Automation IT constructs a telemetry system to manage Curragh Mine's water and power facilities
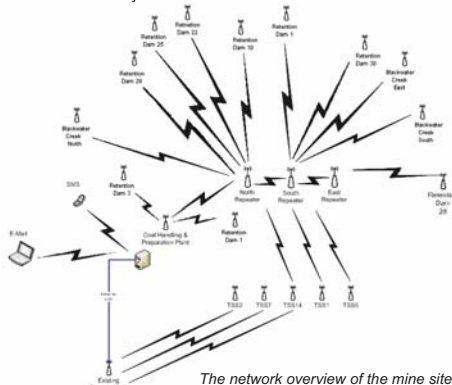

A dragline at Curragh mine

Curragh Mine is operated by Wesfarmers Curragh Pty Ltd and covers an area of approximately 2,600 hectares in the coal-rich Bowen Basin of Central Queensland. The mine is located 14 kilometres north-west of Blackwater in Central QLD. It is one of Australia's largest independent coal producers, producing 6.5 million tonnes of export coal and 2.5 million tonnes of domestic coal per year at the time of writing.

Automation IT assisted Curragh to design and install a telemetry and SCADA system which was able to monitor and control all aspects of the mine's water and power systems in order to ensure a reliable supply and efficient use of both essential resources.

THE PROBLEM

Mine operations throughout Curragh mine have a high reliance on raw water. In order to reduce raw water consumption, retention dams are used across the site and a piping network was installed in order to join all of the dams together. Transporting the water from one retention dam to another was completely a manual operation whereby, if the water in the dam was too low, someone would have to check if a nearby dam had enough water in it then open and close the affected valves, then start pumping the water. Once enough water had been pumped, the whole process would have to be repeated in reverse, thus making it a very arduous and time consuming operation.

In the same way, originally there was no way of recording and monitoring the power usage of each of the four draglines used onsite as they would swap between the five available power substations as they moved locations around the mine. It was decided to also connect the power meters of the substations to the new telemetry system so that this information could be recorded and analysed, in order for the mine staff to be able to use power more efficiently.

The network overview of the mine site

THE SOLUTION

The final design of the telemetry system involved installing an RTU at nine retention dams. These RTUs were able to measure the level of the dams, the flow in each of the pipes, as well as control the local valves and pumps near each of the dams. Similarly, three additional RTUs were installed along Blackwater Creek to ensure that if a pipe burst near the creek, the system would pick it up immediately and close the required valves to ensure that no raw water would pollute the Blackwater Creek.

An RTU was also placed on each of the five portable power substations, to monitor the power usage of the four draglines.

This system was to be monitored by one SCADA system that was able to oversee and control both networks as well as integrate with the existing Curragh North Telemetry Network. The SCADA server was also setup to be able to alert the supervisors immediately via email and SMS should an emergency occur.

THE HARDWARE

The chosen hardware for this project was the Kingfisher Series II RTU. Its ability to create custom solutions by plugging a wide range of modules onto a backplane allowed each RTU to be constructed to meet the exact needs of each location. Each RTU can have as few as four I/O and one communication port to thousands of I/O and sixteen communication ports!

Kingfisher RTUs use powerful Intel processors and large memory capacity as well as a real-time operating system which provides the power for quick logic processing, communications and data storage, thus providing capabilities that were previously only available in PLCs.

In addition, Kingfisher can connect to a wide range of media including sending alphanumeric messages to pager receivers and mobile phones via SMS.
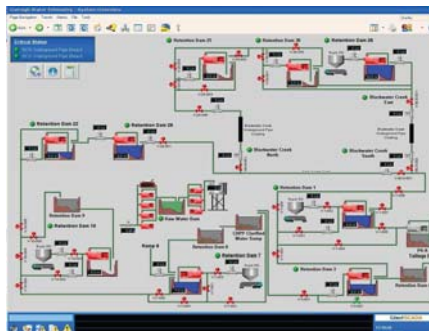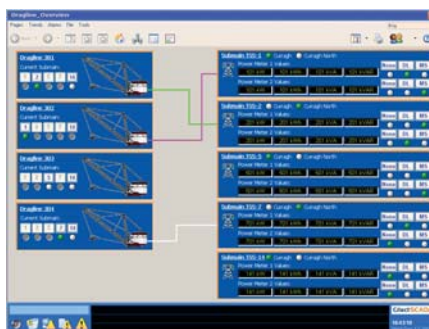

THE SCADA SYSTEM

The SCADA software selected for this project was CitectSCADA. This is due to it being a reliable, flexible and high performance product that is able to be fully customised for each application. Citect is able to provide high graphic visualisation, superior alarm management and built-in reporting, which were all features that were essential for a telemetry system of this size.

