PROCESSING OF RAW MATERIALS
EQUIPMENT

- Fixed-bed reactor (400 liters, 36 bar, ATEX compliant) with forced circulation and separate supply and discharge tanks
- Precipitation tanks (up to 1200 liters, can be cooled and stirred, with continuous solvent evaporation, ATEX compliant)
- Equipment for disintegration, washing and dewatering of pulp
- Tanks for enzymatic hydrolysis and extraction of pulp with spiral agitators for high solid loadings (2 x 800 liters, pH and T control)
- Falling film evaporator for the concentration of sugar solutions
- Rectification for the recovery of solvents (1000 liters, ATEX compliant)
1. Pulping of lignocellulosic feedstock is carried out in a 400 liter fixed-bed reactor at temperatures up to 200°C, during which lignin and hemicelluloses are dissolved in the ethanol-water mixture.

2. Additional tanks and heat exchangers allow efficient displacement washing of pulp at reaction conditions.

3. Lignin is precipitated from the black liquor by addition of water or by distillation of ethanol, filtered, washed and dried.

4. From the filtrate, ethanol is completely recovered by distillation while the hemicellulosic sugars remain in aqueous solution.

5. The pulp is disintegrated, washed and dewatered. If necessary, the pulp can be mixed with enzymes and hydrolyzed at high solid loadings in specially designed stirred reactors. Glucose solution is obtained after a subsequent filtration step and concentrated to a syrup for stabilization using falling-film evaporation.
PROCESS SCHEME

1. Organic solvent
2. Organic solvent/water
3. Wood chips
4. Pulping
5. Digester 400 L 200 °C
6. Tank farm
7. Spent liquor
8. Lignin precipitation/recovery of organic solvents
9. Washing and disintegration
10. Fiber fraction
11. Dewatering

Steps involved:
- Pulping
- Digester (400 L, 200 °C)
- Tank farm
- Spent liquor
- Lignin precipitation/recovery of organic solvents
- Washing and disintegration
- Fiber fraction
- Dewatering
lignin precipitation
recovery of organic solvents
washing enzymatic hydrolysis concentration drying filtration hemicelluloses organosolv-lignin hydrolysis lignin glucose syrup
REFERENCES

Pulping and extraction

- Soda pulping in cooperation with the Technische Universität Dresden as part of the ERA-IB2 project »Products from lignocellulose«
- FABIOLA™: low temperature process based on aqueous acetone, developed by the Energy Research Center of the Netherlands ECN
- Alkaline ethanol-based Organosolv digestion of wheat straw on behalf of the Annikki GmbH, Raaba-Grambach, Austria, developer and owner of the process
- Alkaline extraction of hemicellulose from paper pulp in cooperation with the University of Hamburg in the framework of the FP7-funded CarboPrec project

Variety of starting materials

- Beech wood
- Spruce
- Waste wood
- Eucalyptus
- Wheat straw
- Miscanthus
RANGE OF SERVICES

The focus in the area of raw material processing is on the extraction and pulping of biomass, especially on the fractionation of lignocellulosic feedstock into the constituents lignin, sugars and pulp. An integrated pilot plant is available for research and development of fractionation technologies. Here, up to 70 kg (DS) of wood can be processed daily.

We offer
- Scale-up of processes
- Integrated process development and optimization (energy and raw material efficiency)
- Process analytics
- Process and product expertise in the area of Organosolv pulping

Product portfolio
Supply with products from the Organosolv process
- Sulfur-free high-purity lignin
- Pulp
- Glucose
- Hemicelluloses
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