
TAMIL NADU NEWSPRINT AND PAPERS LIMITED
Kagithapuram, Tamilnadu – 639 136
India
ECF BLEACHING OF BAGASSE
PULP IN TNPL

# Company Profile

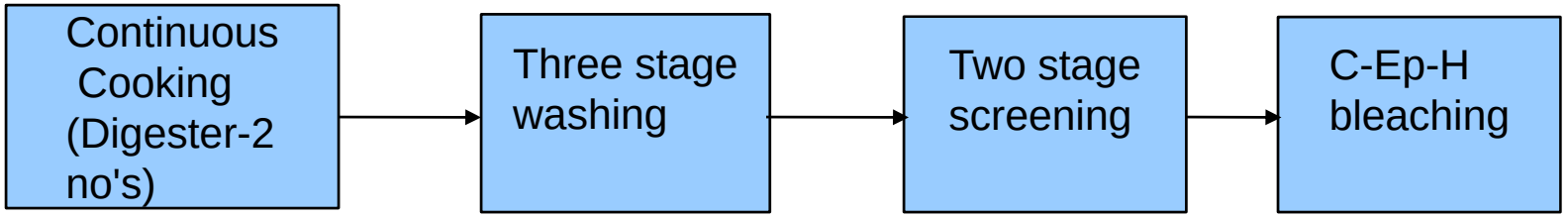
- **Promoted by the Govt. of Tamil Nadu in 1984 to manufacture Newsprint / fine paper using bagasse as primary raw material with a production capacity of 90,000 tons/annum**
- **Capacity expanded to 1.8 Lakh tons /annum with the installation of Paper Machine 2 in 1996.**
- **With the commissioning of Paper Machine 3 by the year 2010 end under mill expansion plan (MEP) production will be augmented to 4 Lakh Tons per annum.**

# Pre-Mill development plan

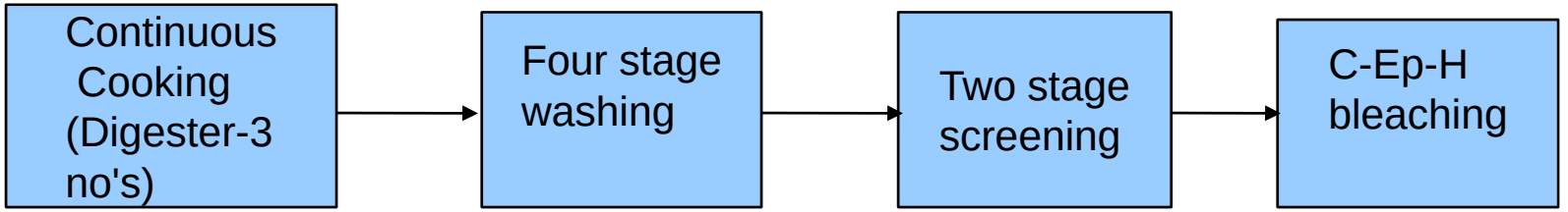
- Pulp mill chemical bagasse pulping consists of two streets.
- Street -1 capacity – 180 tpd of bleached pulp.
- 2 no's of continuous Digester, washing, screening and three stage conventional bleaching of C-Ep-H sequence using vacuum drum filter.
- Street - 2 capacity – 220 tpd of bleached pulp.
- 3 no's of continuous Digester, washing, screening and three stage conventional bleaching of C-Ep-H sequence in street- 2 using vacuum drum filter.

# Pre-Mill development plan

## Chemical bagasse street – 1




## Chemical bagasse street - 2



# Pre-Mill development plan

- **Kappa number of screened pulp – 9.5 to 11.**
- **Chlorine consumption as gas – 30 to 35 Kg per ton of pulp.**
- **Chlorine consumption as hypo – 18 to 20 Kg per ton of pulp.**
- **Total chlorine consumed – 50 to 55Kg per ton of pulp.**
- **Final pulp brightness – 86 to 88% ISO.**
- **Water consumption – 55m3 per ton of pulp.**

# Pre-Mill development plan

- **Chlorine bleaching results in formation and release of Chlorinated organic compounds – AOX.**
- **Higher brightness reversion.**
- **Higher brightness target to compensate brightness reversion.**
- **High bleach chemical consumption.**
- **High bleaching loss.**

