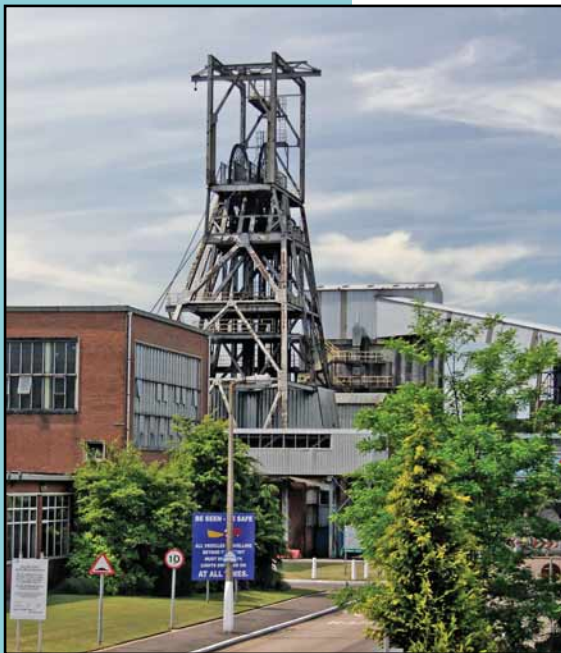


“We could not achieve the budgeted planned output without the system.”

***John Ford, SCADA Manager,
UK Coal Group***

Cutting edge information from deep underground

by Pantek Ltd



Daw Mill Colliery is the flag ship deep mine of UK Coal. Set against a background of the earlier wholesale closure of mines and privatisation, UK Coal found that they needed to take a complete review of their supervisory and control computing and find newer and more supportable technology. Wonderware's FactorySuite A² was selected and has been deployed to control all underground production and conveying at Daw Mill.

Daw Mill is situated above the Warwickshire coal field that is uniquely assisted by its favourable geology, by the width and depth of the seam, and by coal quality. The mine was opened in 1961, following the discovery of the rich seam during the sinking of a ventilation shaft for another nearby mine. Production is almost 3 million tonnes per annum and 96% of the extracted material is saleable. Almost all the coal is used for power generation at a rate of 1200 tonnes per hour. This business environment has to be carefully managed and full control made available to ensure that production is constantly

economically viable in the face of imported coal.

Company Overview

UK Coal - Warwickshire, United Kingdom
UK Coal is Britain's biggest producer of coal, supplying around 7% of the country's energy needs for electricity generation. The group has five ongoing deep mines located in Central and Northern England with substantial reserves and employs 4,000 people. It has one active surface mine and has received planning permission for a further three sites. With substantial land and property interests, UK Coal regenerates brown field sites, develops business parks on former mine sites and manages a substantial agricultural portfolio of land and buildings. UK Coal owns a power generation business utilising waste gas from coal mines to generate electricity and has received planning permission for the development of the Group's first wind farm.

Above all other considerations safety is paramount, in machine operation, transport, environment, ventilation and gas monitoring. Automation has been fully implemented at the mine with machinery being controlled by special intrinsically safe logic controllers. This underground intelligence allowed the use of commercially available real-time software to supervise, monitor and attend to alarms. In addition, data is extracted from the mine's equipment that is used to provide real time information for many management functions.

The current renewal and update programme can be traced back to 1998 when the industry had shrunk and questions were being raised about the ongoing viability of the legacy highly bespoke data gathering solution. In addition to this the existing system's architecture was inherently slow and prohibited effective supervisory control from the surface. Deciding upon a solution for the programme involved visits to heavy industry sites and discussions with



Coal Face Shearer

several suppliers. The decision was made to use Wonderware from Pantek owing to its world-leading InTouch SCADA with particular emphasis upon its ease of use.

The initial deployment was to add InTouch at the surface control room and use this to manage the underground logic controllers. High value coal cutting machines and conveying as well as the underground environment were thus brought under proper control. Safety, as already stated, is the primary concern and particular emphasis was made upon monitoring airflow, methane and carbon monoxide. Alarms are set that shut equipment down at pre-determined levels and also initiate evacuation.

Machinery control includes the coal-face coal shearing machines, ventilation, conveyors and tripper positioning. The coal face at Daw Mill is currently 10Km from the control room, therefore communication has to be fast and effective, fibre optic Ethernet being used extensively throughout the mine.

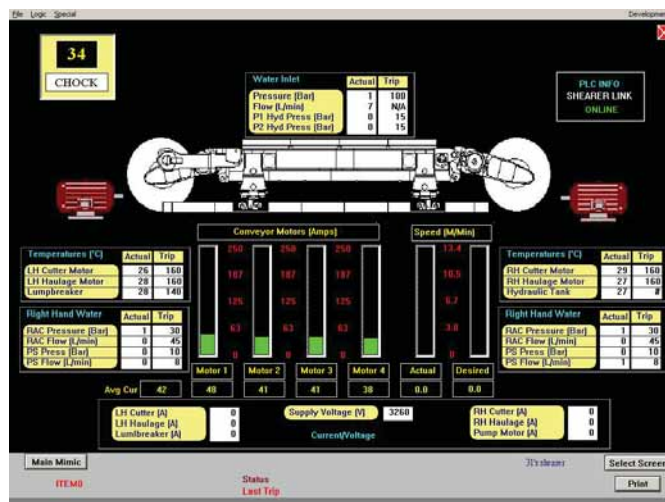
One of the unique differences found in mining as opposed to manufacturing is that the plant is under continuous movement and redeployment. When a coal seam arrives at a boundary the whole of the equipment may be moved to a position several kilometres away and have totally different operating conditions. It was therefore important to the UK Coal engineers that the SCADA solution was capable of easy re-configuration and ongoing development. The roll-out

programme included specialist consultancy from Pantek and UK Coal put several key engineers from local and group staff through the Pantek training school.

