

# New Pulp Technology Fibreline

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Elemental Chlorine Free (ECF) bleaching for pulp and paper Industry, based on chlorine dioxide, offers a number of fundamental benefits over traditional methods. Today, Indian Pulp and Paper Industry realises the importance of ECF bleaching along with oxygen delignification. This paper presents our new fibre line at ITC Ltd, PSPD, unit Bhadrachalam. It has totally eliminated Elemental Chlorine in its process of Bleaching. It is the only one of its kind in the country conforms to world class environmental standards. Unit has adopted Hot screening, Oxytrac, new generation presses both in washing and bleaching supplied by M/s Metso. Oxytrac delignification process is unique in its features to remove 45-50% of the remaining lignin after cooking.

## INTRODUCTION

Developments in Pulping and Soda Recovery area has taken a tremendous leap in last 25 years. There is an advancement both in technology and philosophy of operation. The trend of new millennium is towards closure of chemical cycles for maximum efficiency and minimum Pollution. The driving force behind these changes are stringent environmental demand and economic aspects have a major important role in future design and installation of new pulp mill, regardless of location of the Mill. In practice this means decreasing water consumption, reduction of energy consumption, minimum losses, less effluent discharge and less emission to atmosphere. Operational philosophy which has encouraged maximum automation from centralised DCS control has helped in minimum manual intervention and consistency in operation. At ITC, in our new fibre line we strived to take the advantage of this new developments and has gained enormously in environmental front.

### Literature Survey

Historically, Kraft pulp mills have used elemental chlorine as chemical choice for delignification. The formation of AOX and TOCL in pulp mill effluent is linearly proportion to the consumption of elemental chlorine in bleach plant. This in turn depends on the incoming Kappa no. (the amount of residual lignin) of the unbleached pulp (1). Number of reports are published by various agencies in Bio-accumulation of these compounds, contents in lake and river sediments etc, and these compounds are considered to be toxic for both aquatic life and human. Any process that removes more lignin from pulp before bleaching reduces the need for chlorine-based chemicals and thus potentially lowers the formation of chlorinated byproducts. Mechanical and chemical technologies have been developed and implemented for lignin reduction. Improved brown stock washing is an example of

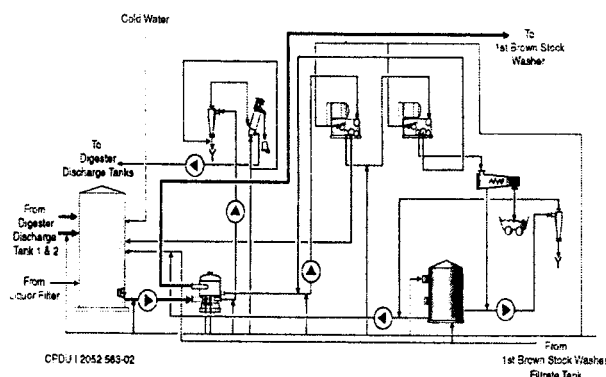


Fig. 1 : Hot Screening

mechanical improvement. Example of chemical technologies are using of chemical additives, oxygen delignification, and extended delignification (2). Oxygen delignification prior to bleaching is now well proven technology. Dissolved lignin and spent alkali can be returned to recovery cycle as with other extended delignification process (3). The kappa no. can be reduced by 40/50% with little or no sacrifice of pulp quality. Oxygen is more selective for attacking lignin vs. cellulose compared to normal pulping, but as selective as conventional bleaching agent such as chlorine or chlorine dioxide (4). The by decreasing the lignin content of the pulp prior to the bleaching plant and by thorough post oxygen washing. Chlorinated organic substances and colour can also be reduced by replacing chlorine with chlorine dioxide (5). AOX formation is influenced by factors such as  $\text{ClO}_2$  substitution, kappa No. reduction of the pulp prior to bleaching (6). Drastic reduction in AOX, about 70%, that was achieved by increasing  $\text{ClO}_2$  substitution from 10 to 100%. The AOX formation reduced from 1.8 to 0.6 kg/T of pulp in the effluent.

