

Heat Trace
Grangemouth Profile
Version Four

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FINAL

Independent Trial Shows Significant Energy Savings are Possible with Special Control System from Heat Trace Limited

With rising energy costs impacting on both manufacturing and process industries, Heat Trace Limited, the global technological leaders in heat tracing, have released details of independent trials conducted at the Grangemouth Oil Refinery that demonstrate how considerable energy savings can be achieved by switching away from conventional ON/OFF capillary thermostats in electrical heat tracing circuits.

The trials were carried out on behalf of the Energy Technology Support Unit of the UK Department of Energy and monitored by The National Industrial Fuel Efficiency Service (NIFES). As a result of the trials, which involved the use of Heat Trace's solid state POWERMATCH and DURASTAT controls being compared with conventional ON/OFF capillary thermostats, energy savings under static (no flow) conditions were between 33% and 40%. For the combined free-flowing and no flow conditions, savings rose to between 68% and 75%.

Potential for £2M+ annual energy savings

Comments Heat Trace Marketing & Special Projects Manager, Michael Dicker, "Since the trials programme was conducted, energy prices have risen considerably. Taking current energy costs into account, we estimate that, at the plant in question, savings in excess of £2 Million could be achieved annually."

Project overview

Heat tracing is necessary to aid the flow within pipes carrying liquids which have a high viscosity at average UK ambient temperatures. In such instances, heating is typically controlled by means of an ON/OFF thermostat. In these trials, the performance of an existing traditional ON/OFF capillary style thermostat was compared with the performances of a POWERMATCH Self-Regulating controller responding to air temperature, together with a pipe surface sensing DURASTAT Proportional controller.

Understanding potential for energy wastage

The operation of the Grangemouth Oil Refinery and its associated sites is reliant upon electrical heat tracing to ensure proper flow through the pipelines. Heat tracing is required when there is no flow in the pipes, when otherwise the contents in the pipe would cool and become too viscous to flow.

Traditionally, mechanical capillary thermostats have been used for pipeline temperature control. These ON/OFF thermostats energise the full heating load at approximately the set point temperature - and de-energise the load at a somewhat higher temperature.

The difference between the ON and the OFF temperatures is called the “switching differential” and this represents a significant energy wastage, even when the lines are static.

Often during flow conditions, when the heat tracing load may not be required, capillary thermostats will have the lines energised. Under flow conditions, the heating load is rarely sufficient to raise the temperature in the line to the OFF temperature, due to the large switch differential. On such occasions, there is a huge waste of energy.

Identical test conditions

To ensure identical test conditions, trials were conducted on a single, six-inch diameter pipe carrying benzene and requiring a flow temperature of 21°C. Three zones of the pipe were then chosen:

- one to test the POWERMATCH Self-Regulating System controller, responding to changes in ambient temperature;
- one incorporating a DURASTAT Proportional controller operating from a pipe temperature sensor;
- and one controlled only by an existing conventional pipe sensing ON/OFF capillary type thermostat.

Six-month monitoring period

Monitoring was conducted over a six-month period and focused on two situations:

1. under no flow conditions with static product in the pipe and,
2. a combination of free-flowing and static product conditions.

Over the trial period, the demonstration showed that both the POWERMATCH and the DURASTAT controllers could achieve significant savings - with the savings in the combined free-flowing and static fluid periods greater than in the no flow periods where the fluid remained static in the pipe.

This result was achieved because of the greater sensitivity offered by the solid-state control. The POWERMATCH controller eliminates excess heat from the heating cable, adjusting the power output to match actual heat losses from the pipe that vary with changes in ambient temperature, whereas the DURASTAT controller offered an accurate set-point of 21°C (±1°C). By comparison, the existing capillary thermostat controllers required a much higher set point in order to maintain a minimum pipe temperature of 21°C, resulting in the system being fully energised for much longer periods of time.

As the product temperature during flow conditions was below the switch off temperature of the existing capillary thermostats - the heaters were almost always energised. Conversely, the sections controlled by the POWERMATCH and the DURASTAT controllers were almost constantly de-energised, resulting in significant energy savings.

Measurable energy savings

In the independent energy demonstration project described above, energy savings for the no flow / static fluid situation, using the POWERMATCH or the DURASTAT, were between 33% and 40%. For the combined free-flowing and static (no flow) conditions, savings rose to between 68% and 75%. It was calculated that when using POWERMATCH and DURASTAT together, the energy savings would be even greater. The figures were adjusted to reflect national average climatic conditions.

Conclusion

Although tested separately, most applications would benefit from a combined system incorporating both the air sensing POWERMATCH and the line sensing DURASTAT controllers.

In view of this, Heat Trace's latest self-regulating controller, **POWERMATCH Micro Plus (PMM+)** now combines the air sensing and line sensing functions into a simple, low cost, control package providing the energy saving functions, together with high and low temperature alarm facilities. The control device, usually located in the control panel,

digitally displays the input parameters, actual temperatures and the load percentage being delivered to the heaters (determined by current air temperature).

Heat Trace's Marketing & Special Projects Manager, Michael Dicker, comments, "We are confident that, in today's increasingly energy-conscious environment, many organisations using electric heat tracing will be interested to discover the significant operating cost savings that can be achieved by switching from conventional ON/OFF thermostatic control to the **POWERMATCH Micro Plus.**"

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