CREAMING OF SKIM LATEX AS A PROCESSING OPERATION IN LATEX CENTRIFUGING INDUSTRY

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INTRODUCTION

Skim latex is a by-product of latex centrifuging industry. When field latex is concentrated by centrifuging, about 15% of the total rubber goes into the skim fraction. The DRC of skim latex generally varies in the range 4-6%. Skim latex is constituted by very small rubber particles, with high specific surface area. Hence the level of absorbed non-rubber materials in skim latex will be much higher compared to field latex or centrifuged latex. The proportion of water in skim latex is also high. This results in the presence of high proportion of water soluble components also. In additiion, some suspended non rubber materials are also present in skim latex. Thus the content of absorbed, soluble and suspended components together, make the non rubber solids content in skim latex much higher, compared to field latex. The normal range of non rubber materials is in the range 5-10%. The present practice of recovering skim rubber is coagulation with sulphuric acid.

The small size, high level non rubber materials and some pro-oxidants like copper, make skim rubber technologically inferior

Seminar on Latex Processing and Pollution Control, 4 Oct 1996. Dept. of Processing and Product Development

compared to normal rubber. Several attempts have been made to upgrade the quality of skim rubber (1-3). Among the various methods, suggested for this purpose, the creaming process, reported by Thomas and Jacob (3), seems to be simple and can be adopted by latex centrifuging units. This paper describes the results of some factory level trials on creaming of skim latex.

CREAMING OF SKIM LATEX

Preparation of Creaming Agent solution

Tamarind seed powder (TSP) was used as the creaming agent. It was made into a slurry with water, sieved to remove any coarse particles and diluted with enough water to get 5% solution. The solution was boiled for one hour and cooled. While boiling, the water being evaporated was compensated.

Creaming process

Creaming of skim latex, obtained from both HA and LA field latex was carried out. The creaming agent was added to the latex to the extent of 0.7% on the wet weight of skim latex and mechanically stirred for half an hour. Soap, which is normally added in the creaming of field latex was not added, as enough soap is present in skim latex. Skim latex was allowed to cream for 48 hours, by which time creaming had reached a stand still.

Coagulation of skim cream

Samples of skim cream were tested for DRC and TS. Cream was manually deammoniated by stirring in an open tank and then coagulated. For all coagulations, 25% sulphuric acid was used. The serum, left behind on creaming was manually deammoniated and the acidified serum, obtained in coagulation, were mixed to get the final composite effluent. Raw skim latex, was manually deammoniated and coagulated with 25% sulphuric acid. This was used as the control. Table 2 gives the quantity of sulphuric acid used for processing 200 kg. skim latex.

RESULTS AND DISCUSSION

DRC and Non Rubber solids of skim cream

Table 1 shows the DRC, TS and NRS of skim latex and skim cream obtained from both HA and LATZ preserved latex. The results in this table shows that the skim cream had a DRC in the range of 20-25% and NRS in the range 2-3%. The NRS is almost comparable to that in field latex. The results in table 1 show that there is considerable removal of NRS on creaming. The DRC figures of skim cream reported here are much less, compared to the values reported by Thomas and John (3). This is believed to be due to the low DRC of skim latex.

The results obtained from skim latex of HA and LA field latex are comparable.

Consumption of Sulphuric Acid

The volume of skim cream, obtained on creaming skim latex is only 15-20% of the total volume. Table 2 gives the quantity of sulphuric acid consumed. The low volume of cream, and the enhanced rubber content, compared to raw skim latex are the reasons for the low consumption of sulphuric acid. Comparison between HA and LA systems shows that, acid consumption is low for the LA cream, due to the relatively lower ammonia content.

Nature of coagulum

Skim cream on coagulation results in instantaneous coagulation and a coherent coagulum is obtained, whereas in the raw effluent coagulation is slow and discrete particles are formed. It is believed that during creaming a portion of the absorbed materials at the rubber serum interface are removed, so that particle agglomeration is easy, resulting in cohorent coagulum.

Volume of Effluent Generated

The volume of serum fraction of the lattices are increased by 28 lit. for every 200 l. (one barrel). It is found that direct coagulation of LA skim results in a reduction of the effluent volume, while for LA skim cream, HA skim cream and raw HA skim finally generate effluent of comparable volumes.

