Dairy Plant Project Summary

Project Summary:

Logicon provided an combined automation system for re-automation of 2 Large Milk dryers, replacing existing obsolete systems. Each system was built using Accord on Simatic S7 platform using S7-317 CPU's with Accord ActiveX controls in InTouch Scada. An extensive Profibus based I/O bus was used also to implement the solution for both systems.
The sysems were implemented with full Hot-Standby Redundancy, each Scada was normally dedicated to 1 Dryer, but was able to take over operation of the other Dryer in the event of a PC Fail.

Sector:	Dairy
Type:	Milk Powder Production
Customer:	Large Irish Dairy
PLC:	S7-300 x 2
SCADA:	Accord Server and ActiveX Controls (VB Version) in InTouch
Networks	Ethernet & Profibus
I/O count	800 I/O in each Dryer Plant

Process Summary:

The dryer receives milk from evaporator or whey concentrate from crystallisation tanks and dries it to produce powder which is sent to powder silos.
The primary air for the dryer will be supplied by 1 (one) supply fan. The air is filtered through the air handling unit. The AHU is has two louvre sets supplying air, one taking air from within the building and the second taking air from outside the building. The air inlet is controlled by controlling the motors of the inlet louvers .

The primary air will then pass the steam heater. This heater will bring the air to the desired process temperature. After this heater the air will be brought in contact with the concentrate in the drying chamber, via the hot air duct and the air disperser.

The concentrate will be pumped from a concentrate tank(s) (outlet of the evaporator) to the wheel atomisation system in the drying chamber.

The exhaust air from the dryer, containing still an amount of powder, is lead through a Bag filter were the majority of the powder is filtered out of the air. By means of the main exhaust fan the air is then blown out of the building via a stack.

The powder collected in the Bag Filter will be fed to a so called middle pressure pneumatic powder transport system, by means of blow thru rotary valve.
A blower transports this powder back to the Fluid bed into the mixing section or the outlet of the bed witch can be selected by means of a switch valve.

The powder, produced in the drying chamber, not discharged by the exhaust air, will drop in the integrated bed where drying, until the required moisture content is reached, will take place.
Next the powder will drop in the external fluid bed, via a rotary valve and a drop chute where the powder if necessary is dried further and/or is cooled down to the required temperature.

The internal or integrated fluid bed has no separate air discharge, but the exhaust air will be part of the drying chamber exhaust air. The exhaust air of the external fluid bed will be sucked through the outlet duct in to the dryer exhaust duct at a higher level.

After the fluid bed the powder will enter the sifter (via a rotary valve future). Oversized powder will be discarded. From the sifter the final powder will be transported to the powder silo's true a blow thru rotary valve by means of a middle pressure pneumatic powder transport (existing system).
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.

