

# IPC Mini Bioplants

## Integrated Process Chain

Frings



### 'Thinking in Processes' FRINGS Mini Plants and Pilot Plants

- ✓ State-of-the-Art Process Technology and Automation Tools for Down-Scale of Bioprocesses
- ✓ Optimization of Industrial Production Processes
- ✓ Modelling, Simulation and Optimization of Complex Processes at University and Industry Level
- ✓ Close Cooperation between Customers' Process Specialists and FRINGS Biotechnologists to achieve a Fully Automated Process Chain
- ✓ Significant Cost Reduction for Process Design, Programming, Assembly and Operation of Laboratory and Pilot Processes

Products for Bioprocess Technology





# IPC Mini Bioplants Integrated Process Chain

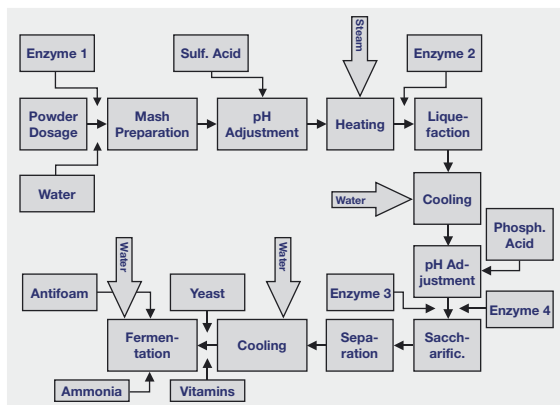
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Integration of mini-plant modules (auto-sterile) into an existing laboratory environment



Process steps implemented by lab-scale fuel ethanol plant (batch sequence)



Turnkey project (hygienic design), modules skid mounted

## Equipment for IPC Mini Bioplants Hydraulic units available

- PROREACT fermentation systems
- ACETATOR fermentation systems
- Mixing units with various stirrer options
- Gas/liquid mass transfer devices
- Heating units (electric, steam, evaporation, ...)
- Dosing units for liquids, powders, slurries
- Defoaming (FOAMEX) and flotation systems
- Membrane units (MF, NF, RO, PV)
- Pumps (peristaltic, high pressure, membrane, ...)
- ...

## Mini Plant Example 1

*Down-Scale of Industrial Acetic Acid Fermentation Process.*

Dual-stage operation in repeated fed-batch mode is the most sensitive fermentation process catalyzed by *Acetobacter spec.*

The reliable FRINGS Mini Plant provides full automation without requiring any manual work. The system achieves a reproducible acidity of >21 % over a period of several months. It allows for programming and automatic balancing and reporting of different recipes, kinetic studies and alternative control strategies.

## Mini Plant Example 2

*Lab Scale Fuel Ethanol Plant*

The process for ethanol production from renewable resources includes several steps. IPC Mini Bioplants are able to simulate either multi-stage continuous or batch-wise liquefaction, saccharification and fermentation processes in SSF or sequential technology.

These mini plants can be combined with a wide range of hydraulic units, sensors and controls, and provide realistic process behavior. They also allow to integrate distillation columns into the hydraulic system and the process control.

## Mini Plant Example 3

*Production of Recombinant Proteins*

The basic PROREACT P bioreactor system can be equipped with different mixing and automation modules to cultivate different kinds of cells. Furthermore, the IPC concept allows to include automatic modules for harvest and separation, such as Crossflow micro-filtration units and centrifuges or purification modules like chromatography or extraction devices. These devices can be customized and included in a turnkey project. The integration of existing standard systems is also possible if they provide the needed I/O signals.

## Automation and control modules

- Sensors and amplifiers
- Set of basic measuring and control routines
- Calibration routines for sensors
- Predefined routines for individual hydraulic units
- Configurable process sequences
- Multi-graphic data display
- Data, alarm and event management
- Analysis and reporting functions
- ...