



Valorization of two complementary streams from Swedish pulp and paper mills

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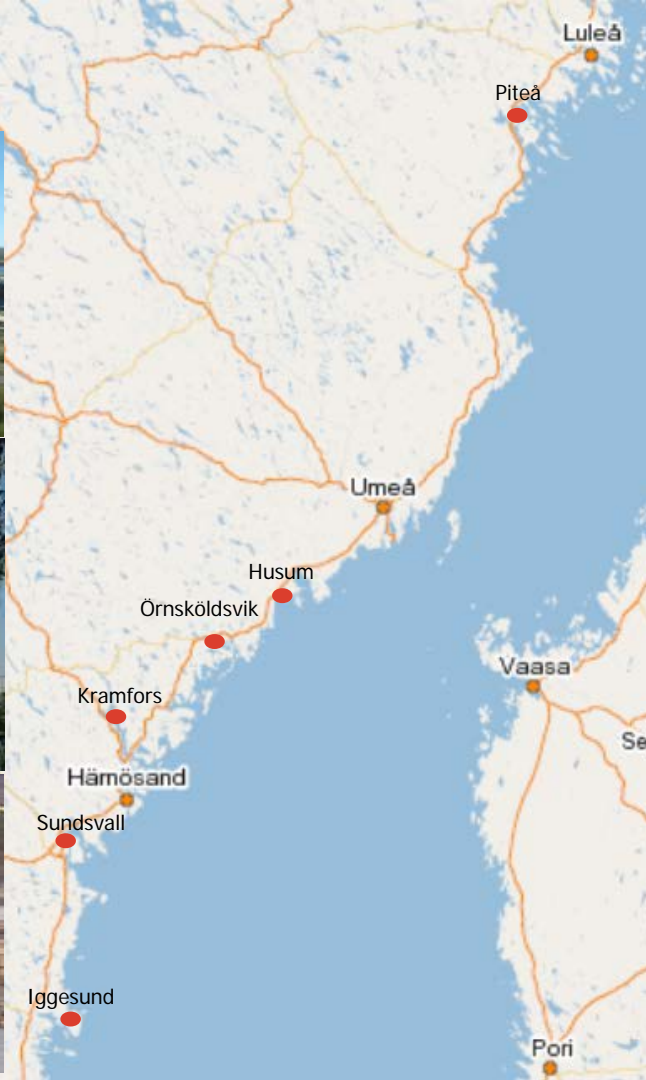


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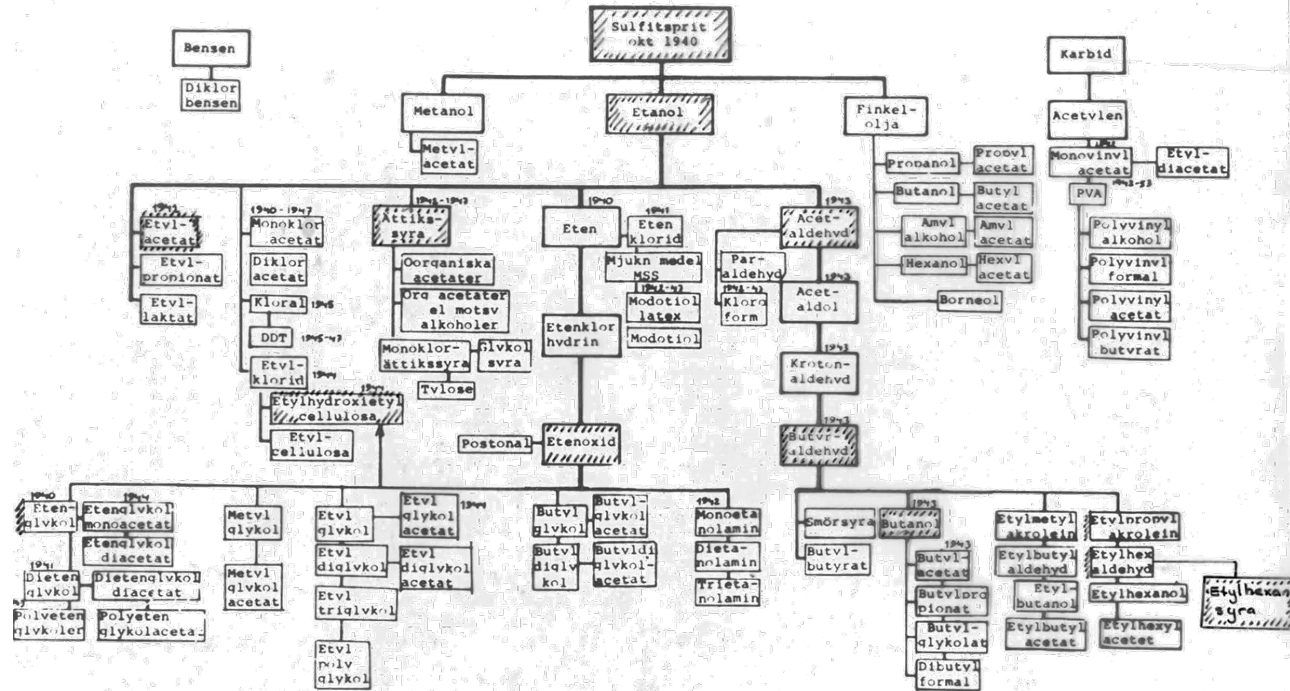
Today's Presentation

