

Application Note

Reactor Temperature Control

Pharmaceutical Industry

The pharmaceutical industry is primarily engaged in manufacturing biological and medicinal products. These companies process botanical drugs and herbs; they isolate active medicinal principals from botanical drugs and herbs; and they manufacture pharmaceutical products intended for internal and external consumption.

Background

Pharmaceutical companies build large scale labs, or LSLs, that often serve the purpose of investigating new manufacturing techniques. Within an LSL are one or more individual labs that contain a number of reactors, or large vats that are temperature and pressure controlled. Reactors are capable of stirring large volumes of liquid raw materials in order to change the materials' chemical characteristics to produce slurry material. This slurry material is then poured off and set in baking ovens.

A reactor will typically operate over a specific temperature range up to 200°C. At Astrazeneca, for example, the LSL has six cryogenic reactors that specifically operate down to -90°C, which is a key temperature to prevent exothermic reactions. Exothermic reactions can cause extreme heating and instability in the process when scientists combine two different compounds.

Temperature Measurement Critical to Reactor Control

Reactors use a number of PRT probes to monitor batch temperatures. These probes must be calibrated to ensure that the reactors reach the proper temperature to facilitate reactions. The probes are calibrated once a year over the range 200°C to -80°C, typically at six or seven points, and overall accuracy required is 0.25°C. At Astrazeneca, scientists attain this accuracy with a Model 7380 Ultra-Cold Bath to achieve -80°C (they later extrapolate down to -90°C). They also use a Model 1521 LLK Handheld Thermometer with a Model 5627 RTD to achieve the desired accuracy without requiring calibration of the baths.

In addition to their function in LSLs, cryogenic reactors can be found on a larger scale in plant production areas. These production areas facilitate freeze drying processes for which -75°C is a critical temperature. Hart supplied 7380 baths for this application at Astrazeneca as well.

Customer Profile

Astrazeneca, formally known as ICI, is a pharmaceutical company located in Macclesfield, England. The company is involved in R&D and manufacturing of tablet and injected drugs for anti cancer and anaesthetic applications.

Hart Equipment Supplied to Astrazeneca

- 7380 Compact Bath (-80°C)
- 1521 LLK Handheld Thermometer
- 5627 PRT (used with the 1521)
- 9103 and 9140 Dry-Wells

Other Applicable Hart Products Not Supplied to Astrazeneca

Pharmaceutical companies can use Micro-Baths to calibrate probes in higher temperature reactors (Hart model depends on temperature range). Additionally, these companies can use probes as transfer standards to increase Micro-Bath accuracy.

Potential Customers

Astrazeneca is by no means unique in this application. All pharmaceutical companies involved in the manufacture of raw materials will have similar requirements. Other possible customers include the following:

- GlaxoSmithKline Beechams
- Pfizer
- Avecia