Considerations for ECF Bleaching

- Consumers in Europe and North America are demanding ECF pulp and paper products.
  - ECF has captured
    - 50% of the Canadian pulp market
    - 25% of the US chemical pulp market
    - Over 80% of European chemical pulp market
- Increasing number of mills are producing ECF pulp
  - At all Swedish and Finnish mills
  - At 80% of Canadian mills
  - In the US and Latin America
- Environmental regulations favour ECF - none presently require TCF
  - Operating Economics favour ECF

ECF Fiberline at Unit Bhadrachalam  
Hot Screening

In this process, first plant after blow tank is Pressure Screening. In a three stage screening process, Pulp first enters in a delta combi which is unique and the latest addition to the screening. Delta combi screen is supplied first time in India by Metso and resulted in superb screening performance. Delta combi has combined advantages of Delta screen and Delta knotter in a single housing. Separated knots from delta-combi goes to coarse screen in which the knots are washed to get clean knots. Recovered fibre goes with wash liquor back to system. After first stage screening in 0.25mm slot, advantages of pressure screening are,

Screening can be done at 3.5-3.7 % Consistency. Less foaming problem because of close system. 0.25 mm slots gives absolutely specks free pulp. No centricleaning required thereafter.

Preservation of heat in Pulp to reduce steam consumption in latter stage.

ITC has recently changed delta screen baskets to Nimega basket which has given an added advantage of higher throughput with the same slot size of 0.25 mm.

Oxytrac delignification "A preparation of fibre for Final treatment"

Oxygen delignification can be carried out in different ways. At ITC, we have Oxytrac delignification supplied by Metso. This two stage oxygen delignification has various advantages. The secret of the process lies in carefully balanced conditions for adding chemicals. Important ingredients in the delignification process are the chemical that break down the lignin. In Oxytrac the use of chemicals has been concentrated to the first stage of the process where they provide the greatest benefits. Apart from addressing environmental concerns, this reduces Kappa No. significantly without harming the fibre. A decisive factor in preserving the fibre quality is the relationship between alkali concentration, temperature and pressure at two stages. In our case we get 45-48% reduction in Kappa No. Thus the dissolved lignin goes back to recovery for evaporation and firing in Soda Recovery boiler. From screening till Oxytrac there is no effluent generation.

