

PRODIAS – Processing Diluted Aqueous Systems – fostering European process industries’ competitiveness in the area of renewable based processes.

A main challenge the process industry is facing today in introducing renewable raw materials into their value chains, is the development of cost- and energy-efficient water removal and product-recovery and purification techniques. In order to unlock the potential of the renewable-based product market for the European process industry, a re-thinking of downstream processing is indispensable. This includes new / optimized separation technologies as well as suitable methodologies for fast-track development of tailored downstream processes.

To face this challenge a consortium of European process industry companies in the areas of biotechnology, renewable resources, chemistry, process engineering and equipment supply as well as research organizations launched the project PRODIAS (PROcessing Diluted Aqueous Systems).

Focus of PRODIAS is to adapt separation technologies to the need of white / industrial biotechnology products and to design novel systems combining individual advantages, for example, selectivity and energy efficiency. Moreover, fermentation and biocatalysis by which the valuable products are produced are subject to alteration and optimization within the project to enable more efficient and resource-saving downstream processing.

Under the consortial leadership of BASF the partners Cargill, University of Kaiserslautern, Imperial College London, Alfa Laval, GEA Messo PT, Xendo, UPM and Enviplan collaborate to develop the needed technologies thus support downstream processing in industrial biotechnology.

PRODIAS – successful consortium work since project start.

Industrial biotechnology is an enabling technology to produce both, complex performance products such as Enzymes and intermediates to be used within chemical value chains based on renewable resources. A standard production process for the respective (bio-)chemical molecules usually comprises a fermentative or bio-catalytic production followed by many concentration and purification steps. Technologies and methods for concentration and purification are in many cases originating from the chemical engineering and designed to suite the demands of fossil based production processes. During the past 36 months, PRODIAS looked at more than 25 methods and technologies and further developed selected ones to enable and optimize their application in the area of industrial biotechnology and developed respective machinery and apparatuses.

Starting in 2015, PRODIAS so far developed 4 technologies to a technical readiness level allowing their direct application within biotech processes.

- PRODIAS succeeded in decreasing energy needs for certain disk-stack separators, centrifuges used to separate cell-biomass from fermentation broth, by 50% compared to standard. In consequence, process energy consumption can be reduced thus contribution to saving resources and decreasing green-house gas emissions.
- PRODIAS partners pushed the limit of concentrating industrial enzymes to above 40% D.S. without measurable activity loss using a hybrid technology consisting of freeze concentration and ultrafiltration. A two-stage freeze concentration plant is under construction and will be in use from Mai 2018 onwards.
- Re-thinking Expended Bed Adsorption: PRODIAS developed an efficient apparatus & software combination allowing for efficient adsorption / desorption process also in continuous process mode. Result: high purification efficiency from particles containing feed stream.
- Boosting fermentation performance: PRODIAS succeeded in increasing fermentation performance of a commercial product by 25% via deep understanding of microbial physiology and process kinetics. This activity, which already transferred to commercial operation led to resource savings as well as decreasing cost of production.

Moreover, 6 methods and technologies were developed to a status enabling their use as standards in R&D. Amongst those are high-potential technology combinations (hybrids) such as adsorption / extraction & electro dialysis, a new device to test the stability of flocks and design and printing of 3D-printed small hydrocyclones.

In parallel, academic partners were working on ground-breaking methods to predict physicochemical behavior of unknown mixtures utilizing combining state-of-the art analytical methods with advanced modelling.

Numerous ideas were born based on PRODIAS findings – exciting work for 2018 and beyond.

PRODIAS made innovation a reality.

The Project will lead to a substantially improved performance in fermentation and downstream processing by a significant increase in productivity and efficiency, lower energy consumptions and a decrease of investment costs. Resource and energy efficiency has a tremendous environmental impact by the reduction of GHG emissions, water usage and raw material.

PRODIAS consortium is dedicated to innovation, the project structured in multi-beneficiary work-packages combining talents, creativity, expertise, and application orientation.

Trust & cooperation, transparency and open communication to overcome technical, organizational, and cultural hurdles are key to achieve the challenging goals.

PRODIAS partners mindsets are focused on collective success but valuing individual

contribution: one project – one goal.

The developed methods and technologies are ready for cross-sectorial use in different industrial sectors. Thus, the project will increase the competitiveness of renewable-based chemical products while at the same time preserving jobs or reinvesting in new employment opportunities. PRODIAS improves the innovation capacity and enables the knowledge integration by sharing knowledge and cost between the cross sectorial partners. Via cooperation's the project deepens the understanding of downstream processes and accelerates the adaption, transfer and take up of new technologies.