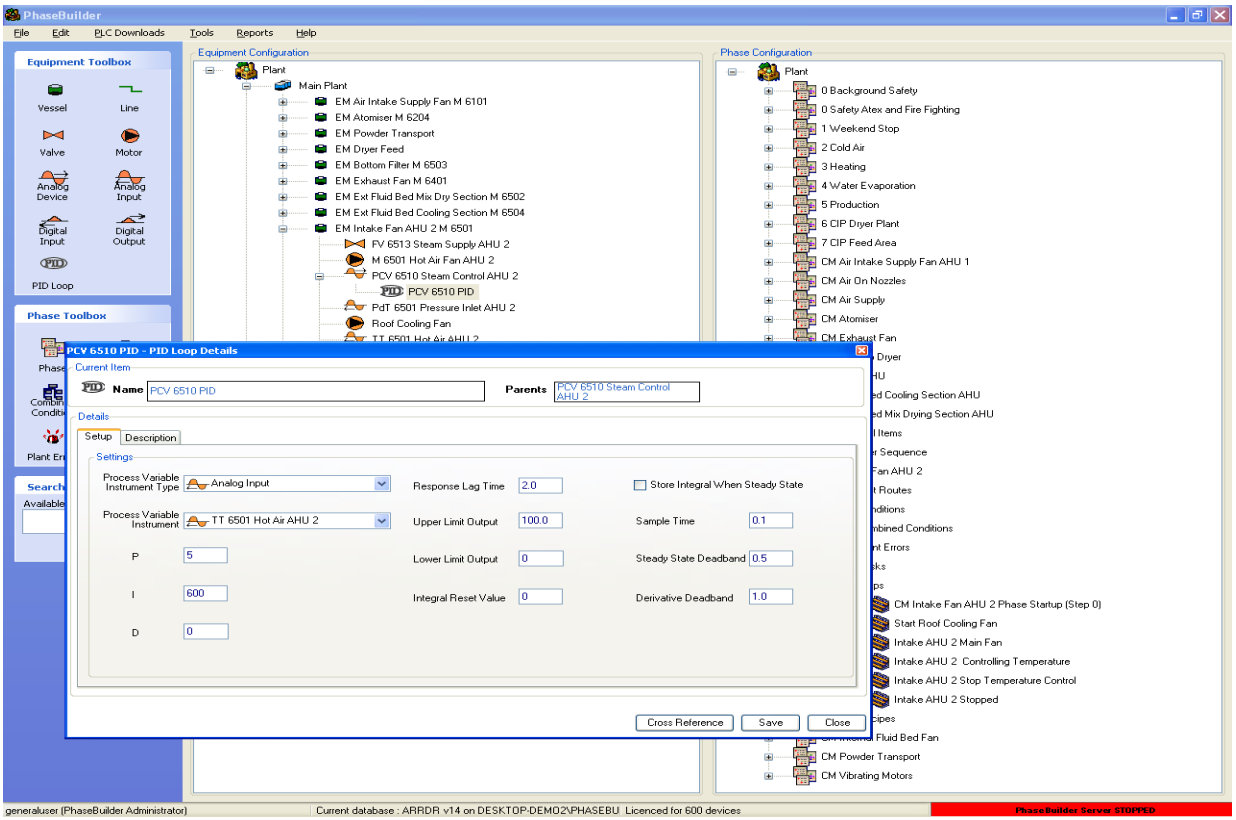
The liquids are mixed in a mixing tank by adding the ingredients sequentially, the amount being added being measured by the weight of the vessel. The blend in the mixing tank is father blended at the hopper, with a third liquid ingredient, and the blending is implemented using speed controller on the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

Accord - Equipment Configuration

The systems are complex, each with many steps for run-up, drying and run-down. The systems were represented in S88 format, It was decided to represent the systems in an S88 format, with valves, motors, instruments being grouped into appropriate sections in the equipment configuration. In this was an error would only cause an error in the appropriate section and not affect the operation of the rest of the plant. This approach was extended to the feed, or wet, area.