- ❑ **Presentation of SP Processum AB**
- ❑ Complementary stream in the pulp- and paper industry;
 - ❑ Green liquor sludge
 - ❑ Fiber sludge
- ❑ Conclusions

The Biorefinery Coast







The Biorefinery in Örnsköldsvik



SP Processum AB

- ❑ 1999 the MoDo-era ends
- ❑ 2003 Processum is started as a technology park
- ❑ Support collaboration between the companies that once belonged to MoDo
- ❑ About 2005, started to work with development of biorefinery products
- ❑ 2013 Processum is bought by SP Technical research institute of Sweden
- ❑ Processum Biorefinery Initiative changes name to SP Processum
- ❑ 40% still owned by the member companies

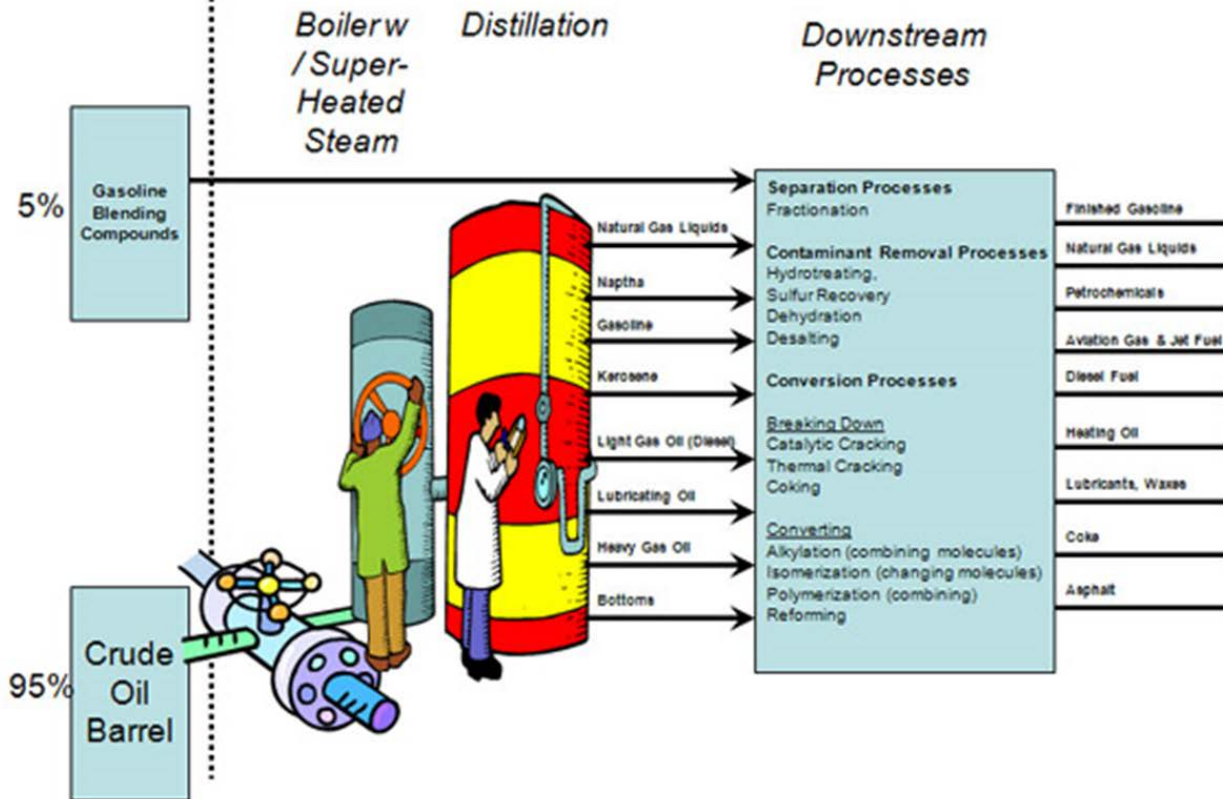


Swedish Government



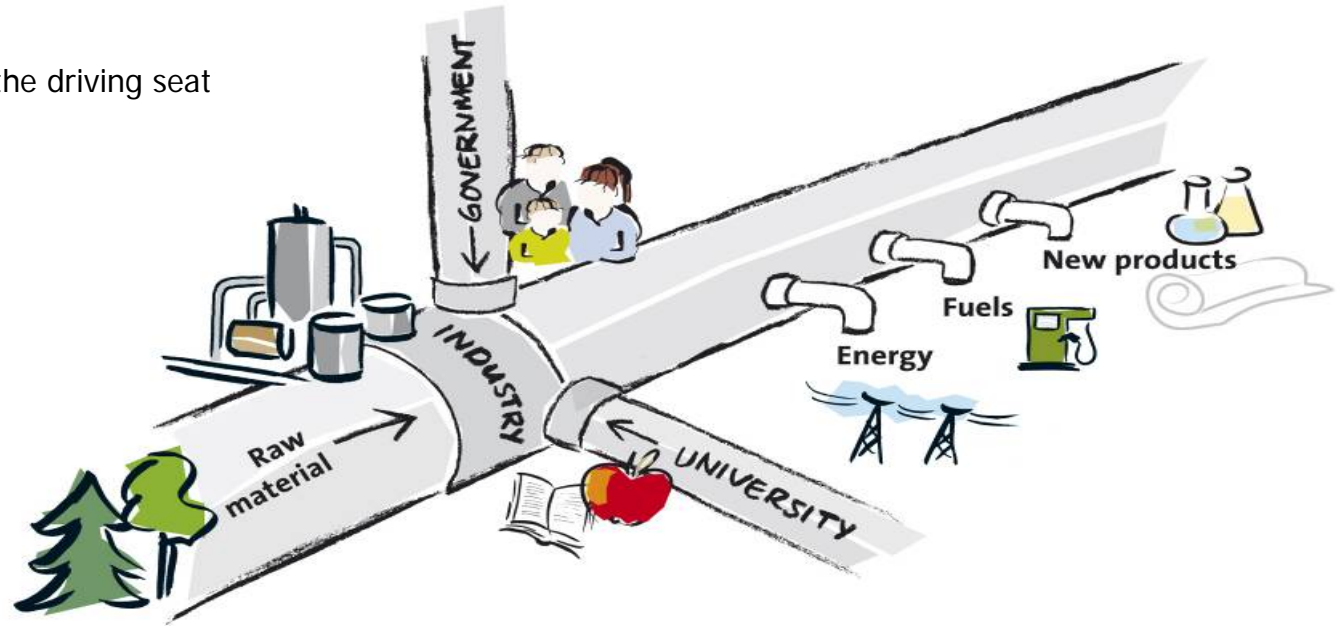
Oil Refinery Inputs

Oil Refinery Processing & Outputs



Biorefinery - our thoughts

We aim to have the industry in the driving seat of our projects



An aerial photograph of a forest landscape. In the foreground and middle ground, there are numerous long, parallel stacks of harvested timber logs, arranged in neat rows. The logs are light brown and show the texture of the bark. The stacks are separated by narrow paths or gaps. In the background, a dense forest of tall, green trees stretches towards the horizon. A road or path is visible on the right side of the image, winding through the forest. The overall scene suggests a managed forest with a significant volume of timber being harvested.

