HORIZON 2020

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

Results in Brief

Improving the processing industry's resource efficiency

Innovative new optimisation-based tools aim to make European process industries more energy-efficient and cost-effective.

CLIMATE CHANGE AND ENVIRONMENT

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From food processing to paper production and refineries, industrial processes use a lot of energy. In fact, it is estimated that the industrial sector uses more delivered energy than any other end-use sector, consuming over half of the world's total delivered energy.

But this use of fossil-based energy comes with both a significant price tag and significant carbon emissions. This cost and increasing pressure to cut emissions are pushing the industrial sector to seek new ways to become more resource-efficient – which is where the EU-funded CoPro project comes in.

"Our goal was to help reduce the carbon footprint of European process industries by improving the energy and resource efficiency of industrial plants and industrial parks," says Sebastian Engell, a professor at TU Dortmund and CoPro project coordinator.

“To do this, we focused on improving process monitoring and implementing optimal dynamic planning, scheduling and control of interconnected process units and plants.”

A portfolio of optimisation-based tools

During their work on previous projects, CoPro researchers found that the energy and resource efficiency of processing plants is largely dependent on the coordination of several units, from material handling and storage to the distribution of energy.

“Moreover, decisions like what equipment to use when, which load, when it should be maintained, and when to shut it down all have a substantial impact on the plant’s overall energy use,” explains Engell.

According to Engell, CoPro aimed to support such decisions using mathematical optimisation. “We even developed methods to coordinate the operation of processing plants that are connected by resource networks but are operated by different business units of companies,” he adds.

The project developed nearly 20 different optimisation-based tools. “These innovations cover a wide range of sectors and they all share the same goal of making European process industries more energy-efficient and cost-effective,” remarks Engell.

For example, the project developed methods for simplifying the process of implementing advanced digital solutions and integrating model-based solutions into a plant’s existing information and operational technology.

Other tools helped operators improve energy and material efficiency in petrochemical plants or optimise the use of sterilisers in the production of canned fish. Other methods were designed to anticipate and prevent anomalies in chemical plants.

The CoPro solutions were demonstrated at several industrial plants covering a variety of sectors. These included integrated petrochemical production at INEOS (website in German), base chemicals and polymer production at Covestro, cellulose production at Lenzing AG, consumer product formulation and packaging at Procter and Gamble (website in Flemish), and packing and sterilising fish at FRINSA (website in Spanish). Following these demonstrations, several of the plants opted to permanently implement the solutions into their daily operations.

Benefiting the European process industry

CoPro successfully demonstrated how using optimisation-based solutions can provide significant benefits in industrial applications, contributing to both improved energy efficiency and reduced production costs. According to Engell, if these solutions are rolled out across European process industries, they could reduce on-site material handling time, resource consumption, energy use and greenhouse gas emissions by at least 5 %.

“The CoPro technologies will significantly strengthen the global position of the European process industry and have a positive impact on their carbon emissions and resource efficiency,” concludes Engell.

The project’s partners are now working to further develop and deploy advanced solutions, including coordination of coupled plants between different business units or even companies.

Keywords

CoPro, processing industry, process industries, energy efficiency, industrial, energy, carbon emissions, industrial plants, industrial parks, greenhouse gas

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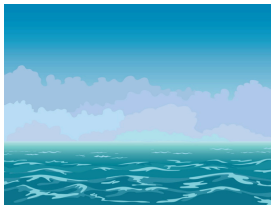

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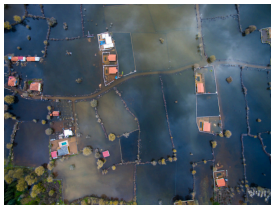

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Project Information

CoPro

Grant agreement ID: 723575

Project website

DOI
10.3030/723575

Project closed

EC signature date
20 July 2016

Start date
1 November 2016

End date
30 June 2020

Funded under
INDUSTRIAL LEADERSHIP - Leadership in enabling and industrial technologies - Advanced manufacturing and processing

Total cost
€ 6 537 270,00

EU contribution
€ 6 059 645,00

Coordinated by
TECHNISCHE UNIVERSITAT DORTMUND
Germany

Last update: 27 November 2020