Accord - Program Configuration - Equipment Modules

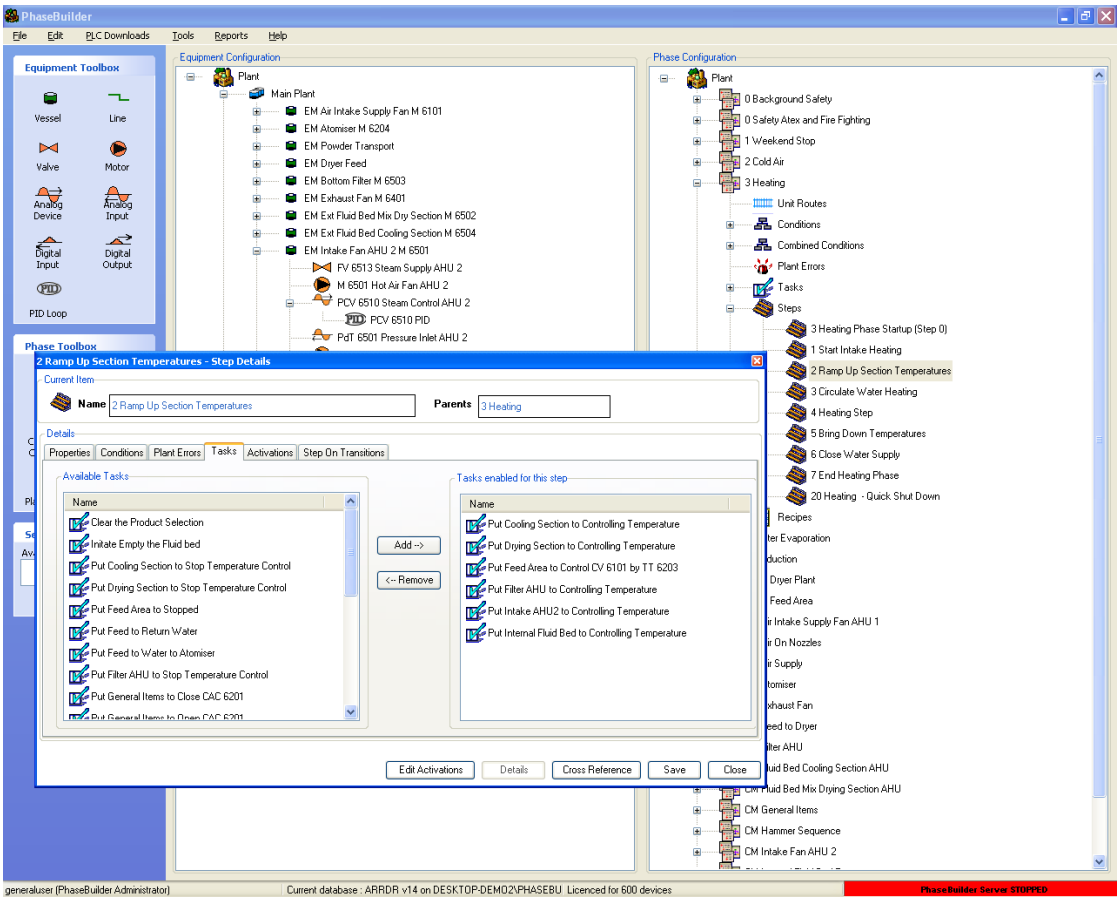
These are small programs that are used to control individual sections of the plant. These programs are started and put into appropriate steps by the sequence programs. Each Equipment Module contains the activations for the equipment items in step activations, and setpoints for PID controllers and analog outputs in its Program parameters in Program recipe. In this manner the activations or setpoint changes are easy to find and modify. This is important in a process which has over 30 process steps from weekend stop to full production to diverting to water. It is much more convenient to configure a system in this way, such that a valve is activated in say 3 steps in an Equipment Module rather than in 20 steps of a main process sequence. This approach would also allow the rest of the plant, other Equipment Control modules to continue in the event of a valve or motor or analog wire break error in one section. The particular section will go into error, and local items in that section may be stopped rather than having to affect the entire plant.



PID loop for Temperature control in Air Handling Unit

Accord - Program Configuration - Process Programs:

The process is composed of a number of stages of plant operation; Weekend Stop, Cold Air, Hot Air, Water Evaporation, Production. When the plant is Running Up it runs from each stage to the next based on operator actions and process readings – that temperatures are achieved. Each of these general stages is represented by a Program, each of which in turn is composed of steps. These steps are mostly composed of commands to the Equipment Modules, which are formed using Operations. For example in the screen shot the step "Ramp Up Section Temperatures" in the Heating Program is composed of 6 Operations to put the Control Modules for Cooling Section, Drying Section, Feed Area, Filter AHY, Intake AHU, and internal Fluid Bed to appropriate (Temperature Controlling) steps. The respective Equipment Modules would each have device activations and PID or Analog Output setpoint loading.