1 million m³

Sustainable Forestry

Yearly growth 100 million m³

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Bio Sludge

Bark

Turpentine
- Pinene
- Carene

Ash

Excess
Heat

Green liquor
sludge

Fiber sludge

Methanol

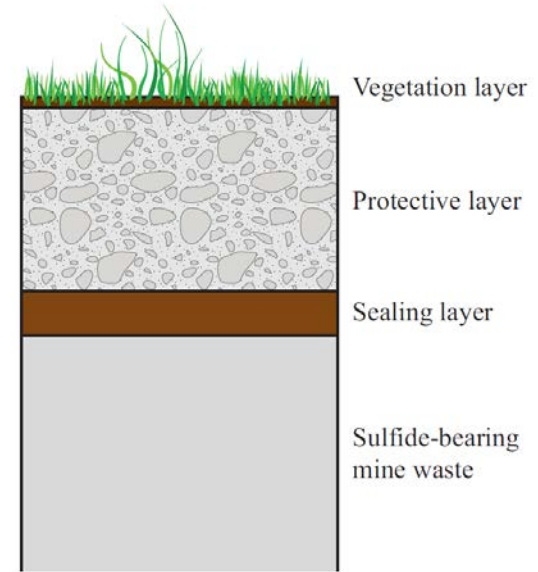
Tall Oil
- Fatty acids
- Rosin acids

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GLS - Prevent acid mine drainage

- **Sulfide bearing mine wastes** are found at more than 180 different locations in Sweden and more than 140 Mt are produced annually
- **General idea** to prevent formation of acid mine drainage by mixing in GLS in the sealing layer
- **Prevent oxygen and water** to enter the sulfide-bearing mine waste and thereby reducing the amount of H_2SO_4 formed
- **Raised pH** from addition of GLS, give reduced leaching of Zn, Cd, Cu, Cr etc



GLS - Analysis

- Important properties of GLS is decided by
 - Surface charge (electrophoresis) and surface structure (SEM)
 - Chemical characterization (ICP-MS)
 - Particle size distribution (laser diffraction)
- Buffering capacity (usually CaCO_3)
- Hydraulic capacity (long term)

