

Comparative study of optimization methods of least-squares support vector machine for NOx emission in a coal-fired boiler

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The low NOx emission are the main goals of boiler combustion optimization. The first work of controlling NOx emissions is to set up a high precision prediction model. So, building an accurate system model is very important for monitoring and optimizing the operations of power plants. For this problem, the least-squares support vector machine (LSSVM), which is suited for small sample data, could be adopted to model and predict NOx emissions. The regression accuracy and generalization ability of LSSVM are extremely dependent on the regularization and kernel parameter. Choosing appropriate parameter values is important for obtaining excellent performance. The parameter choosing of the LSSVM model could be obtained by various optimization methods. In this study, the ant colony optimization (ACO), partial swarm optimization (PSO), genetic algorithm (GA) and simplex method are proposed to identify the appropriate parameters. The NOx values are estimated using a 500 MW coal-fired boiler data and the results are compared. The simplex method exhibits better overall performance compared to other optimization methods.