

## Installation Summary - Reactor

### System Summary:

Logicon provided an automation system for Reactor system at Chemifloc Shannon. The system was designed and implemented with an emphasis on Safety, to include extensive automated alarm handling.

The Reactor carries out the conversion of materials through circulation under high pressure and temperature, with controlled injection of gasses to facilitate the reaction.

The process equipment used in the system consists of a Reactor Vessel, with lines for Filling, Recirculation, and Emptying, and supply lines for required gasses and venting lines. Overall there are 200 separate automated devices for equipment control, both network and electrical control as appropriate.

Three separate automatic sequences were designed, implemented and commissioned as part of the project.

These are

- (i) Device Test, in which each device is activated and monitored individually
- (ii) Pressure Test, in which the Vessel and Lines are monitored at test pressure
- (iii) Production, for product generation.

During the Production Program all devices and plant readings are continually monitored, and the system will change operation to bring plant to a fail-safe state for any deviation from expected operation.

The Production sequence contains 42 steps and allows operation personnel to easily move between steps if required for safety or production reasons.

### Management System Development and Installation:

The system is managed using Accord, an integrated Object Oriented environment for fast, secure implementation which implements control systems from models, with no coding errors, which is of great importance for safety critical systems.

The Process Management was implemented as follows;

A Process Model of the system was developed in Accord Builder by

(i) Assigning the Valves, Motors, Instruments to Equipment Units, from the P&ID and following ISA-S88 guidelines (in S88 terms this assigning a Control Module for each device),

and assigning PLC I/O, both electrical and bus based, within the Model.

(ii) Configuring Programs, Steps, Alarms and activations for automatic operation. Three programs were configured; for Device Test, Pressure Test and Production.

The Model was checked for consistency and imported to Accord Server which acts as a Data Service for all functions and modules.

Graphics were drawn in Accord HMI and the graphics were populated with Objects, which were configured using drop down selections to link to the objects, both equipment and programs, in the Model.

Alternative Recipes for production program were configured in Accord Recipe.

The three automatic programs were placed in a sequence in Accord Plan and this sequence was also tested.

Sample Production reports were configured in Accord Reports. These formats were agreed with client.

The system was then tested using the built-in Emulator and Simulator. This allowed full off-line testing of all programs. The Emulator carries out all the functions of the PLC Library on a PC and the Simulator mimics actual plant operation by returning simulated process values to the Emulator. For example the Vessel weight would increase if the Product Pump or catalyst material Pumps were active and routes were open. Device Failure, Pressure Failure and other Program Critical Alarms were tested as part of this phase.

Using these functions the system was Acceptance Tested prior to installation and automatic report generation and e-mailing was tested as part of this installation.

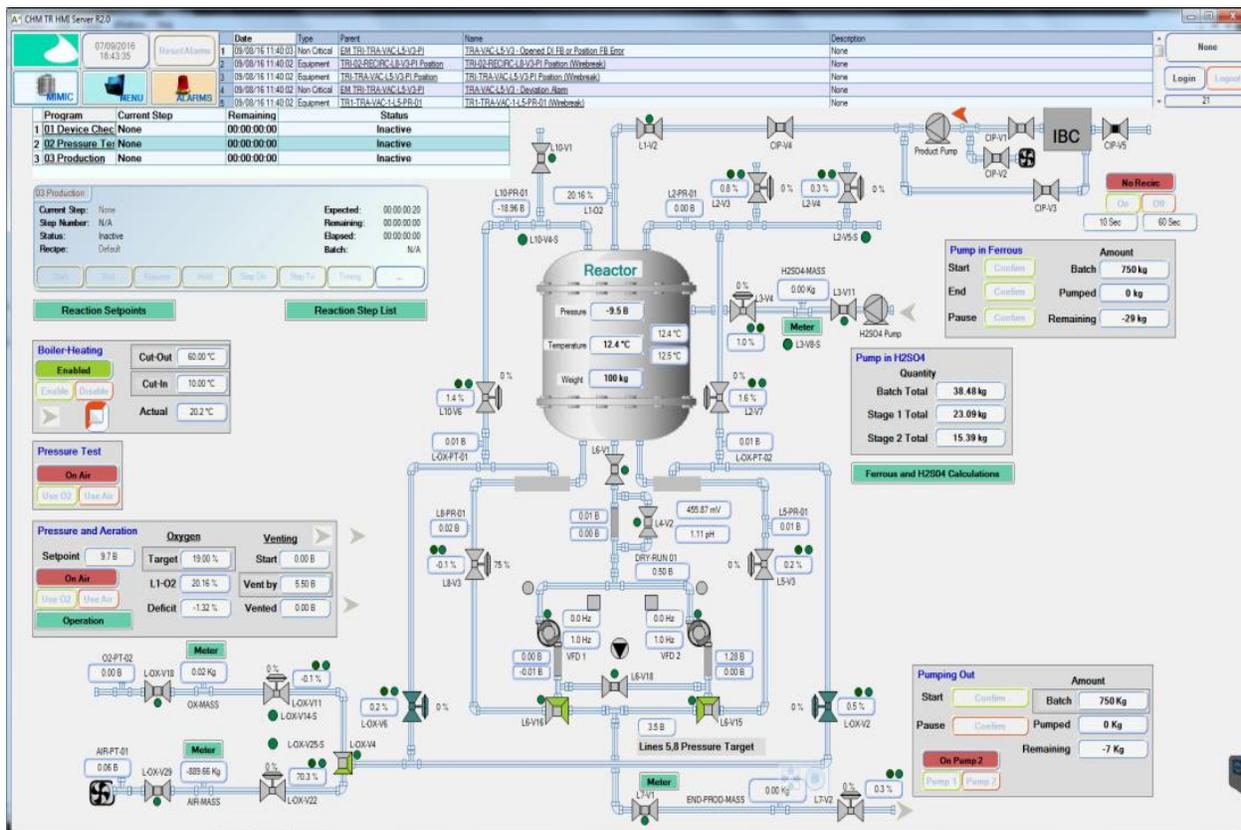
On site, the PLC Hardware was configured and Accord PLC Library loaded was in PLC project and the PLC system was powered up and connected electrically to devices and the Profibus and Profinet enabled devices were connected.

