Gli aspetti tecnici e tecnologici della depurazione delle acque nel settore cartario

L’impianto di La Gère (Francia)

31 ottobre 2008

Carlo Cerutti
Vice Presidente, Ahlstrom Corporate Innovation

Laurent Dreveton
Technical Manager, La Gère Mill
• Ahlstrom in brief
• La Gère plant
• Waste water treatment plant
• Parameters measurements and law requirements
• Odor treatment: a photocatalytic solution
Ahlstrom in brief
Ahlstrom today

• Leading supplier of fiber-based materials
• 6,500 employees in over 20 countries on six continents
• Business segments
  – Fiber Composites
  – Specialty Papers
• Listed on the OMX Nordic Exchange Helsinki since 2006
  – IPO proceeds used for growth mainly in BRIC-countries (Brazil, Russia, India, China)
• Net sales 1.8 billion euros in 2007
• Net sales growth of 10%
Ahlstrom in the value chain

- **Primary production**
  - Natural fibers (wood, cotton, hemp)
  - Oil/petro-chemicals

- **Raw material supplier**
  - Pulp producers
  - Synthetic fiber producers (PET, PP, glass)
  - Chemical suppliers

- **Roll good producer**
  - Ahlstrom

- **Converter**
  - Printers (label, decor, poster, wallcover...)
  - Label metalizers
  - Siliconizers
  - Automotive industry suppliers (filter, gasket)
  - Composite industry

- **Marketer/seller**
  - World class consumer or industrial brands

- **Consumers**

- **Industrial customers**
Global manufacturing presence

- Founded in 1851
- Cross-cultural organization
- Extensive & long international experience
- Presence in BRIC countries
Ahlstrom business segments

Specialty Papers Segment
2007 net sales: EUR 825 million (46%)

- Release & Label Papers
  Self-adhesive labels, labels for beverage bottles

- Technical Papers
  Decor foils for furniture and flooring laminates, abrasive paper, masking tape, engine gaskets, posters, food packaging, baking paper, wallpaper, processing paper

Fiber Composites Segment
2007 net sales: EUR 941 million (54%)

- Filtration
  Transportation, air and liquid filters, industrial and laboratory filtration

- Advanced Nonwovens
  Medical gowns and drapes, wallcoverings, teabags, fibrous meat casings

- Home and Personal Nonwovens
  Wiping fabrics

- Glass Nonwovens
  Windmill blades, flooring, boat hulls
Net sales by business area & end use application
H1/2008

Utilities

Transportation

Graphics

Building

Technical Papers
29%

Advanced Nonwovens
16%

Home & Personal Nonwovens
14%

Filtration
17%

Release & Label Papers
17%

Glass Nonwovens
7%

Food and industrial packaging

Healthcare and hygiene

Small fibers. Big difference.
Global markets of EUR 30 billion growing 4-5% per year

<table>
<thead>
<tr>
<th>Focus areas</th>
<th>Growth %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glassfiber reinforcements</td>
<td>Windmill 20% Marine 5%</td>
</tr>
<tr>
<td>Wiping fabrics</td>
<td>7%</td>
</tr>
<tr>
<td>Industrial nonwovens</td>
<td>7%</td>
</tr>
<tr>
<td>Release base papers</td>
<td>5-7%</td>
</tr>
<tr>
<td>Infusion products</td>
<td>5%</td>
</tr>
<tr>
<td>Air &amp; liquid filtration</td>
<td>5%</td>
</tr>
<tr>
<td>Medical fabrics</td>
<td>5%</td>
</tr>
<tr>
<td>Transport filtration</td>
<td>2-4%</td>
</tr>
</tbody>
</table>
La Gère Plant

Small fibers. Big difference.
La Gère Plant

Key figures

- Sales revenues 95 m€
- Production Capacity
  2007: 95 000 tonnes
- 209 employees
- 100% Release Liner