# Pre-Mill development plan

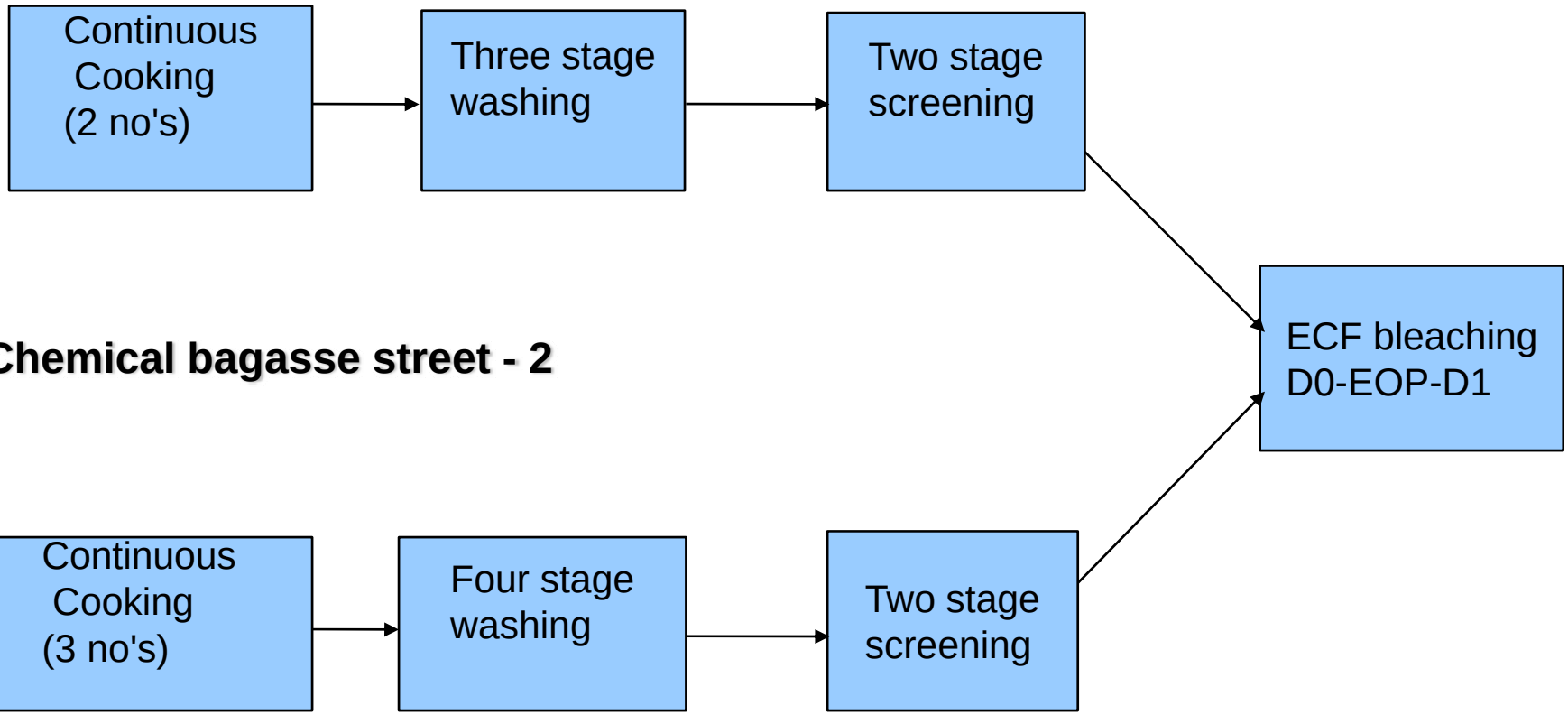
- Low tear index due to severe cellulose degradation.
- Higher colour, TDS and COD in effluent discharge.
- High residual carry over to Paper machine.
- High Water consumption.
- AOX level high in effluent discharge.

