

## BIOPROCESS MODULE 1

# Pretreatment and Hydrolysis

In this module, dry and wet residues can be pretreated, hydrolysed and prepared for the fermentation phase.



### Feedstock Receival and Physical Size Reduction

The BPF can store and process a large variety of lignocellulosic feedstocks (e.g. straw, bagasse, corn stover) as well as other co-products from agricultural, forest or waste origin. In our feedstock receival and size reduction area, the feedstock is treated to be fed into the pilot scale pretreatment unit.

### Pilot Pretreatment Unit

In the flexible pilot scale pretreatment unit, the pre-milled and "cleaned" feedstock can be treated at different processing conditions to investigate the maximum conversion towards fermentable sugars and the removal of the lignin fraction.

A variety of chemical and/or physical treatments of biomass can be applied, e.g. autohydrolysis, acidic and alkaline treatments, liquid hot water,  $\text{SO}_2$ , steam explosion (catalyzed/uncatalyzed). A flexible system allows hydrolysis to occur in (two) stages to maximize sugar yield from the hemicellulose and cellulose fractions of biomass.

The first stage can be operated under different conditions, to hydrolyze hemicellulose, while the second stage can be optimized to hydrolyze the cellulose fraction. Liquid hydrolyzates can be recovered from each stage. The capacity of the pilot scale unit (approximately 40 kg dry biomass per hour) enables delivery of sufficient sugar material for pilot scale fermentations (4 m<sup>3</sup> and 8 m<sup>3</sup>).

### Bench Scale Pretreatment Unit

The bench scale represents the complete pretreatment line on a small scale. The system is able to simulate the major pretreatments in a batch-wise process. The capacity of a batch (feed basis) at the bench scale unit is approximately 4 kg biomass. With these batch sizes, the required amount of sugars for subsequent testing in lab fermentors up to 10 l (after hydrolysis) is possible.

The bench scale unit is a flexible 2-stage system located in an ATEX environment, enabling a large variety of chemical and/or physical pretreatment processes, e.g. acidic and alkaline treatment, liquid hot water, ammonia,  $\text{SO}_2$ , organosolv, ionic liquids, oxidizing agents, steam explosion (catalyzed/uncatalyzed).

### Hydrolysis

Cellulosic fractions of feedstocks originated from the pretreatment unit or externally received process streams can be enzymatically hydrolysed. For the hydrolysis of these process streams, BPF has vessels of up to 10 m<sup>3</sup> available, enabling hydrolysis at both high and reduced viscous conditions. In addition, bench scale facilities are available to study enzymatic hydrolysis of (high solids) feedstocks to produce fermentable sugars for lab scale fermentation.

*Pretreatment available in 2014,  
hydrolysis up to 4 m<sup>3</sup> currently available*

### For more information:

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PILOT FACILITY