## An online use of first-principles models (*Cicciotti et al*)

The simultaneous reconciliation and update of parameters of a first-principles model can be achieved using an optimization framework that exploits physical and analytical redundancy of information. We demonstrate this concept by an industrial case-study with a multi-stage centrifugal compressor. Two industrial cases including sensor failures were analysed where the proposed framework was able to reconcile the measurements for both cases.
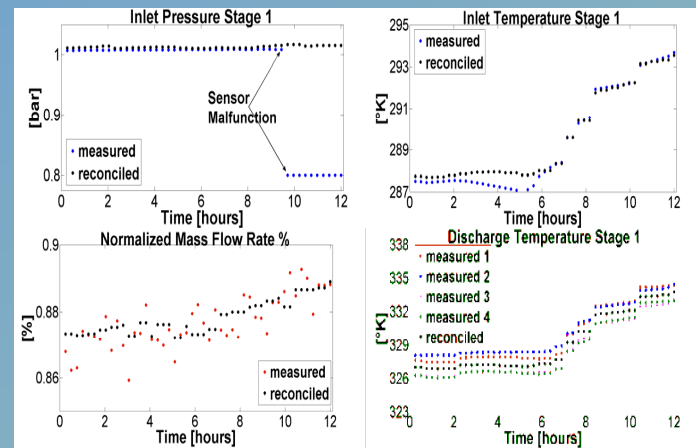
Cross-decomposition scheme for two-stage stochastic programming (*Grossmann et al*)

Two-stage stochastic programming investment planning problems can be hard to solve since the resulting deterministic equivalent programs can lead to very large-scale problems. In order to deal with such problems our algorithm is based on the cross-decomposition scheme and fully integrates primal and dual information in terms of primal-dual multi-cuts added to the Benders and the Lagrangean master problems for each scenario.
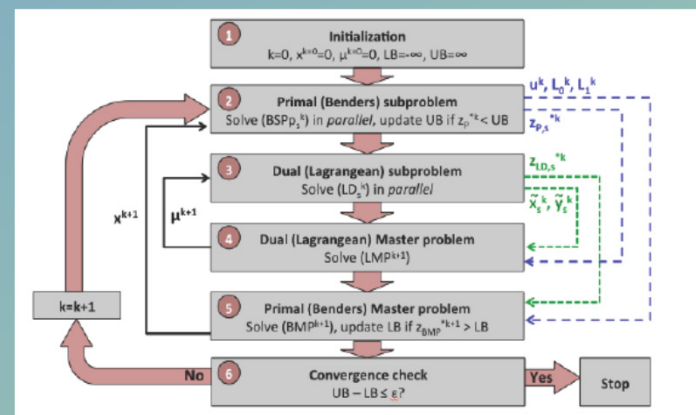
Combining supplier selection and production-distribution planning (*Amorim et al*)

This work addresses an integrated framework for deciding about the supplier selection and assess the impact of such decision in the tactical production-distribution planning of food supply chains. We propose a new multi-objective two-stage stochastic mixed-integer programming model that maximizes the profit and minimizes the risk of a low customer service. Results indicate a clear trade-off between expected profit and customer service.
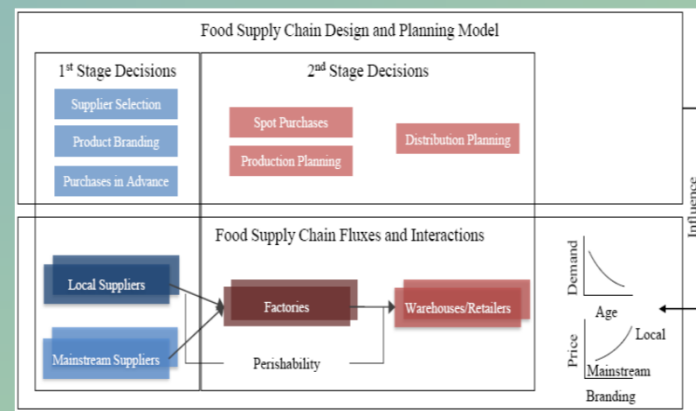
Optimization of methylene blue adsorption from aqueous solution (*Gajic et al*)

Dyes are widely used in many process industries such as textiles, food, paper, cosmetics, polymers and rubbers and may be very harmful when found in water. We propose an energy efficient adsorption process of dyes from industrial wastewaters using bentonite clay as the adsorbent. The central composite design was used for investigation of the interactions between process variables and numerical optimization to find the optimal ones.
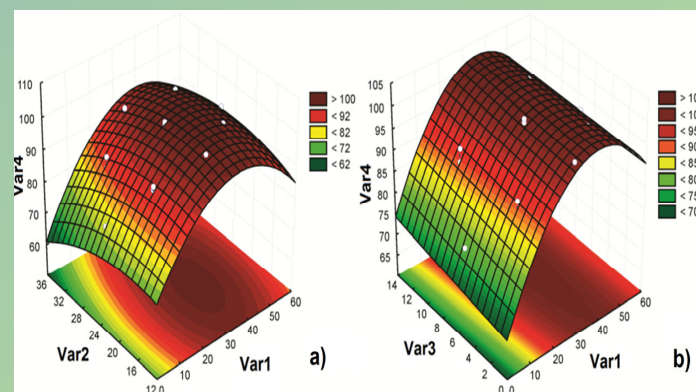
Energy-SmartOps

Large-scale energy savings from smart operations of electrical, process and mechanical equipment

The topics of Energy-SmartOps are equipment and process monitoring, integrated automation and optimization for energy savings in oil & gas, steel and chemical processes.

