Installation Summary - Industrial Blending

Project Summary:

Logicon provided an automation system for Blending for Industrial product manufacture. The system was built using Accord on a Simatic S7 platform with Accord ActiveX controls in RS View Scada. An Ethernet network and a remote I/O on Profibus was used also to implement the solution.

This was the first example of a full Automation system implemented without coding, scripting or tagging anywhere in the world.

The system worked at all times and exceeded the end-client customers' expectations.

Sector:	Industrial Manufacture
Customer:	Irish Manufacturing Plant
PLC:	1 x S7-300
SCADA:	Accord Server and ActiveX Controls (VB Version) in RSView
Networks	Ethernet & Profibus
I/O count	200 I/O

Process Summary

The product is a result of a ratio blending of 3 liquid initial ingredients, with a further blending with a powder agreement to a buffer hopper. The mixture is then fed to a packaging machine where a final element is added.

Holding vessels contain two of the initial liquids. These liquids are made by heating solid pellets which are fed from external hoppers. The vessels, and associated piping, are kept hot using direct steam injection and heated jacket heating.

The liquids are mixed in a mixing tank by adding the ingredients sequentially, the amount being added being measured by the weight of the vessel. The blend in the mixing tank is further blended at the hopper, with a third liquid ingredient, and the blending is implemented using speed controller on the feed pumps, which continuously push the required amount of each of the two liquids to the buffer.

Accord - Equipment Configuration

Each vessel is configured, with feed and empty valves, agitators, weight, temperature and level transmitters and level switches. The heating circuits for each vessel are composed of heating jacket valves, hot water circulation pumps and direct steam injection valves.

The mixing area is composed of liquid transfer pumps, flowmeters, a mixing hopper with a powder ingredient feed system and a pipe which transfers the partial product to the final area. This is represented as a collection of lines in the Equipment Configuration.

Accord - Program Configuration - Process Programs

Initial Vessel Programs

There are two programs controlling each of the initial two tanks. These programs are composed of Filling, Heating and Holding steps as well as an Emptying Step. The filling step activate the pellet transfer line motors to fill the tanks to required weight. The heating step brings the liquid to required temperature by activating the direct steam valves and the holding step maintains the tank at required temperature. The programs are put into the Filling step by the operators and automatically go through to the next steps until they reach the holding step. The programs stay in these steps until the blending program places each vessel program in Emptying step in turn as required.

There are also two programs which control the temperature of the vessels by controlling the respective heating circuits. These programs are background programs.

Mix Vessel Program

This vessel contains the mixture of the first two ingredients from the initial vessels. This vessel has a Program which is composed of Filling, Heating, Holding, Emptying and Circulation steps. The program puts the initial vessel (above) programs into emptying steps when the program is in Filling step. The program fills the vessel from each initial vessel in turn until the required amount is reached according to the mix vessel weight transmitter.

The program then controls the tank and is placed in different steps by the blending program.

A mix vessel heating circuit control program maintains the tank at correct temperature by controlling a water heating circuit.

Ingredient Vessel Program

A final vessel is controlled by another program. It is also composed of Filling, Holding, Recirculation and Emptying Steps.

This vessel is not temperature controlled as the contents are naturally liquid.

Blending Program

This program is composed of priming, production, recirculation and run-out steps. The system is primed at part of start of production and when the system is primed the operators step the program into the production step and the blending program controls the amount of product mixed according to production rate setpoint, buffer hopper level setpoint, recipe blend factors for 2 liquid and 1 powder ingredients. The blending program derives the flow setpoints for each feed ingredient and controls feed pumps using PID controllers which have local flowmeters as process variables.

When production is paused and the buffer hopper level is reached the system places the ingredient vessels into recirculation with fixed pump setpoints.

System Architecture

The installed system was composed of PC and PLC and HMI Operator Panel. The Scada PC's host Accord Builder, Accord Server service, RSView Scada system which contains Accord ActiveX controls.

