

**Silver Jubilee International Seminar & Workshop
Appropriate Technologies For Pulp & Paper Manufacture
In Developing Countries.**

New Delhi - 1989

**CHEMI MECHANICAL PULP EFFLUENT AT HINDUSTAN
NEWSPRINT
A HEADACHE WELL TAMED**

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Abstract

The author in this paper describes in brief, the chemi-mechanical pulping process being used at the Hindustan Newsprint Limited (A Government of India's Enterprise) world's first mill making not only newsprint with as high as 75-80 % of chemi-mechanical (CMP) from eucalyptus, notorious for richness in extractives and coloring matter but tackling/taming the colored effluent in a very judicious way with discharged effluent conforming well to the prescribed standards. The CMP effluent unlike other mechanical pulps (SGW, TMP, and CTMP) is rich in colour 1.5-2 lakh pt. co. and created special problems and ways and means have been developed to process it so as to avoid water pollution. DKP press liquor after filtering through lut filter is sent to the kraft pulp mill where it is further filtered through malone filter before finally going to the soda recovery. Full DKP press liquor is processed as against a part as suggested by the consultants Sandwell, USA. The colored effluent from the unbleach filter and also of the kraft pulp effluent is treated with alum, rare earths chloride and polyelectrolyte in a clarifier and the clarified effluent going to two cooling ponds and two stage aerated lagoons and the final discharged water having a BOD of 20-25 mg/l, 50-80 ppm suspended solids, pH 7.5 and color 120-150 pt. co. The colour removal costs about Rs. 60-70 lakhs annually.

The United Nations Environmental Programme (UNEP) has selected Hindustan Newsprint as a Model newsprint factory in Asia and south Pacific countries and has given financial assistance of about Rs. 2 lakhs for generation of necessary scientific data which will be used as guideline for the pulp, paper and newsprint industry in Asia and South Pacific countries.

Hindustan Newsprint Limited located at Newsprint Nagar (Dist. Kottayam), Kerala is a subsidiary of the Hindustan Paper Corporation, a Government of India's Enterprise and the second prestigious Newsprint factory in the country, went into production in February end 1982 and cost of Rs. 157.8 crores. The newsprint furnish consists of 75-78 % CMP (cold soda - Eucalyptus) and 22-25 % CP (Chemical Kraft pulp from Eta reed and Bamboo) and newsprint is being manufactured on a Voith J.M.

Duoformer 7.5 m wire width and 6.8 m trim at speeds of 600-650 m/min. The annual capacity is 80,000 tpy.

The capacity of the Chemi-mechanical Pulp plant is 235 tpd (Design) and 264 tpd (peak) and the raw material used are Eucalyptus - grandis and hybrid.

The systematic diagram gives at a glance the various process steps involved in Chemi-mechanical pulping.

Spent Liquor System CMP Plant:

The eucalypt (grandis/hybrid) chips after washing in a Chip Washer and presteaming enter via ADI-13½-in screw the PREX and are squeezed in a screw press 17-in to remove the spent liquor/chemicals from the impregnated chips which contain most of the resins and extractives in wood. The squeezed out liquor contains pin chips which are separated in a DSM screen and recovered chips join the squeezed chips from screw press and form the feed to the Raffinator No. 1. The squeezed filtrate from ADI is filtered on a Hillside screen to remove the pin chips thereby reducing the amount of solids sent to the effluent. The average moisture of chips to Raffinator No. 1 is 49-50% and discharged pulp at a consistency of 18-20% is pumped to DKP press to further squeeze out the spent liquor. The squeezed liquor from DKP press and the filtered liquor from DSM screen are collected in the overfeed chest. A part of the liquor from DKP Press is recirculated through No. 2 liquor tank which reduces the dilution water requirement in Raffinator No. 1 and hence the total liquor volume sent to Soda Recovery, as more dilution means more evaporation costs. But this recirculation increases the colour value of the liquor in the system. The liquor from DKP press contains fibers/fines and so it is filtered in a Lut filter (100 mesh wire-cloth earlier was 60 mesh) and the recovered fibres are sent to the Raffinator No. II feed and almost fibre-free liquor is sent to Chemical Pulp Mill where it alongwith the kraft weak black liquor after filtration in a Malone filter is sent to soda recovery. A part of the filtered liquor is sent to

the spent liquor tank and is used for flushing the screw press liquor line and for wire cloth cleaning in the Lut filter. The quantity of spent liquor sent to Soda Recovery is about 2.2-2.4 m³/T of unbleached pulp. With recirculation of liquor this quantity has been reduced to about 1.8-2.0 m³/T of unbleached pulp. For usage of 6 % NaOH on OD chips for impregnation the following average characteristics of spent liquor are:

°TW at 60°C — 3.0-3.5

Total solids — 50 gpl

TTA — 8 gpl

Color — 150,000-200,000 Pt. co.

