

Unistat P915w

Unistat P915w controls the simulated exothermic reactions in a 50 liter De Dietrich reactor



Requirement

This case study demonstrates the performance of the Unistat P915w to control the process temperature during simulated exothermic reactions. Case study also demonstrates the lowest achievable temperature in the process.

The tables and the graphics show the responsive, tight and stable control with the jacket temperature being continually adjusted to return and hold the process temperature at the set-points as the thermal load generated by the immersion heater is suddenly changed.

Simulated exotherms of 1kW, 750w, 500w and 250w were carried out at process temperature set-points of 20°C, -40°C and a 500w simulated reaction at -60°C.

Method

To simulate the exothermic reactions, a 1kW immersion heater was placed inside the reaction mass. The heat output from the immersion heater was controlled by a regulator with the results recorded using Huber's "Service software".

The set-point was entered and the control given time to stabilise. The selected heater value was entered into the heater controller and then turned "On". Once the Unistat P915w had controlled the "reaction" and stabilised, the heater was turned "Off".

The results were recorded using Huber's service software and displayed in the graphics below.

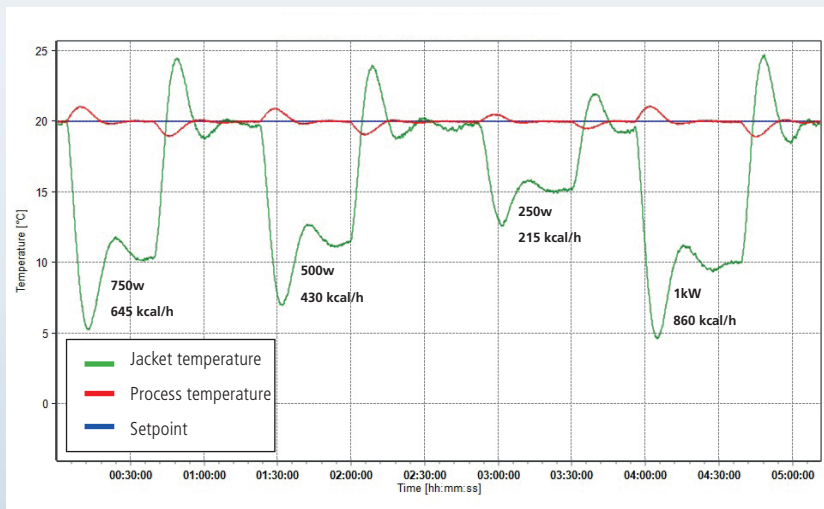
Setup details

Temperature range:	-90°C...+250°C	Reactor:	De Dietrich 50 liter
Heating power:	6.0 kW	Reactor content:	35 l M90.200.02
Hoses:	2 x M30 Metal Insul.	Stirrer speed:	250 rpm
HTF:	M90.055/170.03	Control:	process
Amb. temperature:	+24°C		

Results

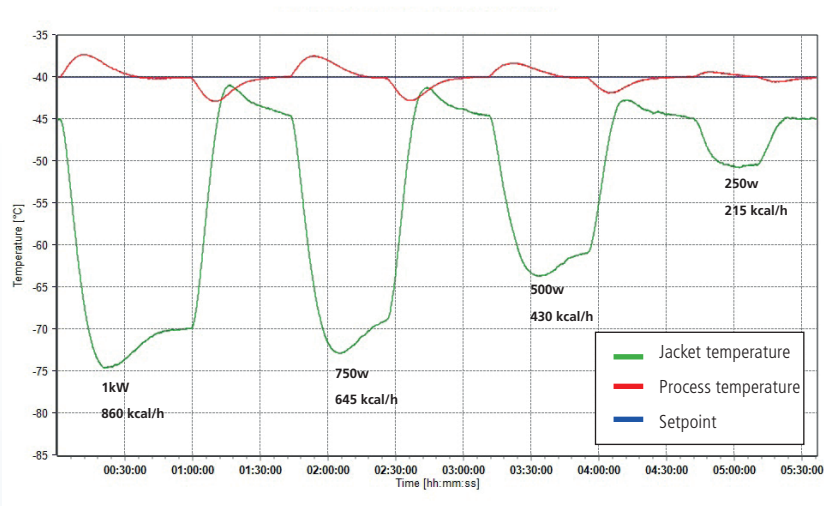
1. Performance. Set-point at +20°C

kW	kcal/hr	Process rise	Recovery	Process fall	Recovery	Max Delta T
1.0	860	1.1K	14 min	1K	14 min	15.3 K
0.75	645	1.1K	13 min	0.9K	15 min	-14.7K
0.5	430	1K	14 min	0.9K	14 min	-13K
0.25	215	0.5K	13 min	0.9K	14 min	-7.3K



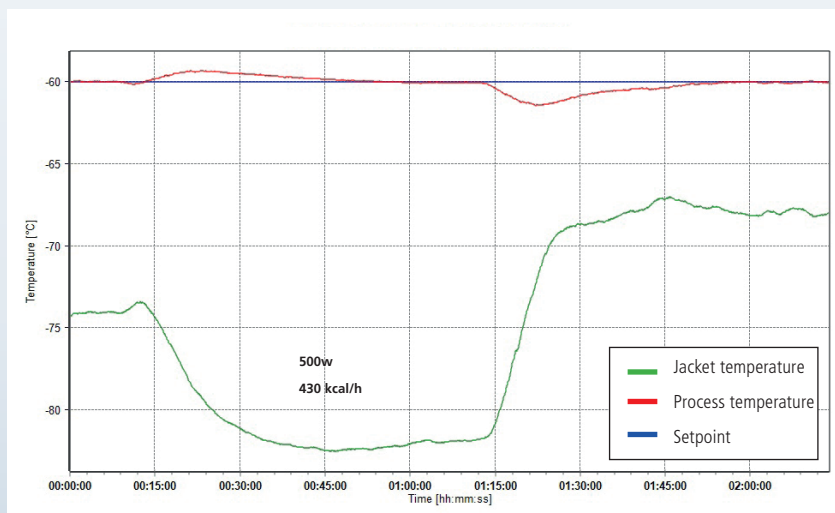
2. Performance. Set-point at -40°C

kW	kcal/hr	Process rise	Recovery	Process fall	Recovery	Max Delta T
1.0	860	2.3K	33 min	-2.9K	30 min	-34.5K
0.75	645	2.5K	30 min	-2.8	38 min	-30K
0.5	430	1.5K	31 min	2K	35 min	-23.6K
0.25	215	0.5K	22 min	0.7K	30 min	-10.7K



3. Performance. Set-point at -60°C

kW	kcal/hr	Process rise	Recovery	Process fall	Recovery	Max Delta T
0.5	430	0.8K	33 min	1.3K	42 min	-23.2K



Set-up: 50-litre DDPS QVF reactor connected to a Unistat P915w



Agitator speed Control

Immersion Heater controller

1kW immersion heater

50-litre De Dietrich QVF jacketed reactor