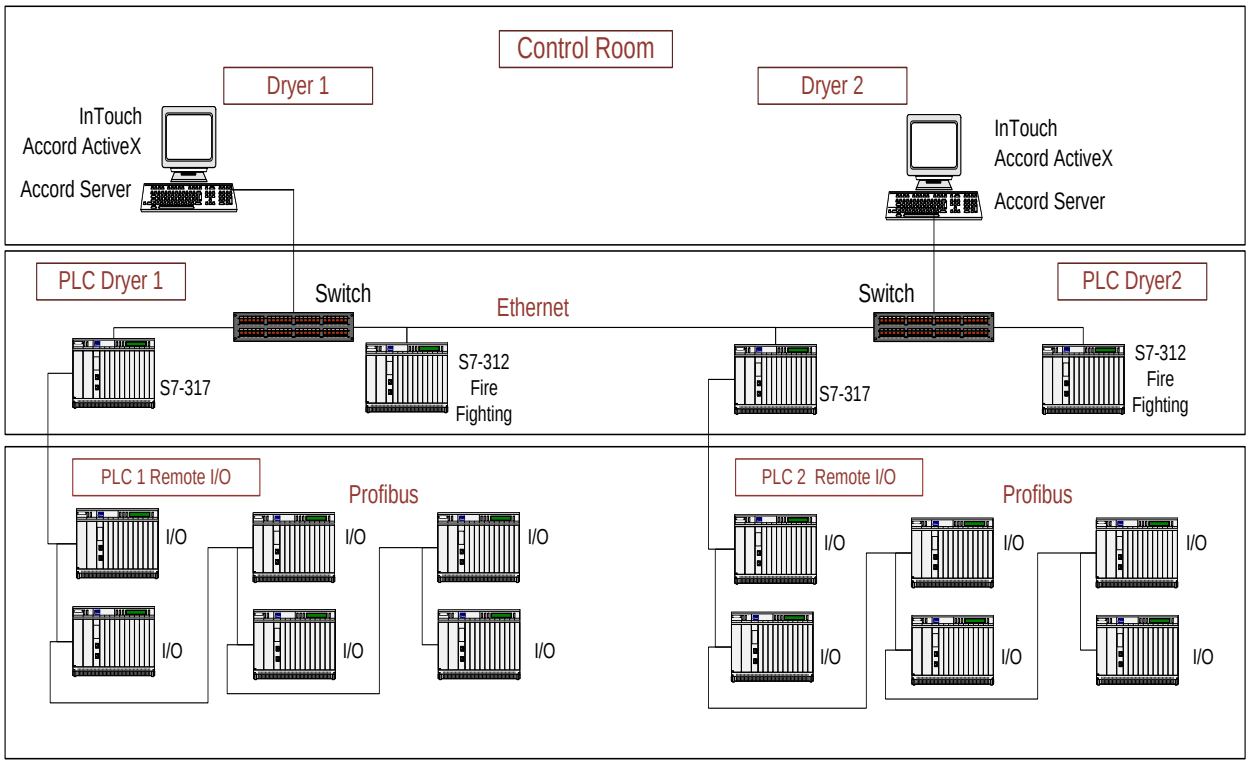


Operations in a Program which put the section Equipment Modules into required steps.

System Architecture

The installed systems are composed of Scada PC's and Dryer PLC's and smaller Fire Fighting PLC's. The Scada PC's host Accord Builder, Accord Server service, InTouch Scada system which contains Accord ActiveX controls.

Accord Builder
Accord Server Service
Scada based on Accord Controls



System Architecture

The connection between the switches allows for full Redundancy for Scada control of PLC's.

Project Implementation using S88

This was a complex system and the approach of using the S88 model, grouping items into appropriate sections made the configuration much better, as section visibility and individual control is now available to the plant personnel.

Each system was discussed for a number of days with the client and implemented over 2 weeks at Logicon and was commissioned over the course of two months to production requirements. The Accord Builder application has been retained by the client on the Scada PC in order to allow them to modify the configuration and to allow them to print all required GAMP documentation as they require.

