Optimal design of bleach plant & global trends

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Agenda

• Design criteria for bleach plant
• Recent installations
• Operational cost structure globally
• Global trends
  – Raw material utilization
  – Water and effluent volume and quality
• What can be done in India?
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Purpose of the fiberline
Convert wood chips to bleached pulp

Design Criteria for Best Possible Conversion
- Raw material
- Pulp quality
- Environmental
- Conversion cost
- Investment cost
- Footprint
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Recent fiberline installations
With 3-stage bleach plant, final pulp brightness 90%ISO

Dht(EP)D

DZ(PO)
Recent fiberline installations

With 4-stage bleach plant, final pulp brightness 90%ISO

Q(OP)(D)(PO)

Q(OP)(Q)(PO) (86%ISO)

Dht(EP)DP
Raw material & final pulp brightness

Bleachability for 2 different eucalyptus species

Kappa after oxygen delignification: ~ 10
Peroxide charge: 6 kg/Adt
Environmental: Water footprint
Focus area for many large pulp producers

Promote energy efficiency, the reduction of water consumption and other natural resources, giving preference to the use of renewable sources of energy, as well as the reduction and valorisation of waste.
Environmental: Bleach plant effluents

Global view

Bleach Plant Effluent Volume (m³/ADt)
Typical Fiberline late 90's

- Oxygen stage
- Use only ClO₂
- Low effluent < 10 m³/adt
Typical Fiberline 2010’s

- Oxygen stage
- Reduce ClO₂ and use peroxide
- Low effluent < 7 - 8 m3/adt
### Environmental impact

#### AOX discharges

<table>
<thead>
<tr>
<th>Sequence</th>
<th>Sec. treatment</th>
<th>Year</th>
<th>AOX [kg/ADt]</th>
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<tr>
<td>CEHED</td>
<td>No</td>
<td>1970</td>
<td>6-8</td>
</tr>
<tr>
<td>O(C90D10)EDED</td>
<td>No</td>
<td>1980</td>
<td>3-4</td>
</tr>
<tr>
<td>O(D50+C50)(EO)D(EP)D</td>
<td>Yes</td>
<td>1990</td>
<td>1.5-2.0</td>
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<tr>
<td>OD(EO)D(EP)D</td>
<td>Yes</td>
<td>2000</td>
<td>0.2-0.4</td>
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<tr>
<td>OD(EOP)DP</td>
<td>Yes</td>
<td>2010</td>
<td>0.0-0.3</td>
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</tbody>
</table>
Challenges with EOP recycling and high degree of closure

- Scaling in fibreline
  - pH change control
  - High pressure cleaning of wash presses
    - ProStream™
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Operational cost structure for HW market pulp

Global variations

Source: FisherSolve™, Fisher International Inc
Wood cost - Biggest contributor to OPEX
Focus on utilization – Yield increase

Cooking techniques for switching defibration point exists

A need for Improved oxygen delignification
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Bleach Plant – Normal solution with presses

No fresh water consumption! - Use of secondary condensates

Sec. Condensate 4.5 m³/ADt

Sec. Condensate 3 m³/ADt 85 °C

White water 3 m³/ADt

Effluent to treatment:
9 m³/ADt
~ 20 kg COD /ADt
Water system set-up depends on location

Large impact on water footprint

Open cooling system

Closed cooling system

River / lake

100 m³/ADt

Cooling water
Sealing water
Demin water
Process
Effluent treatme

90 m³/ADt
10 - 20 m³/ADt

River / lake

90 m³/ADt
20-25 m³/ADt

Cooling water
Sealing water
Demin water
Process
Effluent treatme

2 m³/ADt
10 - 20 m³/ADt
Bleach Plant – Normal solution with presses
No fresh water consumption! - Use of secondary condensates

Sec. Condensate
1.5 m³/ADt

White water
3 m³/ADt

Sec. Condensate
3 m³/ADt 85 °C

Effluent to treatment:
5 - 6 m³/ADt
~ 12 - 15 kg COD /ADt
Suzano Maranhão
The most energy efficient pulp Mill in the world

Suzano Maranhão produces its own energy & exports in average 90 MW to grid.
Recent large projects

- Varo, Sweden
- Ilim Bratsk
- Oji Nantong
- Suzano Maranahao
- Sappi Ngondwana
- CMPC Guaiba
Summary

• Bleaching sequence and use of chemicals depends on
  – Raw material and final bleached pulp quality
  – Cost of chemicals
  – Environmental limitations

• Technology is available to reduce water consumption and achieve low levels of AOX and COD in effluent

• With possibilities of tertiary treatments in ETP, we can get good quality of water to be used in cooling purpose.
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Fiberline for West Coast Paper, India
Designed for 650 odt/d hardwood
ITC Bhadrachalam, India
580 bdt/d Bleached - New bleaching sequence D (Z(EP)) D
Cooking & fiberline at Tamil Nadu Newsprint, Karur, India
Designed for 600 (300) adt/d bagasse
What can be done in India?

- Effective Oxygen stage is a must

- Segregate condensate from Evaps to be able to use as post Ox washing and EO stage

- Look for Ozone alternative to reduce effluent flow < 7 m$^3$/adt while rebuilding bleach plant

- Integrated pulp and paper mills should look for low levels of water consumption and effluent flow < 20 m$^3$/adt