SILCA® (56g – 120g)
Waste water treatment plant

- Physico-chemical treatment
- Lagoon buffer
- Biological treatment
- Clear water
- Rain water tank
- Sludge storage
- Physico-chemical treatment
Water treatment flowchart

- Water inlet: 5600 m³/day
- Water outflow: 5400 m³/day
- Water consumption: 20 m³/t
- La Gère
- Rhône
- Waste water treatment (70,000 eq. Inhab.)
- Sludge

Small fibers. Big difference.
Process Flow « water » and « sludges»

Waste Water Treatment La Gère Mill

Fibres + water

Equalisation basin

Turbocirculator

Oxidation tank

Sedimentation tank

Sludge storage

Emergency tank

Discharge to the river

Small fibers. Big difference.
**Effluents**

- During manufacturing
  - Effluents from cleaning
  - Effluents from process water
- At the end of manufacturing
  - Chest emptying + papermachine washing effluents

**Composition of effluents**

- **Raw material**: Cellulose
- **Additives**: Dyestuff
- **Surface treatment**: Corn starch and Polyvinyl alcohol
Pre-treatment:

- Screens to separate bulky particles
- Flow adjustment valves
- Storage in the emergency tank (lagoon) in case of non-compliant effluents
Primary treatment

- Coagulation and flocculation (volume=1000 m³)
  - pH adjustment

- Suspended solid elimination (fibres)
  - Yield 90%

- Sludge extraction before dehydration

- COD Removal: 70%
**Secondary treatment (biologic):**

- **Oxidation tank** (volume: 2500 m³)
- Organic pollutant treatment
- Sludge production
- **Secondary sedimentation tank** (volume: 3500 m³)
- Natural sedimentation of biological sludge
- **COD removal: 95%**
### Biological plant measurement

**Storage in the emergency tank (lagoon) in case of non-compliant effluents**

<table>
<thead>
<tr>
<th>Monitoring frequency</th>
<th>In-coming water</th>
<th>Out-coming water</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-line control</td>
<td>pH</td>
<td>pH</td>
</tr>
<tr>
<td></td>
<td>Temperature</td>
<td>Temperature</td>
</tr>
<tr>
<td></td>
<td>Flow</td>
<td>Flow</td>
</tr>
<tr>
<td></td>
<td>Turbidity</td>
<td></td>
</tr>
<tr>
<td>1/day (24 h sampling)</td>
<td>TSS</td>
<td>TSS</td>
</tr>
<tr>
<td></td>
<td>COD</td>
<td>COD</td>
</tr>
<tr>
<td></td>
<td>BOD</td>
<td>BOD</td>
</tr>
<tr>
<td></td>
<td>Colour</td>
<td>Colour</td>
</tr>
<tr>
<td>1/week</td>
<td>Total N</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ammonium N</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Phosphorous</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hydrocarbons</td>
<td></td>
</tr>
</tbody>
</table>
Biological plant measurement

River monitoring

- Analyses 1/month before and after the discharge point:
  - pH: no impact detected
  - TSS: no impact detected (8 mg/l before and after)
  - COD: <30 mg/l before and after discharge point
  - BOD: <3 mg/l before and after discharge point

- Analyses every 2 years of biotic index
  The last analysis pointed out a 16/20 note before the discharge point, and a 13/20 note after it (December of 2006); river quality reference 1A (the highest in France)
LAW REQUIREMENTS AND RESULTS

kg/day limit

Flow limit: 21 m³/t

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Before treatment</th>
<th>After treatment</th>
<th>Legal requirement</th>
<th>Removal</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSS (kg/day)</td>
<td>5349</td>
<td>99.6</td>
<td>315</td>
<td>98%</td>
</tr>
<tr>
<td>COD (kg/day)</td>
<td>9947</td>
<td>558</td>
<td>1350</td>
<td>94%</td>
</tr>
<tr>
<td>BOD (kg/day)</td>
<td>871</td>
<td>81</td>
<td>271</td>
<td>91%</td>
</tr>
</tbody>
</table>
LAW REQUIREMENTS AND RESULTS

kg/tons limit

<table>
<thead>
<tr>
<th>Parameter</th>
<th>After treatment</th>
<th>Legal requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSS (kg/tons)</td>
<td>0.4</td>
<td>0.7</td>
</tr>
<tr>
<td>COD (kg/tons)</td>
<td>1.98</td>
<td>6</td>
</tr>
<tr>
<td>BOD (kg/tons)</td>
<td>0.5</td>
<td>0.7</td>
</tr>
</tbody>
</table>