Economic Aspects of Skim Creaming

Additional cost factors involved in

skim creaming, over and above normal processing per tonne of skim are given below.

	Rs.
1. Cost of creaming agent	56
2. Cost of firewood	8
3. Labour for creaming	10
4. Compensation for 2% rubber being degraded as trap rubber	8
Total	82

Savings on creaming

	LA(Rs)	HA(Rs)
1. Sulphuric acid	24	128
2. Labour(manual working on coagulum)	20	20
3. Gain due to enhanced quality	238	238
	282	386
Net gain per tonne of skim latex on creaming	200/-	304/-

Nature of the Effluent

The effluent generated on creaming LA and HA skim, followowded by Sulphuric acid coagulation are shown in table-3. Comparison is made with conventional Sulphuric acid coagulation. The effluent samples were tested for PH,COD, Total solids, Total Dissolved Solids, Total Nitrogen, Ammonical Nitrogen and Sulphate.

The data in table-3 clearly indicate that on creaming the skim latex, the final effluent generated is less polluting. With respect to Dissolved Solids, Total Nitrogen, Ammonical Nitrogen and Sulphate LA skim produces less polluting Effluent.

CONCLUSIONS

1. There is clear economic gain on creaming both HA and LA Skim Latex.
2. Use of LA preservation system for field latex produces savings in the consumption of sulphuric acid and produces a less polluting effluent.
3. Creaming of skim Latex ultimately generates less Polluting effluent.

Acknowledgement

The authors thank the Director, Dept. of Processing and Product Development for his encouragement in the preparation of this paper. The analytical services rendered by the Processing and Quality Control Division is greatefully acknowledged.

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Table 1. DRC and NRS content in Skim Cream

Type of Skim	Skim latex			Skim cream			NRS in Cream as a percentage in skim latex
	DRC	TS	NRS	DRC	TS	NRS	
HA	5.2	10.4	5.2	24.1	26.3	2.2	42.3
	4.8	9.8	5.0	22.4	25.3	2.9	58.0
	5.3	10.1	4.8	25.4	27.9	2.5	55.6
	4.2	9.6	5.4	20.6	23.1	2.5	46.3
LA	4.6	9.9	5.3	23.5	26.5	3.0	56.6
	5.1	10.2	5.1	24.0	26.7	2.7	52.9

Table 2. Results of coagulation of Skim latex cream and Raw skim latex

	L A Skim				HA Skim			
	C	N	C	N	C	N	C	N
Wt.of skim latex (kg.)	200	200	200	200	200	200	200	200
Wt.of creaming agent solution/kg.	28	–	28	–	28	–	28	–
Wt.of sulphuric acid for coagulation	0.45	2.8	0.50	3.0	0.75	5.0	0.75	5.0
Wt.of composite effluent (kg.)	220	202	222	205	220	218	218	214
Theoretical concentration of sulphate	0.0188	0.1273	0.0207	0.1344	0.0313	0.2106	0.0421	0.2146
Wt.of dry skim rubber (kg)	9.55	9.80	9.95	10.20	10.40	10.65	9.65	9.95
Rubber Recovery Ratio = Creaming and coagulum / Normal coagulation %	97.45		97.55		97.66		97.00	

C – Creaming followed by coagulation

N – Normal coagulation

Table-3 <u>Effect of Creaming of HA and LA Skim Latex on properties of Effluent</u>

Property			LA Skim		HA Skim	
			Creamed	Conventional	Creamed	Conventional
1.	PH		9.2	0.4	9.7	1.6
2.	COD	mg/lit	21575	35375	14290	18650
3.	Total Solids	"	49710	91200	50230	73835
4.	Dissolved Solids	"	25330	38500	41190	55470
5.	Total Nitrogen	"	3325	4970	4715	7025
6.	Ammonical Nitrogen	"	1695	1930	3720	4675
7.	Sulphate	"	19395	40610	39620	53040

(2) Cost of Labour

(3) Cost of Electricity

(4) Cost of Maintenance

The operating cost of effluent treatment plant incurred by some of the latex centrifuging units responded to the study are given in Table - 8.

