Unistat 405

Unistat 405 controlling QVF 6 litre reactor

Requirement
This Case Study examines the cooling, heating and temperature control capabilities of the Unistat 405 connected to an uninsulated QVF 6-litre glass jacketed reactor.

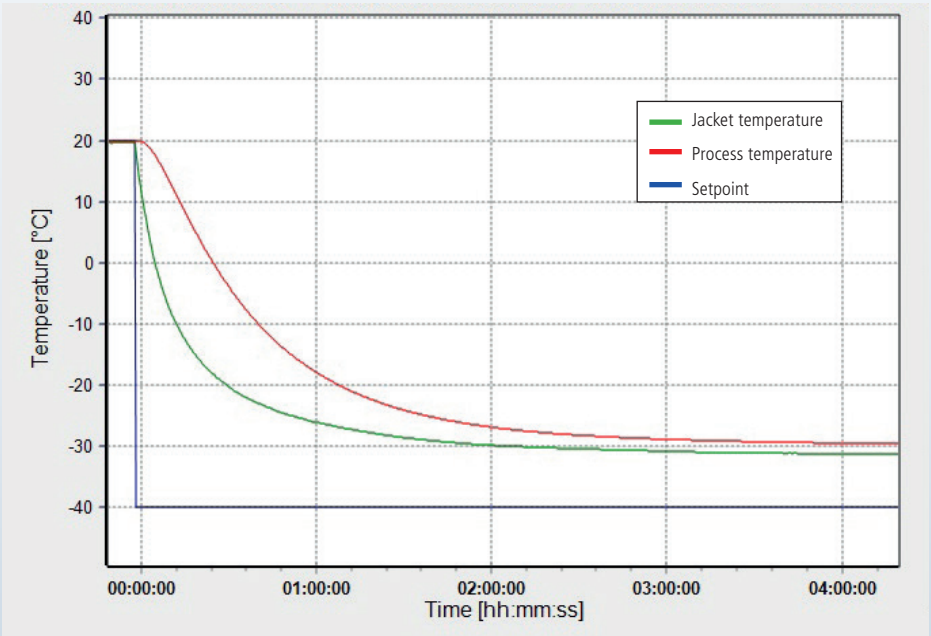
Method
The 6 litre QVF reactor was connected to Unistat 405 using two M24x1,5 flexible hoses. The thermofluid used in the system was "M40.165/220.10 (5 l). "Process" control with small overshoot was carried out via a Pt100 sensor located in the "process" mass. Stirrer speed was set to 260 rpm.

Setup details

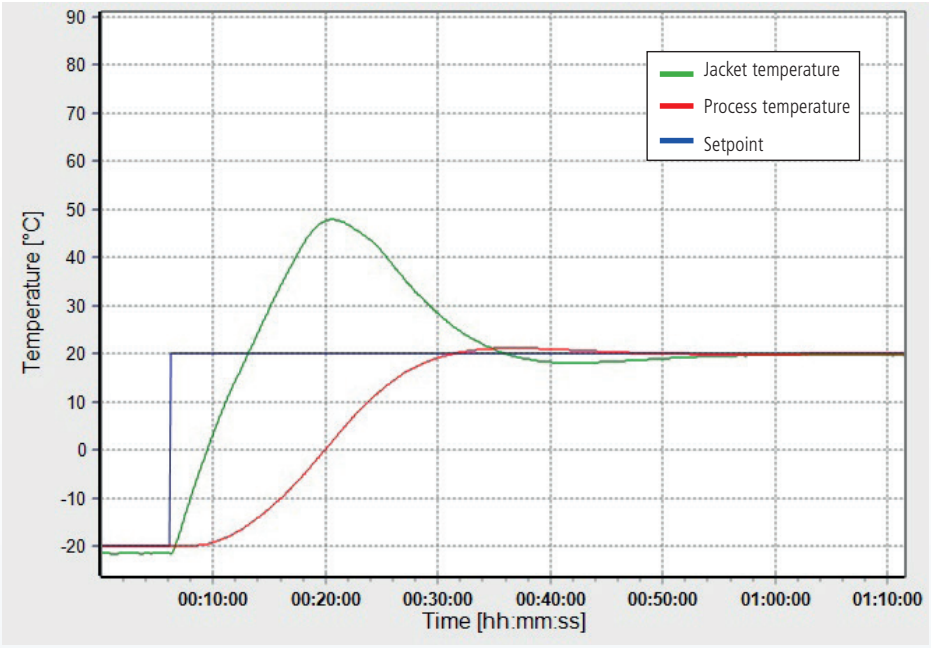
Temperature range:	-45°C...+250°C
Cooling power:	1.00 kW @ +250°C 1.00 kW @ +100°C 1.00 kW @ 0°C 0.60 kW @ -20°C 0.15 kW @ -40°C
Heating power:	1.5 kW
Hoses:	M24 x 1,5 m
Thermofluid:	M40.165/220.10
Reactor:	QVF 6 litre glass jacketed reactor
Reactor content:	5 litre M40.165/220.10
Stirrer speed:	260 rpm
Control:	Process

