



# Fraunhofer

CBP

FRAUNHOFER CENTER FOR CHEMICAL-  
BIOTECHNOLOGICAL PROCESSES CBP

## 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)

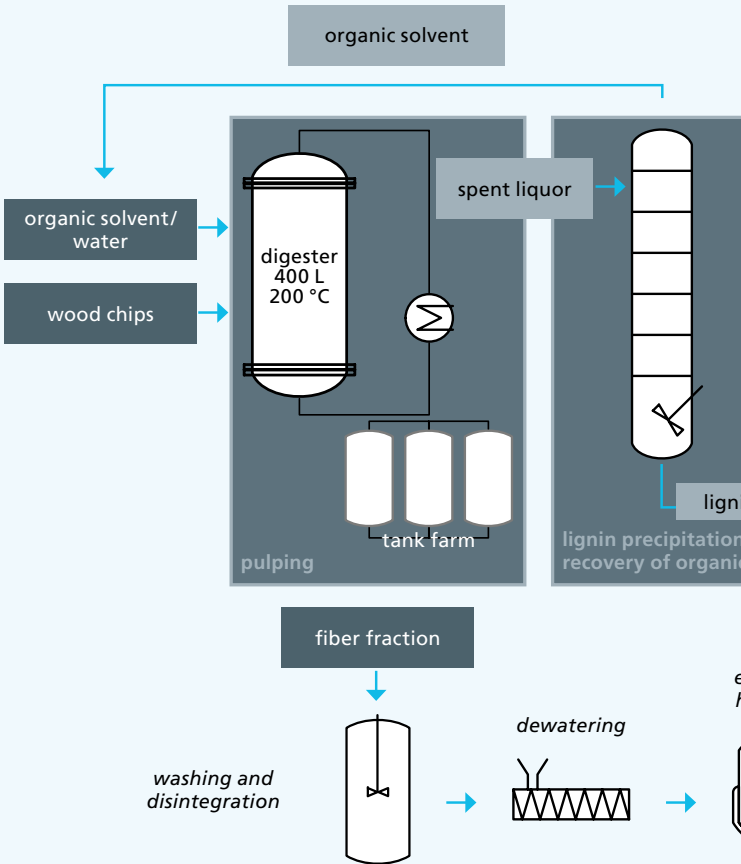


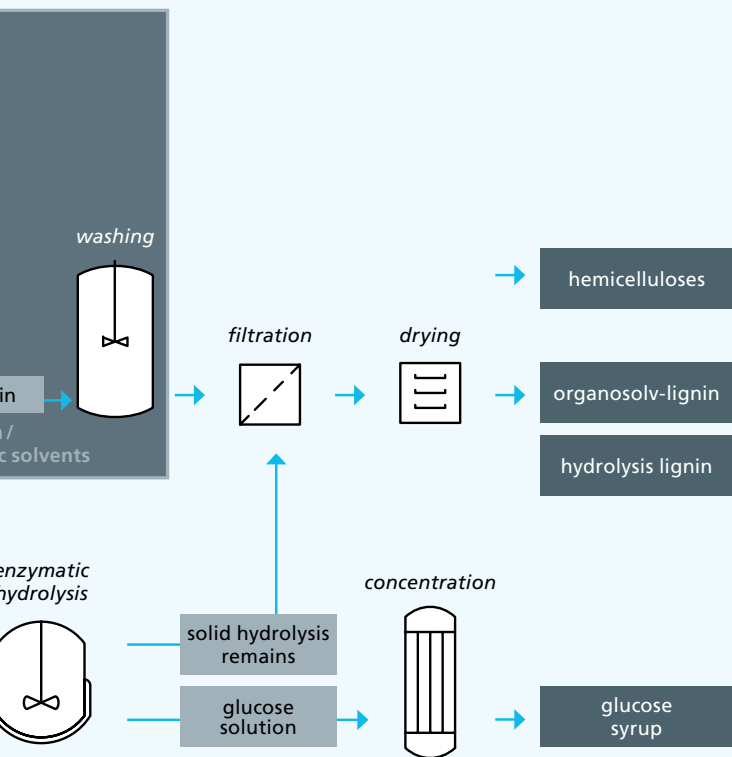
## CORE COMPETENCE ORGANO SOLV

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







## 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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