Accord Builder
Accord Server Service
Scada based on ActiveX controls

The customer has since added PC's for remote viewing to the Scada network themselves.
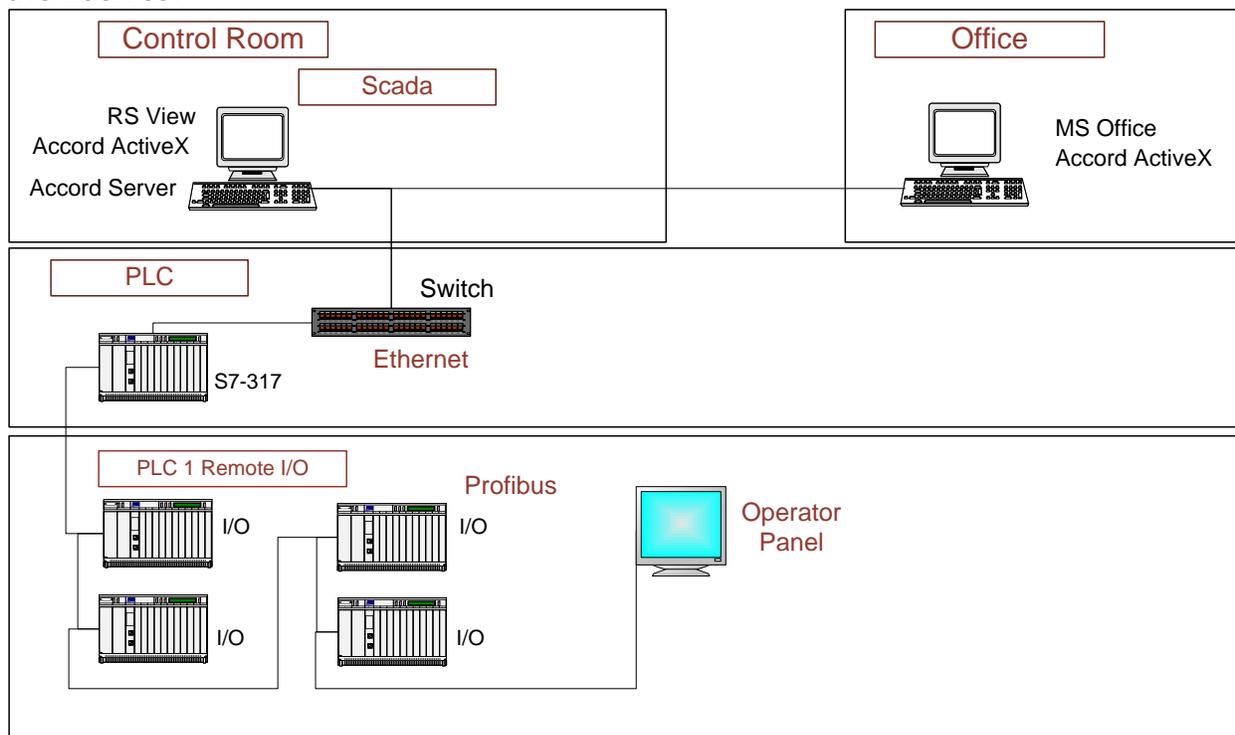
PC and PLC network

Project Implementation using S88

As this was the first Accord project we designed the implementation to be as modular and flexible as possible. The system was designed to S88 standards, having a program for each vessel and for the blending line.
The system was discussed for a day with the client and implemented over two days at Logicon and was commissioned over the course of two weeks by Logicon and end-client staff. At the end of commissioning period end-client staff were making any required changes to the PLC configuration and Scada system, despite having no S7 experience.

Accord Builder was used to provide full design and test documentation in the same week as the project process discussions were held.

Accord ActiveX controls are used by the client to monitor the system locally and at two remote office locations. These remote locations were implemented by the client without Logicon involvement.

The control system was commissioned on schedule and the system generated usable product at first attempt. The built-in Register status facility, allowing commissioning personnel to monitor and modify all data (without PLC addressing knowledge) was very useful during this time.

The tagbase generator facility was used to provide a tagbase for a Simatic HMI which was provided for the operators at the Packaging machine.

The end-client uses the system editor to make all their own modifications when required. They also generate their own reports using Accord Reports.

Following commissioning the customer has taken charge of all aspects of modifications to the plant themselves. This has allowed the customer to reduce operational costs associated with Scada changes.

The customer has also installed the ActiveX controls on other PC's and is able to configure remote "dashboard" facilities themselves to view live and historical production and trend and report data from anywhere in the plant. As the ActiveX controls are able to install in any Windows environment no further licences are necessary.

Scada Implementation

The visualisation layer of the system was implemented using the Accord Server service and the supplied ActiveX controls. These controls were used to automatically link to all PLC objects, without any PLC tagging being required. The equipment controls were used for Valves, Motors, Switches, Instruments, Drives, PID loops and Trends. The program controls allowed complete control of the automatic sequences, including access to Parameters and Step Times, from a single object or from multiple objects placed in the relevant Scada pages. Controls for Alarms as well as Multicontrols showing Lists of Items in Manual and Items in Simulation were also used.

Client Satisfaction

Client Testimonial written 1 year after installation

To whom it may concern,

When we first heard about Accord, it appeared to meet all our needs for an upgrade we were doing in one of our plants. After seeing a demonstration of the product I felt it was something we had to explore as it was a solution that allowed us to commission our process faster and in addition provide all the necessary documentation that is required with any new plant. We had the reassurance that we had the hardware and SCADA package had it transpired that Accord was an aspiration and not a complete solution. It not only ticked all our boxes, it has turned out to be an incredible success for us. In the first year since Accord was installed, we saved considerable time and money over any other traditional PLC/SCADA based systems because;

Development time for the process is considerably reduced
Our team can program an advanced PLC & SCADA with a small amount of training
The safeguards in Accord prevent incomplete or erroneous downloads to the PLC
Comprehensive documentation for our process is readily available
A complete trail of all process data & events is available
The various ActiveX controls allow us to build complex SCADA screens in a short space of time

When you scratch the surface it becomes evident that Accord is a complex and well-built suite of tools. Multiple functionality is provided, any of which makes Accord a must have tool for anyone developing a new or upgrading an existing process. I highly recommend Accord, there are no cons, it is that good. I would urge anyone involved in process development at any level to download the demo and experience the full range of the product.

Regards,
Production Manager