THE PROJECT DESCRIPTION (appendix A)

Development of Artificial Neural Network Simulation and Condition Monitoring Tools for Coal Based Power and Cogeneration Plants of India

Project description

The power and CHP sectors all over the world have gone through major transformations over the last two decades due to rising competitiveness for deregulation of electricity and more stringent laws for environmental protection. Continuous monitoring of plants to detect early faults to avoid major future breakdowns and to estimate the performance and emission characteristics are considered essential for modern plants. Conventional simulation and performance monitoring as well as maintenance schedules need significant improvement to cope with the present need. Several Artificial Intelligence (AI) based tools for this purpose are found very useful in some preliminary investigations [1, 2]. Artificial Neural Network (ANN) is one such AI based tool for simulation, performance and condition monitoring of power and CHP plants. ANNs are computer algorithms that can learn patterns through proper training, i.e., adaptive [3]. Because of this feature, these are often well suited for modeling complex and non linear process of real life operating machineries/plants including power and CHP plants [4-7]. Moreover, introduction of information technology has made it possible to combine the effects of this strong feature of ANN with the advantage of using it for performance and condition monitoring of remote plants using internet based real time data transfer [8]. Thus using IT based ANN tools for effective and reliable monitoring of power and CHP plants may be one of the best possible options for emission control and early warning system for improved performance and availability improving the power/utility heat production as well as the general quality of life.

Since 1998, Principal Investigator (Sweden) of this proposed project belonging to the division of Heat and Power Engineering, Department of Energy Sciences, Lund University, Sweden has been active in the field of ANN related research for improved plant monitoring and environmental performance. Gas turbine based plants as well as steam cycles using different fuels have been studied and results have been implemented and evaluated using synthetic or real plant data [1,2,9,10]. Also the pilot plant of evaporative gas turbine installed at Lund University was monitored successfully from New Castle University using internet based data transfer [9]. On the other hand, simulation and performance analyses of advanced coal based power and CHP plants have been the main research topic of the Principal Investigator (India) belonging to the Department of Mechanical Engineering, Jadavpur University, India. In their investigations, system level performance study as well as its variation due to change in design and operating parameters has been investigated for coal based Integrated Gasification Combined Cycle (IGCC), Fuel Cell integrated hybrid systems etc [12,13].

In this proposed work, these previous experiences of the investigators will be utilized to develop improved simulation and monitoring tools for coal based power and CHP plants. Experiences and available plant data from the Indian investigator will be combined with the knowledge, tools and experiences from ANN applications of the

Swedish partner. Different ANNs will be trained with real coal based plant data from India to predict the performance and emission characteristics of those plants. Input and output parameters will be initially decided on the basis of previous experiences of system simulation. However, these will finally be decided on the basis of sensitivity analysis with the trained ANNs. The final trained ANNs may be used for simulation, performance and emissions monitoring of those plants. Internet based data transfer may also be used to monitor plants of India from Sweden.

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