# STORAGE TANK

## FAST RESPONSE TO TEMPERATURE CHANGE

### APPLICATION

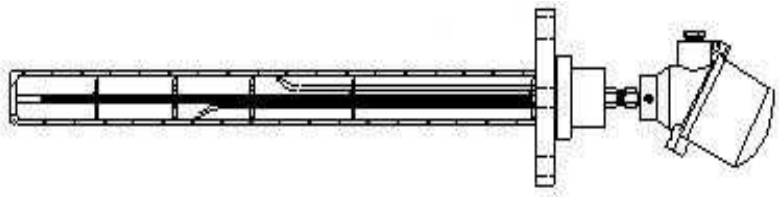
A client was in the process of constructing 5 large gas storage vessels, each 28 metres in diameter and 20 metres high and located in a large European port complex. The vessels were being built to hold bio ethanol gas that was to be shipped in by tanker from South America.

### PROBLEM

Bio ethanol has a low flash point of around 12.5℃ (the temperature at which the fuel can vaporise to produce an ignitable mixture with air), therefore the effect of solar radiation on the large surface area of the storage vessels needed to be considered. Although the average summer temperature was 20℃, midday temperatures could fluctuate between 23℃ and 26℃ and so could increase the gas temperature significantly. A nitrogen blanket would be in place to exclude any oxygen together with an adequate fire detection system, but the client felt it was necessary to have a continual indication of any change in gas temperature.

### SOLUTION

It was recognised that in order to provide sensible data, the speed of response of the sensor would be critical. Therefore an arrangement utilising four 1.6mm OD miniature thermocouples of varying lengths and in opposing orientations were housed within a common protection tube. Each thermocouple had its hot junction mechanically forced against and held firmly to the inside wall of the protection tube. This together with using a thin walled protection tube ensured the fastest response time possible. The four thermocouples were then connected in parallel in the junction box to provide a single, average output to a temperature transmitter and via a safety barrier located in the safe area to the clients instrumentation. The thermocouple assembly was mounted onto a flanged nozzle in the sloping roof of the vessel. For further information please see Data Sheet PDS-056-FD1.



### BENEFIT

Independent data shows that a 1.5mm OD thermocouple will take 0.25 seconds to reach 63.2% of an instantaneous temperature change from ambient, when immersed in an air flow with a velocity of 65 feet (19.825 metres) per second. Since the gas in the vessel is static for the majority of the time, response times will be considerably longer than this data indicates, but will still provided a faster response than other methods.

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