Suspended solids - Nil (100 mesh retention)

Sandwell U.S.A. our Project Consultants had recommended recovering only 165 litres/min (i.e. sending to soda recovery) and draining 235 lpm to the effluent. In the initial stages, drainage of the highly colored spent liquor to the effluent created lot of problems like higher BOD, COD and colour with the discharge water becoming pink and the drainage of liquor also meant loss of residual alkali (left over after impregnation). And besides brought in lot of protests and dharnas from the populace from villages living downstream and forced us searching ways and means for processing liquor fully with no drainage at all. To-day we have a foolproof system without any problem and double filtration of the spent liquor once in Lut filter in CMP and second time in Malone filter in CP - ensures liquor free of fibers/fines as far as possible and thus avoiding fouling of the tubes in evaporator bodies and resultant downtime.

Treatment of Colored Effluent at Hindustan Newsprint

The excess filtrate from the unbleached pulp washer (CMP) is the main source of color contribution to the effluent. After recirculation and use for dilution etc. within the CMP plant this excess filtrate which is too dilute to be economically concentrated for soda recovery and hence is drained.

It has a color value between 25,000-30,000 Pt.co. units and has been brought down from the earlier of 50,000-70,000 Pt.Co. units. The color value of the high solid stream (CMP) is 12,000-14,000 Pt.Co. units after mixing with other stream like the centricleaner rejects etc. etc. The total volume of high solid stream effluent is about 3000 m³/day which joins the main HS sewer of mill containing HS effluents from other plants - Chemical Pulp Mill, Soda Recovery and mainly effluents from the Paper Machine.

The final high solids stream effluent going to the effluent treatment plant is about 10,000-12,000 m³/day having a color value of about 4,500-6000 Pt.Co. units, which is then treated for color removal.

At the man-hole alum and poly-electrolyte are added in requisite quantities (1000-1500 mg/l alum and 1-2 Ppm Poly-electrolyte). Rare earths chloride (Trivalent metallic ions of lanthanum and cerium) (10 ppm) was added for about 2 years but later discontinued. The pH of the high solid stream drops from 9-9.5 to 5.0-5.5 thereby the coloring matter precipitates. On entering the clarifier, all the solids including the precipitated color settle to the bottom and is withdrawn as underflow and filtered on vacuum filter. The solid residue is disposed as land-fill and filtrate is returned to the clarifier. Alum has a positive charge equal and opposite to that of colloids and it neutralises the charge on the colloids, removes the colour and forms a floc. At the correct pH value this neutralising effect produces a good sludge blanket and a clean treated water. Blanket stability and sludge removal are both an operational and financial problem.

Polyelectrolyte collects the fine alum flocs into larger particles and in doing so increases the rate of settlement which improves blanket density and plant efficiency/output.

For removing the colour from the effluent, problem has been faced by many paper and newsprint mills worldwide. Many treatments have been suggested/tried from time to time such as uses of lime (but the problem of handling huge quantities of resulting sludge has stood in the way of its exploitation commercially) use of fly ash and alum where cost has stood in the way. But at Hindustan Newsprint alum has been used alongwith rare-earths chloride and polyelectrolyte even inspite of the cost of Rs. 60-75 lakhs annually because of no other alternative available and to keep the mill running.

Overflow from clarifier then flows to the two cooling ponds after mixing with the low solids stream of the mill for temperature reduction/stabilisation and extended settling with a retention time of 2-2.5 days in the each cooling pond. The effluent at a temperature 30-31°C with little suspended solids goes to aeration lagoons for secondary treatment which have two compartments - primary and polishing. Nutrients in the form of urea and phosphoric acid are added in the ratio of 100 BOD: 5 Kg N: 1 Kg P. After 9 days of retention and aeration with 12-13 floating aerators (total 16) the BOD is reduced from 250-300 to 20-25 mg/l. This treated mill effluent alongwith the treated municipal sewage from the colony and storm water from mill area are discharged through a 1200 mm pipeline to the Moovattupuzha River.

