Unistat® 510w

Temperature control of the 100-liter Chemglass reactor

Requirement

This Case Study demonstrates the process temperature control and the minimum achievable process temperature when Unistat 510w controls the temperature of the reaction mass in a 100-liters Chemglass reactor.

Method

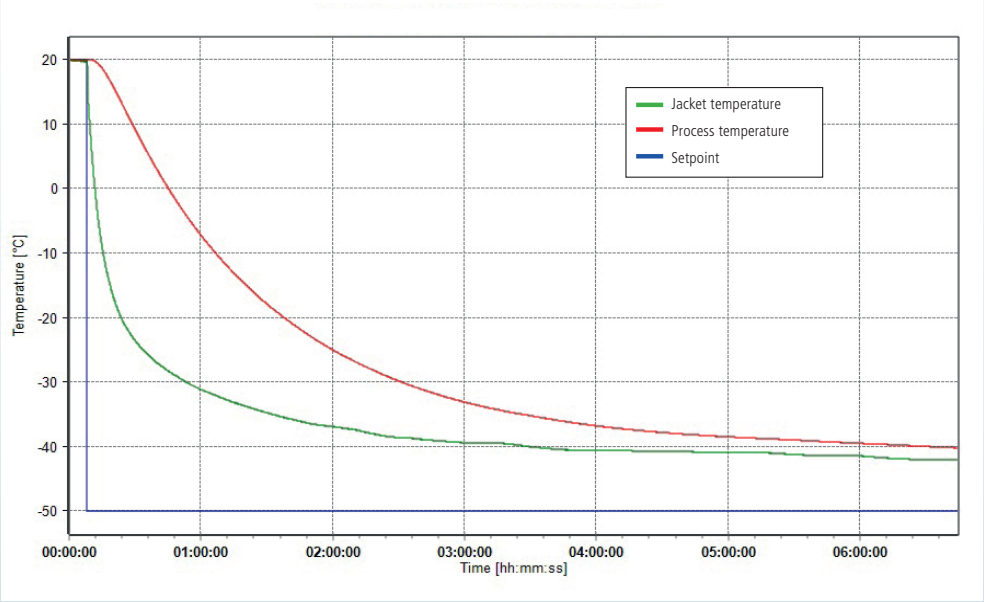
The Unistat and reactor were connected using two metal hoses M30. The reactor was filled with 65 liters of DW-Therm. "Process" control was carried out via a Pt100 sensor located in the process mass. Stirrer speed was set to 65 rpm.

Setup details

Temperature range:	-50 … +250°C
Cooling power:	5,3 kW @ 0°C
	2,8 kW @ -20°C
	0,9 kW @ -40°C
Heating power:	6,0 kW
Hoses:	2 x M30 metal Insulated
HTF:	DW-Therm
Reactor:	100 litres glass jacketed
Reactor content:	65-litres DW-Therm
Reactor stirrer speed:	65 rpm
Control:	Process
Amb. temperature:	+27°C