During the project the following additions were made to Accord platform

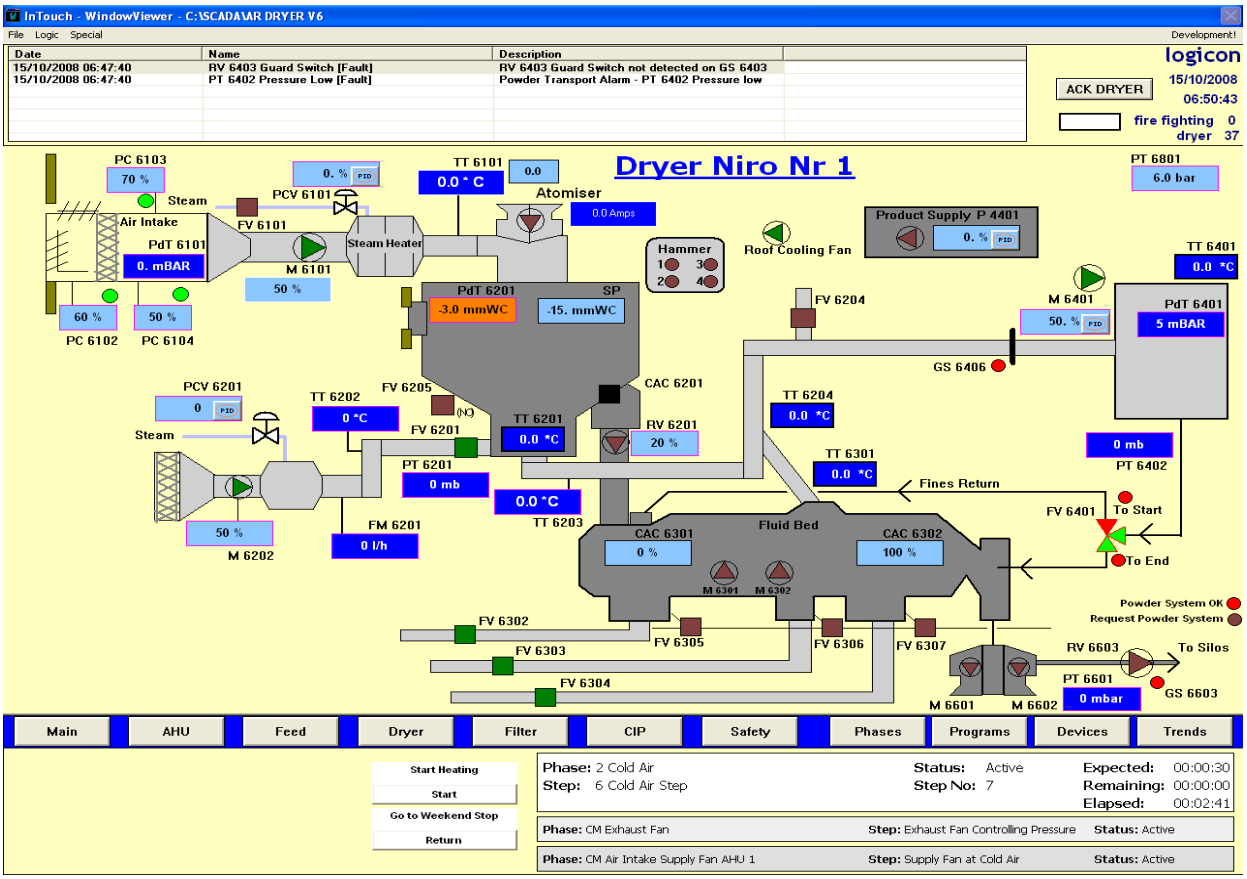
1. A Ramp function Operation to allow fan setpoints to be incremented or decremented linearly, with variable step changes and step times.
2. A Condition to determine if a Value was within a parameterisable deadband of a setpoint.
3. A Condition to determine if a Value was outside a parameterisable deadband of a setpoint.
4. An ActiveX control to represent 3 way valves.
5. An ActiveX control to allow operators to write manual production data to the MIS at configurable intervals. This data is then available to be included in the configurable MIS reports generated by Accord Reports.

All the requested additions to the functionality of Accord Builder were implemented without disruption to the commissioning or production.