Delignification with oxygen primarily intended to

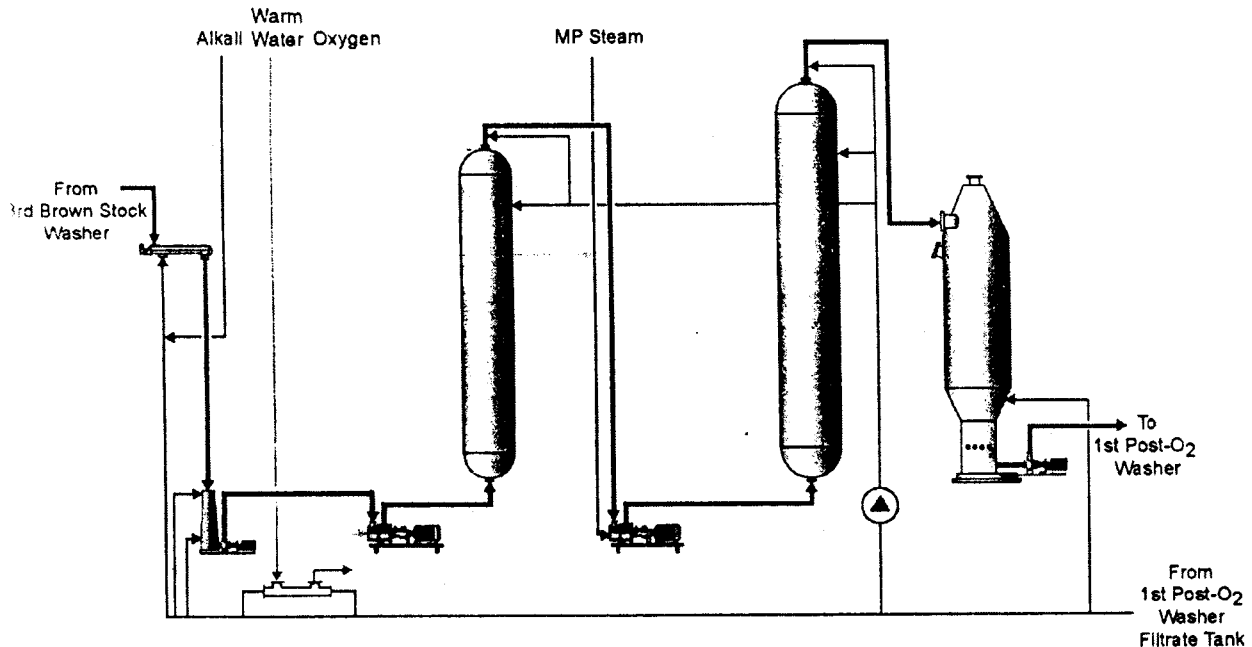


Fig. 2 : Oxytrac

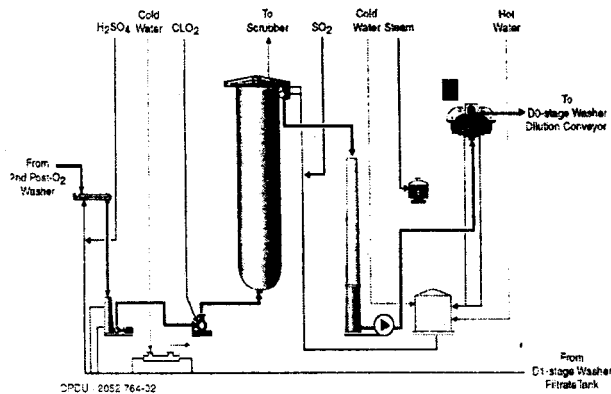


Fig. 3 : D<sub>0</sub> Stage

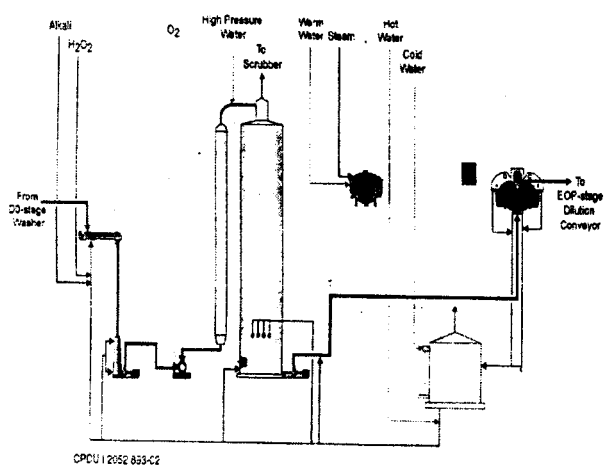


Fig. 4 : EOP Stage

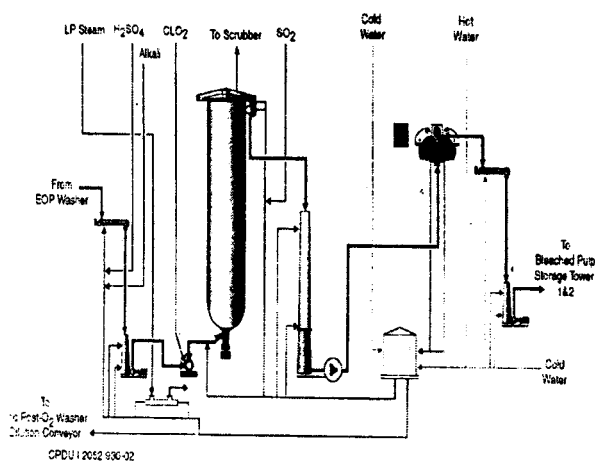


Fig. 5 : D<sub>1</sub> Stage

facilitate next stage i.e. Bleaching. Bleachability of the pulp after Oxytrac is better than that with traditional oxygen stages.