Pilot trial - GLS in sealing layer



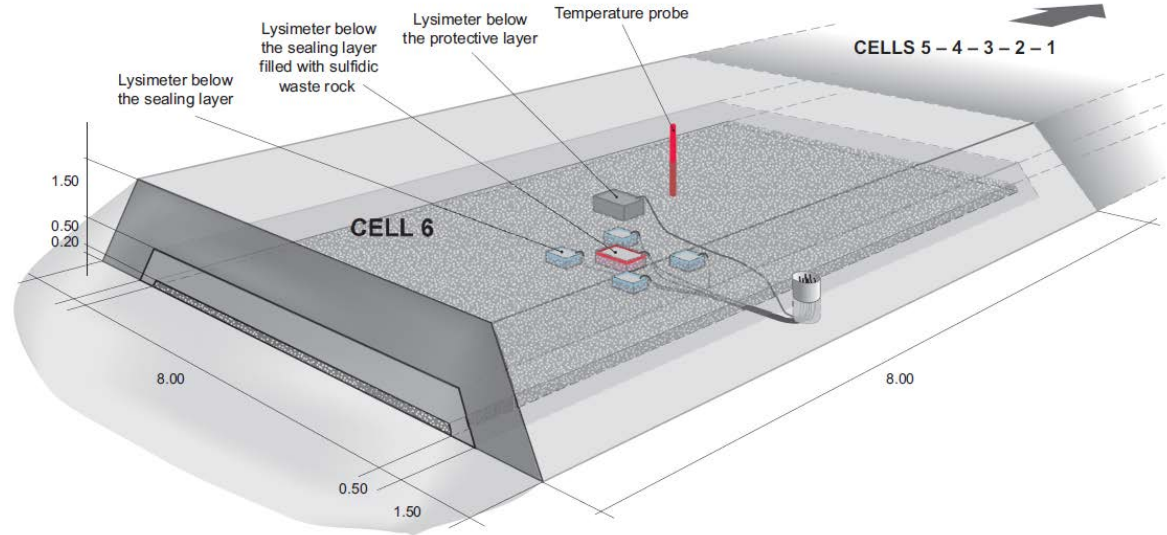
Mixing of till and GLS



Preparation of a test area

Pilot trial - GLS in sealing layer

- 10% GLS mixed with till
- About 400 m² surface area
- GLS mixed with till to ensure capacity as sealing layer
- Lysimeters installed over and below sealing layer



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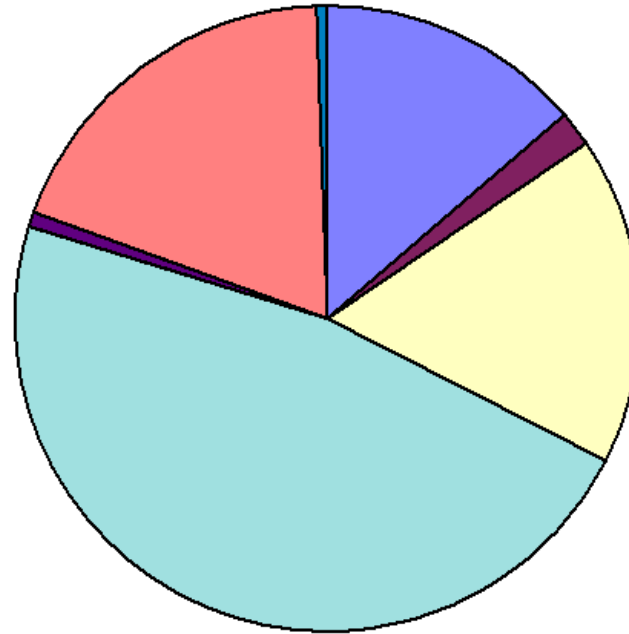
Fiber sludge as Raw Material

- Fiber sludge is a complementary stream containing cellulose
- Fibers are short and do not qualify to make paper
- Usually fiber reject is incinerated for steam production
- Composition differs between mills
- About 1-5000 t annually/mill
- Two applications; raw material for the sugar platform and usage as stable litter

