

Power Station Control and Optimization

Customer

Powergen is one of the UK's largest electricity generation and distribution companies.

Business Problem

The research group at Powergen, Power Technology, had written an optimization system for coal-fired power stations. This receives operating parameters, such as the rate of supply and quality of coal, real-time emission readings, power required etc and generates recommendations for the control of the station. This enables them to minimize emissions and maximize efficiency.

At the heart of the system is a neural network model trained on long term historical data from a range of sensors. A cost function that weighs various factors against each other is minimized over the range of sensor data, for example turning a coal supply feeder on is expensive compared to adjusting the speeds of feeders already in use or changing the burner tilts. The optimum controls to minimize the emissions are found and passed back to the operator for action.

The system had been created on an Alpha VMS system using Fortran77. In order to promote the product and sell it to other generating companies, Power Technology wanted the code ported to Windows NT and Fortran90.

Tessella Solution

Tessella tackled the porting task in several stages. This was required to ensure that the control recommendations and predictions were not altered significantly by the conversion.

First the original Fortran77 was made to compile on Windows NT and tests made with sample data to validate that the output data was correct.

Next the code was converted minimally to Fortran90, for better compliance with coding standards and available products. Problems arose during this phase with the outputs drifting significantly from those expected. These were resolved through discussions with Power Technology.



Finally the code was reworked to give a better structure and to improve flexibility with differing types of power station design. The final product utilized two main libraries: the first containing all the generic training and processions functions. This then calls the second library, which is built for a specific power station.

'Dongle' based copy protection was added. A Visual Basic front-end was also demonstrated for Power Technology to use as a basis for a package tailored for specific customers.

Results and Benefits

The Generic Nitrogen Oxide Control Intelligent System (GNOCIS) product allows a power station to operate at optimal levels to ensure conformance with regulations. It does this by learning how the station performs, continually adapting to maintain maximum effectiveness. Tessella's work made the system available to the widest client base by implementing the system robustly on a common platform.