Project number: ETB-2012-26

Acronym: OPTISOLV

Type of biotech: Industrial

Project title: Development, optimization and scale-up of biological solvent production

Total budget of the project: 2.412.000 €

Participating countries/regions:
- Germany
- Italy

Summary of the project:

Worldwide, capacities for biological production of base chemicals and biofuels are currently built up. After being the largest industrial non-food bioprocess in the first half of the last century, fermentations employing solvent producing Clostridia are again in the focus of interest. In industrial application, main drawbacks of butanol production by Clostridia are related to process stability, complex metabolism and to the low concentration of butanol in the broth. Process improvement by implementation of research results on Clostridia in large scale processes is currently restricted to the use of optimized strains. Beyond strain related measures, butanol production can be enhanced by proper selection of bioreactor design, optimization of operating conditions of the fermentation, and by selection of suitable downstream processing. To reach these goals, process design must be coordinated with microbial behaviour.

Recent advances in systems biology of Clostridia allow detailed insight into the dynamic intracellular events and their relation to extracellular conditions which in turn are governed by process conditions. This ultimately allows computer simulation of interactions between intracellular metabolism and overall process control. Induction of metabolic pathways and increase of their effectiveness by external stimulation of Clostridia has been shown on a laboratory scale. Transferring this approach to an optimized reactor in pilot scale is the aim of this project. Most important feature of this continuous plug flow type reactor will be the introduction of stimuli at optimal points along the length coordinate, predicted by computer simulation. The process proposed includes furthermore a reactor system based on a biofilm fixed bed and a butanol recovery system based on integrated downstream processing within the fermentation step.