

CQS Innovation, Inc.

# Automated Batch System Provides Superior Control

Automated DeltaV control system provides:

- Mission-critical data collection
- 21CFR Part 11 compliance
- Reduced manpower



*The automation of reactors was necessary to achieve higher manufacturing standards.*

## BACKGROUND

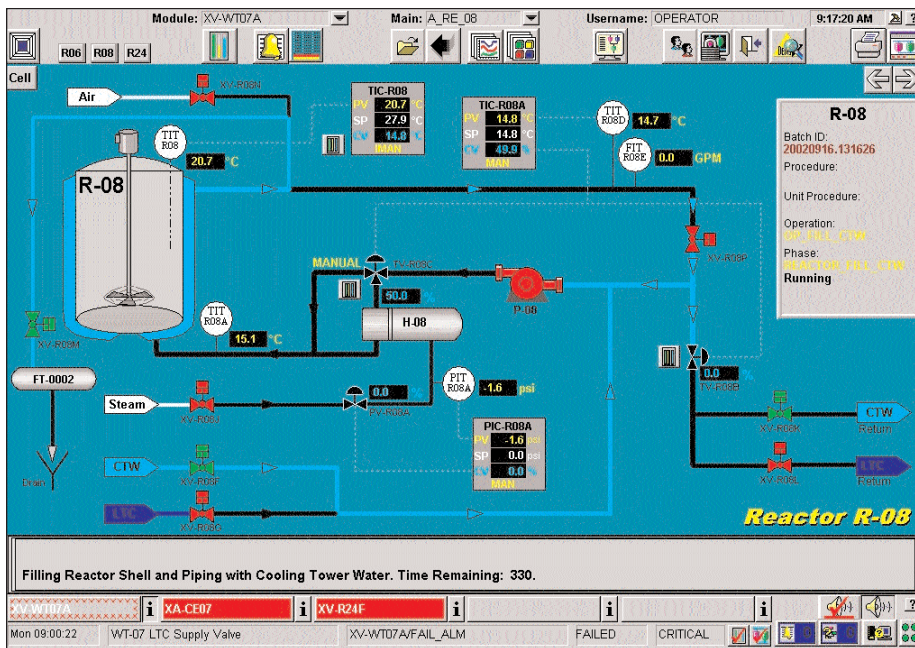
Critical batch operations for a Midwest manufacturer of Active Pharmaceutical Ingredients (API) were manual in nature, which made it highly dependent on the actions of the facility's operators. To meet higher manufacturing standards of the market, management recognized the need to automate three of their reactors to meet the requirements being set forth by new customers. Furthermore, the manufacturer needed automation to reduce the cost and time it took to deliver the product in crystalline form. Recognizing that the reactor heating and cooling functionality represented an area where significant cost reductions could be obtained, the manufacturer decided to upgrade the Jacket Heating/Cooling capability of three reactors.

The formation of the API in crystalline form represented a real controls challenge, since the formation of the crystals was directly related to the rate at which the reactor pot temperature is cooled. The previous method of producing this reduction in temperature was to open a cooling valve by hand and then monitor the temperature. This method of reducing the reactor's pot temperature did not work very well and would often require repeating critical steps in the manufacturing process before the crystals were properly formed. Being able to control this rate would allow the manufacturer to produce crystals of targeted size without reprocessing, thus reducing the amount of unsellable product.

## CHALLENGE

CQSI and a process engineering company worked with the manufacturer's engineering team to define the requirements for the reactor's new heating/cooling equipment:

- Heat transfer Jackets on the reactors are supplied by skid mounted pumps and valves.
- Each skid must be capable of using three different media types.
- The software for the skid must be capable of ramping the pot temperature of the reactor either up or down over a time period and hold the end point temperature for a fixed period of time. The parameters for this function would be user-definable on a per-operation basis.
- The software must be flexible and capable of being reconfigured into user-definable sequences.
- The temperature of the reactor must not overshoot its set point by more than 2.0°C.
- The tuning of the PID loops must be robust enough to safely handle many different types of chemical reactions within the reactor.
- The skid must be able to automatically change the thermal media without cross contamination.



*Sample DeltaV screen to monitor and control reactor temperature.*

## SOLUTION

The new control system consists of a S88.01 compliant DeltaV Batch Control System that directly operates the heating/cooling skids. The control system runs DeltaV Basic Batch with a MD controller interfacing to the equipment.

The customer uses Foundation Fieldbus to interface their 50+ intrinsically safe instruments and valves which are located in Class I, Division 1, Group C and D hazardous areas. Server class computers are used for the mission critical SCADA and batching functions. Office grade machines are used for the HMI and configuration workstations.

CQSI engineered five phase-logic classes to control the functionality of each skid. These phases are configured into unit operations that meet the customer's need for flexibility. The number of phases will be expanded when more of the reactor's functionality is integrated into the Batch Control System.

The PID loops are configured with three different sets of tuning parameters selectable from the phase logic that uses them. This allows the control system to accommodate the many different types of chemical reactions expected by the manufacturer.

## RESULTS

The customer receives significant, measureable benefits from their new Batch Control System including:

- Superior control of the reactor's pot temperature, which yields reductions in the amount of re-work due to unacceptable crystal formation.
- A 21CFR Part 11 compliant Batch Control System for collection of mission critical data.
- Reduction of the manpower required to adjust and monitor the reactor's temperature. The operator is available to concentrate on other assigned tasks.
- Continuing local support by CQSI.

The Batch Control System was installed, commissioned and validated within the customer's scheduled downtime period. CQSI has exceeded the customer's objectives for the temperature control of the reactors bringing a high level of productivity and product quality.

## Making your manufacturing world-class

From plant-wide systems to customized solutions for specific needs, CQS Innovation, Inc. has the experience in automation systems to meet your project's goals.

For more information on how our integration of computer systems, controllers, networks and software systems can improve your manufacturing site's product quality, production flexibility and quality-control tracking, call (800)860-1968, ext. 385.