Results

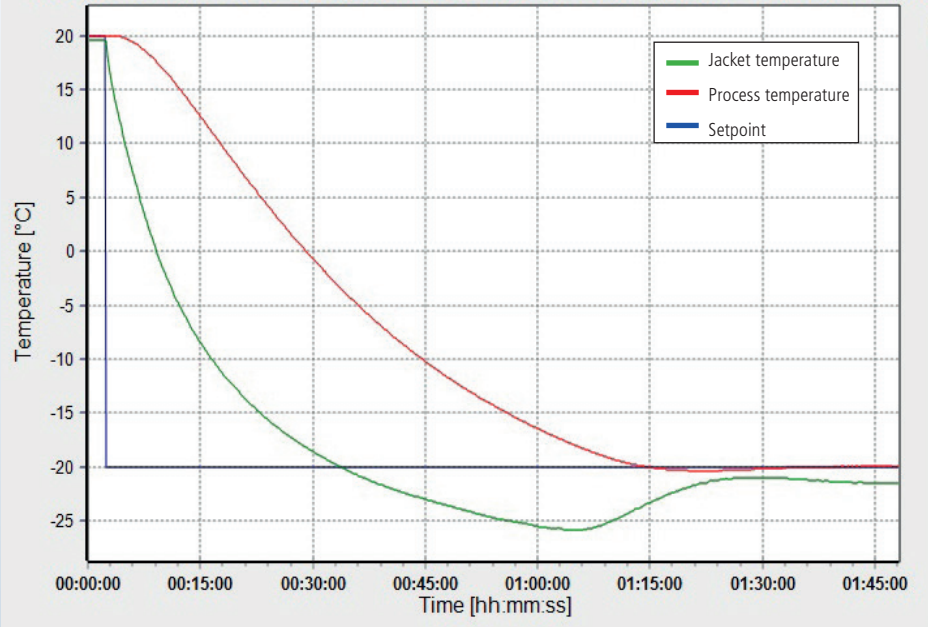
1. Lowest achievable temperature (Tmin):
Once stable at +20 °C under the "Process" control, a set point of -40 °C is entered. The Unistat needs approximately 4h to cool the reactor down to the minimum achievable process temperature of -29,5 °C.



2. Temperature control of the reactor between -20 °C and +20 °C:
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 25 minutes after the start +20 °C could be reached as process temperature.



The second graphic shows the time taken to cool the process from +20°C to -20°C. It can be seen that the time taken is approximately 72 minutes, again the stability and accuracy of the control is clearly demonstrated.



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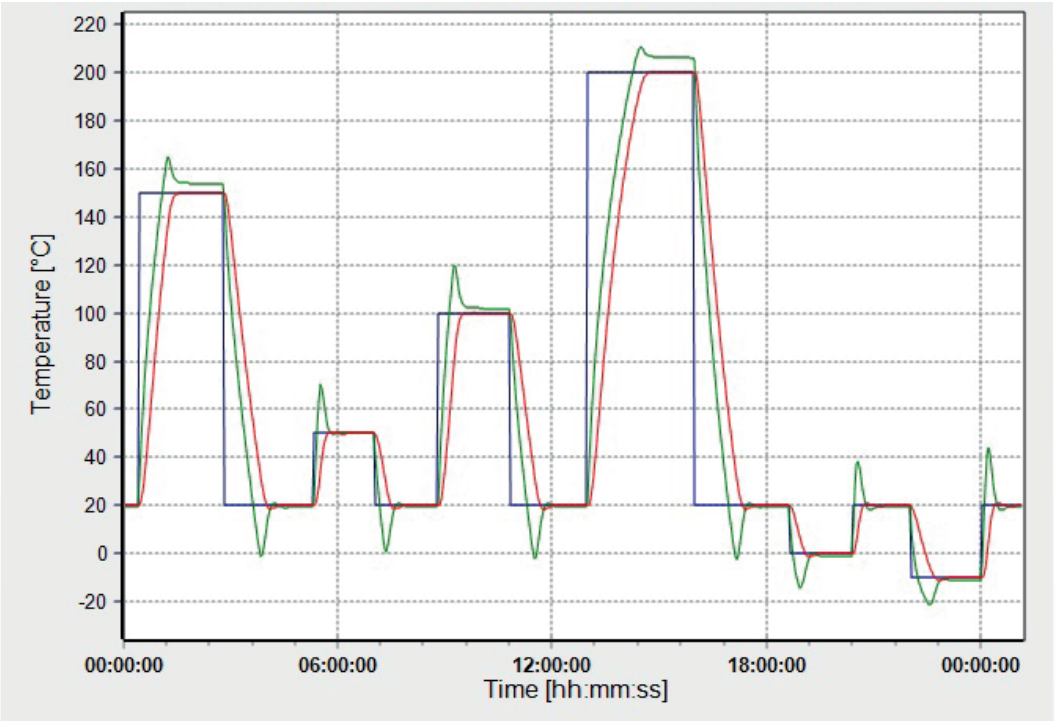
3. Temperature control of the reactor in a temperature range from -10 °C to +200 °C:
The graphic shows the time taken to cool down and heat up the process in a temperature range from -10 °C to +200 °C.
The table given below shows the various time taken to cool down and heat up the process in a different temperature ranges.



Ramps (Start temperature & Set point)	Time to reach Set-point
+20°C to +200°C	1h 56 min
+200°C to +20°C	1h 21 min
+20°C to +150°C	1h 20min
+150°C to +20°C	1h 13min
+20°C to +100°C	52 min
+100°C to +20°C	52 min
+20°C to +50°C	24 min
+50°C to +20°C	29 min
+20°C to 0°C	28 min
0°C to +20°C	19 min
+20°C to -10°C	42 min
-10°C to +20°C	23 min

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