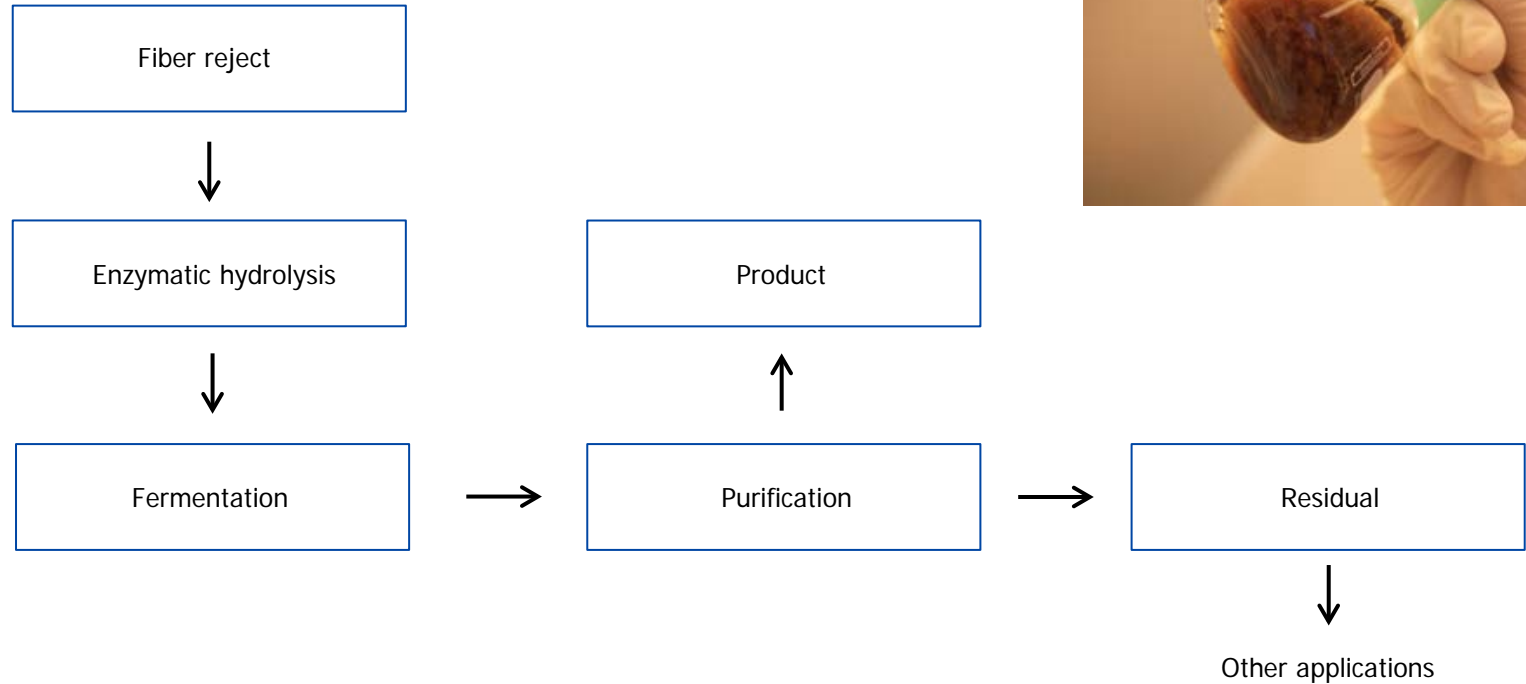


Fiber sludge - Composition

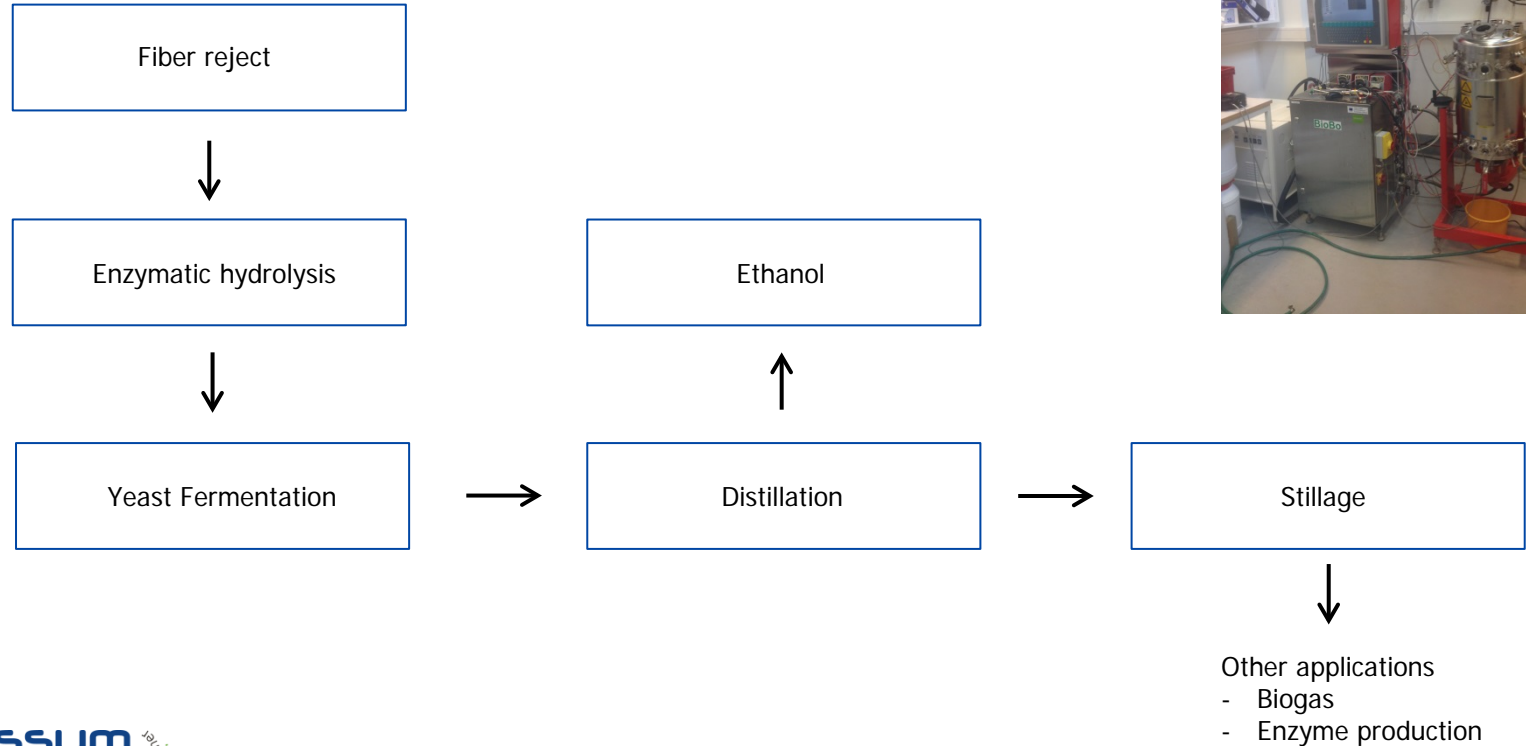
- Typical composition of fiber reject
- Mill with both birch and softwood
- Sugar, lignin and ash