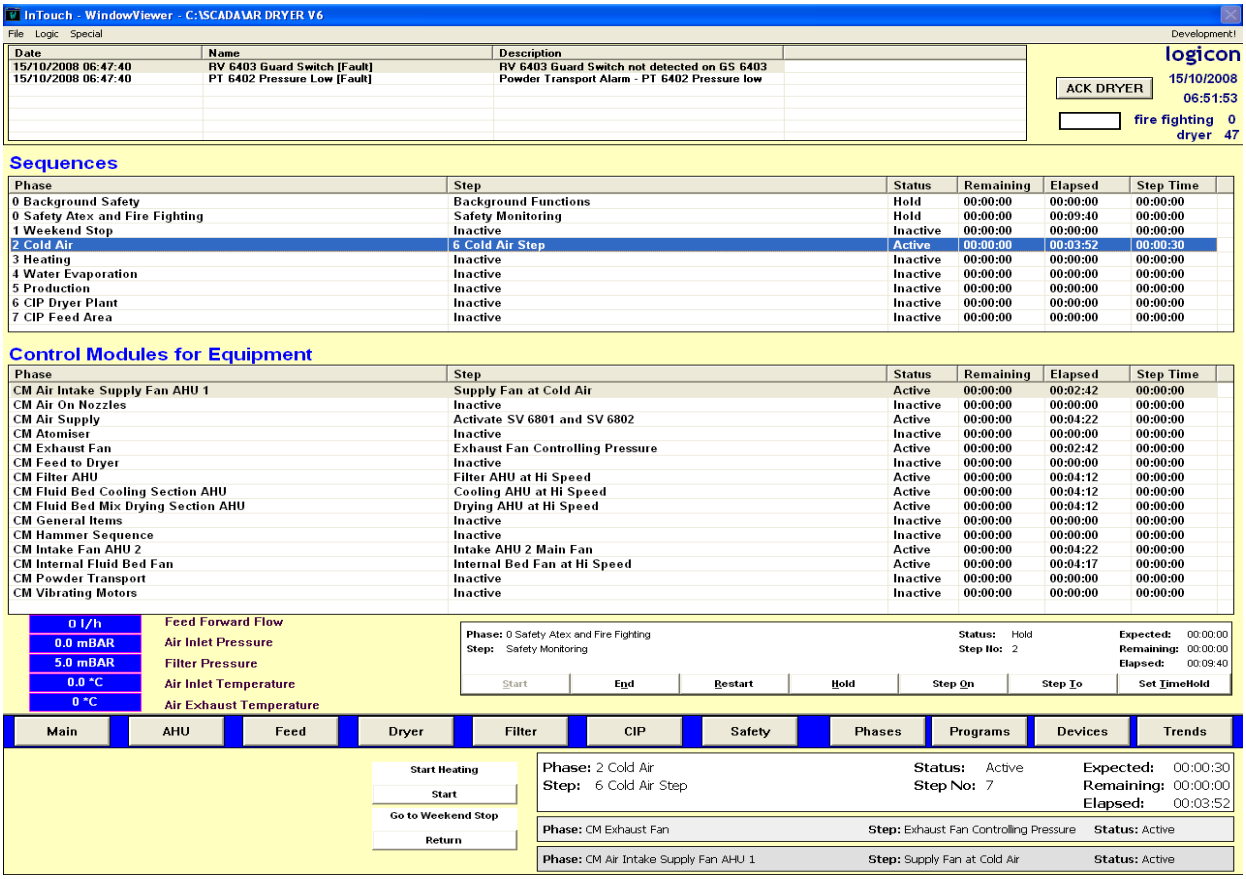
The control system was commissioned on schedule and the system generated usable product at first attempt. The built-in Register status facility, allowing commissioning personnel to monitor and modify all data (without PLC addressing knowledge) was very useful during this time.

Scada Implementation

The visualisation layer of the system was implemented using the Accord Server service and associated Accord controls in InTouch. 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 and Equipment Control Programs, including access to Parameters and Step Times, either from a single object or from multiple objects placed in the relevant Scada pages. Controls for Alarms as well as Multicontrol showing Overall Items in Manual and Items in Simulation were also used.

