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FUNDAMENTALS OF CATALYTIC HEATERS IN MEASUREMENT APPLICATIONS

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Catalytic heaters are used to prevent liquid distillation and freezing in natural gas which is a common problem in regulation and measurement as often caused by the Joules - Thompson Effect. Since the maximum operating temperature is always well below the temperature for ignition required of natural gas, the heaters are ideally suited for hazardous locations in the oil and gas industry.

As relevant to measurement applications, this paper will cover the principals of catalytic heater installation and operation.

How Catalytic Heaters Work

Catalytic heaters generate heat using a chemical reaction between natural gas and a pre-heated Platinum based catalyst. The heater contains an electric heating element positioned behind the catalyst in order to preheat the catalyst to the required temperature. Once the catalyst is preheated to the temperature required for combustion, gas is supplied through an orifice and distributed evenly to the face of the heater. The result of the process is radiant heat emitting from the face of the heater.

Applications

This principal of safe, flameless heat is applied in different ways in measurement applications. With a freezing regulator or valve, a catalytic heater is commonly mounted in a stainless steel enclosure to directly apply the heat to the valve or regulator.

Pilot operated regulators are often better suited by using a heat exchanger to preheat the gas stream as it comes into the regulator. By increasing the temperature of the gas, liquids do not form in the gas stream and the orifice of the regulator has decreased chances of freezing.

In many instances, catalytic heaters are used to provide heat to a building or an area that may be a hazardous or classified location. The goal of these applications may be to keep instrumentation above freezing or provide a heated work environment for employees in cold environments.

Controls for Catalytic Heaters

The most common control used for catalytic heaters is a Gas Shutoff Valve. This valve is used in conjunction with a thermocouple to ensure that gas does not flow to the heater while the catalyst is below the temperature required for combustion. When the heater is at the necessary temperature, the thermocouple sends an electric charge to the Shutoff Valve and activates an electromagnet. When the gas flow is started, this electromagnet holds the valve in the open position. It is important to note that when the valve is open, the button returns to the up position.

Thermostats are also often used to control the overall heat output of the heater. A sensing tube is placed in an appropriate location to detect the temperature at the desired point. This point may be the gas stream as it comes in to a regulator with temperature sensitive components or it may be the ambient temperature. When the sensing tube detects that the set temperature has been reached, the thermostat switches to the "closed" position which in turn, reduces the flow to the heater by approximately 50%.

Summary

There are many ways in which catalytic heaters can provide solutions for problems caused by freezing and liquid distillation in the measurement and regulation industry. Through their many applications, they have become a useful tool to help provide accurate and reliable measurement and regulation stations.