The large distances involved also caused InTouch for Terminal Services to be utilised, in addition to solving the topographical problem this has also brought MTTR (Mean Time To Repair) to a minimum. A faulty workstation can now be swapped out in minutes without any subsequent software loading and configuration.

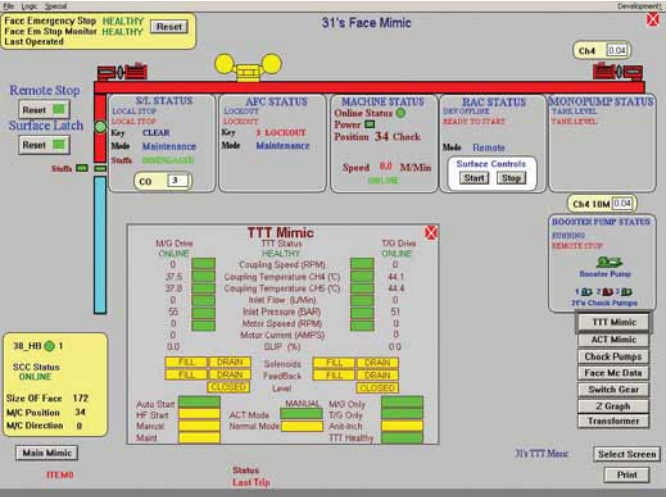
Once that the supervisory control had been established it was clear that the system contained a great deal of useful data that would provide information for the better running of the mine. Wonderware's IndustrialSQL Server historian and ActiveFactory reporting tool were deployed to fully take advantage of data availability. The high compression available in IndustrialSQL Server allowed UK Coal's engineers to acquire and store fine resolution data, in real time; this is particularly useful when looking for anomalies in operation and also in providing realistic and meaningful trends.

The availability of data has been exploited in an innovative way in monitoring the performance of the motors on the coal shearing machines. Approximately 50 data tags are continuously monitored and stored; in turn this is made available by SSL transfer through a web portal to the OEM supplier of the motors - their expertise can then be accessed to determine likely failure through remote condition monitoring, as well as allowing application-specific MTBF to be calculated. Daw Mill has two shafts, one for the miners, one for



Coal Face SCADA

Mining ActiveFactory, FactorySuite A², IndustrialSQL Server, InTouch, InTouch for Terminal Services



Coal Face Status

equipment, but in fact is a drift mine in that the coal is transferred to the surface by inclined conveyors. The conveyors have powerful motors to cope with the weight and loading changes in operation.

These conveyor system motors are also monitored. Within the project period it was noticed that a motor was drawing higher than normal current, but examination of the fine resolution data showed that this was caused by external effects rather than imminent motor failure. The fault proved to be a belt scraper that was pressing on the belt and causing slipping - thereby explaining the high current. The benefit to UK Coal of accurate diagnosis was the best part of £500K (calculated from parts and lost production), whereas the cure was a 5 minute job to clear a blocked air pipe. This was correctly analysed from the availability of fine resolution archive data.

The system itself has over 30 users on site and 15 external concurrent users. Controllers, operators, managers and suppliers can access the information that they require from the system. Over 4000 data tags are historised,



Daw Mill Drift Mine Conveyors

providing a rich source of information for many differing requirements. The ease of use of the ActiveFactory reporting tool allows UK Coal engineers to show users how to get their own information, rather than having to request a special report. Self-empowerment is at the heart of concept of ActiveFactory and the effect upon businesses is that users can investigate independently of IT department support or User Requirements Specifications, UK Coal has fully adopted this method of working.

Self-empowerment has also been adopted by UK Coal's engineers themselves. New screen designs and operating procedures can be prepared on the engineering system and placed before operations staff to gain their feedback and further requirements. Although initially the system was designed to reflect the "look and feel" of the legacy MINOS system, the easier-to-assimilate features of new screen displays have been readily accepted by control room staff.

John Ford, UK Coal Group SCADA Manager, says, "We could not achieve the budgeted planned output without the system."

Currently, the system is being engineered to provide additional information to suppliers, which will be in real-time and have a controlled degree of closed loop feedback. The entire mine electrical schematic will also be visualised on the system, allowing faster maintenance access and fault diagnosis. Further plans exist for underground SCADA (possibly on wireless tablet PCs), Video over IP, Voice over IP, and tracking people and trains underground with RFID.

The use of readily available and standardised software products from Wonderware has benefited UK Coal by providing advanced features that are

easy to assimilate and take advantage of. The real-time system is subject to constant change and development according to changing operating conditions and the realisation of solutions that will directly affect productivity and cost, cutting edge technology delivering benefits in depth!