Table - 8

Operating Cost of Effluent Treatment Plant (Daily Basis)

Quantity of Effluent (Litres)	Operating Cost (Rs.)				
	Chemicals	Labour	Power	Maint	Total
25,000	369	100	130	--	599
80,000	--	--	--	--	1000
15,000	--	--	--	--	500
40,000	101	165	350	--	616
40,000	1174	304	306	--	1784
30,000	--	--	--	--	616
37,000	--	--	--	--	200
4,500	--	--	--	--	80
2,000	--	--	--	--	240
30,000	112	50	250	98	510
8,000	596	120	--	--	716
22,000	225	150	500	--	875
65,000	--	--	--	--	1000
6,000	--	--	--	--	200
9,000	185	90	48	--	323

70,000	1215	400	--	--	1615
483,500					10874

The above table shows that the average operating cost of effluent treatment plant is around 2.25 paise per litre of effluent.

C. CONCLUSION

Latex centrifuging factory is considered the most polluting among the different rubber processing factories. It is seen that a treatment system combining flocculation, sedimentation and biological oxidation with mechanical aeration can be employed to treat the effluent to the limits prescribed for onland application. The operating cost will be around 2.25 paise per litre of effluent or 9 paise per litre of cenex produced.

D. ACKNOWLEDGEMENT

The authors place on record their gratitude to Chairman, Rubber Board and Director (P&PD) for permitting them to conduct the study and for their guidance. The authors are also grateful to the management of 29 latex centrifuging plants who have responded to our study by sharing with us the operational results of their effluent treatment systems.

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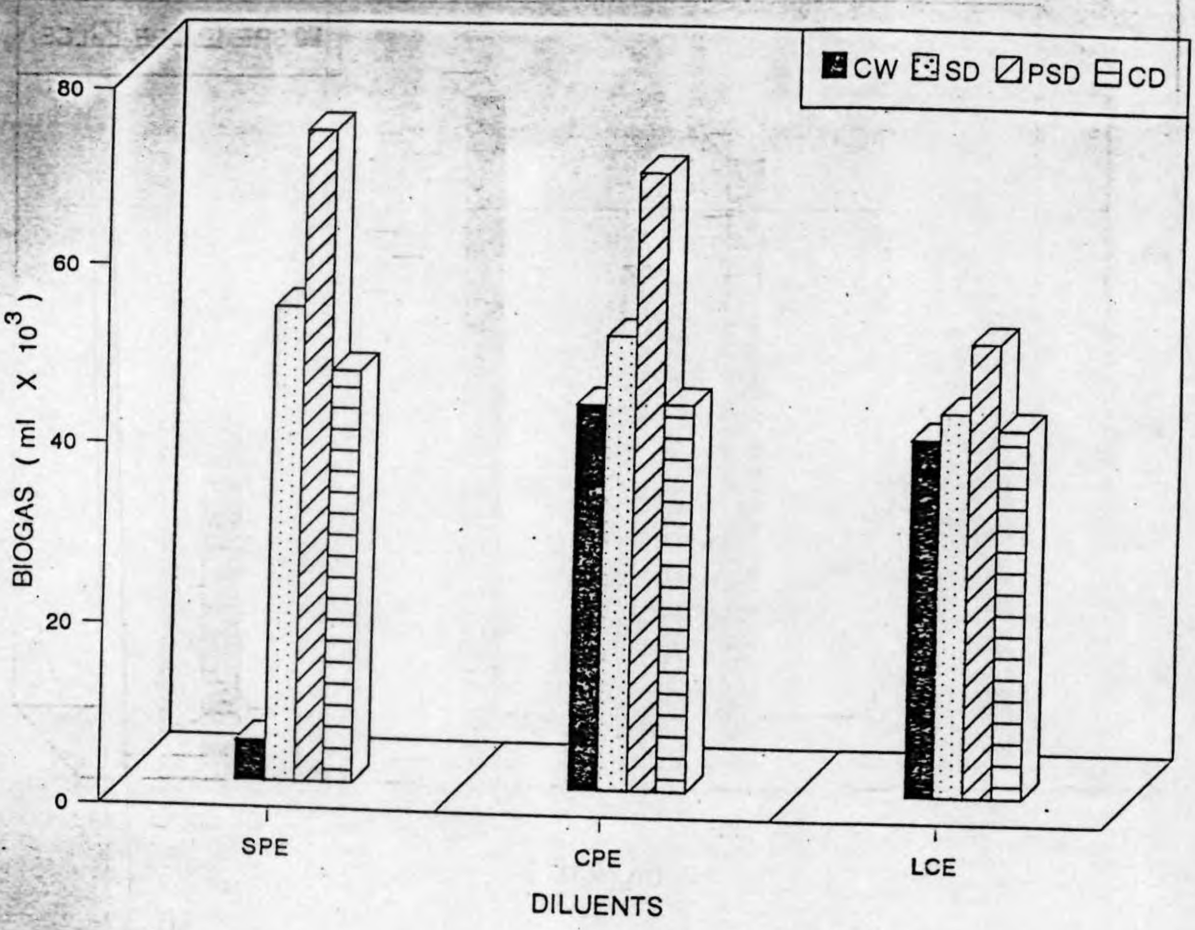

