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Abstracts of IEI-IIT Fellows:

Dynamic simulation of natural circulation boiler

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Dynamic simulation of the boiler consists of developing mathematical model of the boiler. It explains the fundamental physical processes that determine the interactions among the input and output variables. Dynamic simulation models offer a cost effective tool for studying the operating characteristics of the power plant. These models can simulate various operating procedures similar to those actually used in power plant operation. Dynamic simulation model of a 250 MW, pulverised coal fired, and natural circulation boiler of Dahanu Thermal Power Station (DTPS) is presented here. In simulating boiler, mathematical model of each section of the boiler is prepared by application of mass, momentum and energy conservation principles to each section. Graphical modelling technique of SIMULINK is used to configure the models. Using this technique all the component models are connected to each other by steam and gas flows. Boiler main steam pressure controller is also developed. Model is validated by comparing its steady state and dynamic responses with the responses of boiler of DTPS. Open loop responses of the model to the step changes in the operating parameters are also analysed. Model developed can be used for designing control system. It can also be used as a training simulator to train the new plant operators.

Industrial load management for Maharashtra

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The Indian power sector is facing an energy shortage and peak power shortage. In the year 2002-03, energy shortage and peak power shortages are estimated to be 8% and 12.5% respectively. Industrial consumers are few in number (3%) but consumption (34%) accounts for the largest component of the total consumption. Large industries that receive high-tension (HT) power normally face a two-part tariff (maximum demand and energy charges). In developing countries time differential tariff has been implemented by many utilities and they have achieved significant reduction in peak and energy shortages. Many utilities in Indian power sector are introducing time differential tariff in the industrial sector.

The Maharashtra State Electricity Board (MSEB) was the first Indian utility to introduce a Time of Day (TOD) tariff (four slots) in 2000-01. This report presents results from one of the industrial sub-stations in Maharashtra. An analysis of end-user's load profile shows the usage patterns of sample industries before and after the TOD tariff reveals the extent of load shifting and the impact of the tariff. The overall impact of the tariff on the sub-station load profile is also carried out by the analysis of utility's load profile before and after the introduction of TOD tariff. Response to TOD tariff by industrial consumers is evaluated.

The analysis on industrial and express feeders shows that average demand of 300 kW (2.3%) has reduced in the morning peak period, the average demand of 145 kW (1.1%) has been increased in night period and marginal change in evening peak period. End-user's consumption pattern has changed after the introduction of TOD tariff in such a way that morning peak and partial peak period consumption has shifted to other periods. The analysis reveals the initial results and lessons for TOD introduction in the Indian power sector.