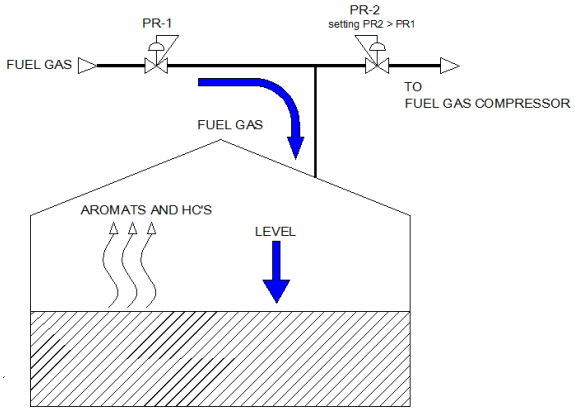
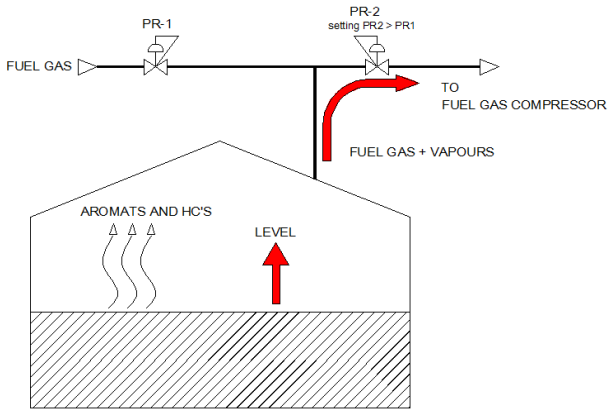
Reduction of VOC venting in atmosphere by using the WIM Compas F in blanketing applications

The reduction of Volatile Organic Compound (VOC) from (Crude) Oil Storage tanks is a world-wide topic. Oil Companies have to reduce the discharge of VOC's to the atmosphere.

An efficient way of realizing such targets is blanketing the tank head space with fuel gas. Main advantage of using fuel gas as blanket is that all VOC coming from the oil enters the fuel gas and therefore contributes to the energy production from the fuel gas when combusted instead of polluting the environment.



By using a fuel gas based blanketing system the composition of the returned fuel gas will be subject to rapid changes upon the filling process of the tank. The amount of VOC's in the headspace of the tank will depend on pressure, temperature and medium stored in the tank.



The WIM Compas can be used for real time analysis of the key combustion parameters

- Energy content (Wobbe Index or Heating Value)
- Stochiometric combustion air requirement

By correct feed forward control of the fuel gas combustion the following benefits are achieved:

- Energy savings
- Reduction of flue gas emissions such as CO and NOx
- Increased utilization of boilers and furnaces
- Better temperature control and less risks of hot spots in the furnaces

Instrument installation and selection

When it is decided to install an analyzer for measuring the heating value and/or Wobbe Index for feed forward fuel and air/fuel ratio control, following requirements should be fulfilled:

1. The analyzer should be as fast as possible. It makes no sense to install a calorimeter with a 20 – 30 seconds response time if changes occur within seconds. The WIM Compas F has a response time of less than 5 seconds for a 90% response to a step change in sample composition - lag or "dead" time included.
2. Signal noise should be as low as possible. High signal noise levels will require smoothening of the signal, typically by averaging. As a consequence the response from the control system to a step change will be slower. The WIM Compas F has a repeatability of 0.05% of measured value!
3. Local installation close to sample tap point. Ideally the fuel gas heat value and air demand signal should be available before the fuel gas leaves the burner tip. This means that the travelling time of the fuel gas from sample tap point to the burner should be longer than the travelling time from sample tap point to the analyzer plus the analyzer response time. The WIM Compas F can be installed outdoor in hazardous area as close as possible to the sample tap point.
4. The sample handling system should have minimal internal volume. Although a fast loop theoretically can compensate for any dead volume in the system this will result in excessive venting and/or flaring of fuel gas. The WIM Compas F has an integrated sample conditioning system and requires no additional external sample handling.
5. A combustion air requirement signal should be available. As outlined above the heating value or Wobbe Index can be poor indicators for the air demand in fuel gas applications. The WIM Compas F is based on the residual oxygen content principle and stores separate calibration lines for Wobbe Index/Heating Value and CARI/Air Demand.
6. Rangeability of the analyzer should match all possible cases Typically the analyzer should be able to handle large fluctuations in the fuel gas composition. The WIM Compas F can analyze fuel gases of all possible compositions in the 0-120 MJ/Nm3 (0-3000 BTU/SCF) range without the risk for flame-out or overheating.
7. Thorough application review. Each application is different and proper review is essential. Issues that should be considered include:
   - Calibration gas selection - the correct calibration gases give best accuracy in all cases, do not contain many components (not more than 2-3 preferably) and allow sufficient filling pressure even when ambient temperature may be low.
   - Parameters measured - For the WIM COMPAS, CARI and Wobbe Index are standard outputs; Specific Gravity, Heating Value and Air Demand are standard options.
   - Fuel gas hydrocarbon and/or water dew point - It is not uncommon that fuel gas is taken form a knock out vessel. Care must be taken that no condensation takes place in sample lines or inside the analyzer. The WIM COMPAS sample handling compartment is heated to 60°C as a standard but can be heated up to 150°C if required.
   - Sulfur content and presence of other corrosive components - Wrong material selection can rapidly corrode and clog an analyzer. Proper component selection and analyzer design enables continuous operation even when more than 10% sulfur is present!
   - Overall response time - A lag time analysis from sample probe tip to analyzer signal output should be provided to ensure compliance with the requirements. This is especially important when high pressure gas lines must be analyzed.
   - Ambient temperature range and hazardous area certification requirements - Must of course be considered. The WIM COMPAS F is certified for ATEX, IEC/EX Zone1, and FM Cl.1 Div2. Its' epoxy coated stainless steel enclosure is IP65 design and suitable for hostile environmental atmospheres