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CASE STUDY NOTES

DC ARC Fan Drive, Outokumpu, Sheffield

A new fan and inverter drive system improves control and maximises energy savings on the DC ARC fume extraction system at the Outokumpu plant in Sheffield.

Outokumpu Stainless have made significant improvements in both the process and energy usage by replacing the existing outdated fan and control system with a new control system provided by Drives and Automation Ltd. 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.

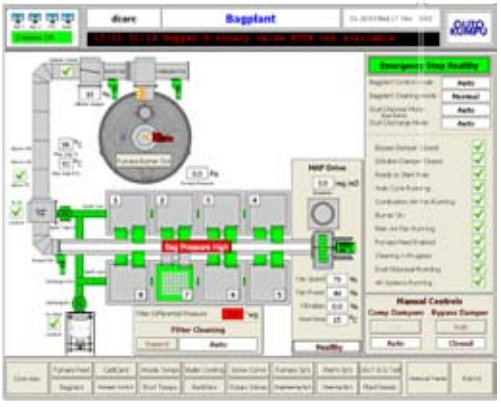
The existing control system was based on a GEM80 PLC and a star / delta starter. Maintenance was a headache after the control equipment had fallen into disrepair. Drives and Automation Ltd were awarded the contract for replacing the control system which had to be completed within a set timescale to minimise downtime. DnA provided a new PLC and inverter drive system to replace the existing cubicle.

A new, more energy efficient fan was installed at the same time as the overhaul of the control system. DnA were tasked with updating the SCADA system and sorting out the existing communications network which was a hybrid of many differing protocols making fault finding and diagnostics very troublesome.

The replacement control system featured an Allen Bradley ControLogix PLC and a Rockwell Power Flex inverter as spares were held already on site for both items.

In addition to the main fan inverter the control system required additional DOL motor starters.

Allen Bradley E3 Devicenet overloads were selected which allowed motor status, loadings and fault diagnostics to be carried out remotely on the SCADA Screen.



Technical Details

- Allen Bradley ControLogix PLC System
- Allen Bradley Powerflex Inverter
- Allen Bradley E3 Intelligent Devicenet overloads
- Intouch SCADA Package
- Pilz Multi Safety Relay System

DnA Drives and Automation

Project Details

The purpose of the fume extraction system is to extract fumes from the DC Arc Furnace and filter out dust particles that are harmful to the environment. Gases leaving the furnace pass through an 'After Burner' then travel through ducting where dilution air is added and then to a 'Spark Trap' before entering a bag plant. The bag plant consists of eight independent hopper compartments. Filtered air from the bag plant then passes through a large fan and exits into a discharge stack.

The speed of the airflow in the system is controlled by a variable speed 250kW motor driving the fan. Another factor controlling the airflow from the furnace is the 'Air Dilution Damper'. This allows cool air to enter the system and mix with gases exiting the After Burner. The effect of this is to reduce the air temperature entering the bag plant, but it also reduces the amount of gas taken from the furnace.

The ultimate aim of the system is to remove all gases produced in the furnace. If the extraction is excessive then air will be drawn into the furnace from outside, increasing the energy used both in extraction system and furnace. In order to maintain the correct airflow from the furnace, the furnace is fitted with a pressure sensor. This allows the system to maintain a slight vacuum therefore optimising the extraction airflow and energy usage.

The furnace pressure is set by the operator on SCADA screens in the Pulpit. A PID control loop in the PLC then controls the fan speed to maintain this set point pressure. The air dilution damper has another PID control loop to set its position. This temperature set point is again set by the operator on SCADA screens. An addition control loop monitors for over temperature and takes over control of the fan should the temperature levels exceed the bag plant capability.

The PLC also controls the bag plant cleaning cycle and dust disposal system.

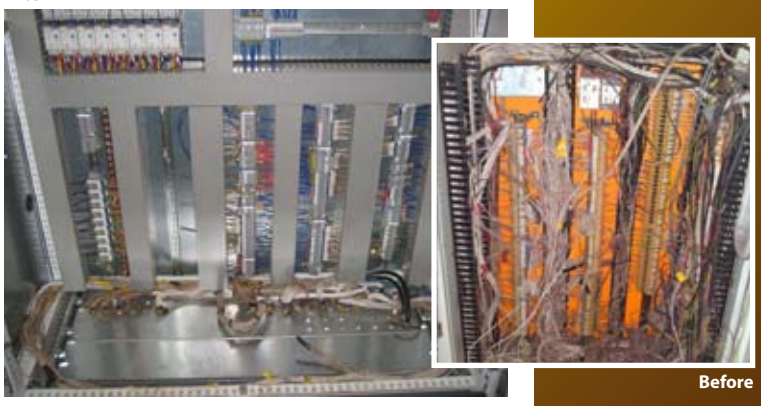
Each compartment is automatically isolated in turn for bag cleaning. Each row of bags has a pulse valve, which are pulsed in pairs, in a predetermined sequence. A delay of a few seconds between each pulse allows the dust to fall into the hopper.

After each compartment is cleaned, the dust is allowed to settle and then the inlet and outlet dampers are opened to bring it back online. There is a predetermined delay before the next compartment is cleaned.

The dust disposal system transfers dust exiting the base of the hoppers, via screw conveyors and a discharger conveyor to a collection bag. Controls are built in to detect for a full bag and allow for bag changes.

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.

After



Before

After

Before

Problem Solved

- Existing Control System Obsolete
- No Spares available
- Fault Finding very difficult
- Extended Downtime
- Expensive to Maintain

Solution

- New Control System
- New Inverter
- Modern PLC Control
- SCADA Diagnostics
- Comprehensive Documentation

Benefits

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

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