AI-Tool for predictive process optimization and control for medium-sized process plant operators (KI-Tool).

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Partner:

- EDI GmbH - Engineering Data Intelligence
- MVV Umwelt GmbH
- Karlsruhe Institute of Technology (KIT), Institute for Technical Chemistry (ITC)

For the application of Artificial Intelligence (AI) in industrial production, especially in Small and Medium Enterprises (SME), there is a lack of suitable tools and methods that can be implemented with low business effort. The aim of the project is to develop, validate and provide an AI tool for SMEs. In this project, thermochemical waste utilization is the use case (gasification and incineration). The optimization goal is process efficiency with varying feedstock composition.
The solution is a generic tool to enable predictive plant control for different chemical processes or plants of SMEs without requiring AI and programming skills from the user. AI algorithms are provided in a scalable way for a wide industrial application using cloud technology. As another special feature, an AI-based hybrid modeling approach is applied, which is both data-based and experience/model-based.

This project is the first to transfer and apply EDI Cloud technology to industrial process optimization, and to validate it on a large scale for two use cases:

- at the KIT bioliq®-demonstration plant for sustainable chemical production using the example of synthetic fuel production from waste biomass (experience knowledge + data-based knowledge + physical/chemical model): expected CO2 emission reduction of 30 kg/t fuel.
- at a waste incineration plant of MVV in Mannheim as demonstrator for 12 incineration lines, 3 of them in Baden-Württemberg: expected CO2 emission reduction of 2500 Mg/a at one incineration line.

The use case bioliq®-demonstration plant consists of providing a broad data base from the operation of the pilot entrained flow gasifier and thus the operational experience with the complex production plant in industrial design for the development of algorithms. The widely varying feedstocks and different optimization targets will be systematically investigated for a robust and widely applicable semantic decision support system.
The efficiency improvements are to be achieved by improvements in the operational and process engineering areas, e.g. by increasing the plant availability by avoiding critical operating conditions

and by increasing the product yield at constant plant performance despite strongly varying input compositions and complex physical-chemical material conversion processes in the plant.

These improvements lead to an increase in in-house material and energy efficiency and thus to increased sustainability with lower operating costs of the bioliq® process as an example of the modern chemical plant with advanced control technology. After a configuration and calibration process, the digital product can be used to efficiently control such and similar plants. To make this possible, special attention is paid during development to this adaptability, i.e. to the generic structure of the AI tool for different chemical processes.

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