Visit us at the ESCAPE 24

Special Session

Tuesday, June 17, 2014

11:00-13:00

**FP7 Marie Curie Initial Training Networks
PITN-GA-2010-264940 (2011-2015)
Project consortium**

BASF, ThyssenKrupp Acciai Speciali Terni, Statoil, ABB R&D in Germany, Norway and Poland, ESD Training Simulation, Imperial College London, Cranfield University, ETH Zurich, Politechnika Krakowska, Carnegie Mellon University

Objectives

- **Generate creative ideas for energy savings in large-scale industrial sites, and test them in case studies.**

- **Develop scalable and complete equipment monitoring systems integrating multiple measurements from the process, mechanical and electrical subsystems.**

- **Do performance monitoring and control by capturing information from all three subsystems.**

- **Develop new algorithms that explicitly manage the interfaces and interactions between them.**

- **Study various ways that energy savings can be achieved through optimization and better integration of operations.**

- **Transfer knowledge between academia and industry.**

Energy Saving / Optimization / Performance & Control / Equipment Monitoring

Challenges

- **Integration of both models and measurements from the process, mechanical and electrical subsystems**

- **Integration across different enterprise levels , e.g. process control and scheduling**

- **Efficient methods for solutions to large scale optimization problems**

- **Implementation and testing in a real production environment**

Energy-aware production scheduling (*Hadera et al*)

We extend a continuous-time scheduling model with generic energy-awareness to optimize the electricity purchase together with the load commitment problem. Considered electricity sources are volatile day-ahead markets, time-of-use and base load contracts, as well as onsite generation together with a possibility to sell electricity. The model is applied to a batch process of a melt shop in a stainless steel plant.
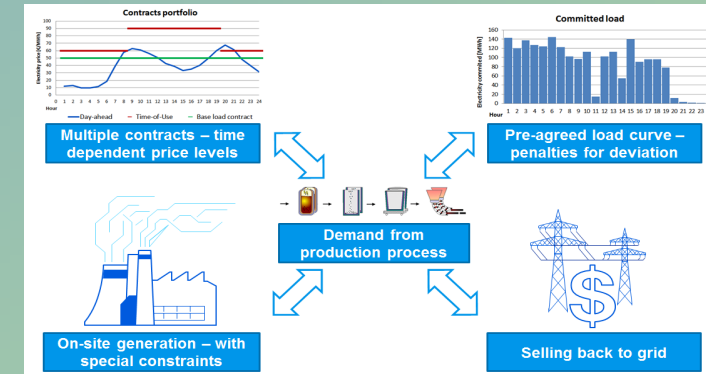

Integration of scheduling and ISA-95 (*Harjunkoski*)

Collaboration between production systems and scheduling is often cumbersome, partly due to the difficulty of sharing problem data. This work addresses the ISA-95 standard and its role as a neutral data platform. Typical industrial requirements are highlighted together with insights on how to systematically provide production data from a production facility to mathematical models. This can also foster the collaboration between Academia and Industry.

Information-rich visualizations to explore process connectivity (*Romero et al*)

We propose a new approach to the visualization of connectivity information, which is capable of representing a large number of connections between process variables and units, as well as process-specific information and alarm history. The novel visualization is based on the Circos framework. The benefit of adapting information-rich visualizations for the field of process systems engineering will be discussed based on an academic use-case.
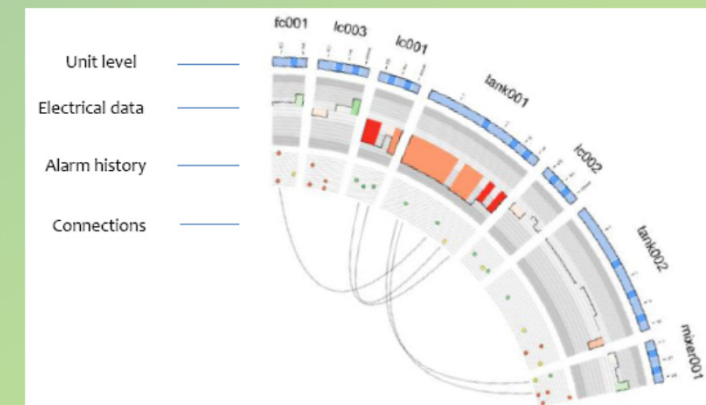
Operational optimization of compressors (*Xenos et al*)

Compressor condition varies during its operation due to mechanically degrading effects that result in decreasing performance and increasing power consumption. In our work, the increase in the power consumption of each compressor is linearly correlated to the periods of continuous operation, and the results demonstrate that the simultaneous optimization of condition-based maintenance and operation reduces costs and improves the compressors network flexibility.