Unistat 510w

Unistat 510w controls the simulated reactions in a 16l DDPS QVF Stainless Steel Glass Lined Reactor

Requirement

This case study demonstrates the ability of the Unistat 510w to control the process temperature of the reaction mass when a simulated exothermic reaction is taking place in a 16l GLSS reactor from DDPS QVF.
The agitator speed was set to 150rpm.

Method

To simulate the reactions, a 1kW immersion heater was placed into the reaction mass (15l of DW-Therm) and connected to a controller.
At set points of +70°C and +20°C, the heater was turned "On" at values of 1kW, 750w, 500w and 250w with a further test at a set-point of -20°C with a heater value of 250w.
Once the temperature had stabilised with the additional heat load of the simulated reaction, the heater was turned "Off".
Once the temperature had stabilised, the heater was turned "On" again at the new wattage level and the procedure repeated.
The results were recorded using a USB thumb drive via the Pilot ONE controller and can be seen below.

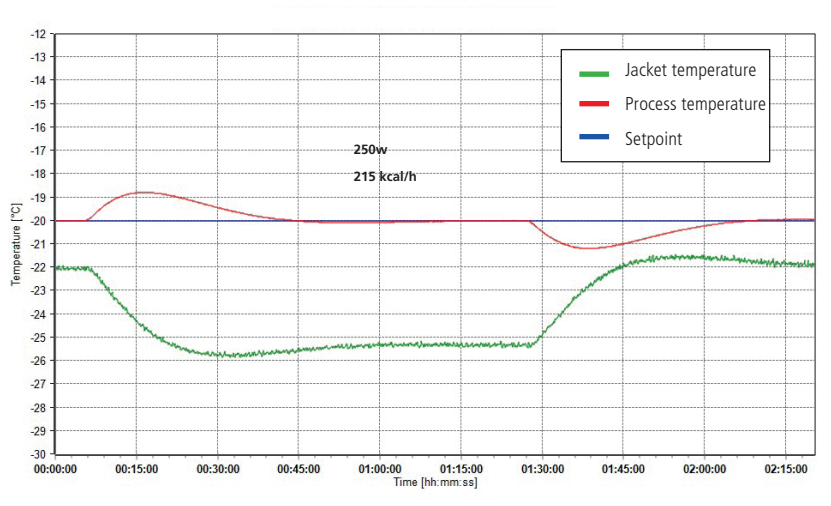
Setup details

Temperature range:	-50°C...+250°C
Heating power:	6.0 kW
Hoses:	2 x 2m M30 Vacuum insulated flexible tubing
HTF:	M40.165/220.10
Reactor:	DDPS QVF GLLS 16l
Reactor content:	15l DW-Therm
Control:	process
Stirrer speed:	250 rpm
Amb. temperature:	+24°C

Results

1. Temperature control of the simulated reaction at -20°C

kW	kcal/h	Process Rise	Recovery	Process Fall	Recovery	Max Delta-T
0,25	215	1.1K	38 Minutes	-1.1K	39 Minutes	-5.8K



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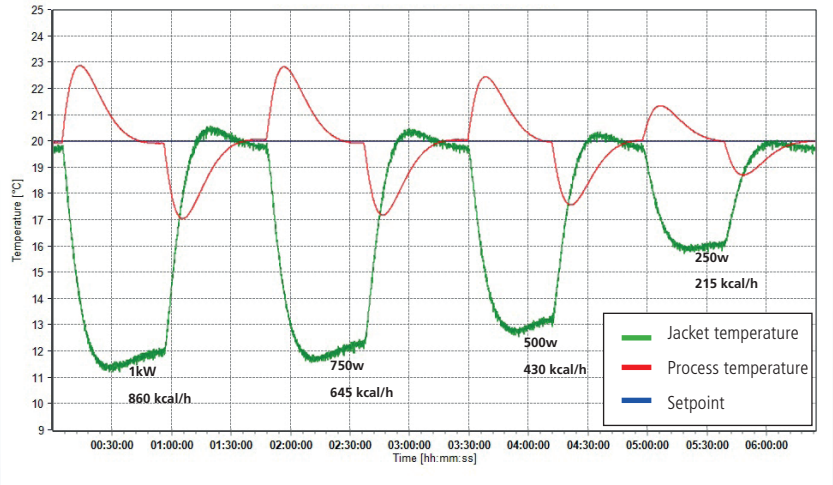
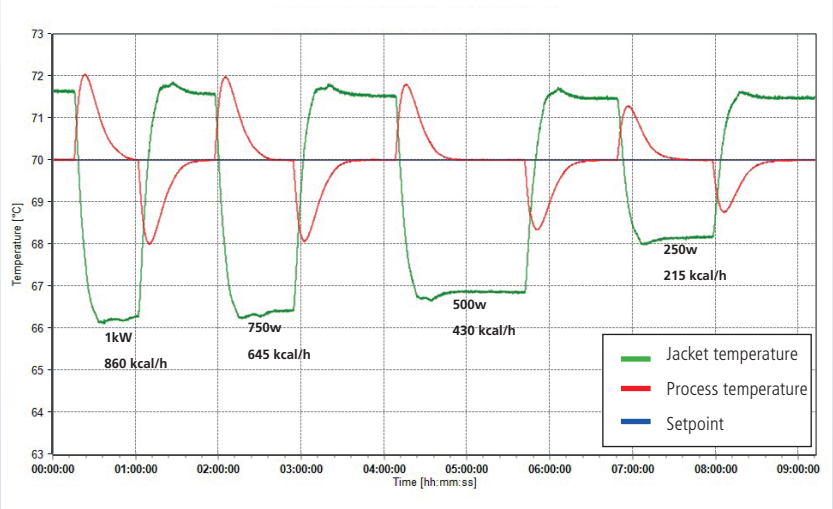
2. Temperature control of the simulated reaction at +20°C

kW	kcal/h	Process Rise	Recovery	Process Fall	Recovery	Max Delta-T
1.0	860	2.9K	38 min	-3K	39 Min	-9.6K
0.75	645	2.8K	38 Min	-2.8K	39 Min	-8.3K
0.5	430	2.5K	39 Min	-2.4K	40 Min	-7.4K
0.25	215	1.4K	40 Min	-1.2K	43 Min	-4.2K



3. Temperature control of the simulated reaction at +70°C

kW	kcal/h	Process Rise	Recovery	Process Fall	Recovery	Max Delta-T
1.0	860	2K	43 min	2K	47 min	3.9K
0.75	645	2K	42 min	2K	43 min	3.8K
0.5	430	1.8K	47 min	1.6K	44 min	3.3K
0.25	215	1.3K	52 min	1.2K	51 min	2K



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Set-up: Unistat 510w connected to a 16l GLSS reactor with the immersion heater located in the “reaction mass” together with a Pt100 sensor.

Agitator speed control

Immersion heater controller

Pt100 connection

1kW immersion heater

16l De Dietrich QVF GLSS reactor

Vacuum insulated tubing

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