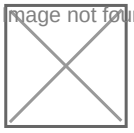
CoPro: Surrogate modelling tool and workflow in gPROMS

Project:
Improved energy and resource efficiency by better coordination of production in the process industries



The goal of the CoPro project was to develop and to demonstrate methods and tools for process monitoring and optimal dynamic planning, scheduling and control of plants, industrial sites and clusters under dynamic market conditions, to provide decision support to operators and managers and to progress to automated closed-loop solutions to achieve an optimally energy and resource efficient production.

CoPro brought together 17 partners from 8 EU countries, including 5 industrial end users and 6 technology providing SMEs. The project developed solutions for the **plant-wide optimisation of large plants, for balancing production and consumption in industrial parks for industrial symbiosis**, and addressed **power plant scheduling** and **demand-side response**. It further developed online data analytics for **anomaly detection**, and **decision support** for plant operators and managers. The solutions can be integrated into the IT infrastructure of the plants via an **integration platform** that supports the connection to different IT systems. CoPro developed **model libraries** for the efficient development of advanced optimisation-based solutions and techniques and software for **hybrid modelling** and **model management**.

The developments of CoPro were motivated by and applied to challenging use cases from different sectors of the process industries:

- (Petro-)chemical production;
- Cellulose fiber production;
- Production, formulation and packaging of consumer goods;
- Sterilisation and packaging of food.

CoPro demonstrated that significant savings of energy and resources are possible by using advanced technologies for monitoring, decision support, optimisation, and planning and scheduling.

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Sector:

Chemicals

Summary:

The Problem

- First-principles process models can offer high-fidelity predictions over wide operating ranges. However, they can be computationally complex.
- This computational complexity can prohibit the use of these models for certain high-value applications, for example optimisation of integrated plant networks and other very large systems, online advisory systems and advanced control.

The Solution

- Automatic derivation of surrogate models, usually in the form of explicit input/output relations, which capture the behaviour of complex first-principle models in the relevant operating space while being able to be evaluated rapidly and robustly.
- Graphical User Interface elements within PSE's gPROMS modelling platform to facilitate rapid creation of surrogate models and the assessment of their accuracy by engineering users.
- A plug-in software architecture to support the addition of generation algorithms for different surrogate model types in the future.

Theme:
Plant-wide monitoring - SPIRE02-2016
Keywords:
Modelling, Optimisation, Model reduction, Machine learning, Simulation, Advanced control
Type:
Software
Poster

Resources

Link:
Technology Short Description: Surrogate modelling tool and workflow in gPROMS

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Complementary Material:

Poster: Surrogate modelling tool and workflow in gPROMS

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