

Thin-Film Resistance Temperature Detectors

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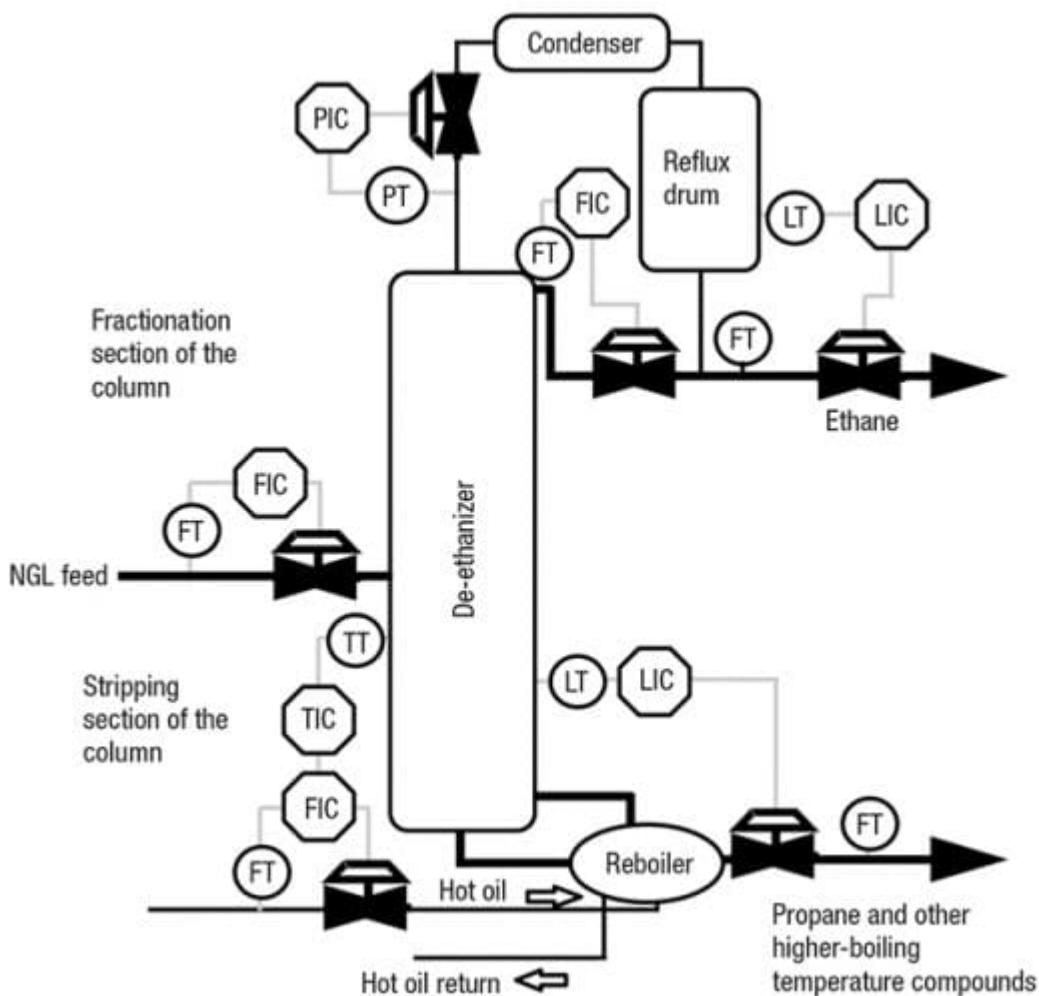
Current Advances In Process Temperature Measurement: Trends And Technologies

Thin-film resistance temperature detectors are devices that are used in measuring temperature in Chemical process industries. The temperature measurement device is important since it improves the processes in chemical industries. Therefore, it is used in critical parts of processing, for instance, it is used in measuring temperatures in the reactors, boilers, heat exchangers and evaporators processing. The market for these technologies continues to revolutionize due to technological advancement. At a personal level, one can use a portable mercury temperature sensor as a device used for noting temperature changes. They help create health awareness for an individual who uses them; thus, they help individuals make healthy decisions and deal with temperature-related issues. After the time, the temperature is the second most measured data. Therefore, the measurement of the temperature goes way back to the 2nd Century. Therefore, people have already known that expansion occurs due to heat while contractions occur due to cold. The technological growth of the devices used in measuring temperatures has experienced rapid growth over time. In the year 1998, the most common temperature device used at the time was mechanical type sensors. The mechanical temperature sensor depends on the expansion and contraction of liquid, solid or gases substance to determine and measure temperature changes. The most common mechanical temperature sensor is the mercury temperature sensor since it uses contraction and expansion of liquid to show changes in temperature. But for the purposes of this discussion will use the thin-film resistance temperature detector technology.

