



1 *Corn as an example of renewable resources for the recovery of recyclable materials.*

## DOWNSTREAM PROCESSING

### THE WAY TO YOUR PRODUCT

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Industrial white biotechnology relies on the use of renewable or biogenous resources for the production of chemical and pharmaceutical products.

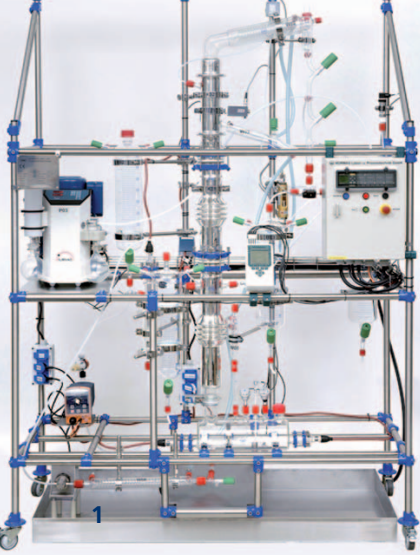
The success of biotechnological processes is, apart from the conversion step, also essentially determined by the processes of product isolation and cleaning (downstream processing, DSP) which follow the bioconversion. In this connection the mechanical, thermal or chemical separating techniques must be adjusted in an optimum manner to the upstream bioconversion and the downstream processing. The available raw material mixtures often show a low concentration of the desired recyclables while at the same time high requirements with regard to the purity of the final product are to be met.

#### Keywords

- Process screening
- Process development
- Laboratory examination
- Analytics
- Economic evaluation
- Simulation

#### Industrial sectors

- Chemical industry
- Pharmaceutical industry
- Food industry



- 1 *Laboratory rectification plant.*
- 2 *Laboratory crystallization plant.*
- 3 *Laboratory extraction plant.*

### Our competencies

Fraunhofer UMSICHT develops and optimizes technical processes for the production of recycling materials from renewable resources. In this connection system solutions for process technology are developed and realized on the basis of demonstration plants at the laboratory and in the technical shops as well as by means of model-based simulation software. In this connection the study of the process chain as a whole – from the process idea to the commercial process and from the raw material to utilization of residues at the end of the product life cycle– is of essential significance because this is a requirement for the provision of economic processes. The development of effective and optimized procedures for downstream processing is in this connection largely effected

- by the integration of upstream and downstream processes to increase throughput and improve economic efficiency
- by targeted process screening from economic points of view
- by the use of simulation tools
- by accompanying economic evaluations.

### Technological specifications

To carry out examinations the required equipment for mechanical and thermal process engineering is available at our laboratory and pilot plant..

- Thermal separating technology: Evaporator, molecular distillation, rectification, extraction, adsorption, absorption and crystallization for product recovery
- Membrane technology: Reverse osmosis, ultra, micro and nano-filtration, electrodialysis as well as hybrid processes for the solution of product recovery tasks
- High pressure technology: Utilization of the properties of supercritical fluids for reaction, crystallization and extraction
- Reaction technology: Reactors for multiphase systems, gaseous phase extraction and microreactors for the chemical conversion of fermentation products into high-grade special chemicals
- Modeling and simulation: Calculations with common software tools (e.g. ASPEN-Plus™, FLUENT) and internally developed models

### Our service

Based on the know-how and technical equipment of our laboratories and technical shops we offer

- process screening to work out optimum process stages on a laboratory and pilot plant scale
- modeling and simulation of reprocessing processes
- development of integrated processes for the optimization of the overall process
- economic evaluation for the assessment of existing processes and of processes to be developed.