ith the help of Rockwell Automation, one of Australia’s newest longwall coal mining ventures, Oaky North in the Bowen Basin region, reached an important milestone last year. The mine completed its first longwall block after a three-year development period.

The philosophy of providing sound, well-planned infrastructure outside of the longwall itself forms a firm foundation for Oaky North’s success. “Although the longwall produces all the tons, it doesn’t matter how good your longwall is if the rest of it falls apart,” reflects Mine Manager Ken McLaren.

This philosophy extends widely across the mine to areas such as secondary gateroad roof support, quality road development, rib meshing, a capacity-strong outbye system, and a comprehensive automation and control system. This attention to detail ensures that the primary focus remains on the issue at hand, physically cutting the coal.

The attention to detail paid off when Oaky North produced 1.8 million tons in its first five months of operation. Those early production figures proved the fledgling longwall’s ability, with outputs peaking at 570,000 tons in one month during this time period.

**Powerful outbye system**

A key infrastructure element is Oaky North’s powerful outbye conveyor system, which consists of more than 5.5 km of conveyor from coal face to surface stockpile, providing peak throughputs of 6,500 tons per hour. The outbye system comprises two 4,500 tph, 1.6 metre-wide maingate conveyors (one for each Oaky North longwall), and a two metre-wide trunk and ramp conveyor system, each rated at 6,500 tph and stretching a total of 3.8 km from maingate to surface stockpile.

The entire conveyor system, from maingate to ramp conveyor, features a total Rockwell Automation solution, utilizing DODGE® Controlled Start Transmission™ (CST) products coupled with Allen-Bradley® PLC control technology.

Chosen by Oaky North as a result of a global search for conveyor control technology, the DODGE® CST system provides full soft-start and torque/speed regulation of the conveyor. The CST uses an electronic-hydraulic control that allows the motor to come up to full speed under no load. Based around a wet-clutch brake/torque application system, the CST transmits torque to the output shaft simply by varying hydraulic pressure in its reaction disk system.

Oaky North’s 11kV, 1100 kW ramp and trunk conveyor units are the largest CSTs in Australia. In addition, Oaky North’s two maingate...
conveyors feature Australia’s first right-angled CSTs (each rated at 1kV, 320 kW).

John Clack, engineering director with outbye system supplier Continental Conveyor, believes the CST offers a clear advantage. “The CST was designed specifically for starting conveyors. With the control of the conveyor on the low speed side of the gear box, we can get quite accurate control for small changes in load.”

Information-rich control system

The underground conveyor system is also supported by a comprehensive underground-to-surface information and control system, totaling around 3,000 PLC I/O points and 4,500 SCADA tags.

Based around a network of Allen-Bradley Ethernet-enabled controllers (SLC-5/05s and PLC-5/40Es), the system is connected via a five km surface-to-longwall Ethernet fiber network, providing data transfer rates as high as 100Mbits/sec.

Controller technology was chosen according to functional requirements and budget, the SLC-5/05 small controller for the conveyor systems, and the PLC-5s to provide the higher end functionality and data handling required at the longwall.

Although Ethernet provides the main backbone medium, Oaky North has opted to use Allen-Bradley Data Highway Plus (DH+) peer-to-peer communications for communications between the two systems.

Blocking out the coal reserve

Longwall coal mining is a well-established practice in the underground coal industry. Blocks of the coal reserve are systematically and safely cut by the longwall mining machine, a massive assembly of rotating shear, conveyor, and hydraulic roof supports.

A main surface-to-orebody shaft leads to a network of tunnels running perpendicular to the main access shafts, or maingates. Installed at the end of each maingate, the longwall machine rakes along the coalface, dropping the coal pieces onto a conveyor belt below. The roof is allowed to collapse in a controlled fashion, with the outbye conveying system transporting the coal to the surface.
communications in the coalface vicinity of the longwall itself, with Ethernet on fiber as back up. “We pass a lot of information between the PLCs down at the longwall,” explains Oaky North Electrical Engineer Heather Crabb. “The DH+ is better designed for passing information between PLCs than Ethernet. Sometimes Ethernet can incur delays. We can’t handle this at the longwall.”

Oaky North Engineering Maintenance Superintendent Peter Binnie (right) and Maintenance Coordinator Greg Rushforth inspect the ramp conveyor’s three 1100kW DODGE CST units, the largest in Australia.

Exceeded early capacity

With 1.8 million tons mined in the first five months of production, the mine exceeded early capacity estimates on its way to filling its first year’s goals.

The Oaky North outbye conveyor, control, and automation system is a crucial element in the mine’s drive to profitability: “The outbye system has the built-in capacity and reliability we need,” concludes McLaren. “It’s really just the conditions on the face that now determine how fast we can mine.”

They all use Rockwell Automation products to help them keep equipment and production levels up. In fact, five out of six of the businesses shown here, including 1998-99’s single most productive coal operation in Australia, use the DODGE® CST™ product on their conveyor systems. The sixth uses RELIANCE ELECTRIC® DC motors to power their operations.

The DODGE CST system provides controlled starts and repeatable acceleration for heavily loaded conveyors in mining and aggregate applications. CST systems provide a controlled start, allowing a heavily loaded conveyor to accelerate smoothly to operating speed. This controlled start eliminates belt shock waves and extends conveyor belt life. It also reduces the need for maintenance on other system components like couplings, bearings, shafts, gears, and keys. A smaller motor can be utilized by sizing the motor on the basis of running load rather than high starting torque requirements.

CST systems also work with booster systems, achieving dynamic load sharing and speed matching, even under varying load conditions. In addition, solid-state digital controls consistently assure accurate start-up and controlled acceleration under any load or ambient condition time after time.

The CST system conserves power by substantially reducing the peak current demand. Hard starts, which draw excess current and thereby shorten the motor’s life, are eliminated. CST systems also allow minimum thermal shock by bringing systems smoothly and economically up to speed.

The results are obvious and exciting. Shouldn’t you make Rockwell Automation part of your success story?