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Application note

Oxygen content in inert gas generators for crude oil tankers

Benefits:

Thermoparamagnetic oxygen analyzers compensate for the background gases, and with no moving parts, are insensitive to the movement of the vessel.

Summary

During the transportation of crude oil and refinery products, the possibility exists for oxygen (from ambient air) and hydrocarbon vapors to form an explosive mixture. To avoid this, cargo tanks blanket the liquid with an inert gas to remove the hazardous gas and air mixture. Inert gas blanketing occurs during loading, crude oil washing, purging, and for topping-off during the voyage

Application

Oxygen is measured in inert gases that blanket hydrocarbon liquids to maintain restricted oxygen content. A shipboard inert gas generator produces inert blanketing gas. In the generator, fuel oil and air are brought together in a water-cooled combustion chamber in which controlled, complete combustion takes place. Seawater is used indirectly to cool the combustion chamber, and directly for after-cooling and SO2 washing. The clean products of combustion, ideally a mixture of nitrogen, carbon dioxide, and water vapor leave the generator a few degrees above the seawater temperature. The water vapor is condensed out and discharged along with the cooling water, and the resulting N2/CO2 mixture is used for safety inerting as the blanket gas. The oxygen transmitter monitors and controls the combustion process to ensure the produced gas has restricted oxygen content.

Application specifications

Application:	0 to 2% O2, typically below 1% ~15 CO2 500 ppm CO maximum 50 ppm SOx Balance N2
Temperature:	Ambient
Pressure:	Near 0 psig

Challenge

Prior to the use of thermoparamagnetic oxygen analyzers in this application, zirconia analyzers and paramagnetic dumbbell-type oxygen transmitters were used. Zirconia analyzers reported false-low readings, as trace hydrocarbons and carbon monoxide would combust with the available oxygen at the sensor surface. The paramagnetic analyzer was sensitive to the movements of the tanker.

The solution

The recommended installation would include a thermoparamagnetic oxygen transmitter mounted in a sample system with an optional local display. The sample system may include solenoid valves tied back to the analyzer to enable auto-calibration on a timed basis.

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