The most measured variable in chemical process control is temperature. Therefore, temperature devices revenue is approximated to be \$400 million and 30% going towards chemical process industries in the United States alone (Cushing, 2017). Over the years, the chemical process industries have experienced technological advancement in sensors. Due to accuracy issues, cost, and high maintenance costs, industries have shifted to using resistance temperature detectors (RTDs) instead of the commonly used Thermocouples (T/Cs). The development of the RTD technology will enable users to measure the temperature values accurately. Also, the technology offers more stability. The thin-film RTD technology development has the desire to reduce costs and improve operations (Cushing, 2017). Therefore, the technology will replace the use of T/Cs and also increase the availability of temperature-integrated assemblies. The new technology is designed to solve problems associated with the temperature process in chemical process (Cushing, 2017). The technology will help in decrease wiring costs, reduce hardware and increase efficiency and accuracy, easing future upgrades and also help in simplifying engineering by preventing wiring mistakes.

In the process of RTDs, in order to achieve ultimate accuracy, the user can depend on two available options. First, for sensor matching from the RTD, you can use Callendar-Van Dusen (CVD) data, and the second one can change CVD data to avoid errors in the transmitter (Cushing, 2017). This technology offers high-accuracy RTD and includes:

- Choosing the element results in high-purity platinum, which ensures the highest accuracy and stability.
- Also, it has the ability to reduce self-heating effects.
- RTD is not connected to a specific transmitter. This aspect ensures RTD, transmitter and sensor are flexible.
- Increase time efficiency.
- The technology reduces and eliminates the costs related to VCD calibration.
- The technology offers the best accuracy and reliable point of measurement.



Part 2

Predictions: Cone of Uncertainty

The 2019 and 2023 milestones below were forecasts made when the analysis was written; those dates have passed and the claims should not be read as verified outcomes. The 2028 statement also remains a projection.

Uncertainty

Achieve 100% accuracy level

50% of CPI will use the Resistance Temperature Detectors

Accuracy level 99.9% and gain attraction

2019 2023 2028 Time

High Accuracy the Resistance Temperature Detectors

Integrated Assemblies for process temperature measurement

Uncertainty

Short-term: Guaranteed level of accuracy of 99.9% and Market Attraction

Time-Frame: 2019

Level of Certainty: Relatively certain

We forecast that by 2019, the technology behind the resistance temperature detectors will gain market attraction and penetrate the market by approximately 30%. Also, the technology would have been modified to improve its accuracy level. Thus, the accuracy level of the technology would be modified up to 99.9%. With already in use in the market, the technology will help in addressing the problems with existing processes of temperature measurement in the chemical process industries. With the growing popularity of the technology in the rise, the chemical process industries will be able to reduce the costs associated with the existing process of measuring temperature. By 2019, most chemical process industries in the business, especially in the United States, will have incorporated the technology into their process system. Also, by 2019 will see the RTDs technology being used in

different chemical processes. First, the technology will be used in the reactors process, boilers process, heat exchangers and evaporators process. Therefore, the technology will improve the processes as well as increase the efficiency and effectiveness of the processes. Also, the technology will help in decreasing wiring costs, reducing hardware and increasing efficiency and accuracy, easing future upgrades and also help in simplifying engineering by preventing wiring mistakes. We certain this level of uncertainty as relatively certain because the technology is already in uses and because we have seen an increase in demand for advanced technology before.

Mid-term: 50% of the Chemical Process Industry will adopt the use of Resistance Temperature Detectors

Time-Frame: 2023

Level of Certainty: Moderately Certain

We predict that by 2023, the technology will be used widely all over the world. Also, 50% of the process temperature measurement in chemical process industries in use will be resistance temperature detectors. Since by then the technology would have proved how it works, it will an imported into various industries which the technology. With the growth in the industry, we expect the market for the product to have competition. By 2023, the demand for technology will be high, and there will be the entry of new companies with the same technologies, leading to market competition in the technology.

We positioned this prediction as being moderately certain due to some potential factors that could halt the advancements. Also, by 2023, the resistance temperature detectors will incorporate integrated assemblies to increase the effectiveness and efficiency of the process of the temperature measurement system.

Mid-term: Achieve 100% accuracy level and use High Accuracy of the Resistance Temperature Detectors

Time-Frame: 2028

Level of Certainty: Relatively Uncertain

We predict that by 2027, the technology will be improved to achieve a 100% accuracy level, and the technology will use high-accuracy resistance temperature detectors. Even small CPI will adopt this technology due to its high accuracy level. Also, we foresee that the technology will become popular with its consumers, and the company providing this technology will partner with other big tech companies to ensure a 100% accuracy level. In the process of RTDs, in order to achieve ultimate accuracy, the user can depend on two available options. First, to sensor matching from the RTD, you can use Callendar-Van Dusen (CVD) data, and the second one can change CVD data to avoid errors in the transmitter. This technology offers high-accuracy RTD.

Works Cited

Cushing, Michael. (2017) "Advances in process temperature measurement: trends and technologies"
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