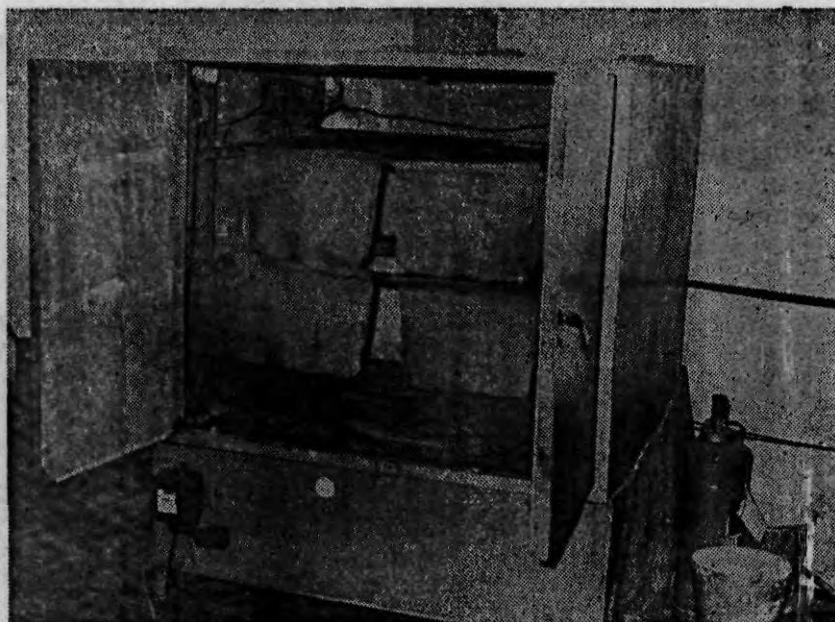


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## DRYING OF SHEET RUBBER USING ELECTRICITY

N Radhakrishnan Nair, E V Thomas & Mathen Parappuram

Although electrical drying systems have already been standardised for drying crumb rubber, a simple electrical drying system for sheet rubber has not been standardised. Solid block rubber is an expensive proposition for small holders. Small holders are drying their sheet rubber either in smoke houses or kitchen hearths. A Suitable drying system is yet to be evolved which could be beneficial to the small growers. The article prepared by N. Radhakrishnan Nair, E.V. Thomas Research Assistant and Dy. Director of Rubber Research Institute of India respectively and Mathen Parappuram of Kedco Dryers & Thermal Systems, Pallom, Kottayam, throws light as to how the new system fabricated by M/s. Kedco Dryers functions.



Important forms of processed natural rubber are; (1) Sheet rubber (2) Solid Block rubber (3) Estate Brown Crepe (4) Pale Latex Crepe and (5) Concentrated Latex. For the processing of first four forms, there is a stage in which heat energy is to be supplied to the processed rubber to drive out moisture. After coagulation and machining, the moisture content will be 10-25% in the rubber before it is fed into the drying chambers or smoke houses. Although electrical drying systems have already been standardised for drying crumb rubber, a simple electrical drying system for sheet rubber has not been standardised. Processing of rubber in solid block form is capital intensive and cannot be adopted by small planters. Small rubber planters of this country are presently drying their rubber

sheets either in smoke houses or over kitchen hearths. Many small holders are not able to set up a smoke house because of the difficulty in providing the recurring fuel requirement. A suitable electric drying system that can be used for drying rubber sheets may find acceptability among small planters.

### Electric Dryer

The electric drying system used for trial purpose was fabricated by M/s Kedco Dryers and Thermal Systems, Pallom, Kottayam. The dryer had internal dimensions of 1200 mm x 900 mm x 900 mm capable of accommodating 90 sheets in 2 layers conveniently. The walls of the dryer was 25 mm thick with heat insulating materials to minimise loss of energy due to dissipation. An exhaust vent

was provided at the top for the escape of humid air. The oven was also provided with a watt-hour meter and a thermostat. Proper care was taken to protect the heating elements from being spoiled by water dripping from the sheets and also to distribute the heat energy uniformly to the bottom layer of the dryer. The cost of the dryer was around Rs. 12,000/-.

### Preparation of Sheets

Field latex was diluted to 12.5 drc and the sheets were prepared by coagulation using formic acid. Sodium bi sulphite was added at a rate of 1.2 gm/kg of dry rubber to prevent discolouration of sheets. The coagulum was pressed down to 3 mm thickness and passed between ribbing rollers. Pressed sheets were

hung in open air for 4 to 6 hrs to drip and then transferred to the dryer. After noting the wattmeter reading, the dryer was set for a temperature of  $60 \pm 5^\circ\text{C}$  inside the drying chamber. After the sheets have completely dried up, final wattmeter reading and the weight of the dried sheets were noted. Energy consumed ie; KW/kg of dry rubber was calculated.

The drying of sheet rubber was carried out under different conditions to study the nature of drying and power consumption.

#### Batchwise Loading

This was similar to drying of rubber sheets in a producers smoke house by loading the dryer upto 1/3rd its capacity on consecutive days. Initially, the sheets were hung at the bottom region and subsequently removed to the top. The drying of sheets was effected under the influence of convection currents within the dryer. Results are given below.