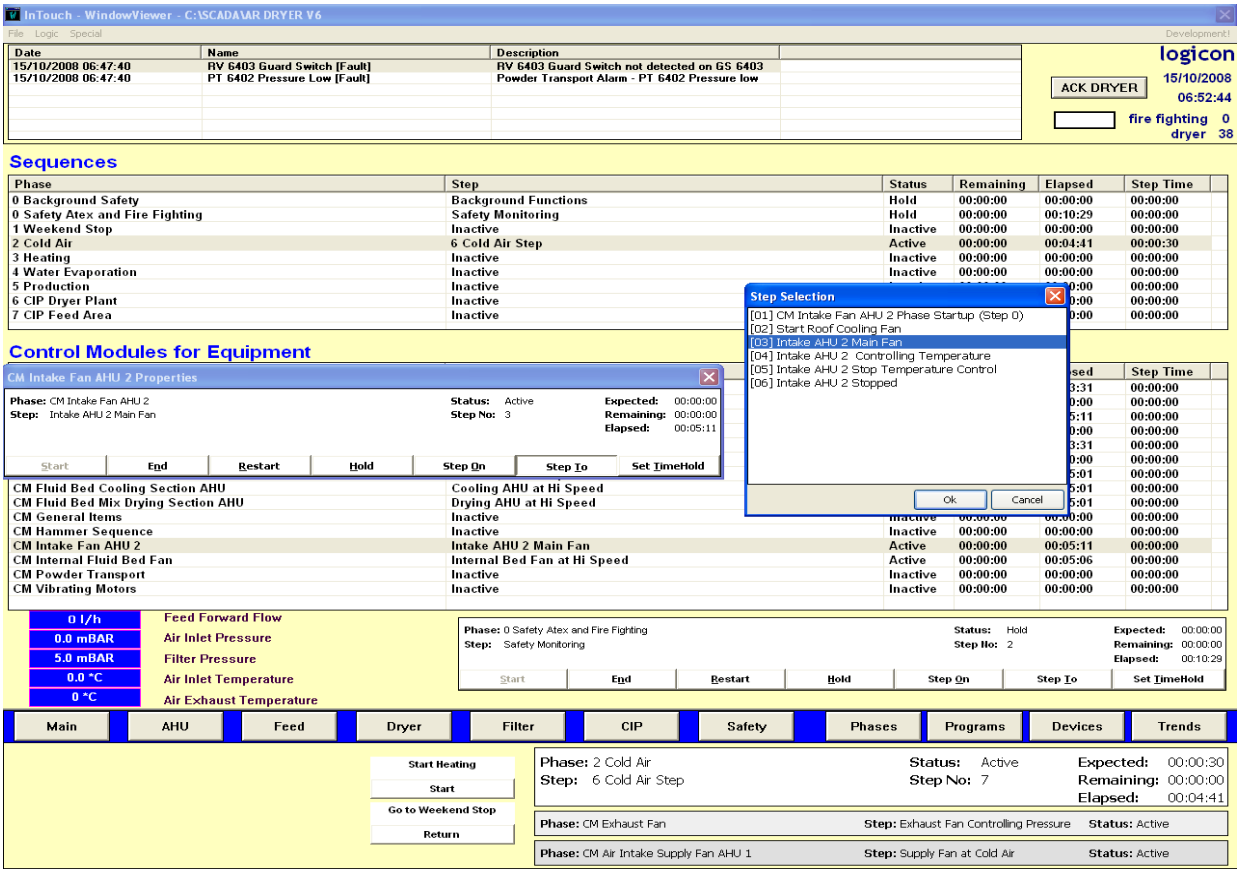


Scada plant screen composed of Accord Device and Program controls

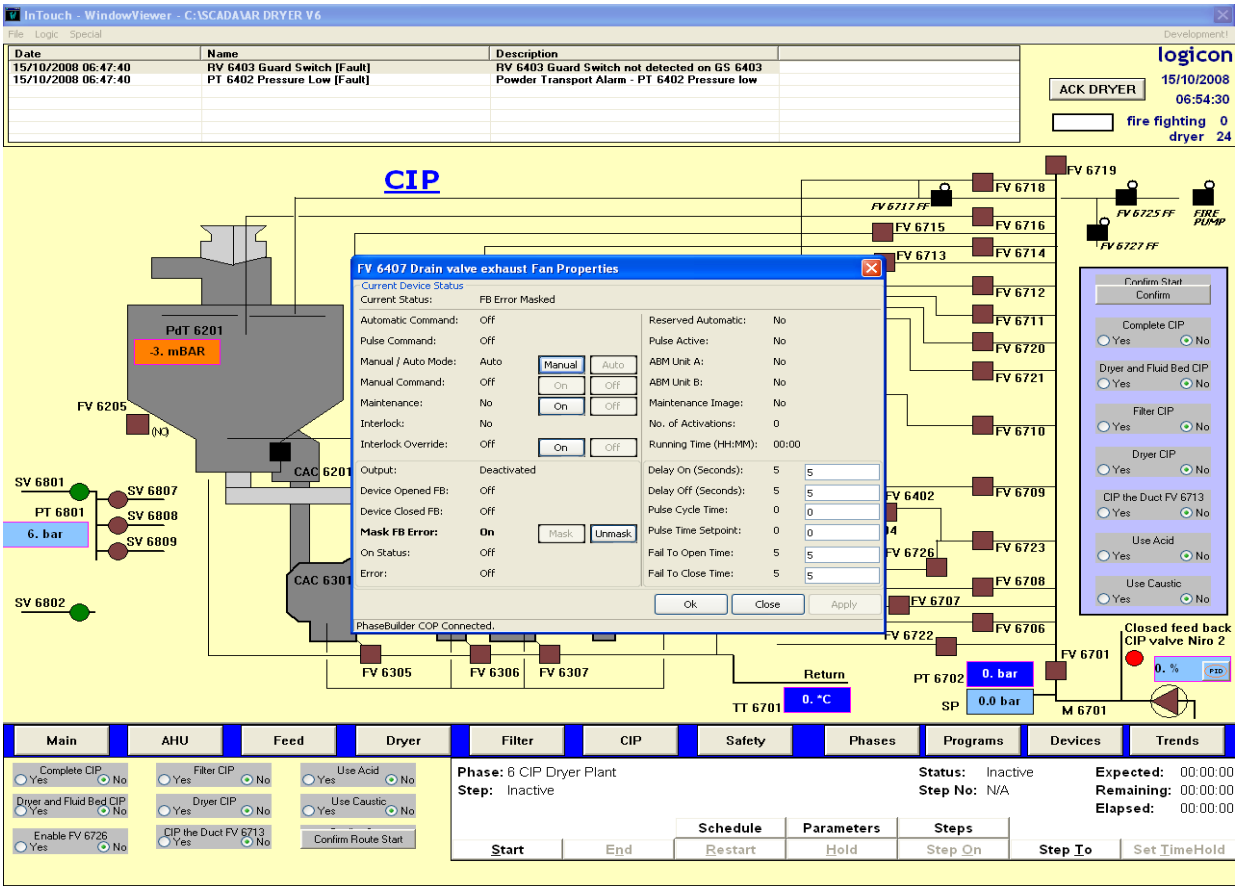


Scada screen Accord controls for Alarms, Sequences and Equipment Module Programs

The buttons in the bottom banner are Accord controls also, allowing one-step error-free configuration of single large buttons. The Program controls in the bottom banner show single programs, one of which also is configured for control of the Program.



Scada screen showing Accord controls for 1 Program, with Step Selection panel.



Scada screen for CIP showing Accord Controls for valve and Scada Decisions for CIP options.

Client Satisfaction

Following commissioning Logicon have not been called back for any issues with the system. Any modifications have been carried out in 1 day, without any disruption. The system has met all the client expectations and the facility to view production reports is very good in this type of plant.