taken to recover solvent vapours.

Another area where bad practices can cause health hazards to factory people is, the present method of breaking the latex coagulum or collecting scrap in the soaking tank for feeding into rollers. Factories have the habit of employing workers to dip their feet sometimes to the waist level to collect the coagulum in acid water or in the scrap dipping tank where the bacteria infected dirty water is present. It is a common scene in rubber factories to see people with various skin diseases and rotten toe nails due to the action of above toxins on the human body. These problems can be easily eliminated if machines could be developed to automatically collect both these rubbers to feed into mills.

Machinery safety

Safety precautions taken with regard to machines to cover fast moving belts, fly wheels *etc.*, is highly inadequate. In many instances belt guards and fly wheel guards are not reinstalled after removing them once for repairs. They can cause lot of damage to workers.

In two roll mills used for milling rubber, instant break systems are used rarely. In most cases when the safety bar is pressed in an emergency, the rollers travel few rounds before coming to a halt. This problem also cause severe injuries to factory workers in an accident.

Hence, educating factory personnel on the safety precautions and conducting safety drills periodically is essential to prevent this type of problems.

In electrical switch boards, main switch covers, fuse box covers, *etc.*, are seen rarely. When they are removed for repairs, they are never being replaced due to negligence.

Another important exercise to carry out with regard to factory personnel is to conduct classes on maintaining machinery. Usually, a mill is greased or oiled only when the work comes to a complete halt due to break down. As a result, even the normal work and output of the factory is interrupted. But, if regular maintenance is conducted, such setbacks could be prevented easily.

Importance of energy management

This is something that we should emphasize to all factories. This will not only help them to cut down on electricity bills and minimize C.O.P., but also help to minimize the burden on the heavily over loaded national electricity grid. Although RRI has emphasised the need to do this to all rubber producers, only a few have so far gone to the power factor corrections. Load rescheduling in rubber factories is also an essential step for all to follow to minimize the maximum demand. By these two means nearly 35% of the electricity cost could be saved in factories.

Drying of rubber

Improvement of efficiency of crepe rubber factory drying towers is essential to reduce the fuel wood consumption for drying. Fuel wood is becoming more and more scarce and expensive daily and hence the saving on fuel wood is helpful to the factory to reduce C.O.P.

Hence, some improvement must be done to the radiator systems in use in crepe rubber factories.

Rubber factory effluent

Compared to other factory effluents, effluent from raw rubber factories is fairly harmless. It has only some proteins and carbohydrates, most of which under anaerobic conditions produce stinct. But there are no heavy metal ions or other lethal toxins in raw rubber factory effluents. Rubber Research Institute of Sri Lanka has now developed a anaerobic/aerobic coupled biological treatment for both crepe and concentrated latex factories. These two methods are accepted by the CEA as proven methods of treating rubber factory effluents. These techniques are implemented in many rubber factories now. If all rubber factories go for these cost effective effluent treatment methods, the problem will be solved easily within the next few years.

Characteristics of effluent from rubber factories

Parameter	RSS	Crepe	TSR	Latex Concentrate	Dipped Products	Regulatory Standards
pH	4.9	5.0	5.7	3.7	7.2	6.5-8.5
Settlable Solids (mg/l)	50	45	155	100	200	
Suspended Solids (mg/l)	140	130	237	190	241	100
Total Solids (mg/l)	3745	3500	1915	7576	2457	1500*/1000
C.O.D.	3300	3500	2740	6201	2011	400
B.O.D.	2630	2500	1747	3192	1336	50/60*
Ammoniacal Nitrogen (mg/l)	75	80	66	401	126	300*/40
Total Nitrogen (mg/l)	500	550	147	616	180	300*/60
Sulphates (mg/l)				1610	72	1000

* CEA standards Centrifuged latex processing effluent

ISO 9000 Registration for crepe factories

All crepe factories within country numbering over 150 are going to get ISO 9000 registration soon. If this is done, implementation of all the above regulations in the rubber industry will be an easy task.