Integrated Process Control based on Distributed In-Situ Sensors into Raw Material and Energy Feedstock

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***Abstract* – Inspired by world leading industrial partners in the non-ferrous, ferrous, chemical and steel industries, the DISIRE project aims at advancing existing industrial practices towards a sustainable process industry. Overall improvements in resource and energy efficiency are enabled by the DISIRE technological platform through 1) the pervasive sensing of the properties of raw materials and product flows, 2) the development of Process Analysis Technology (PAT) to assess quality and performance requirements and 3) the development of optimal and adaptive Industrial Process Control strategies.**

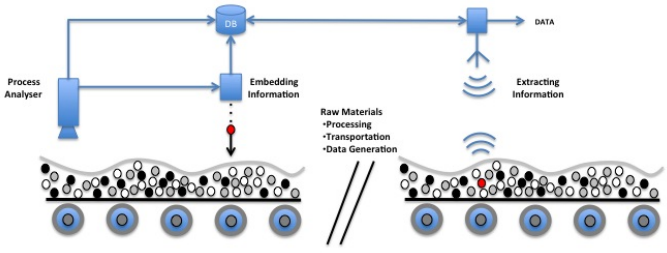
Executive Summary

Top researchers and world leading industrial players will cooperate under the DISIRE research umbrella in order to develop robust, yet miniaturized in-situ Process Analyser Technology (PAT) sensors and introduce a novel reconfigurable IPC approach to current industrial processes. The ultimate goal of the DISIRE technological platform is to establish a seamless integration of multiple DISIRE enabled PAT sensors into raw material flows to analyze and transmit big volumes of process data and on-line optimize the existing control loops for achieving better product quality, lower energy consumption and improved industrial reconfiguration and adaptability in the product production processes. Based on the DISIRE scientific and technological contributions, multiple new opportunities for commercial applications and cross-sectorial business cases will emerge.

DISIRE Technological Platform

The **key features** of the DISIRE technological platform in a nutshell:

- Scalability, robustness and adaptability to the industrial processes and to the characteristics of the raw materials.
- Reconfigurable IPC approaches featuring a new online PAT analysis for optimal control.
- Inline disposable swarms of sensors capable of measuring in real time the processes' internal dynamics.
- Advanced process status cognition, statistical learning and process model generation with the ability to generate process analytics in near real time.



Our contribution

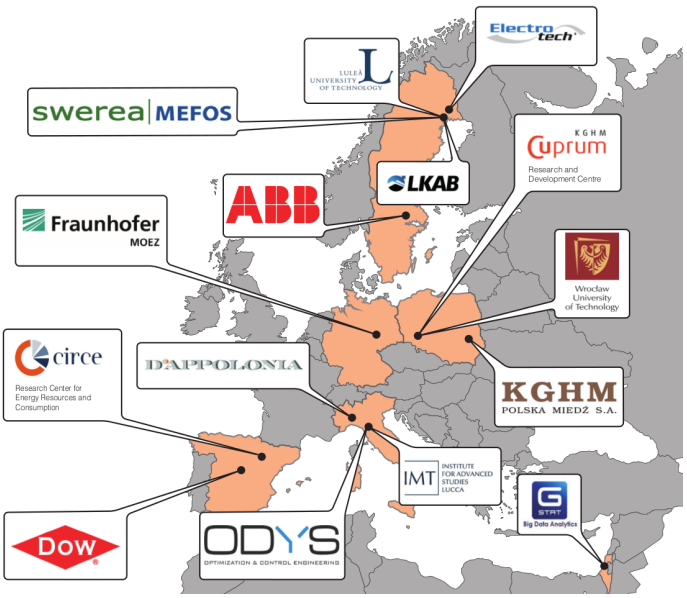
The Control Engineering Group at LTU is actively pursuing the following research directions (see the references below):

- increasing awareness of the process's state through fast and efficient distributed estimation of its properties;
- devising model predictive control strategies that are able to self-reconfigure in order to optimize the energy expenditure.

Partners

The consortium is formed by international leaders in the fields of ore mining and chemical processing technologies, industrial sensing / measurement, data acquisition / mining and world renowned control research groups.

SPIRE
Sustainable Process Industry through Resource and Energy Efficiency



References

- The SPIRE / DISIRE homepage at http://spire2030.eu/disire/
- R. Lucchese, D. Varagnolo, J.-C. Delvenne and J. Hendrickx. Network cardinality estimation using max consensus: the case of Bernoulli trials. *IEEE Conference on Decision and Control (submitted), 2015.*
- R. Lucchese and D. Varagnolo, "Networks cardinality estimation using order statistics," *In Proceedings of the American Control Conference, 2015.*