Temperature measurement for reformed gas in refinery

A reputed oil & gas customer in the Middle East with extremely high demand for quality and performance were able to improve operation efficiency and safety using the customized solution of a purge system connected to type K thermocouple with an alloy 800 thermowell.

Benefits at a glance:

- Higher life time of the temperature system
- Repeatable reading with higher accuracy
- No failures in thermowell and sensors
- Increase in the efficiency of process
- Increased plant and personnel safety
- Very low maintenance costs.

The main objective of a reforming process is to convert low octane naphthas into higher octane reformate products for gasoline blending and/or aromatic rich reformate for aromatic production. Basically, the process re-arranges or re-structures the hydrocarbon molecules in the naphtha feedstocks as well as breaking some of the molecules into smaller molecules. Reforming also produces high purity hydrogen for hydrotreating processes.

For the reaction to even occur during the reforming process, the temperature must be within a certain range. That's why accurate temperature measurement is so important and is a crucial factor in the complete process. Refineries rely on accurate temperature measurement and monitoring for information about catalyst performance and condition. This ensures the desired high quality of the output which is further blended to get the final product.

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The Challenge:

Many temperature applications in the oil & gas, petrochemical, and other industries involve demanding process conditions, hazardous media, elevated corrosion rates, turbulence, vibration, and high pressures and temperatures.

In this case,

- The reformed gas vessel was situated in an area having explosive atmosphere rating.
- The high corrosive properties of the process required wetted parts to withstand the harsh environment.
- This was coupled with high pressure rating of about 26 bar and very high temperature range till 900° C.

Customer expectation:

- Customer wanted a measurement sensor with good stability and accuracy, added with a purge system to keep the mixture of high corrosive gasses out of the thermometer sensor.
- Increased operation efficiency, safety, high demand for quality and performance in a cost-effective manner was the essential requirement.

Our Solution:

- A Bar Stock thermowell model TA575 made of alloy 800 wetted part with a special pressurization thermocouple insert (Technically special product for temperature). This insert was specifically made with ¼" NPT purge inlet and outlets to have a pressure tight system.

Result:

- Extension, immersion length and total length of the thermowell was chosen according to process requirements
- Thermocouple type K provided the required measurement range of 1100° C along with 4-20mA HART output.
- The sensor and transmitter combined with a purge system provided highly accurate and long-term stability to the user.
- Easy and reliable integrated purge system solution was provided
- Appropriate selection of the wetted parts w.r.t the process combined with rugged purge system, kept the sensor isolated from external effects resulting in increased efficiency
- Nature of materials and assemblies used lead to very low maintenance requirement and costs.

Environmental regulations, safety requirements and the need for better control of processes is driving increased use of temperature profiling in many industries. To best monitor the temperature, it is a good practice to have multiple temperature sensors in different areas of the reformer furnace as well as the reformed gas vessel. These sensors can give early warning of temperature variations, allowing operators to better manage and take informed decisions as and when necessary.

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