#### Full Capacity Loading

During the second trial, the sheets were charged into the oven in one lot and observations made on the drying process. Results are given below.

#### Properties of The Sheets

Properties of electrically dried sheets were determined and compared with smoke dried sheets prepared from the same lot of latex.

#### Technical Properties

Smoked and electrically dried sheets were compounded in a typical recipe given below and the properties of the vulcanisate so obtained were evaluated in accordance with ISI/ASTM procedures. Results obtained are tabulated below.

#### Recipe:

Natural Rubber	-	100
Zinc oxide	-	5
Stearic acid	-	2
HAF black	-	50
CBS	-	0.6
Aromatic Oil	-	5
Sulphur	-	2.5

#### Energy Consumption For Drying Operation

Date	Wattmeter reading (KW)	Fresh charge into the dryer		Weight of sheets in the dryer
		No. of sheets	Weight (Kgs)	
25.9.1984	210	29	25	—
26.9.1984	229	28	22.5	—
27.9.1984	248	29	18.5	—
28.9.1984	266	—	—	48
1.10.1984	304	—	—	44.2

Energy consumed =  $94/44.2 = 2.13 \text{ KW/kg}$ .

#### Energy Consumption For Drying Operation

No.	Date		Wattmeter reading		Wt. of sheets		Power Consumption (KW/Kg)
	From	To	Initial	Final	Wet	Dry	
1.	9.1.85	14.1.85	822	866	36	21.5	2.05
2.	29.3.85	2.4.85	1042	1094	31	22.5	2.3

#### Raw Rubber Properties

Property	Electrically dried	Smoke dried
Colour . . . . .	Golden	Brown
Volatile matter %	0.5429	0.5801
Po . . . . .	50	46
PRI . . . . .	78	89

#### Comparison of Processing and Vulcanisate Properties

Property	Smoke dried	Electrically dried
<b>Rheometrics (150°C, 3" Arc Model R-100)</b>		
Minimum torque (Range 100)	11	9.5
Maximum " "	86	86
Scorch time (Min)	4	3.75
Optimum cure time (Min)	13	12
<b>Physicals</b>		
Tensile strength (MPa)	23.3	24.9
M-300 (MPa)	10.1	10.5
Elongation at break (%)	598	617
Tear strength (N/mm)	84.7	82.9
<b>Demattia Flexing</b>		
Kcs to (1) Pin head bubbles	14	15
(2) Small crack	24	24
(3) Complete crack	35	35



Evaluation of Drying Cost

No.	Date	Weight of dried sheets (Kgs)	Energy consumed (KW)	KW/Kg.
1	1.10.1984	44.2	96	2.13
2	22.11.1984	47	97	2.06
3	14.1.1985	22.5	44	2.05
4	2.4.1985	22.5	52	2.3

Drying Cost

Consumption of electrical energy for drying/making sheet rubber during different trials is summarised below.

Energy consumed for drying sheet rubber is roughly 2 KW/Kg of dry rubber.

The raw rubber and vulcanisate properties of the sheets are comparable. Electrically dried sheets have a better colour. It is likely that the sheets dried in electrical drying chambers will substitute air dried sheets (ADS) and may fetch a good price if supplied to the market in large quantities. □

INCREASE IN USAGE OF RUBBER

Rubber consumption by the Malaysian rubber products manufacturing industry increased 14.1 per cent to 18,584 tonnes in the third quarter of 1985, the highest quarterly uptake recorded so far.

The increased consumption was a reversal of the decline in the second quarter.

It was also 5.2 per cent higher than the consumption figure in the same quarter of 1984, according to the latest issue of the Malaysian Rubber Review.

Total consumption for the first nine months of 1985 reached 51,796 tonnes, up 1.4 per cent over the same period in 1984 but far below the 10 per cent growth rate needed to meet the target of 300,000 tonnes by the year.

The latex sector accounted for 30.2 per cent of total rubber

uptake followed by the tyre and general rubber goods sector which consumed 26.6 percent and 25.1 per cent respectively.

With the exception of the tyre and foot wear sectors, all sectors maintained positive consumption trends.

Although the third quarter uptake by the tyre sector was higher by 38.2 per cent than the previous quarter, it was 6.6 per cent short of consumption in the same quarter of 1984.

The footwear sector, on the other hand, surpassed the 1984 third quarter consumption by 14.5 per cent but fell 5.1 per cent relative to the second quarter of 1985.

Output

Tyre sales reached \$136.1 million, up 70 per cent from that of 1984 while sales of inner tubes reached \$11.1 million compared with \$9.9 million

reported for the first five months of 1984.

Tyre exports grew 15.6 per cent to \$292.6 million in the first 8 months of 1985 compared with the same period in 1984 while imports dropped 27.8 per cent to \$92 million.

Passenger car registrations were 38.6 per cent below those of the same quarter in 1984 despite the introduction of the attractively-priced Saga, but commercial vehicle registration were up by 39.5 per cent. Malaysian motor vehicle assemblers have lowered their output to about 30 per cent of daily capacity. Two passenger car assemblers have suspended operations because of the slump in the market.

It is believed that the dullness of the market resulted from the general economic situation which had not improved much, the review said.