

Goals & Results

Goal

RECOBA aims to improve product quality, enhance efficiency and flexibility of batch processes using state of the art solutions

Outcomes

- novel, innovative solutions for the measurement and control of product quality for batch processes
- new mathematical models to realise integrated model based process control of batch processes
- advanced process monitoring using newly developed hard and model based soft sensors for batch processes
- real-time process control & optimization of batch processes through model based & closed approach
- new markets development through novel business model for relevant industrial sectors
- ensuring better product quality, improved batch efficiency, reduced energy and lower carbon footprint



RECOBA - the project

- Start date: 2015-01-01
- Duration: 2017-12-31
- Budget: 6 M €
- Coordinator: Omar Naem, BASF



RECOBA

REal-time sensing, advanced
COntrol and optimization of
BAtch process saving energy
and raw materials





The RECOBA project

The RECOBA project aims to improve product quality, efficiency and flexibility of batch processes

Cross-sectional challenges: Many companies of the European process industry face the same challenges, irrelevance of industrial sector:

- Improved product quality at minimum production costs to be competitive on the world market
- Reduced resource and energy consumption for lower ecological footprint

The development of new production technologies is one of the possible method to tackle given challenges. Examples include modularized processes in the chemical industries, new ways to reduce iron ore to liquid iron in steel industry or increasing the yield during refining of silicon industry. These can be a part of long-term solutions. RECOBA addresses promising short to medium term solutions: Efficiency increase of batch processes **by improved and integrated process control.**

In many aspects batch processes are superior to continuous ones. Therefore it is worthwhile to take advantage of recent progress in sensor technologies, modeling and automation to develop a new paradigm for the design and conduction of batch processes. **The objective of the project is to maximise efficiency of batch processes regarding quality, energy, raw materials, costs.**

Case studies

Polymerisation process

A demonstration case concerns semi-bath emulsion polymerisation, which is one of the most complex polymerisation processes. The final goal of the project is to demonstrate real-time control of molecular structure and morphology of polymer latex particles. This is possible using new hard sensors, novel model based soft sensors and nonlinear closed loop model predictive control.

Liquid steel-making process

A second demonstration case focuses on liquid steel-making, in particular the following two processes: the RH treatment (a vacuum degassing step) and the gas stirred ladle treatment. New technology for inline measurements is introduced. Model predictive control is developed, incorporating the whole chains of batch processes, while considering interactions and interdependencies.

Silicon refining process

Silicon refining is a high temperature ladle process involving a liquid alloy, refining gas and refining materials. New temperature measurements have been successfully tested in the case study. A solution for model predictive control has been developed for optimal use of refining gas and materials, for improved control of process temperature and alloy composition.

Consortium Partners

Industries

Global players from the polymer industry, the steel industry and the silicon metal industry provide their processes and infrastructure for validation in different industrial environment: BASF SE, Germany, Thyssen Krupp Steel Europe AG, Germany, and ELKEM AS Technology, Norway.

Research Institutes and universities

Our academic partners possess leading scientific expertise covering material science, mathematical foundations of modelling, chemical reactions, computational and process system engineering to provide purposive research strategies: RWTH Aachen University, Germany, University of Cambridge, United Kingdom, University of Chemistry and Technology Prague, Czech republic, University of the Basque Country, Spain, and VDEh - Betriebsforschungsinstitut GmbH, Germany.

SMEs

Two SMEs provide applied research, sector knowledge and large-scale implementation experience for a wide range of measurement techniques, control systems and process automation: *Cybernetica AS, Norway, and MINKON Sp., Poland.*