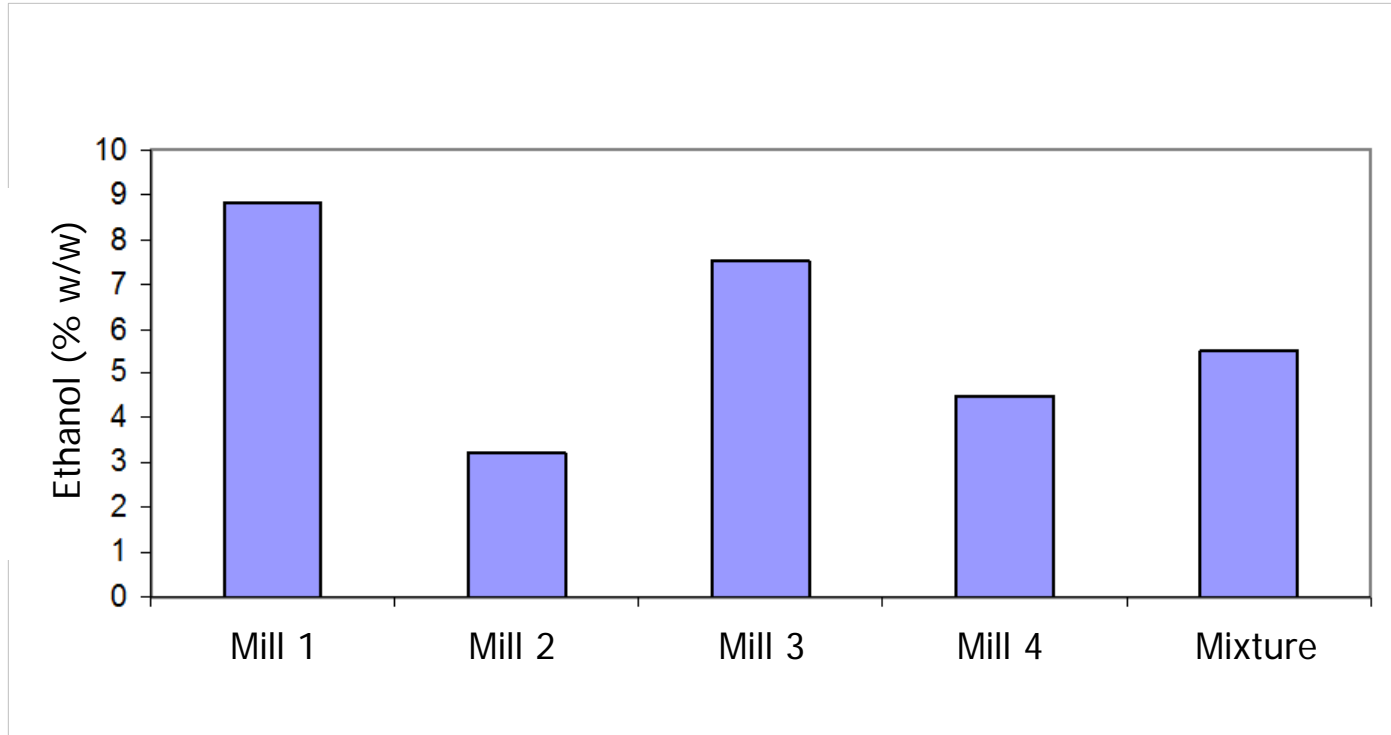
Fiber sludge - Sugar platform



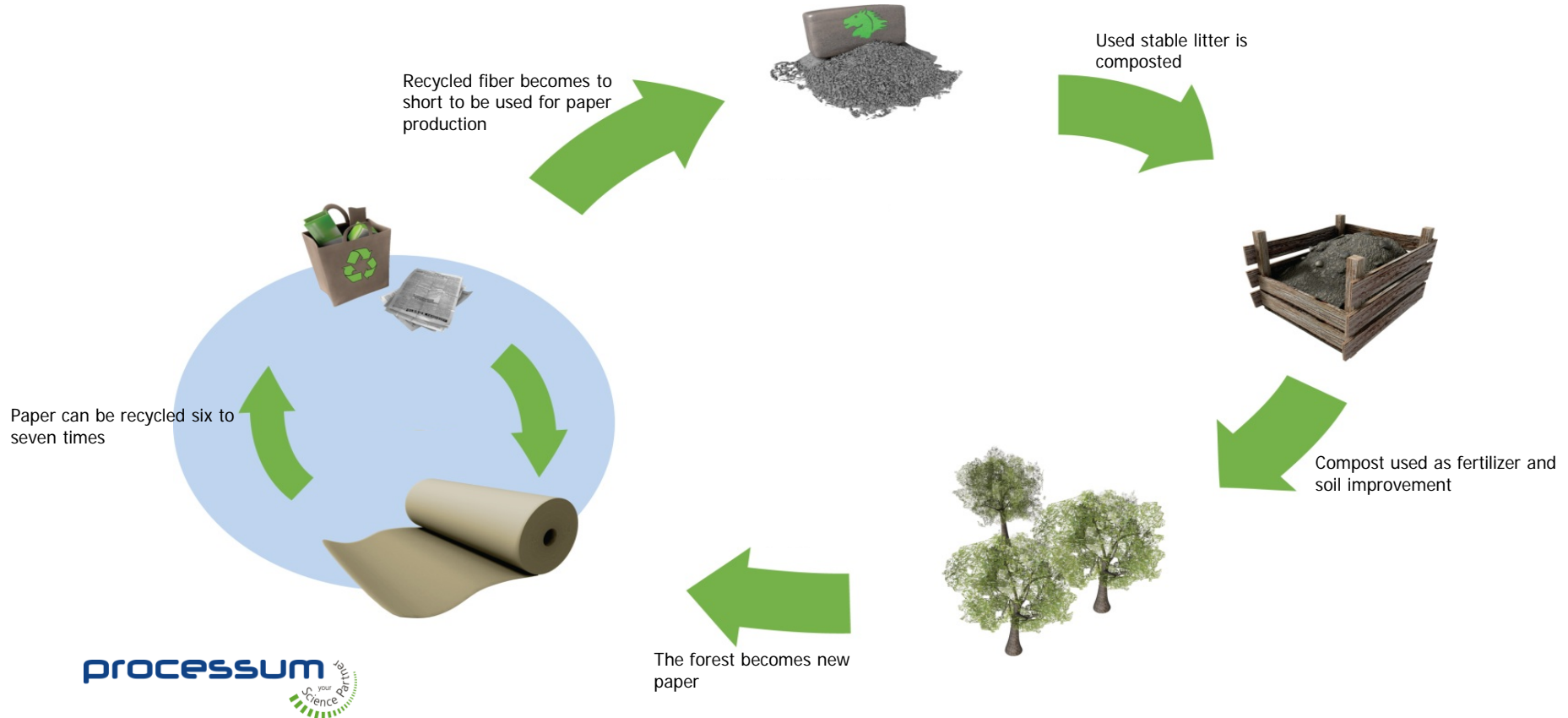
Fiber sludge - Sugar platform



Fiber sludge - Ethanol fermentation



Fiber sludge - Stable Litter



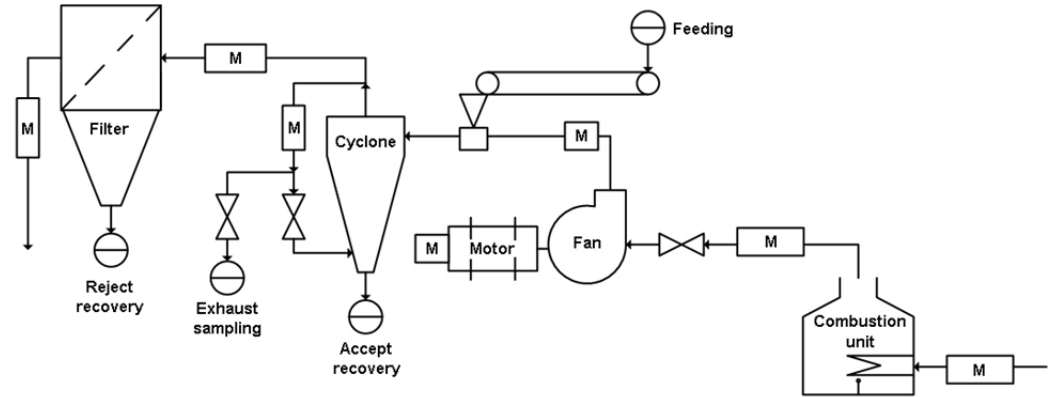
Fiber sludge - Drying studies

- Drying was performed in a Tornado dryer, Airgrinder AB
- Possibility to control DM content related to energy consumption
- Different types of fiber sludge were evaluated
- Aim to get a dry matter content of 70%



