Unistat® 912w

Unistat 912w cycling a 60 litre vacuum-insulated glass Asahi AG reactor

Requirement

This case study demonstrates the ability of Unistat 912w to cycle the process temperature in a range from +20°C to -90°C, the closeness of the temperature control and the minimum process temperature achievable in the process mass. Additionally the case study shows an exothermic reaction simulated with an electrical immersion heater.

Method

The 60 litre reactor was connected to the Unistat 912w using two M30x1,5 1,5-meter flexible hoses. The thermofluid used was M90.055.03. "Process" control was carried out via a Pt100 sensor located in the process mass. Stirrer speed was set to 230 rpm.

Setup details

Temperature range:	-90…250°C
Cooling power:	7 kW @ 0°C 7 kW @ -20°C 6 kW @ -40°C 3.5 kW @ -60°C 0.9 kW @ -80°C
Heating power:	6.0 kW
Hoses:	M30x1,5 ; 2x1,5 m
HTF:	M90.055.03 (#6259)
Reactor:	60 litre glass reactor vacuum-insulated
Reactor content:	45 litre M90.055.03 (#6259)
Reactor stirrer speed:	230 rpm
Control:	Process

Results

Simulated exothermic of 2000 W @ 20 °C:
At the beginning the exotermic reaction was simulated with an electrical immersion heater switched on. Once the "reaction" was under steady control the heater was turned "Off". It can be seen how rapidly the ΔT between the process and jacket is increased to "suck" the thermal energy from the process to restore and maintain the process temperature set-point. The results can be viewed in the following graphics.

Cooling a 60-litre insulated glass reactor from 20 °C to T_{min}:
It can be seen from the graphic how quickly the jacket ramps creating a wide difference in temperature between the jacket and process in the initial cool down phase. Around 120 minutes after the start, -75 °C could be reached as process temperature. The corresponding minimum process temperature was -88 °C. It was reached in about 5 hours.