

Research topics

Power Station Design

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Abstract

The design of stand-alone power plants is significantly different from the design of cogeneration power plant. In the design of stand-alone power plants the efficiency of power generation is of paramount importance and even small percentage improvements in efficiency are important. Such power plant design is normally carried out by experienced power station designers, making extensive use of simulators to evaluate designs. A new systematic methodology has been developed, which uses a combination of thermodynamic analysis and mathematical programming for the conceptual design of power stations. Both new design and retrofit are considered.

Project description

The design of power stations requires the simultaneous consideration of heat integration and power generation. A new thermodynamic approach has been developed for the analysis of such systems. Like other aspects of process integration it analyses the whole system but with simultaneous consideration for heat as well as power. New graphical tools have been developed to assist in the analysis.

The insights gained from the thermodynamic analysis of power stations have been exploited in a new approach to power station design based on mathematical programming. This allows a wide range of design options to be screened automatically and allows complex sets of constraints to be included. Such constraints are particularly important when dealing with retrofit of power stations. The approach has been successfully applied to the analysis of a number of industrial power stations and has shown significant benefits. Applications have included gas turbine integration into existing power stations.