Today the colour problem resulting from the effluent of CMP (unbleach filtrate) and also problem from the spent liquor have been fully tackled and tamed at Hindustan Newsprint perhaps the only mill in the world removing colour from the effluent. The CMP plant also is running very successfully and meeting well the demands of paper machine. Use of imported pulps have been cut down to the minimum possible (used only in

emergency/breakdown etc.) and the plant has produced a record production of 255 tons on September 1, 1985 and a monthly record of 5342 tons (achieved in March, 1986) and is well geared to supply more pulp. Hindustan Newsprint can boast of having the best CMP operating plant in the country with the pulp quality beating even the bamboo cold soda pulp at NEPA even in spite of using hardwood (Eucalyptus) - having fibre length about one third of Bamboo which is 2.5 mm.

The successful/excellent results obtained at Hindustan Newsprint not only in pulping hardwood (Eucalyptus grandis and hybrid) but at the same time tackling the effluent problem especially the colour where the legislation and standards are strictening day by day and there is a greater awareness in the public for clean rivers and clean water and especially when the Department of Environment had been created quite sometime back, and also making newsprint conforming to international standards which is a clear/big pointer to putting up more hardwood/bamboo based newsprint mills in the hardwood and bamboo rich states so as to increase the country's newsprint productivity which is snailing while the demand galloping and the imports entailing huge foreign exchange about Rs. 130-140 crores which our country can ill afford for all times and ages to come.

The United Nations Environmental Programme (UNEP) has selected Hindustan Newsprint as a Model Newsprint factory in Asia and South Pacific countries and has given financial assistance of about Rs. 2 lakhs for generation of necessary scientific data which will be used as guideline for the Pulp and Paper and Newsprint Industry in Asia and South Pacific countries.

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Acknowledgement:

I would like to thank Shri V.K. Jain, Managing Director, Hindustan Newsprint (HPC), Newsprint Nagar (Kerala) for giving permission for presenting the paper at this conference and its subsequent publication.

COLOUR VALUES AT VARIOUS STAGES

High Solid Stream
at Effluent Treatment
Plant (Containing
Effluent from Chemical
pulp, soda recovery and
paper machine)

