

# £1.3M Electric Arc Furnace (EAF) Control System Project, Outokumpu, Sheffield



## £1.3M EAF upgrade project replaces outdated control system at Outokumpu Steelworks in Sheffield.

Outokumpu is an international stainless steel company with plants worldwide. Stainless steel is the fastest growing metal market across the world and Outokumpu are one of the world's four largest producers, and widely recognized as world leaders in technical support, research and development.

The control system managing Outokumpu's 90MVA Electric Arc Furnace (EAF) located in the SMACC department had grown over the years to incorporate several different PLC's, some of different manufacture. Some of these PLC's had become obsolete and fault finding was a time consuming process. The decision was therefore taken by plant engineers to replace the complete control system with a new design.

Drive and Automation were awarded the £1.3M project to design, supply and commission a replacement control system for the Electric Arc Furnace, a project which had to be completed and ready for production within the planned two week summer shutdown 2012. The turnkey solution included a PLC control system with

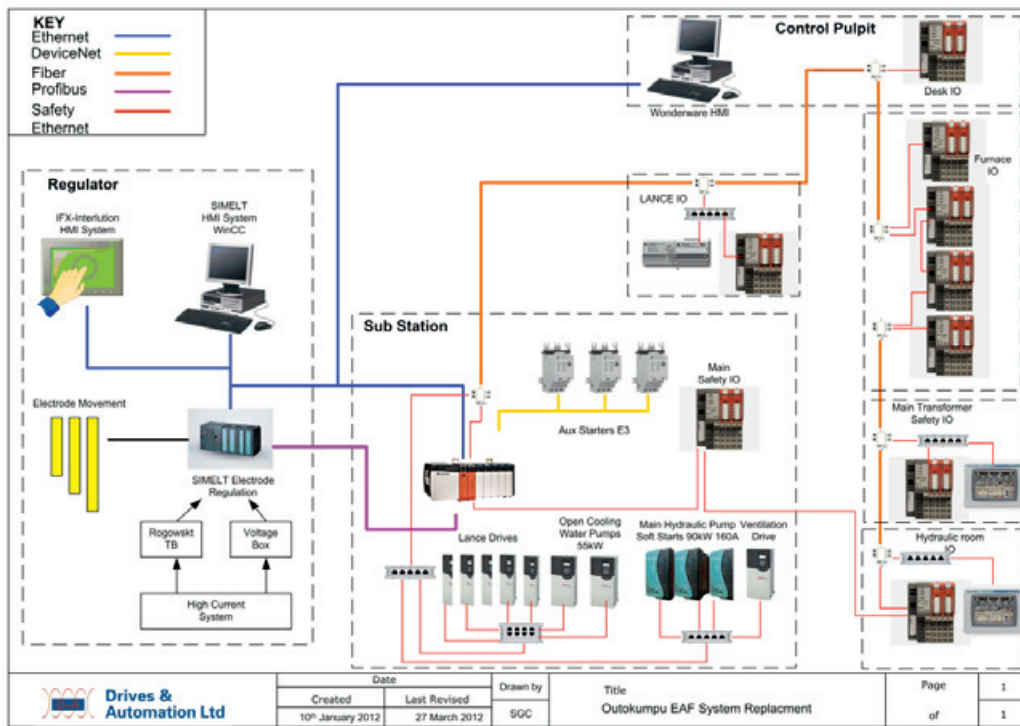
integrated safety, remote I/O stations, redundant Ethernet communications, inverter drive controllers, soft starters, intelligent motor starters, SCADA / HMI modifications, electrical installation works and interfacing to the new SIMELT electrode regulator control system.

The replacement control system featured an Allen Bradley ControlLogix Safety PLC, Wonderware SCADA system, Panelview local control HMI stations and Rockwell Power Flex inverters. Direct on line motors were protected by Allen Bradley E3+ Devicenet overloads which allowed motor status, loadings and fault diagnostics to be carried out.

### Technical Details

- Allen Bradley ControlLogix / Guardmaster Safety PLC System
- Allen Bradley Guardmaster Remote I/O
- Allen Bradley PanelView + HMIs
- Allen Bradley Powerflex 755 Inverter Drives
- Allen Bradley E3+ DeviceNet Overloads
- Allen Bradley SMC Soft Starts
- Wonderware SCADA Package





The EAF furnace crucible is loaded with iron, scrap metal, chemicals and additives. A set of precisely controlled carbon rod electrodes are lowered into the crucible along with oxygen, argon and other gases via injecting lances. A large electric current is passed through the 'mix' via the electrodes and the product melts forming molten steel. The depth of the electrodes (arc length) and voltage determines the amount of energy passing into the product, the wear on the electrodes and furnace lining and operating efficiency. Therefore a precise position control system is required. The existing electrode regulator control system was replaced with a Siemens SIMELT system as part of a separate contract. The new PLC system communicated with the SIMELT regulator using a Profibus communications link.

The existing furnace control system relied heavily on obsolete equipment. This was extremely difficult to fault find or service due to the various PLC types and a communication system based on a hybrid of many differing protocols.

Drives and Automation completely re-designed the control system and their plant locations to provide an easier to maintain solution. Remote I/O stations located near to the controlled equipment simplified fault finding and allow maintenance personnel to concentrate on one aspect of control at one time. The remote I/O stations are controlled using a redundant EtherNet / Fibre Optic communications network from a single ControlLogix PLC with integrated safety, located in the main control panel.

The remote I/O stations provided included a Hydraulic station (hydraulic system condition monitoring and pressure control, maintenance filling controls from a local HMI, Furnace movement controls, electrode control), Transformer station (transformer condition monitoring, tap changing control, HV switchgear control and safety proving), Furnace station (furnace cooling and temperature monitoring, position detection, safety lock bolt

control, manual controls), Gas mixing and lance control station (gas injection controls, mixture monitoring, safety shutdown, lance position detection and local controls), Pulpit station (operator desk normal and safety controls), main control panel I/O (protection monitoring, fire detection, local controls). All I/O stations incorporated MCB protection monitoring and internal panel temperature monitoring to aid fault finding/maintenance and prolong control system life.

Drives and Automation provided all project management including preparation of the functional design specification, risk assessments, quality documentation, safety requirements and due to the size of the project CDM regulations were applicable.

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.

### Problem Solved

- Existing Control System Obsolete
- Few Spares available
- Fault Finding difficult
- Extended Downtime
- Expensive to Maintain

### Solution

- New Control System
- New Inverters
- Modern PLC Control
- SCADA Diagnostics
- Comprehensive Documentation Provided

### Benefits

- Downtime Reduced
- Production Increased
- Easy To Maintain and Fault Find
- Energy Savings Maximised
- Easy to Support
- Reduced Cabling



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