# Post-Mill development plan

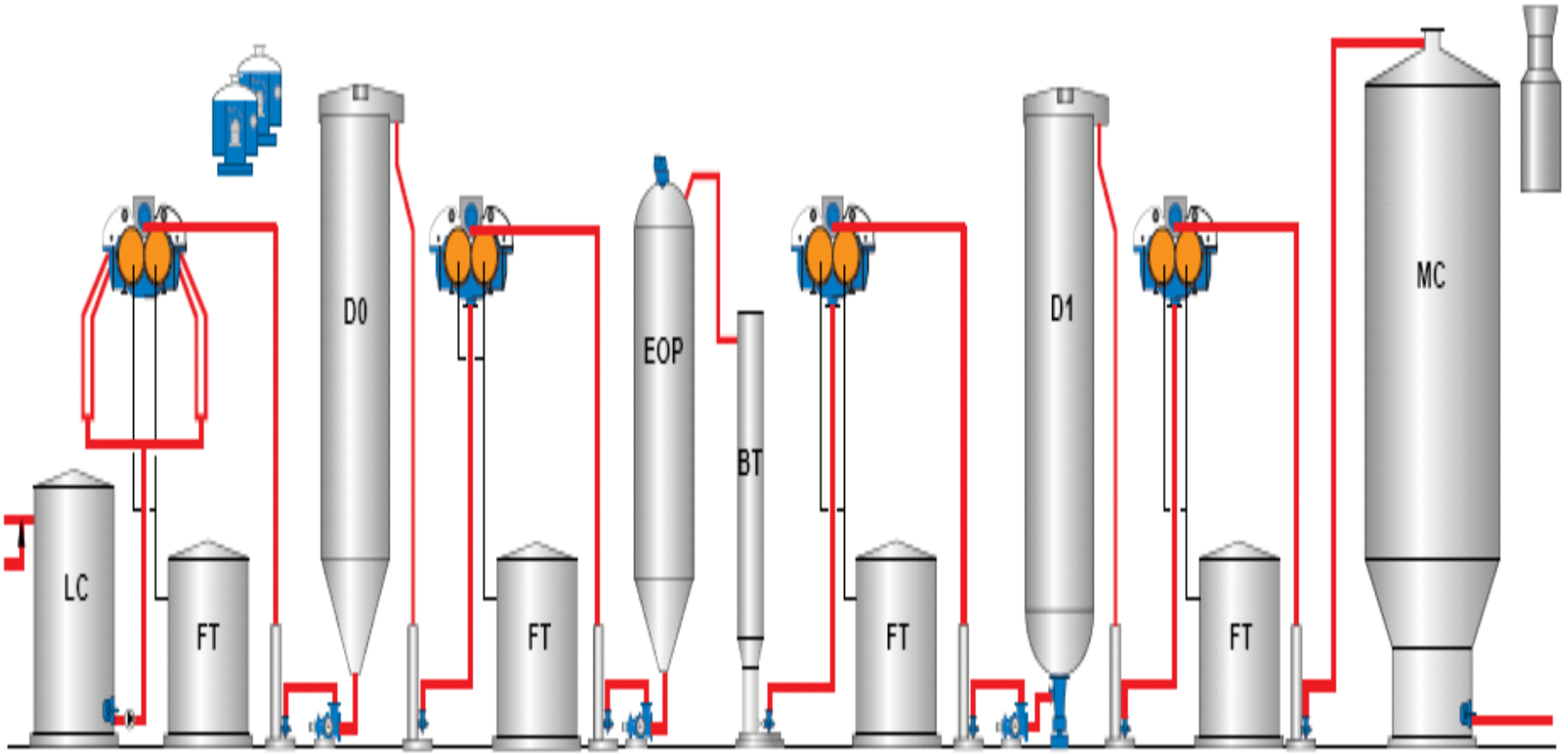
- **Bagasse pulping street – 1 and 2 comprises cooking, washing and screening.**
- **Unbleached pulp from Street – 1& 2 pumped to common ECF bleach plant of new location.**
- **Capacity of chemical bagasse ECF bleach plant – 500 tpd.**
- **Bleaching sequence – D0 – EOP – D1.**
- **EOP – Pressurised stage.**

