fact file

CASE STUDY NOTES

DnA

Drives and Automation

Vault Retrieval System at Berkeley Nuclear Power Station is set to Manage Future Intermediate Level Waste Processing

The new Vault Retrieval System is set to manage intermediate level waste retrieval at the disused Berkeley Magnox reactor site in Gloucestershire.

The Magnox reactor buildings at the world's first commercial nuclear power station at Berkeley, Gloucestershire stand square and defiant against the breeze from the River Severn. Built in the late 1950s, the power station produced enough electricity during its heyday to supply a city the size of Bristol. These days, devoid of life and stripped of its external pipework, the seven-storey buildings are little more than hollow shells.

Electricity production at the Berkeley site ceased in the late 1980s, marking the end of just over three decades of supplying the National Grid and since then, the reactors have taken on new lives. Following two decades of dismantling and decommissioning, their function is now to store the reactor's casing and core. In nuclear jargon, sealing the buildings is referred to as "entering Safestore"; the second stage in a lengthy process of nuclear power plant decommissioning.

Berkeley is the first of 10 Magnox nuclear power stations in the UK to reach this stage of decommissioning, though they will all follow suit over the years ahead.

The majority of all the active waste from Berkeley, some 99%, was sent for reprocessing to Sellafield so most of the radioactivity has long since left the site. Berkeley has nevertheless been left with about 1,000 tonnes of intermediate-level radioactive waste from its research laboratories, and also in the form of sludge from the treatment of the cooling water. This waste is currently stored below ground in eight-metre deep vaults, each of them six metres wide and 14 metres long.

Like all the contaminated waste in the UK, Berkeley's intermediate-level waste will eventually end up in the planned underground repository. In the meantime it will be stored on site.

A new storage facility will be created above ground adjacent to the two reactor-buildings-cum-waste-stores. The winches provide part of the infrastructure to process this waste by retrieving waste from within the underground vaults using hydraulically operated grabs and depositing it onto a ground level conveyor system for transfer to the following processing stages.

Barnsley based Qualter Hall were given the Mechanical and Electrical design contract for the design and manufacture of the winch system, the main client was Cavendish Nuclear, part of the Babcock Group. Drives and Automation provided, the drive hardware and bespoke drive and safety software along with the operator HMI programming.

Technical Details

- Emerson / Control Techniques Unidrive SP Inverters
- Emerson / Control Techniques Second Processor Application Modules
- UNIOP HMI Operator Interfaces
- Pilz Multi Programmable Safety Relay
- Beckhoff Remote I/O

The Vault Retrieval System has three independent hoists along with a common hydraulic power pack. Contained within the main control panel are six Control Techniques Unidrive SP AC inverters. Each of the three hoist systems comprises of, one VSD for the main hoist motor and a second VSD for the hose reeler.

The six Unidrive SP AC inverters were each fitted with a second processor option module (SM Apps module) configured to communicate between the drives and the Beckhoff remote I/O via the Control Techniques Hi-Speed CT Net network. The SM Apps modules were individually programmed to perform the control and hoisting functions.

The V3A main hoist motor drive was designated as the 'master' for the CTNet communications and was used to drive the outputs on the Beckhoff remote I/O rack. The 'master' Unidrive SP node was also fitted with an SM Ethernet module which was used to communicate with the HMI.

The system also included a Pilz PNOZ Multi programmable safety relay which was hardwired into the control circuits for the safety functions. The status of the Pilz PNOZ Multi safety relay was monitored by the drive control system via hardwired signals and the Beckhoff remote I/O rack. The Pilz PNOZ Multi safety relay was also connected to an HMI via an Ethernet link for diagnostic purposes.

The HMI provided status information for the control system, together with diagnostic data for the Unidrive SP drives, the Beckhoff I/O, and the Pilz safety relay. The HMI was also used to configure various parameters required for the operation of the control system such as the hoist positions.

Overall control and supervision of the hoist system was by an Allen Bradley ControlLogix PLC and SCADA system by means of a series of digital interface signals between a ControlLogix Remote I/O node and the Beckhoff I/O rack.

Drives and Automation (DnA), based near Sheffield, provides a comprehensive system design and build or retrofit service for control systems, encompassing drives, PLC systems and complete projects working alongside machine builders or end users.

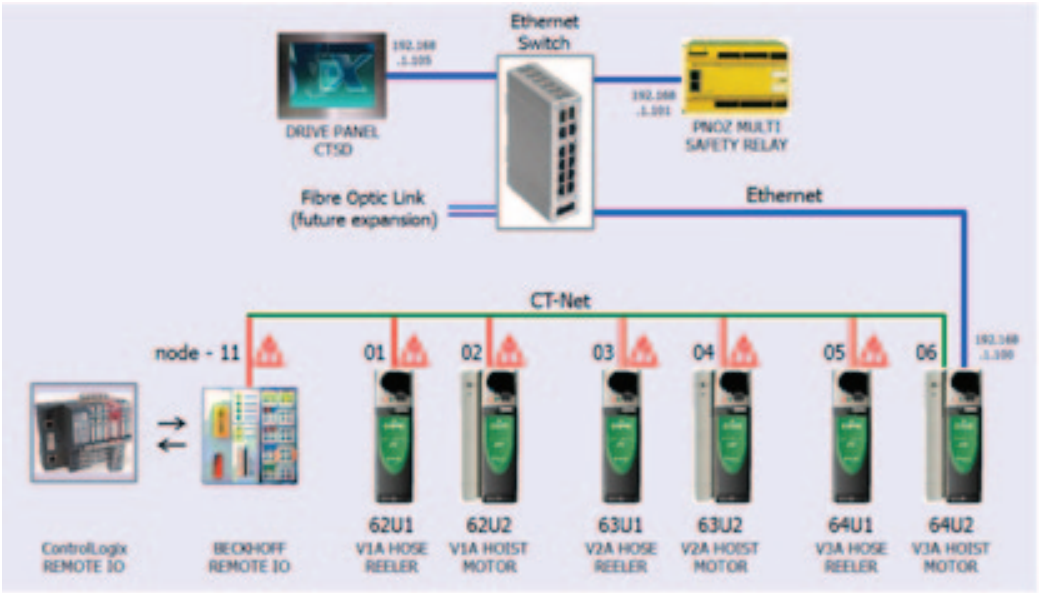
Solution

- Drive based hoist control software
- Identical systems provided for each hoist
- Common spares throughout
- Position control and hoist speed control built into the drive
- Cost effective solution
- Comprehensive Documentation Provided

Benefits

- Ease of use and setting up
- Ultra smooth operation and positioning control
- Safety based solution offering operator and load protection
- Easy To Maintain and Fault Find
- Easy to Support

Hoist Grab in-situ



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