

Research topics

Cogeneration and Total Site Utility Systems

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Abstract

Utility systems consume fuel, generate power and distribute steam. The heating and cooling requirements of the site dictate the site-wide fuel demand and cogeneration of the utility system. New tools have been developed for the design of cogeneration and total site utility systems which, not only allow design changes for reduced energy costs and reduced flue gas emissions, but also provide the basis for planning infrastructure investment for production expansion.

Project description

Most processes operate in the context of a total site utility system in which a number of processes are linked to the same utility system. The utility systems of most sites have evolved over a period of many years without fundamental questions being addressed as to the design and operation of the utility system. The picture is complicated by the growing trend of individual production processes on a site belonging to different business areas, each assessing investment proposals independently of one another and each planning for the future in terms of their own business. Yet the efficiency of the site infrastructure and the required investment is of strategic importance and must be considered across the site as a whole, even if this crosses the boundaries of different business areas. What is needed are tools which allow the overall picture of the site to be assessed in terms of modifications to existing processes, closing down existing processes, starting up new processes, fuel costs, power tariffs and changes to emissions regulations.

When studying existing sites it is important to understand the way in which the existing site infrastructure influences the degrees of freedom to make changes and the economic consequences of any changes. Top Level Analysis has been developed to direct the designer to the few most attractive changes in the site.

New tools have also been developed for the design of site utility systems to determine the most appropriate number and levels of steam for the site and simultaneously the most appropriate cogeneration system of steam turbines and gas turbines. The resulting network features the optimum trade-off between fuel, power and capital costs.

The tools developed for total sites can be used to reduce operating costs for an existing system, to determine and assess new investment proposals or to provide long term investment plans for the infrastructure to allow for projected changes in the pattern of production.