4500-6000

High Solid
stream
filtrate
centri cleaner
rejects

12000-14000

Unbleached
washer
filtrate

30,000-40,000

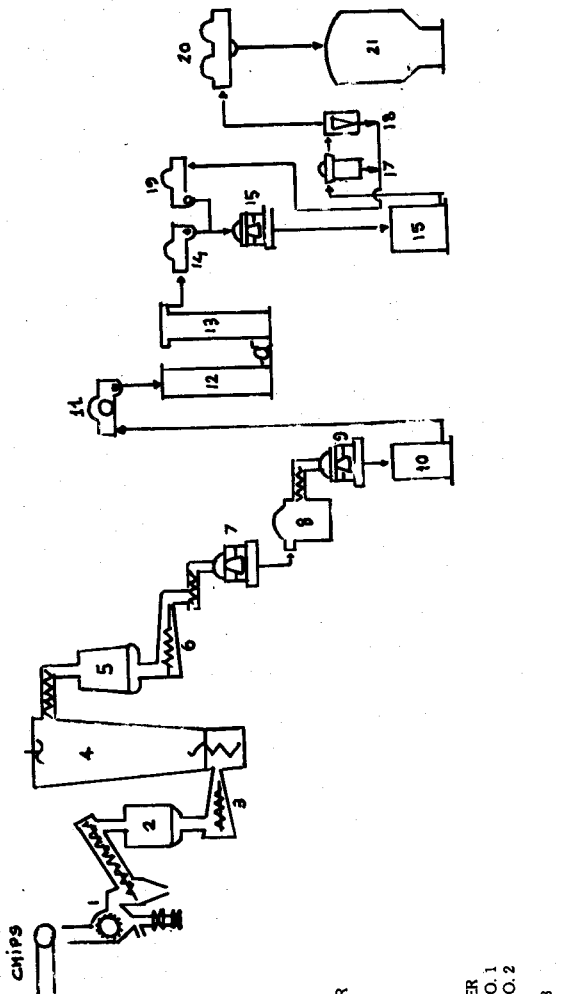
DKP Press
pressed
liquor

1.3-2.5

Effluent Discharged
Into the River
120-150

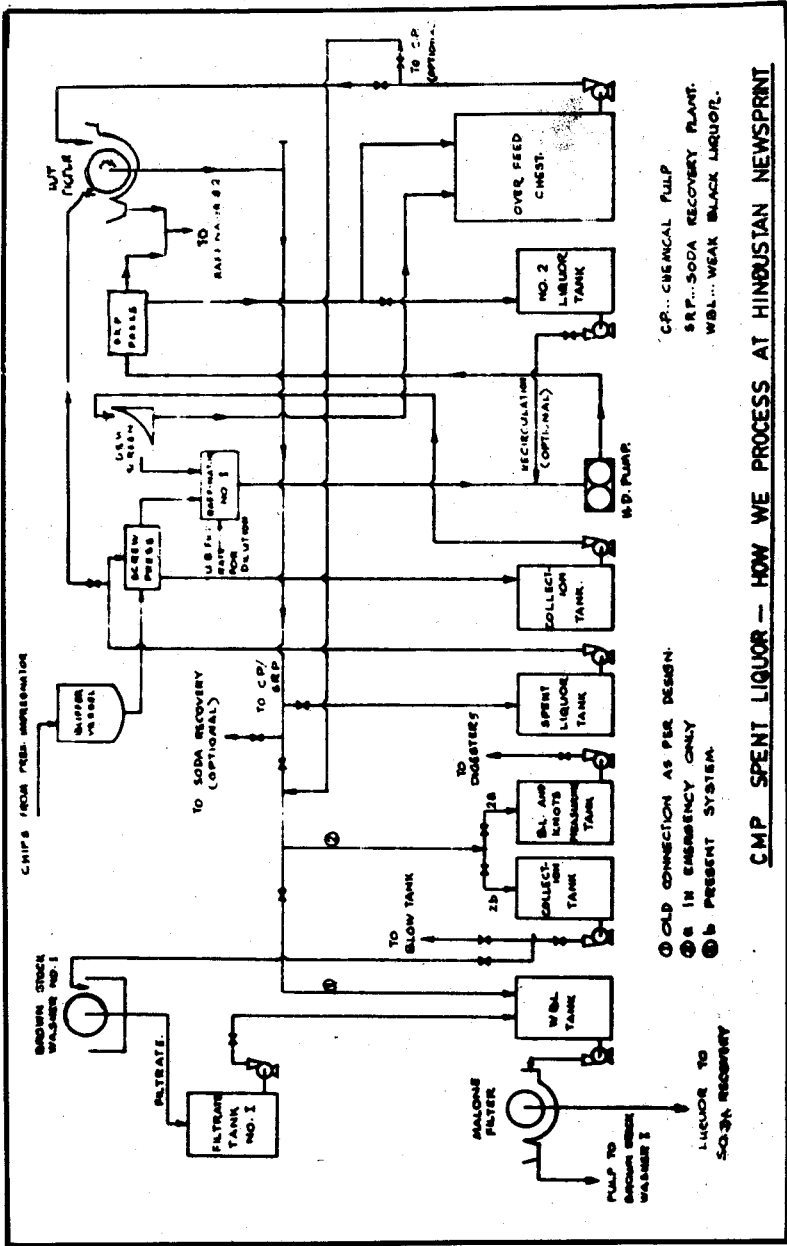
After the
Clarifier
150-200

Color Value
In lakhs
Unit: Pt.Co.



SCHEMATIC DIAGRAM OF CMP PLANT

1. CHIP WASHER
2. PRE STEAMER
3. ADI SCREW
4. PREX IMPREGNATOR
5. BUFFER VESSEL
6. SCREW PRESS
7. RAFFINATOR NO.1
8. DKP PRESS
9. RAFFINATOR NO.2
10. LATENCY CHEST
11. UNBLEACH WASHER
12. BLEACH TOWER NO. 1
13. BLEACH WASHER
14. BLEACH WASHER
15. RAFFINATOR NO. 3
16. PULP CHEST
17. PRESSURE SCREEN
18. CENTRI CLEANERS (4 STAGE)
19. REJECTS FILTER
20. DISC FILTERS
21. HIGH DENSITY TOWER



CMP SPENT LIQUOR - HOW WE PROCESS AT HINDUSTAN NEWSPRINT