# Post-Mill development plan

**Chemical bagasse street – 1**



# ECF – Process Diagram



# ECF – Process conditions

**Pre-thickening and washing before bleaching.**

| | D0 stage | EOP stage | D1 stage |
|---|---|---|---|
| Retention time, mts | 60 | 60 | 120 |
| Temperature $^0$C | 55 | 70 | 65 |
| Consistency % | 10 | 11 | 11 |
| Pressure Kg/cm$^2$ | Atm | 1.5-2 | Atm |
| Flow | Up flow | Up flow | Up flow |

# ECF – Process conditions

- **Chlorine dioxide consumption as active chlorine in D0 stage – 30 to 32 Kg per/ton of pulp.**
- **Brightness achieved in D0 stage – 65% ISO.**
- **Caustic consumption in EOP stage – 14 Kg/ton of pulp.**
- **Hydrogen peroxide consumption in EOP stage – 5 Kg per ton of pulp @ 50% conc.**
- **Brightness achieved in EOP stage – 78% ISO.**

# ECF – Process conditions

- **Chlorine dioxide consumption as active chlorine in D1 stage – 8 to 10 Kg/ton of pulp.**
- **Brightness achieved in D1 stage – 90% ISO.**
- **Total chlorine dioxide consumption as active chlorine –**

  **40 Kg/ton of pulp**
- **Water consumption – 25$m^3$ per ton of pulp.**
- **So2 added to neutralize the residual in D0 and D1 stage.**
- **Twin roll presses for dewatering.**

# Comparison of strength properties of CEpH and ECF PULP

| Description | Units | Unbleached pulp | CEpH | D0-EOP-D1 |
|---|---|---|---|---|
| CSF | ml | 350 | 360 | 300 |
| Bulk | cc/g | 1.48 | 1.4 | 1.4 |
| Tensil Index | Nm/g | 61.5 | 64 | 61.5 |
| Tear Index | $mNm^2/g$ | 6.2 | 5 | 6.3 |
| Burst Index | $kpam^2/g$ | 4.29 | 4 | 43.5 |
| Brightness | % ISO | 44.6 | 86.5 | 88.6 |
| Opacity | % | 91.2 | 74 | 74 |
| Scatter Coefficient | $m^2/kg$ | 30.3 | 29 | 30 |
| Yellowness | % | 28.1 | 5.8 | 4.9 |

# Comparison of bleach plant effluent characteristic of CEpH and ECF

| Parameters | Unit | CEpP | ECF | % of reduction |
|---|---|---|---|---|
| Colour | Kg/t | 23.8 | 7.63 | 67 |
| TDS | Kg/t | 85 | 45 | 47 |
| COD | Kg/t | 35.6 | 31.2 | 12 |
| AOX | Kg/t | 2.21 | 0.3 | 86 |

# EOP filtrate heat recovery

- **Presently hot water for process generated by direct heating of LP steam.**
- **Temperature of EOP filtrate to effluent – 65 $^0$C.**
- **High temperature of EOP filtrate affects the effluent treatment system.**
- **Installed a shell and tube heat exchanger to reduce the EOP filtrate temperature from 65 $^0$C to 40 $^0$C.**
- **Hot water from the heat exchanger used for process.**
- **LP steam saving per day - 30t**

# Backward integration of bagasse street under MEP

- **Addition of one more continuous digester of 225 tpd.**
- **Elimination of individual unbleached section of street 1 and 2.**
- **Single line chemical bagasse street of 600tpd of unbleached pulp and 500 tpd of bleached pulp after the implementation of mill expansion plan.**
- **Three stage hot stock screening, three stage press washing, single stage oxygen delignification and two stage post oxygen washing.**

