

# SmartLine Differential Temperature Measurement for Improved Heat Exchange Performance

## Solution Note

Monitor and improve heat exchanger performance through differential temperature measurement.

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.

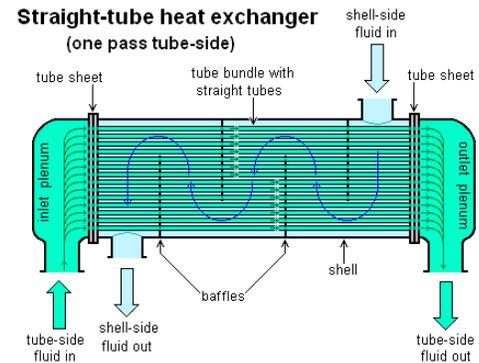
### Solution: SmartLine Temperature Transmitter

The Honeywell SmartLine® Temperature Transmitter is the ideal solution to meet the above challenges.

- Measure and output differential temperature by accepting two sensor inputs.

## FEATURES & BENEFITS

- Industry leading stability with drift at 0.01% of URL for 10 years, ensuring that the temperature measurement is accurate and reliable with less maintenance
- Single transmitter with dual input capability to easily measure differential temperature thus simplifying wiring and installation.
- Hardware or software burnout feature notifies maintenance personnel about any sensor that has failed or sensor issues, thereby reducing plant downtime
- Flexible mounting options giving flexibility to the user depending on the location of the measurement.
- Process temperature high and low tracking allows monitoring the asset temperature of the plant hardware.



Typical straight-tube heat exchanger illustrating the pathway of both fluids. SmartLine Temperature Transmitters offer a dual input capability and thus a single transmitter is capable of measuring the delta temperature change between inlet and outlet.

- 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.
- Availability of burnout feature in the hardware or 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.

## 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 a performance metric 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.

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

The differential measurement capability can readily be used to help calculate the amount of heat transfer.

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.

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

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.

### 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.

### The Honeywell Advantage

The reliable SmartLine Temperature Transmitter is ideal for performance and efficiency monitoring of industrial heat exchangers. SmartLine Temperature's built-in differential temperature measurement capability, support for the common industrial protocols (DE, HART, and FF), safety certifications, flexible mounting options and a proven track record in similar applications provide an ease of mind when selecting a temperature transmitter for your plant operations. These devices are fully supported by Honeywell's global application and technical support services.

## SmartLine Transmitter Family

The SmartLine Pressure, Temperature, Level and Multivariable Transmitters deliver total value across the entire plant lifecycle, from construction to operations to maintenance.

Smart Performance: SmartLine accuracy, stability and response time result in tighter process control, improving product yield and quality.

Smart Design: SmartLine's innovative modular design reduces complexity by allowing quick on-field replacement of parts without taking transmitters out of process and thereby reducing downtime, maintenance costs and spares inventory. SmartLine's universal terminals reduce costly wiring errors, troubleshooting and re-work by allowing loop wiring to be reversed. Rich advanced display and local configuration capabilities enable field operators to more efficiently perform tasks, solve problems and avoid errors with no need for a handheld device.

Smart User Experience: Smart messaging, maintenance and safety features as well as unique integration with Honeywell's Experion® control system reduce design and operator errors and enable faster intervention to avoid process upsets.

## SmartLine Support Services

This product comes with worldwide, premium Technical Assistance Center (TAC) support services, which are part of the Total Care Field Instrumentation Services. The TAC services, along with the services provided by the local distributor, are designed to help customers improve and extend the usage of their field instrumentation, providing a safer, more reliable and more efficient operation.

Honeywell's Total Care Services bring 30 years of experience in terminals and the expertise of over 1,000 contracted customers around the world. Backed by the Honeywell Operating System, our support teams deliver greater in-depth domain and product expertise. We'll provide the right solution to critical issues—the first time—for a safer, more reliable and more efficient operation.

## For More Information

To learn more about how Honeywell's SmartLine Temperature Transmitters can improve plant operations, visit our website [www.honeywellprocess.com/smartline](http://www.honeywellprocess.com/smartline) or contact your Honeywell Account Manager, Distributor or System Integrator.

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