Model-based profitability analysis of a modular continuous production of recombinant proteins

Dipl.-Ing. T. Seifert, Prof. Dr.-Ing. G. Schembecker, Dipl.-Ing. Stefan Sievers, Dr.-Ing. C. Bramsiepe

Technische Universität Dortmund, Dortmund/Germany

Multiproduct batch plants and continuous world-scale plants are currently the dominant types of chemical production plants. Using multiproduct batch plants offers the opportunity of quick response to market changes. However, due to discontinuous production mode, batch plants are usually inefficient in terms of energy and raw material consumption. Large continuous world-scale plants on the other hand are very efficient but inflexible. The idea to combine the flexibility of a multiproduct batch plant and the efficiency of a continuous world-scale plant offers the opportunity to overcome the disadvantages of both concepts. Therefore world-scale plants could be divided into several smaller plants and multiproduct batch plants have to be converted into continuous mono-product plants. Building chemical plants with a modular design to reduce design and construction time can additionally increase the economical benefit for the new production concept. Thus new markets can be served faster which is of special interest for products with a limited lifetime such as agro chemicals and pharmaceuticals.

In this lecture a multiproduct batch plant is compared with continuous modular mono-product plants to emphasize economical benefit resulting from continuous modular plants. The process chosen is a multiproduct batch plant for the production of four different proteins [1]. It contains fermentation, micro-, ultra- and diafiltration, homogenization, aqueous-two-phase extraction and chromatography. This process was converted into four different continuous mono-product plants. To determine the operating and investment costs all plants were simulated in INOSIM Batch®. The two concepts were evaluated economically by means of discounted cash flow calculation.

[1] J. M. Pinto, J. M. Montagna, A. R. Vecchietti, O. A. Iribarren, J. A. Asenjo; 2001; *Process Performance Models in the Optimization of Multiproduct Protein Production Plants*; BIOTECHNOLOGY AND BIOENGINEERING, VOL. 74, NO. 6: 451-465

Acknowledgment

The research leading to these results has received funding from the European Community's 7th Framework Program under grant agreement n° 228867, F^3 Factory.