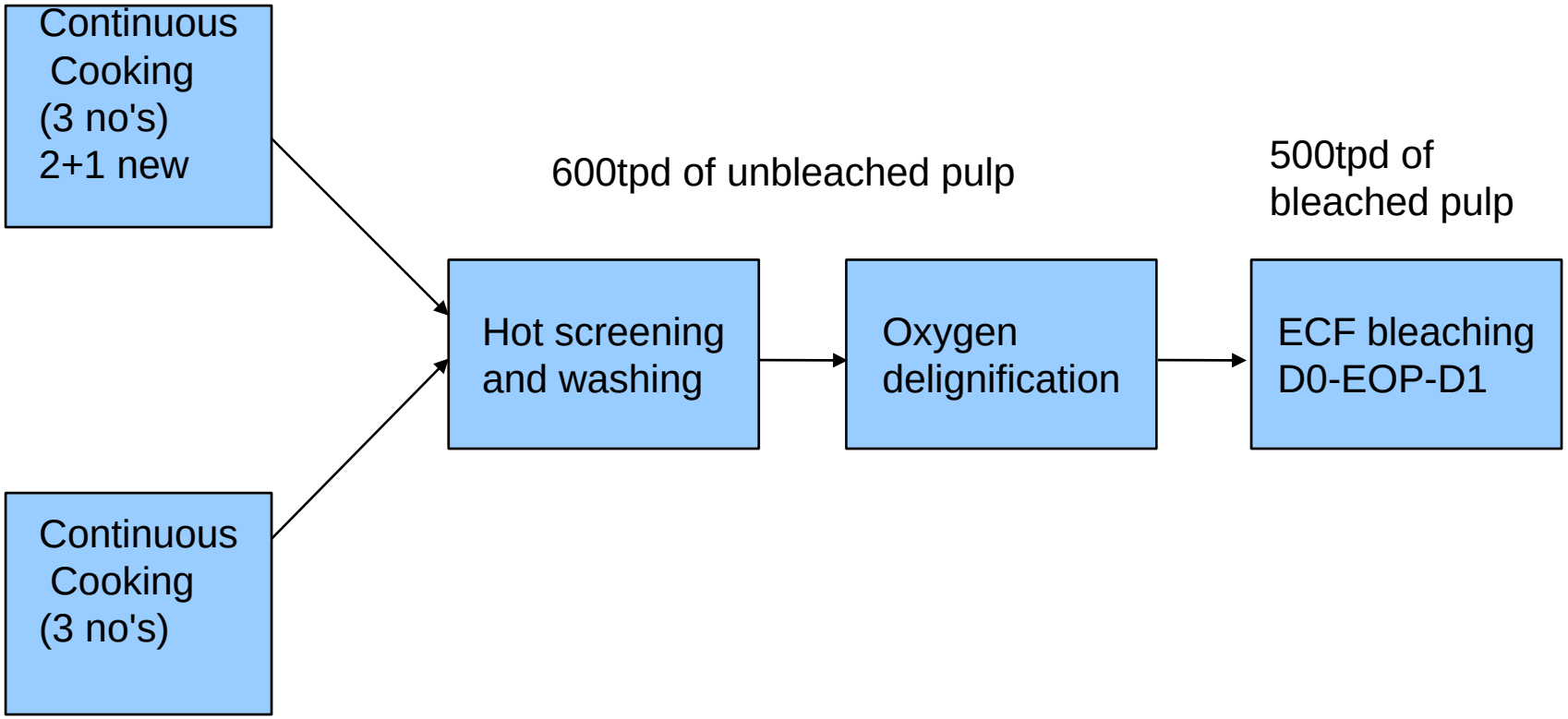
# Backward integration of bagasse street under MEP

- **Installation of oxygen delignification for low kappa number bagasse pulp to reduce shives content of unbleached pulp before bleaching.**
- **Shives content after screening - 1%.**
- **Installation of oxygen delignification furthur reduces chlorine dioxide consumption and AOX level.**
- **Improves final pulp cleanliness.**

# Backward integration of bagasse street under MEP

- **Implementation of cold blow to eliminate blow vapour to atmosphere.**
- **Excess generation of hot water from cold blow system.**
- **Pre heating boiler feed water using excess hot water generated from cold blow system.**
- **No primary steam will be used for hot water generation after implementation of backward integration under MEP.**

# Process diagram of bagasse fiber line after backward integration under MEP



# Summary

- **ECF bleaching preserves the strength properties especially tearing strength.**
- **Significant reduction achieved in AOX, Colour and TDS.**
- **Reduced colour reversion.**
- **Less water consumption and reduced effluent discharge.**
- **Installation of oxygen delignification to reduce chemical consumption, AOX level in effluent discharge and improvement in pulp cleanliness.**

# Thank You