REDESIGNING THE TEMPERATURE MEASUREMENT SYSTEM IN A STEAM-JACKETED MIXING TANK TO MINIMIZE THERMOCOUPLE SENSOR CALIBRATION FREQUENCY

(Case Study of PT Kalbe Farma's Engineering Department)

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ABSTRACT

This paper is to show that the current work suggests a modification of the temperature measurement system in a steam-jacketed mixing tank by redesigning and changing the position of the sensors for accuracy in temperature reading as well as lesser frequency in calibration. The main issue with the current configuration has been with K-type thermocouples measuring three simultaneous sources of heat: liquid contents inside the tank, condensate, and protective jacket heat. Inaccurate measurement and product failure have resulted from the liquid temperature not well controlled during boiling. Reconfigured to measure only liquid contents, PT100 sensors will replace K-type thermocouples (accuracy: 0.1–0.5°C).

I tested the performance of the original K-type thermocouples and the modified PT100 sensors using a comparative test method using liquid as purified water. Six tests were conducted using clean, purified water to guarantee consistent results. I have tested the new PT100 sensors and the results show that they are more accurate (±0.3°C) than the old thermocouple (±2.5°C), almost removing measurement error and temperature-related product defects.

With an 88% accuracy rate in liquid temperature readings, stable readings assist avoid product failure and lessen the need for calibration. To increase production efficiency and product quality, other relevant industries should implement system redesigns like to those in the pharmaceutical sector.

Keywords: Steam-jacketed mixing tank, K-type thermocouple, PT100 sensor (RTD), temperature accuracy, sensor calibration, and temperature measurement system redesign, type thermocouple, steam-jacketed mixing tank, sensor calibration, temperature accuracy.

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