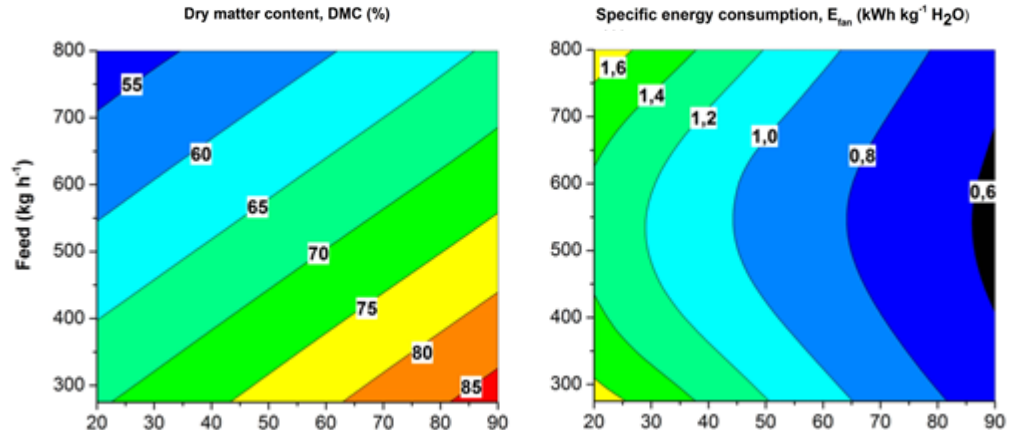
Fiber sludge - Tornado dryer

- Process design of drying
- Heat is generated from combustion of biofuel
- Feed can be varied independent of air temperature

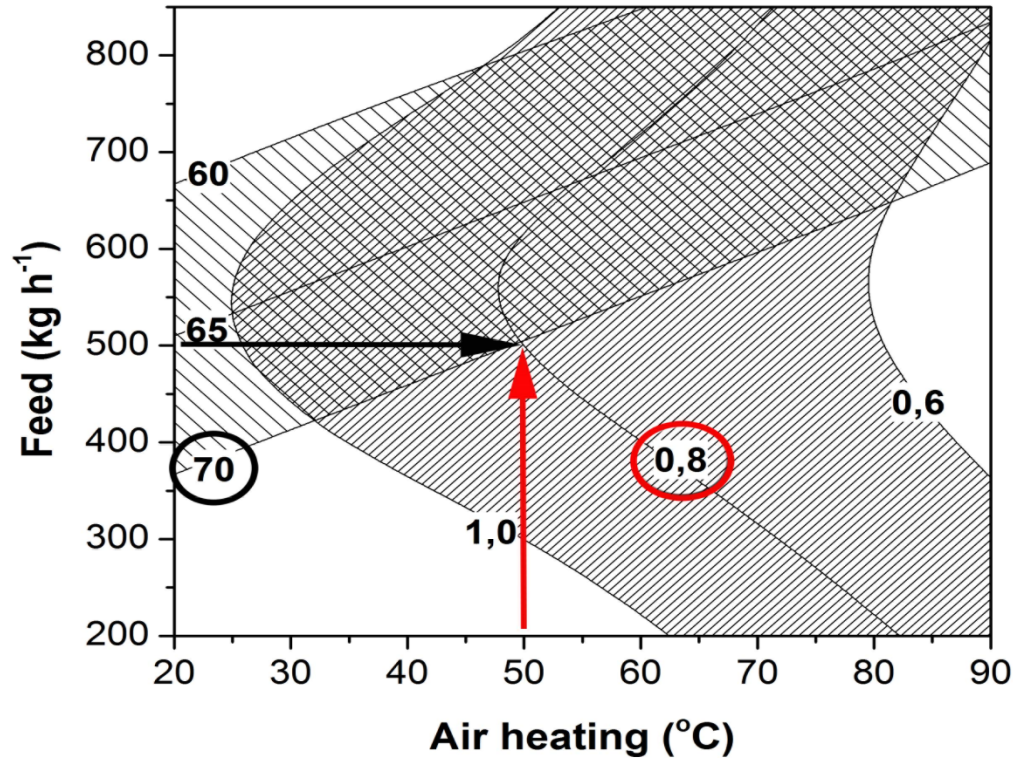


Fiber sludge - Drying results

- Temperatures ranging from 20 to 90 °C
- Feed rates from 300 to 800 kg/h
- Specific energy consumption measured on the fan



Fiber sludge - Tornado dryer



Pre heated air: 50 °C
Feed: 500 kg/h
Resulting DMC: 70%
Electricity used: 0,8 kWh/kg evaporated water

Conclusions

Green liquor sludge

- Possible to use GLS as an additive in till to get a sealing layer to cover acid mine drainage
- A pilot trial is performed and will give large scale answers
- A full scale cover of an old mine in Näsleden is initiated

Fiber sludge

- Fiber sludge can be used as raw material for chemical production
- Also suitable as stable litter, an effective drying technique, good absorption and a recycling strategy outlined

Acknowledgement

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All the mills along the coast of northern Sweden



Thank You for your attention

En investering för framtiden



EUROPEISKA
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LÄNSSTYRELSEN
VÄSTERNORRLAND



ÖRNSKÖLDSEVIKS KOMMUN



processum-
medlemmarna