Fig.2 Biogas production with various diluents and substrates.

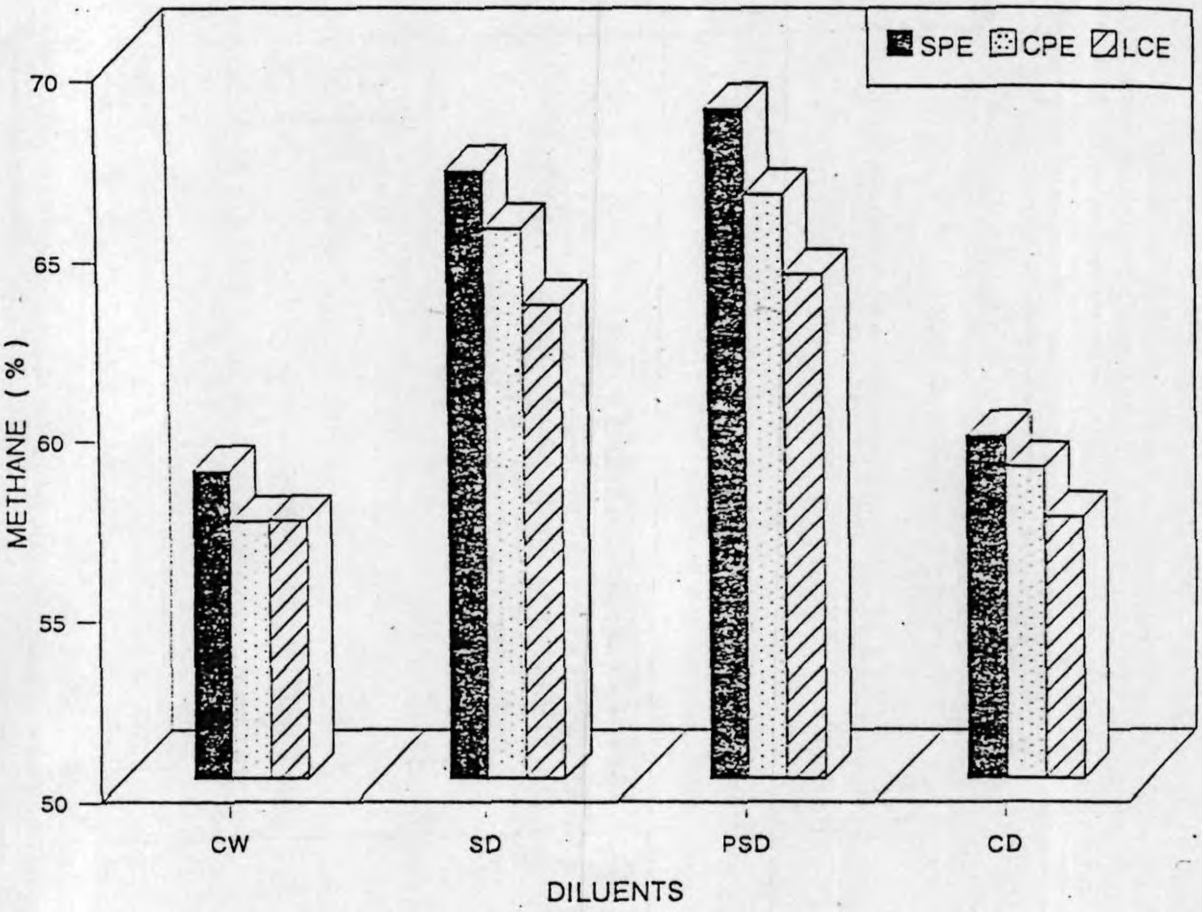

Fig 3 Methane content in the biogas with different diluents.