PRT Monitoring Suggestions to Ensure Accuracy and Energy Savings.

As the price of fossil fuels-based gasoline increases, ethanol is becoming a very popular alternative. Ethanol is a renewable fuel produced by the fermentation of corn. Ethanol is clean burning and reduces greenhouse gas emissions and foreign oil dependence.

Critical temperatures are monitored and controlled in many ethanol processing locations including fermentation, distillation, regenerative thermal oxidizer, evaporators and dryers.

Maintaining temperature measurement accuracy in the production of ethanol can reduce energy costs and help maintain process efficiency. Measurement errors of as low a 1°F can result in thousands of dollars of waste per year not to mention the potential loss of product or fines associated with regulatory violations.

Platinum resistance thermometers (PRTs) are very reliable instruments, however, monitoring through periodic verification, calibration, or replacement is recommended to insure the measurement continues to meet the accuracy required for the application. Whether by regulation or by desire to run an efficient process, the method can be the same.

For PRT sensors using a nominal resistance vs temperature (R vs T) relationship such as the one contained in IEC 60751 or ASTM E1137, verification of the accuracy at a single point may be all that is needed. These standards contain the tightest tolerance at 0°C, so this temperature is a good choice for a single point verification. If the PRT is used at only one temperature, or the user has imposed a tighter tolerance at a temperature other than 0°C, then a temperature close to the temperature of interest would also be a good choice, however convenience in producing this temperature should be considered.

One simple alternative to verifying the accuracy of a used PRT is to replace the PRT with a new one. This will insure that any changes in the R vs T performance caused by use will be eliminated. This solution is generally only practical if the cost of a new PRT is comparable to the calibration cost.

For PRTs that require a multi-point verification, the test temperatures may be more difficult to select. A compromise between the range of interest and the convenience or

ability to produce the temperatures is needed. A new ASTM standard, E2593 *Standard Guide for Accuracy Verification of Industrial Platinum Resistance Thermometers* has been published and contains details on how to perform verifications as well as some recommendations on verification temperatures.

For PRT sensors that use sensor unique R vs T relationships, a three or four point calibration will be required to generate the Callendar-Van Dusen (CVD) coefficients. To generate the CVD coefficients for a range above 0°C, the points needed are 0°C and two points above 0°C. It is recommended that the highest calibration point be close to the maximum temperature of use, and slightly higher is preferred. The third point should be any convenient temperature approximately mid way between 0°C and the highest point. Some typical three point calibrations are 0°C, 50°C, 100°C, or 0°C, 100°C, 200°C. For ranges that include temperatures below 0°C, an additional point below 0°C is required. This point should be lower than the minimum temperature of use, however, this becomes increasingly more difficult as temperature drop below -38°C. The user should consult with the calibration lab on these situations.