



## ADVANCED INTELLIGENT COORDINATED CONTROL OF COAL FIRED POWER PLANT BASED ON FUZZY REASONING AND AUTO-TUNING

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**ABSTRACT**—The load following operation of coal-fired boiler-turbine unit in power plants can lead to changes in operating points, and it results in nonlinear variations of the plant variables and parameters. As there exist strong couplings between the main steam pressure control loop and the power output control loop in the boiler-turbine unit with large time-delay and uncertainties, automatic coordinated control of the two loops is a very challenging problem. This paper presents a new coordinated control strategy (CCS) which is organized into two levels: a basic control level and a high supervision level. PID-type controllers are used in the basic level to perform basic control functions while the decoupling between two control loops can be realized in the high level. Moreover, PID-type controllers can be auto-tuned to achieve a better control performance in the whole operating range and to reject the unmeasurable disturbances. A special subclass of fuzzy inference systems, namely the Gaussian partition system with evenly spaced midpoints, is also proposed to auto-tune the PID controller in the main steam pressure loop based on the error signal and its first difference to overcome uncertainties caused by changing fuel calorific value, machine wear, contamination of the boiler heating surfaces and plant modeling errors, etc. The developed CCS has been implemented in a power plant in China, and satisfactory industrial operation results demonstrate that the proposed control strategy has enhanced the adaptability and robustness of the process. Indeed, better control performance and economic benefit have been achieved.

**Key Words:** power plant, boiler-turbine unit, coordinated control systems, auto-tuning, decoupling control, fuzzy reasoning, adaptive control, system implementation

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