

Next-generation utilities optimisation for large-scale chemical production sites

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Refineries and chemical production sites are major consumers of energy in the form of electricity, steam and hydrocarbon feedstocks. Given that tariffs, costs and demands are constantly changing, there is much scope for optimizing on-site production, conversion and distribution of energy to minimize cost and emissions, by managing the options available in the most cost effective way while meeting all constraints of the system.

This paper describes an advanced optimization platform for managing and optimizing utility operation that not only helps planners rapidly optimize equipment selection and load allocation to improve overall efficiency and reduce emissions and operating costs, but also presents operators with a ranked list of possible actions from which they can choose the best for the current situation.

The approach uses mathematical models of the utilities system and major devices coupled with plant operating data via data validation and reconciliation facilities. An advanced optimization system capable of both continuous and integer decisions determines the economically optimal operating point taking into account equipment and operational constraints, including availability. The resulting mathematical problem is solved within an equation-oriented framework, providing robustness and speed of execution well in advance of most current systems.

Because of the speed of solution, a key feature is the ability to run multiple optimizations and present operators with a ranked list of potential combinations of changes and their corresponding benefits, within a dashboard tailored for the site. This allows operators clearly to evaluate and discuss which changes are the best to apply when, resulting in advice that is practical and easy to implement and verify. It addresses one of the biggest obstacles to practical realisation of the benefit of optimization systems, which is gaining operator buy-in to proposed changes.

The paper is illustrated with an examples of implementation on a major European chemical manufacturing site.