



Best Practices for PRT Installation to Optimize Process Efficiency

When selecting a PRT, also known as an RTD, several factors must be considered to ensure an accurate and repeatable temperature measurement. We call them the 4 P'S: performance, protection, placement, price, and service life. An accurate temperature measurement is vital for energy intensive processes in the ethanol industry such as dryers and the Regenerative Thermal Oxidizer as we work towards an efficient response to reduce our dependence on foreign oil and meeting the Renewable Fuels Standard goals.

Performance items to consider are the sensor long term accuracy, time response, temperature range to be measured, and use of a transmitter. A transmitter is recommended if the distance between the RTD and the readout instrument is greater than 250 feet to avoid a lead-wire error which can be up to $+0.16^{\circ}\text{F}$ per 100 feet of 18 AWG cable. Overall accuracy of the process temperature measurement must be considered to efficient use of energy and maintain optimum product quality. There are several factors to consider in addition to the basic RTD accuracy. For more information on accuracy visit the Technical Papers section on our website at: <http://www.burnsengineering.com/pgd.asp?pgid=doctech>

Protection refers to the items that are used to shield the sensor from the ambient conditions and from the process environment. External to the process a connection head is commonly used to provide a transition from the RTD leads to the facility wiring. In addition it can provide protection from explosive atmospheres and keep water and other contaminants away from the sensor. Any of these can cause sensor failure. To maintain protection from the process a thermowell can be used to protect the sensor from corrosive, erosive, or high velocity flow. Protection from high pressure and vibration is also solved with the use of a thermowell. RTD's that need periodic calibration can be easily removed from a thermowell without draining the system.

Placement considerations involve determining where in the piping or tank an entry can be made to accommodate an RTD and provide enough immersion length for an accurate measurement. As a general rule any RTD and thermowell assembly should have at least 4.5" immersed in the process to avoid stem conduction error. This error is caused by heat conducting from the external portions of the sensor assembly to the sensing element causing a too high or too low measurement. For direct immersion RTD's there should be 10 times the sensor diameter plus the sensitive length as a minimum immersion. For $\frac{1}{4}$ " diameter RTD's that equals 3.5". There are exceptions and the Burns Customer Service Team can assist you in identifying those applications. For pipes less than 4" and other situations where sufficient immersion cannot be obtained, there are other solutions. Installing a tee allows the RTD to be aligned parallel to the flow and extend down the pipe. Other choices may be to use a surface mount



RTD, or a flush mount. Enter “surface” into the search box on our website to view a few of the styles available.

No decision is ever made without the consideration of cost. For any measurement point the costs for maintenance, calibration, acquisition, and accuracy must be accounted for. The initial cost of the RTD can be insignificant if a poor quality inaccurate device is selected. A poor quality RTD will waste energy, require frequent replacement, require more frequent calibration, and can ruin product quality. A more expensive high quality RTD will alleviate all of these problems and related expenses.

Finally, the service life of an RTD varies dramatically based on how it is used. Two main factors that affect life span are temperature cycling, and vibration. All industrial grade RTD’s will drift over time and require periodic calibration to determine if they are still within tolerance. Selecting the right RTD and considering the 4 P’S will insure a long, accurate, and trouble free temperature measurement.