Coordinating Optimisation of Complex Industrial Processes

12 partners from 6 European countries (Finland, Sweden, Denmark, Germany, The Netherlands and Spain) covering several sectors of the industry: **steel**, **nutritional** and **materials products**, **automation technology providers**, **consultancy** and **software.**

The vision:

Complex process industry plants
will be optimally run by the operators with the
guidance of a coordinating, real-time optimisation system

General details

Project Start Date: 1st October 2016
Project End Date: 31th March 2020
Project duration: 42 months
Grant Agreement n.: 723661
Subprogramme area: SPIRE-02-2016,
H2020-IND-CE-2016-17
Web page: www.cocop-spire.eu
@CocopSpire

Contact Information

Prof. Matti VILKKO (matti.vilkko@tuni.fi)
Department of Automation
Science and Engineering
Tampere University
Finland

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723661

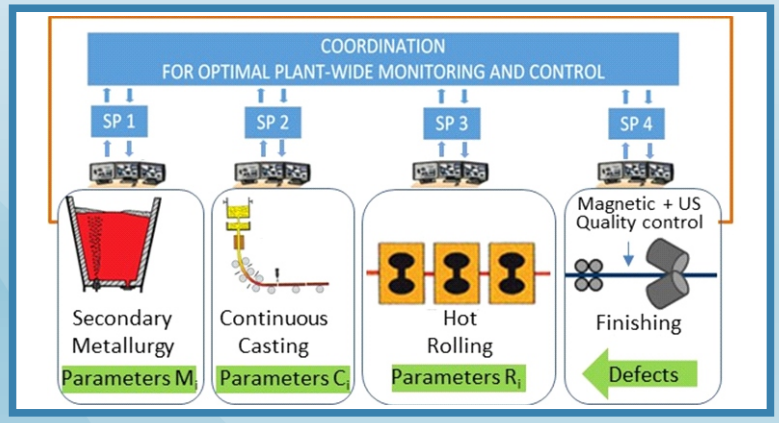
Need

Process industry faces a strong need to increase **product quality** and **reduce operating costs & environmental footprint**. A complex plant comprises continuous and/or batch unit processes, where the complexity stems from its dynamic properties, so a **plant-wide monitoring** and **control is needed.**

Objective

To achieve **plant-wide monitoring** & **control** by using the **model-based, predictive, coordinating optimisation** concept in integration with plant´s automation systems.

- COCOP is based on the **decomposition-coordination optimisation of the plant operations:** the overall problem is decomposed into unit-level sub-problems, and then, solutions of sub-problems are coordinated to plant-wide optimal operation using high-level coordination.



- COCOP combines the technological development with a **social innovation process** of co-creation and co-development for improving effectiveness and impact of the innovations and operator acceptance

Benefits

- Increased **product quality**
- Increased **productivity** and reduced operation **costs**
- Increased **sustainability** (reduced **energy and resource consumption** and decreased **greenhouse gas emissions)**
- Improved **working conditions** of plant operators
- Increased **competitiveness** of the European process industry

Steel pilot case

Goal: to develop a steel manufacturing **plant-wide monitoring and advisory tool to reduce the number of surface defects** at the final product for micro-alloyed steels, ensuring a good performance of the related sub-processes (secondary metallurgy (SM), continuous casting (CC) and hot rolling (HR)).

Models:

- SM model → predict the **castability index** of a heat.
- CC models → predict **thermal** and **shell thickness evolution** during the solidification process.
- HR model → predict **minimum/average temperature** of the billet before continuous rolling mill.
- Defects model → predict the **surface defects** generation in final product.

Advisory Tools:

- **Optimisation** tools → to define the optimal values for the parameters of the different sub-processes.
- **On-line monitoring and alarm** tools for SM and CC → to provide values of relevant parameters that are not measured and to warn in case of risks (alarms).
- **Off-line prediction** tools → to analyse the influence of the different parameters of the sub-process on its performance.
- **Quality** tool → to generate the quality report of a heat.

On-site application and testing:

Tools are easy to use and offer innovative data to support the production work and have a high potential the workers could benefit from.

Alarms: bad temperature, thickness, No. of defects →

Solidification front →

← **Temperature** evolution before straightener

← Shell **thickness** evolution at the end of mould