The way to energy savings and lower environmental investment

Process integration of energy and environmental plants

Energy saving is an important issue in the process industry. The still increasing demands from authorities regarding reduction in environmental impact and emission of green house gasses are keeping the area in constant focus.

The process industry has experienced increasing expenses related to fulfilling demands of environmental impact and for the assessment and documentation of energy efficiency. It is vital that initiatives within these areas are co-ordinated and integrated with plans for production.

A process integration analysis is a highly suitable measure in this respect, since it relates the production, the energy efficiencies and the construction costs.

The general experience of process integration is that large amounts of energy can be saved, with a short pay-back time. When it comes to environmental investments we have experienced that large savings are often involved when the production site is considered as a whole instead of regarding each individual process separately. Integrating know-how on the entire processing plant often leads to new models or ideas that are different and superior to conventional "stand-alone" solutions. The results are often both increased energy efficiency and reduced cost of investment.

In process integration feasibility studies, FORCE Technology applies advanced and efficient tools for setting up models of the various processes. Mass and energy are balanced ensuring that the models

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are consistent. The feasibility study includes optimisation of economics and technical design at a level ready for making decision. FORCE Technology has experience with cases where energy consumption went down by some 60% at the same time reducing investments for environmental installations.

Method
In a process integration study, the companies' processes are systematically mapped and investigated in order to see exactly how the various operations interact. A Pinch analysis is applied for providing a clear picture of any thermodynamic bottlenecks in the production. Besides, the Pinch analysis is a valuable tool in:

1. identification ways of increasing heat recovery
2. analysing the scope for increasing capacity or
3. optimal integration of future environmental plant.

The goal is to achieve an optimum balance between efficiency (operating costs) and cost of plant on the basis of the primary manufacturing conditions.

Usually, a process integration study involves inspection of all the important and major processes in a production.

In order to ensure high standards of implementation we need to establish a close co-operation with those people being responsible for the production and for the people delivering data.

Typically a process integration study comprises the following elements:

- Process mapping and data acquisition
- Setting up a model of the processing plant for process simulation, amongst others for providing better and lacking data
- A Pinch analysis to determine the scope for energy savings
- Process simulation for investigation of the consequences of various proposals for process modifications
- Detailed optimisation of the plant design and heat recovery system is applied, based on pinch analyses and the simulation model.

Tools
FORCE Technology has in its disposal a general process simulator (HYSYS) capable of doing both steady state and dynamic simulation. In addition we have developed our own optimisation programs for pinch analysis (FT-PINCH and HEN-Explorer).

Basically, HYSYS is applied for setting up energy and mass balances and describing the course of any relevant chemical reactions. The database integrated contains thermodynamical properties and physical data of more than 5,000 compounds.

HYSYS and FT-PINCH are used in a systematic procedure identifying potentials of heat recovery and for determination of the final design of the heat recovery plant on the basis of detailed cost correlations for equipment.

Qualifications and results
Through application of advanced tools combined with a substantial experience of a wide range of industrial studies of processing plants, FORCE Technology is fully qualified to carry out process integration studies effectively and efficiently. Many studies have resulted in huge energy savings and a payback time less than three years.

Process integration is advantageous wherever there are evaporators, distillation columns, driers and/or large-scale heat exchangers.

Related services
FORCE Technology gives advice and provides design and project consultancy in association with new construction or extension of an existing plant. FORCE Technology has a comprehensive monitoring division providing all necessary documentary proof of energy consumption and emissions. In addition FORCE Technology carries out process and production assessments in relation to problems on the environmental front.

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