

Solution Note

Monitor and Improve Heat Exchanger Performance Through Differential Temperature Measurement



Improve process unit energy efficiency

With energy costs continuing to rise and becoming an increasing percentage of end product cost, industrial customers in almost all sectors need to conserve energy.

One way to improve energy efficiency is to revamp an existing process to increase heat recovery within and across process units. Heat is recovered from waste heat streams and used to provide preheat to process streams that are heated with more expensive fossil fuels in furnaces or boilers. Increasing the temperature by 6°C through process or waste heat can reduce fuel consumption by 1%, leading to reduced costs.

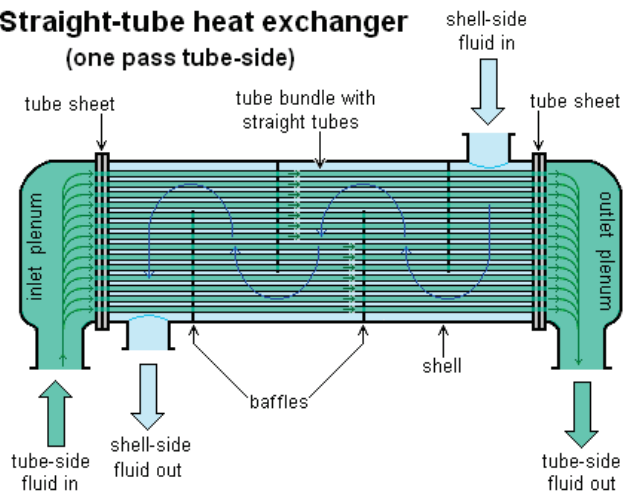
The heat exchanger is used in different forms to transfer heat from hot fluid to cold fluid. The difference in temperature between the two fluids is a critical factor for heat transfer that's measured as the differential temperature to monitor heat exchanger performance and maintain that performance at optimal levels.

Solution: Honeywell STT 3000 temperature transmitter

The Honeywell STT 3000 Temperature Transmitter is the ideal solution to meet the above challenges:

- Measure and output differential temperature by accepting two sensor inputs.
- Track the upper and lower values of the measurements to ensure the limits do not cross the boundaries set by the process and the equipment supplier.
- Mount the unit in the back of a local panel or inside the sensor head.
- Availability of burnout feature in the hardware/software form. This notifies maintenance personnel about any sensor that has failed, or any sensor displaying a problem, thereby reducing plant and equipment downtime.
- Safety certification complying with IEC 61508, making it compatible with safety systems, thereby enhancing the overall safety of the plant and reducing risk.

Straight-tube heat exchanger (one pass tube-side)



Heat exchangers

A heat exchanger is a device that allows the transfer of heat energy from one fluid to another for any of the following purposes:

- Heat cooler fluid by means of a hotter fluid.
- Reduce temperature of a hot fluid by a cooler fluid.
- Condense a gaseous fluid by means of a cooler fluid.

Heat exchanger performance metrics

a) Amount of heat transferred (gained or lost) is one of the metrics used in heat exchangers. This is the product of mass flow of the fluid (m), specific heat of the fluid (Cp) and temperature difference between inlet and outlet of the fluid.

$$Q = m \cdot C_p \cdot (T_{\text{inlet}} - T_{\text{outlet}})$$

Differential temperature measurement can readily be used to derive the above metric.

b) As opposed to efficiency, effectiveness is measured in a heat exchanger to determine its performance. Here again the ratio of amount of heat transferred to the heat that could be transferred is calculated.

Differential temperature is again a key parameter to calculate this effectiveness.

c) Overall heat transfer coefficient is an important metric that is periodically calculated to determine an economically attractive timeframe for cleaning the heat exchanger.

$$(U=Q/\Delta T_{lm})$$

This coefficient also depends on the logarithmic mean of the differential temperature.

Apart from monitoring the performance of heat exchangers, differential temperature also helps in predicting fouling and corrosion issues which are very common in heat exchangers.

Applications

Typical applications involving heat exchangers with a potential opportunity to measure differential temperature are as follows:

Shell and Tube Type Heat Exchangers

These consist of a bundle of parallel tubes that provide the heat transfer surface separating the two fluid streams. In most cases the evaporators used in food processing, chemical, steel and textile units are of shell and tube type heat exchangers.

Condensers

Petroleum refining and chemical manufacturing units extensively use condensers to condense components from gaseous mixtures.

Plate heat exchangers

Although these are employed across several applications, they are particularly popular in the dairy, brewing and fruit processing industries, all of which involve the pasteurization process.

For More Information

Learn more about Honeywell's Honeywell STT 3000 Temperature Transmitter visit our website www.honeywellprocess.com or call your local HPS Account Manager.

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The Honeywell advantage

The reliable Honeywell STT 3000 Temperature Transmitter is ideal for asset health and efficiency monitoring, enhancing safety. It features built-in differential temperature measurement capability, support for different protocols (DE/HART/FF), safety certifications, flexible mounting options and a proven track record in similar applications. These devices are fully supported by Honeywell's global application and technical support services.



It Matters. [Learn more](#) how Honeywell solutions help solve what matters.

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