The PLC was connected to Ethernet Switch and then to PC and Panel PC. The Model data was transferred to the PLC and the system devices were tested from the HMI. Following this the automatic programs were tested in turn.

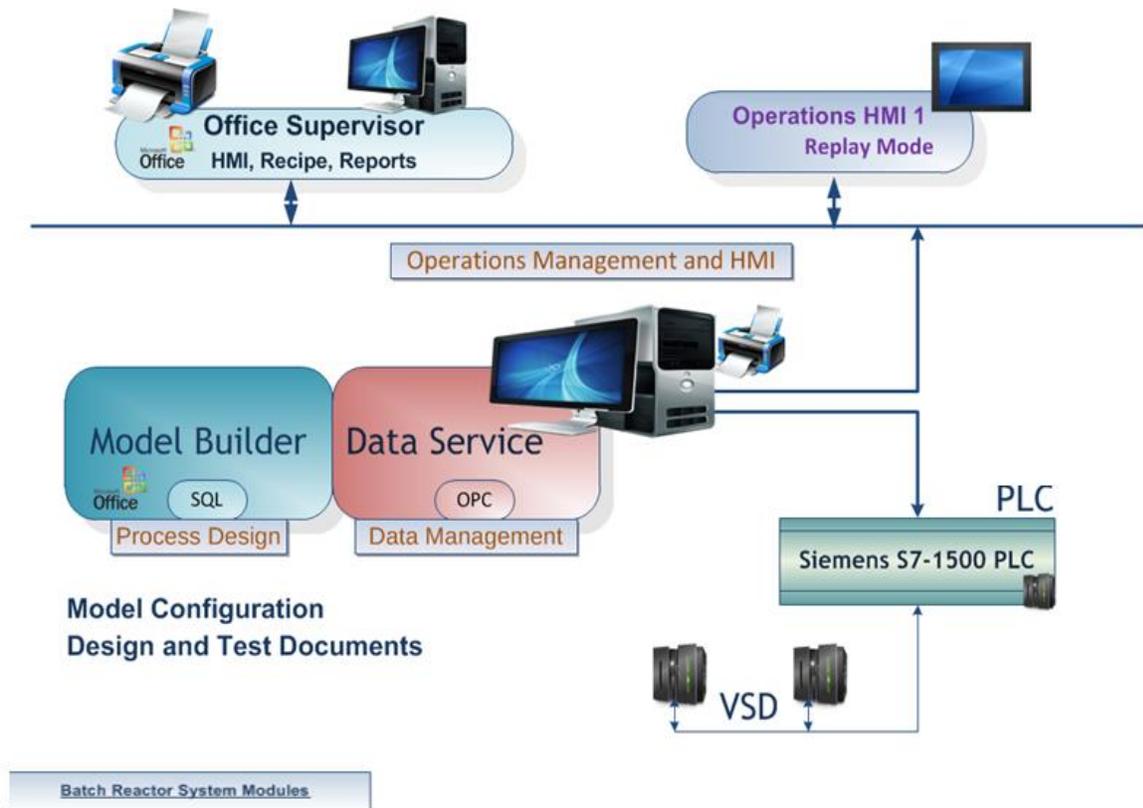
Production began using the tested configuration as soon as the electrical checks were complete and the network was proven.

Accord modules are installed on the Control Room Server and on Operator Panel and on Office PC. This allows management to remotely monitor the system at all times, and to receive reports and to change Recipe or Plan sequences if required.

Sector: Industrial Manufacture  
 Customer: Irish Manufacturing Plant  
 PLC: 1 x S7-1500  
 SCADA: Accord Server and HMI, Reports, Recipe, Plan  
 Networks: Ethernet & Profibus  
 I/O count: 200 I/O  
 Year: 2016



System Mimic, showing all plant states and sequence states.



Network diagram, showing PLC (controller) PC's, and software modules

Project Conclusion:

The system began making product immediately, without the long commissioning periods usually associated with new system installations. Client management received valid productions reports from the first day and the system continues to be available for production when required with full monitoring and control. The system may be safely modified as required in a Pilot plant, with full security for any changes.

The installation was a commercial success also as it was installed and commissioned without any drawbacks and in a much quicker time than using standard PLC, HMI and Scada coding.