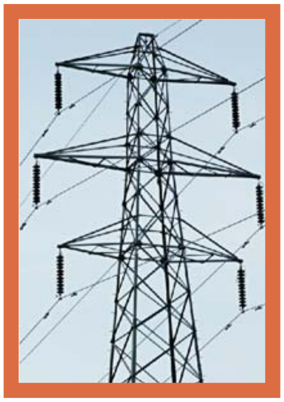
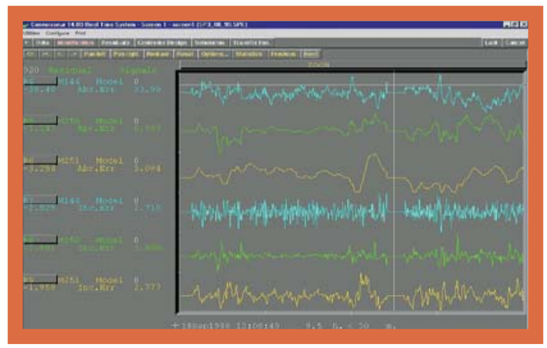
IPCOS

CASE STUDY: NOXIOUS NO_X



With ever more stringent environmental regulations, controlling and reducing emissions have become a key focus for electricity producers. Minimising NO_x production while maintaining CO and unburned carbon at acceptable levels must be balanced against improving heat rate and maxmimising power output. Traditionally plants have had to invest in expensive equipment to make sure NO_x emissions meet standards, but on-line control optimisation techniques have revolutionised the industry by enabling plants to achieve significant NO_x reductions at a fraction of the cost.

The task of modelling NO_x and other boiler emissions has commonly been attempted using nonlinear modelling. This is adequate for modelling emissions performance, but translating the results into on-line control optimization has been difficult to achieve over the full range of operating conditions. However, by transforming these non-linear relationships into linear models effective control can be achieved using industry proven linear technology.



Co-ordinated manipulation of the many variables regulating the combustion process is required for safe and effective emissions reductions, but while the methods for reducing NO_x are fairly well-defined, the difficulty of establishing appropriate boundary conditions makes it difficult to develop an on-line control solution that attains the full emissions benefit.

Patrick Thorpe and colleagues developed a flexible, cost effective linear control optimization system for a US customer to address emissions reductions and thermal performance. Using Connoisseur software they designed an optimizer and analysis tools to assess the controllable parameters and tuned it to solve the optimum steady state solution for the plant. To accurately model NO_x emissions performance and establish effective boundary conditions for the optimization, the team integrated a non-linear facility to model 'soft sensors' and incorporate first principle equations coupled with linearization algorithms. These solutions form targets fed to an independent multivariable controller (MVC). The MVC operates in incremental feedback steps to constantly coordinate and update its objectives to maximise plant efficiency. The dual structure of an optimizer and independent MVC separates the prediction of the control targets from the implementation of the targets. The optimizer predicts the optimum targets based on the long range solutions, considering the cost of NO_x and CO emissions, unburned carbon, and heat rate parameters. The MVC translates these targets into the control realm of the actual process, respecting the constraints and limitations of control devices.

The project resulted in significant emissions reductions and cost savings. More details can be found in, *Labbe D. and Thorpe P Joint ISA POWID/EPRI I&C Conf., St. Petersburg, Florida, June, 1999.*

For more information please contact us at

IPCOS (UK) Ltd

Tel. + 44 (0)1223 833228
Fax. + 44 (0)1223 834162
Email info@ipcos.com
Web www.ipcos.com