The Citect project makes it simple to manage the complete water and power infrastructure by providing:

- A Water Overview page to oversee all of the retention dams and valves distributed over the mine site

- 17 Site pages which show in detail the status of the selected retention dam and its associated valves and pumps
- A Geographic Overview Page
- A Network Overview Page
- 51 popup windows
- 40 trends to be displayed over 5 pages,
- An Alarms Page

The Power usage is also able to be monitored and controlled using a similar setup, with an overview page that allows the user to select which power meter on which substation is able to power which dragline provided they meet the minimum requirements.
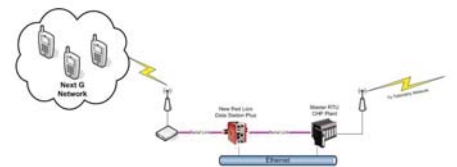
SMS ALARM SYSTEM

Short Message Service (SMS) Alarm functionality was also added to this system to provide notification of critical alarms and events generated by the Power and Water telemetry system. Key personnel were notified using the SMS over Telstra's NextG Network, thus reducing the reliance on an operator to monitor the SCADA system continuously.

A RedLion Data Station Plus (DSP) was used to connect to the Master RTU (MTU) located at the CHPP via an RS232 serial connection using the Modbus Protocol. This communications link provides the means of alarm notification from all of the Power and Water remote RTU sites without relying on the SCADA servers to be operational.

For redundancy, the DSP unit also connects to the Master RTU via the Ethernet network providing a fast and widely available means of alarm configuration and custom message generation. In the event that both communication links fail between the DSP and the Master RTU, an SMS message will be sent to the nominated group. SMS Messages are then transmitted from the DSP via a serially attached InterCel Next G Modem (SAM3G).

The DSP is able to be configured via a Web Browser such as Internet Explorer so that the SMS' and the contacts list is able to be easily modified.
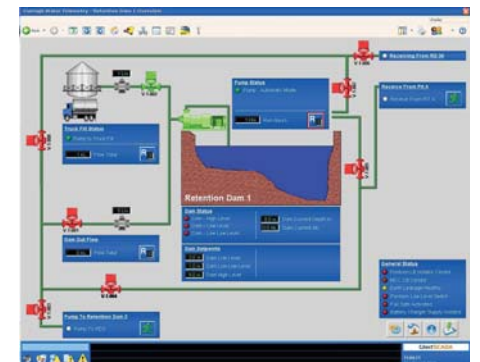

The Hardware Configuration of the SMS Alarm System

COMMISSIONING

In order to minimise the disruption of the mine's operation, this system was rolled out in phases. Firstly, the master RTU and SCADA server was installed in the CHPP. As each of the remote RTUs were installed, the sites became available and the SCADA began monitoring and controlling the site immediately. Subsequently, the RTUs at the three repeater sites were installed and linked to the MTU so that the remote sites would be able to link up to the CHPP.

Once all of the remote RTU sites had been installed and connected into the network, the SMS alarm system was added to the network as well as the report functionality configuration was updated so that the data logs could be automatically sent via email to the corresponding operators and supervisors in weekly, monthly and yearly intervals.

The Geographic Overview Page

CONCLUSION

With the implementation of this telemetry system, AIT was able to assist Curragh mine to manage its two most precious resources more efficiently by allowing them to monitor and control both the use and distribution of water and power throughout the site.

By doing this they are not only able to save time and reduce operating costs but also minimise their impact on their surrounding environment. By ensuring that no raw water enters into the local Creek and dramatically decreasing the mine's power consumption, Curragh Mine is leading the way in taking responsibility for the environment in which they live.

Ask Automation IT to help reduce your carbon footprint today!