AOX and Metal residuals are under legal requirements
Photocatalytic Building for sludge odour removal

Small fibers. Big difference.
Papermill sludge description

Raw materials
• Pulp (cellulose)

Additives
• FDA dyestuff

Surface Treatment
• Corn starch and Polyvinyl alcohol (PVA)

→ Mostly organic based sludge: anaerobic bacteria growth inside the sludge creating bad smells

→ Sludge will be laid down on agricultural field from July to December, storage from January to December.
Odour treatment building

Erection of a 1500 m² building:

- Aluminium structure
- Roof and upper part of wall based on flexible canvas sheet (PVC)
- Main sides consist of apertured flexible PVC sheets containing Ahlstrom active media.
- Building under pressure (4 fans of 40,000 m³/h) to force polluted air to go through the active walls.
Photocatalytic and adsorbant media

Outside layer based on photocatalytic TiO₂ → **activated carbon regeneration**

Inner layer based on activated carbon → **Foul-smelling odour absorption**

Br1054:500 g/m² (patented)
Olfactory sampling principle
(Standard EN-137125)

Sampling of gas to be analyzed

Polluted gas

Sampling Pump

Lung box

Tedlar Bag (non adsorbant bag)

Outside air (no contamination)
**Olfactory analysis principle**
(Standard EN-137125)

- Panel of 4 « nose » experts
- Dilution of Tedlar bag samples
- Odour unit = 50% of experts finding no odour after dilution

### Sampling point | Odour consistency ($U_{OE}/m^3$)
--- | ---
1 (internal before media) | 1810
2 (external after media) | 230
3 (internal before media) | 3670
4 (external after media) | 230
5 (internal before media) | 4830
6 (external after media) | 240
Results from olfactory measurements (Standard EN-137125)

<table>
<thead>
<tr>
<th>Sampling point</th>
<th>Media Olfactory Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 / 2</td>
<td>87,3 %</td>
</tr>
<tr>
<td>3 / 4</td>
<td>93,7 %</td>
</tr>
<tr>
<td>5 / 6</td>
<td>95,0 %</td>
</tr>
</tbody>
</table>

- Efficiencies between 87% and 95% are considered excellent results compared to existing methods.
Results

- Panel of 7 skilled people
- Method consist of describing eventual odours by sniffing in different points of the plant, using an exhaustive form
- Weather conditions (May 22nd, 2007) = no wind, sunny.
suivi cinétique des COV à l’intérieur et à l’extérieur de la tente

<table>
<thead>
<tr>
<th>concentration en µg/m³</th>
<th>à l’intérieur du bâtiment</th>
<th>à l’extérieur du bâtiment</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100.0</td>
<td></td>
<td></td>
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<tr>
<td>150.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200.0</td>
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<td></td>
</tr>
<tr>
<td>250.0</td>
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heure de l'analyse
Odour analysis conclusion

- 92% average efficiency of odour removal = excellent yield
- Remaining odours outside are non persistent (no odour measured at 50 m from the building).
- Results confirmed by Explorair (analysis company) on tenax fibres:
  - 85% Sulphur based compounds (DMS – DMDS)
  - 70-95% ketone (2-butanone – acetone)
  - 95% Aromatic (Ethyl-benzene)
- No claims from neighbourhood since building erection
Photocatalytic Buildings

Purifying buildings for odorous storage

Decompression room for chimneys

Small fibers. Big difference.
Small fibers ...

... Big differences.

Thank you!