#### Results at ITC Fiberline

Production	ADT/day	360
Kappa in	Kappa	21
Kappa out	Kappa	11-11.2
Delignification degree	%	46-47
Alkali charge	KgNaOH/ADT	23
Viscosity Drop	Cp	2.5
Retention Time	Min.	30+60

#### ECF Bleaching line : "Introducing a new generation Pressess"

Traditionally, Twin roll washing was used only in the brown stock washing area of fibre line. At ITC Bleach plant is supplied by Metso with Twin roll Presses for all the three stages. The twin Roll pressess has an ability to form the effective barrier between the various bleaching stages. This has enabled to make very sharp pH changes and closing the Bleach plant without risk of Scaling problem. The sequence is short D0-EOP-D1 designed for 88 + ISO brightness. This has given benefit of lower shrinkage losses, higher brightness and better strength properties. There is drastic reduction in AOX value of Bleach plant effluent.

#### Bleaching Condition :

		D <sub>0</sub>	EOP	D <sub>1</sub>
Consistency	%	10	10	10
Temperature	°C	65	75	75
pH	-	2-2.5	10.5-11	3.5-4

#### Resource wastages and Plant environment

- All the pumps such as pumps for pulp, black liquors chemicals, back water are fitted with Mechanical seals. This has resulted in zero leakage in fibre line and keeps the plant absolutely clean.
- All equipments tanks, presses in unbleach section connected by ducting and which in turn connected to a central Blower sucking all vapours to be discharged above the building height keeping the plant free from vapour and corrosion.
- Similarly all bleaching equipments, tanks, presses connected through another blower to a scrubbing system where acid effluent is scrubbed by extraction effluent before discharging.

#### Evaporator :

ITC has installed 8 effect falling film evaporator with

Table 1 : Bleaching sequence

Previous Bleaching process

C-Eop-Ep-D

Selected sequence

Oxygen delignification followed by ECF process

Do-Eop-D<sub>1</sub>

Table 2 : Waste water Pollution per tonne of production

Parameter	Before ECF (200TPD)	After ECF (300 TPD)	Reduction%
TSS Kg/T	46.15	24.06	47.8
BOD Kg/T	29.95	13.73	54.2
COD Kg/T	92.25	31.15	66.2
AOX Kg/T	1.8	0.6	66.7

Table 3 : Water Pollution Loads/day

Parameter	Before ECF (200TPD)	After ECF (300 TPD)	Reduction%
TSS (TPD)	9.23	7.22	21.8
BOD (TPD)	5.99	4.12	31.2
COD (TPD)	18.45	10.32	44.1

Table 4 : Pulp Mill Waste water Characteristics

Parameter	Before ECF (200TPD)	After ECF (300 TPD)
Water M3/day	20270	13000
Water M3/T	101	43
pH	7.0-8.5	7.0-8.5
TSS mg/l	300-500	200-350
BOD mg/l	240-280	160-200
COD mg/l	700-900	350-500

two standby bodies Advantages experienced with falling film evaporator are as follows:

1. Improved energy efficiency i.e. Steam economy improved from 3.4-6.5.
2. Availability of the plant is improved and mechanical cleaning of the bodies are minimised.
3. First effect was sub divided into two parts and lime steam is given to both effects.
4. Steaming bodies does not require frequent mechanical cleaning because of washing cycle.
5. Because of less water in HBL steam generation was improved in recovery boiler and flue gas volume was also reduced. This has given considerable improvement in runnability of Boiler.

#### Future perspective :

Installation of New fibre line which includes screening washing, oxygen delignification and ECF bleaching has given us benefit both in economic and environment front. We feel that total benefit can be accrued only after extension of this modernisation in other areas of Pulp Mill. In this context we are contemplating investment in

1. Superbatch digester : This will give energy saving, better pulp quality and odour free pulp mill.
2. Addition of Z trac in bleaching to enhance quality,

throughput and bleaching cost reduction.

3. Modernisation of causticising plant to enhance efficiency, reduction of losses and white liquor quality.

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