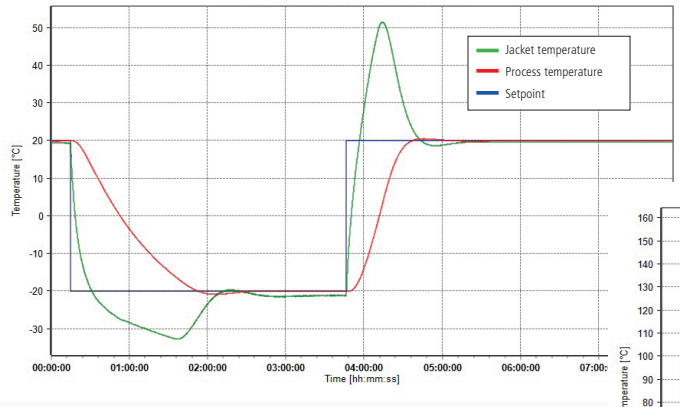
Results

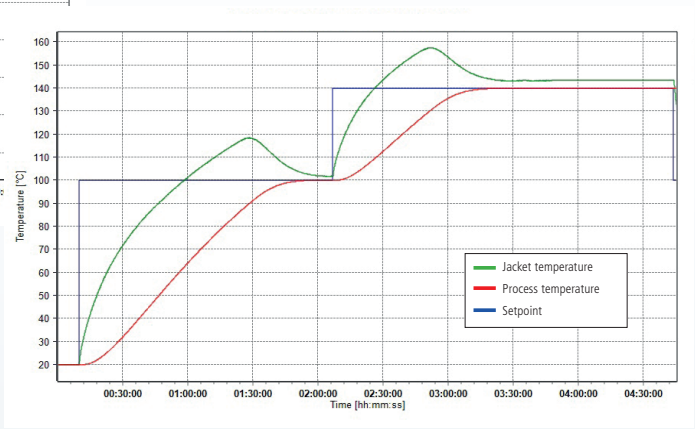
1. Lowest achievable temperature (Tmin):
The graphic shows the minimum achievable process temperature to be -40.2°C.



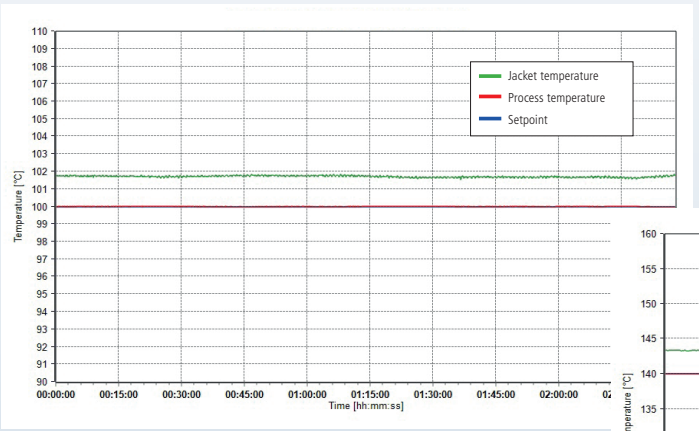
2. Performance:
The graphic shows the speed, accuracy and stability of the Unistat 510w as each new set-point is reached.

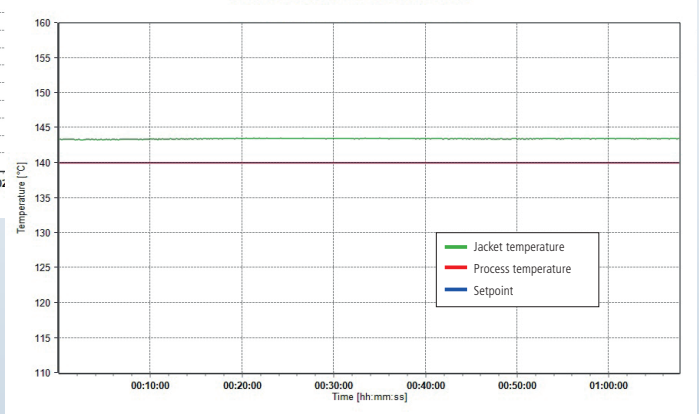
Start T	End T	Approximate time	Av. Ramp Rate	Fastest Ramp Rate
+20°C	-20°C	98 minutes	0.4 K/min	(10°C to -10°C) 0.5 K/Min
-20°C	+20°C	50 minutes	0.8 K/min	(-10°C to 10°C) 1.3 K/Min
+20°C	+100°C	106 minutes	0.8 K/min	(30°C to 60°C) 1.1 K/Min
+100°C	+20°C	77 minutes	1.0 K/min	(60°C to 30°C) 1.3 K/Min
+20°C	+100°C	100 minutes	0.8 K/min	(30°C to 60°C) 0.9 K/Min
+100°C	+140°C	75 minutes	0.5 K/min	(110°C to 130°C) 1.0 K/Min





3. Stability:
The DIN12876 states that the conditions for stability testing approved for publication in Technical Specifications should be carried out in a room controlled to an ambient temperature of 20°C. This Case Study was carried out to simulate more realistic conditions with the Unistat 510w and reactor in full sunlight with an ambient temperature of 28°C.
The graphics show the stability of control at 100°C, 140°C.





Version: 8/2020