

Project Name:	Roasthouse ReAutomation
Customer:	Large Brewing Company, Ireland
Sector:	Food and Beverage
PLC:	4 x Siemens S7-300 PLC's
SCADA:	InTouch 8.0
Networks	Ethernet & Profibus
I/O count	Over 1000 I/O

Original System Summary;

The roasting of barley in the Roasthouse is the first stage of production, giving the distinctive flavour and colour to the product. The roasting is carried out in batches and two Roasters are used. The roasters are large cylindrical ovens which roast a set weight of barley in each cycle. The weighed amount of barley is transferred from Intake Silo for roasting and then transferred to Roast Material Day Bins following roasting and hence to Silos prior to transfer to the Brewhouse. The overall system dates from the 1980's. A passive wall mounted mimic driven by PLC I/O provided a graphical display of the plant operation.

The system was previously controlled by the following controllers and operator interfaces;

Roaster 1	Simatic S5-155U (S5 PLC) with Simatic Coros and printer
Roaster 2	Simatic S5-155U (S5 PLC) with Simatic Coros and printer
Conveyor	Simatic S5-115U (S5 PLC)
Transfer to Brewhouse	Simatic 5Ti (Texas Instruments PLC) with push buttons and lamps

Each Roaster PLC controls a rotational drive, air fans and gas heating system required for controlled and accurate heating of the material to desired colour and temperature. The temperature is very important as the material is heated to within a few degrees of its burning point. The temperature control is achieved by use of two PID loops on each machine, controlling air and gas flow through the burners, these burners being also controlled by the PLC's.

The Roasters produce a batch report at the end of each roast, and this is sent to the printer. Operator interface and printer are controlled directly by PLC.

The Roasthouse Conveyor system acts as a serving system to the Roasters, receiving requests to transfer the barley to and from the roasters. The conveyor system controls a series of elevators, conveyors and flap valves which are used to transfer material on request from the Roaster PLC's.

The second conveyor system (5Ti) sends roasted material to the Brewhouse for mashing and generation of wort for the product.

Project Requirements;

The main aspects of the project were;

Replacement of each of the PLCs with a newer Simatic S7 system

This involved designing new PLC controllers, and an Industrial Ethernet communications network. All field (non-mimic) I/O points were to be maintained.

Replacement of the Operator interfaces with modern Scada stations - InTouch stations

These stations are identical and capable of switching over to control other roaster on hot-key. The stations provide a graphical display of the plant as well as recipe based control of the roasters. The control is based on replication of all old Coros features in a modern manner to allow seamless transition to the new system with minimum of training or disruption due to system navigation

Removal of all Operator Interface code and printer code from the new system

The S5 system had a large amount of legacy code controlling these items which had to be carefully removed.

Recoding of all code to reflect changed addressing structures

The S7 system allows addressing within the Data Block. All items were addressed correctly to ease maintenance, documentation and understanding of the system for commissioning.

Removal of all mimic I/O and sorting of remaining I/O to reduce number of I/O cards required.

The mimic I/O was identified and tagged for non-connection to the new system. The references to I/O in the code were removed and all I/O was re-organised.

Installation of new weight modules for measurement of weight at roaster and cooler

The Siwarex system was updated for Simatic S7

Generation of detailed Software Design Specification Document

The code was documented completely to give the plant owners an accurate statement of how the plant operates. This was generated entirely from the code.

Storage of Data on the PC's

Each InTouch station stores report data indefinitely in delimited files, for retrieval at a later date if required.

Rewriting of reports

The batch reporting mechanism was moved from PLC data storage to PC –InTouch storage, giving the facility to view the batch as it occurred and the facility to print from a new printer. This rewrite involved a lot of complex PLC and InTouch coding.

Phased Commissioning

The client requested that commissioning occur in 2 phases. This meant that the inter PLC communication was to temporarily facilitate S5 to S7 communication.

GAMP Lifecycle and Simulation

Gamp style protocols were followed during the project and a FAT was carried out. This involved building InTouch functionality to allow simulation of all plant inputs and conditions.

Connection to other systems

A connection is provided to Grain Handling area to allow roasting and stock levels to be monitored.

Project Summary;

The original system was examined by witnessing production and compiling notes on operation. This was necessary as it was not possible to remove the existing Operator Interfaces, A User Requirements Specification was agreed with the client, detailing project requirements and timescales.

All necessary equipment and licences were decided upon and ordered by Logicon. The system components were assembled and tested in Logicon and all communications were set-up using Simatic technology.

The examination of the existing code was carried out and the PLC code was rewritten to remove unneeded aspects and to provide full documentation. Full Software design specification documents detailing all physical operations were produced and approved by the client. The InTouch system was built to provide full mimic and operational functionality, as well as Reporting and Data Storage.

Following basic integration testing by Logicon, a Factory Acceptance Test was performed at the client's premises. The FAT was approved and the first stage of commissioning was performed. The commissioning was successful, conveying system was returned to the client, fully operational in 2 days and roaster 2 was returned, with new PLC and InTouch system, after a further 2 days.

A representative of the Roaster OEM witnessed commissioning and was satisfied with the newly installed system.

Project Conclusion;

There was no effect on Roast Material stock levels as a result of the commissioning. The client was extremely happy with the execution of the replacement. Operators learned to use the new system during FAT and commissioning.

The project showed the ability of Logicon to successfully execute the replacement of legacy systems without extensive recourse to original installers. The solution provided was extremely cost-effective for the client.