# COCOP: Overview

Project:
Coordinating Optimisation of Complex Industrial Processes

Project website: *www.cocop-spire.eu*

A complex industrial plant comprises continuous and/or batch unit processes where the complexity stems from its dynamic properties. In order to achieve an economically and environmentally efficient operation of a plant, the objective of the COCOP project was to **enable plant-wide monitoring and control by using the model-based, predictive, coordinating optimisation concept in integration with local control systems.**

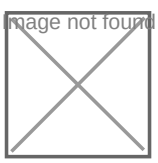
The project also combined technological and **social innovation within a common co-creation process** in order to improve effectiveness and impact of the innovations, their implementation process and user's acceptance.

The implemented solutions were tested in **two industrial scale tests**: in a **steel** and in a **copper plant**. The test cases validated the requirements and the developed solutions. The quantitative results provided good evidence that these approaches can enable to achieve the objectives and **provide considerable economic benefits** when the solutions have been developed to the TRL 9 level.

The COCOP general concept can be applied to any large industrial production site because it relies on general methods such as modelling of dynamics, data analysis and optimization. Thus, the project also analysed the transferability to other three sectors: Wastewater Treatment, Chemical and Glass Manufacturing sectors.

COCOP was a collaborative 42-months SPIRE project (October 2016-March 2020) and the consortium consisted of 12 partners (5 research organisations and 7 companies), from 6 European countries**.** This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723661.




Sector:

## Chemicals

found or type unknown

## Engineering

found or type unknown

## Non-ferrous metails

found or type unknown

## Steel

found or type unknown

## Water

Summary:

The final goal of COCOP was to increase the **competitiveness of the European process and automation industry** by increasing product quality, improving sustainability, reducing operation costs and improving working conditions.

The approach was to consider operating conditions of all unit processes of an entire plant and the mutual interactions of the unit processes to optimise and improve the overall plant-wide operation, integrating technological and social innovation within a common co-creation process. Development of data based and mathematical process models and application of plant-wide optimisation are the key elements of the project. A straightforward optimisation formulation of plant-wide operations creates such a huge mathematical optimisation problem that it is difficult to solve it with existing optimisation algorithms. An alternative approach, benefited in COCOP, is to decompose the entire optimisation problem into sub-problems and then, coordinating the solutions of sub-problems to achieve a plant-wide optimal operation.

The COCOP solution developed in the project consists of a novel ICT architecture, methods and instructions ("cookbook") for developing models for the two pilot cases (copper and steel manufacturing process), pilot cases related models and the corresponding optimisation methods, and implementations for test cases. Additionally, the integration of technological development within a social innovation process led to new methodological insights and tools.

The new predictive models and optimisation algorithms provide relevant information of the process. Using this information, the operator and other personnel can improve the overall understanding of the constraints of the process and bottlenecks of the operation, which affects to process operation and efficiency. The COCOP concept and system architecture facilitates integration of distributed processes and provides the required scalability and standardised interfaces for integration of information and control systems used in the industry.

Theme:

Plant-wide monitoring - SPIRE02-2016

Keywords:

plant-wide, process model, process control, model-predictive control, data analysis, decomposition, coordination, optimisation, social innovation, co-creation, optimal scheduling, product quality, copper, steel

Type:

**Video**

**Document**

**Poster**

**Presentation**

## Resources

Upload Files:

cocop_flyer_overview.pdf

cocop_poster_overview.pdf

cocop_modelling_guideline_document_and_demonstration_development_kit.pdf

Link:

COCOP in a nutshell video

COCOP Overview video

- Overview flyer
- Overview poster
- Report: modelling guideline document & demonstration development kit
- COCOP in a nutshell video
- COCOP overview video

Contact Name:

Project Coordinator: Prof. Matti Vilkko (Tampere University)

Email:

matti.vilkko@tuni.fi