

Controlled supply of odorant to natural gas



Application note A073-OG02-0517C



◆ Commercial natural gas

You might think that natural gas has a typical pungent smell by itself. But nothing could be further from the truth, as natural gas is virtually odourless. The typical smell originates from THT, which is a compound that has been added artificially to commercial natural gas. Its aim is to act as a 'warning agent' in case of a leakage of this highly flammable gas during transport or use.

THT, short for tetrahydrothiophene, is under ambient conditions a colourless volatile liquid with an unpleasant smell. Commercial natural gas in the Netherlands has to contain at least 18 mg of THT per cubic meter gas. Natuurgas Overijssel B.V. generates biogas from anaerobic decomposition of organic matter, which is upgraded to natural gas quality for injection into the Dutch natural gas mains. Natuurgas Overijssel requested Bronkhorst for a solution to supply THT to their biogas in a controlled way.



Natuurgas Overijssel B.V.



Application requirements

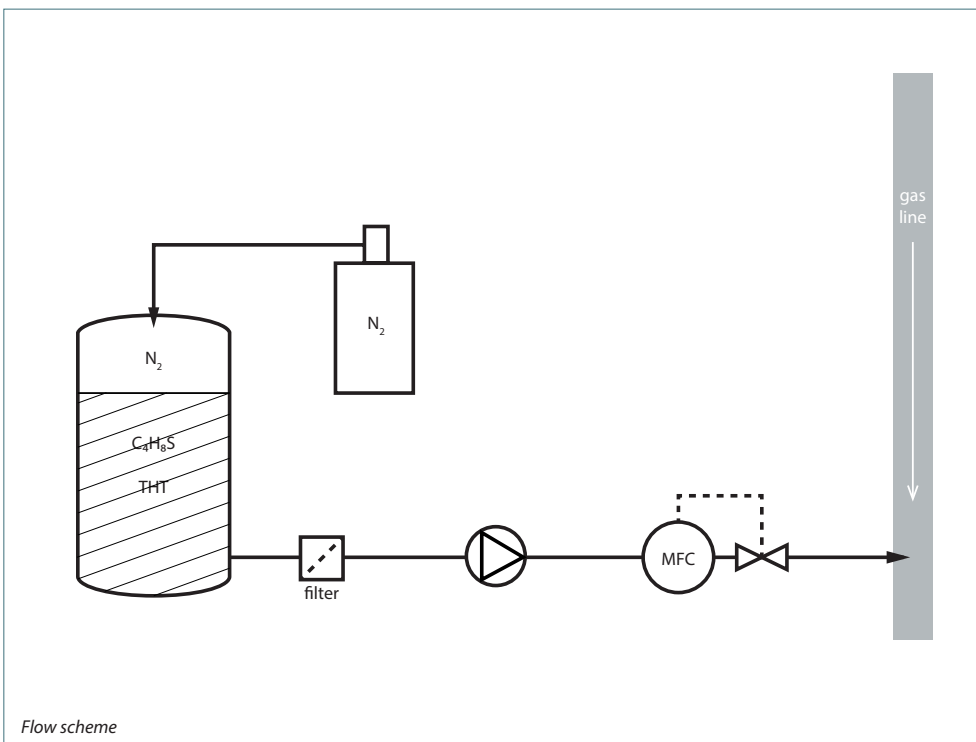
Traditionally, THT is added pulse-wise to the gas on a regular basis, using a pump with a fixed stroke volume. Especially for small gas flow - for biogas installations in the range of 40-50 m³/hour - such a batch-wise injection may lead to liquid THT remaining in the gas lines.

In this way, THT may not be mixed well with the gas, it might have the wrong concentration and there is no control on supplying. These lacks of guarantee for continuity and accuracy have to be overcome with the new solution.

Important topics

- ◆ Continuous and accurate dosing of odorant
- ◆ Homogeneous distribution in the natural gas
- ◆ Solution gives operational reliability

Process solution



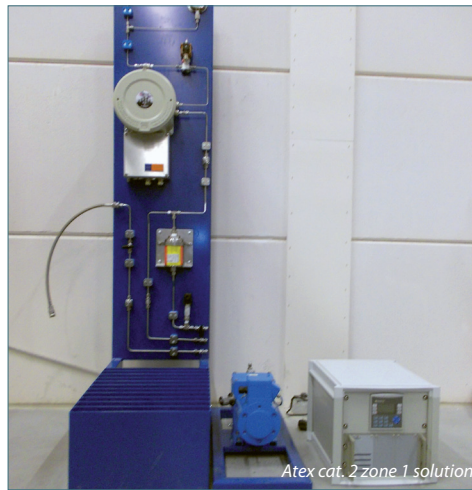
Flow scheme

The heart of the new process solution is a Bronkhorst M12 mini CORI-FLOW mass flow controller that injects a small but continuous liquid THT flow into the biogas flow. A master mass flow meter measures the biogas flow and sends a signal to the M12 via a PLC. The M12 - acting as a slave - has been set to a dosing value of typically 18 mg of THT per cubic meter gas. Hence, this mass flow controller continuously injects the correct amount of THT, based on the actual biogas flow.

In this configuration, a 40 liter THT storage tank is pressurised by means of nitrogen gas. A pulsation damper is incorporated to remove pressure surges and to guarantee a stable control. This results in a precharge pressure upstream of the M12 of 10 to 13 bars. Downstream of the device, in the biogas flow, the pressure is typically 8 bars. The full scale of the M12 is occasionally set to maximum dosing value of 40 mg/m³.

Using this solution, THT can be dosed very accurately, within a bandwidth of 1-2%, which is a major improvement compared with the traditional batch-wise method. Furthermore, the continuous dosing results in a homogeneous THT/biogasmixture, which is a more efficient way of dealing with the amount of odorant as overdosing is avoided. ▶

Another important aspect is the operational reliability of this solution - the ability to supply to the natural gas mains. Prior to entering the mains, the biogas composition is analysed by GC. If the biogas contains not enough THT, the grid operator will shut off the supplier from the natural gas mains. By default, the monitoring of the dosing occurs by PLC, but it can also be done by means of the mini CORI-FLOW itself. In this solution, it is exactly known how much THT has been dosed - and an alarm will be given when no odorant is detected. Moreover, a prediction can be made when an empty THT storage tank has to be replaced. ■



Recommended Products



mini CORI-FLOW M12 with V14 valve

The unique design of the miniature Coriolis sensor features unsurpassed performance, even with changing operating conditions in pressure, temperature, density, conductivity and viscosity. Contrary to many other Coriolis flow meters on the market, mini CORI-FLOW offers integrated PID control and close-coupled control valves or pumps

- ◆ Direct mass flow measurement
- ◆ High accuracy, excellent repeatability
- ◆ Cost-effective design
- ◆ Compact design, with integrated PID controller for fast and stable control
- ◆ Now suitable for (very) low flow ranges
- ◆ Digital technology allows fieldbus communication and offers configurable control characteristics



mini CORI-FLOW XM12-XM14

The mini CORI-FLOW series XM12-XM14 has been built in a flameproof (Ex d) housing for use in IECEx and ATEX Zone 1 hazardous areas, ATEX approval II 2 G Ex d e IIB T6 Gb. All electrical connections are available on screw terminals in an increased safe (Ex e) housing connected to the flameproof housing. The Ex d series are designed for small flow rates, from 100 mg/h up to 30 kg/h, both for liquids and gases.

- ◆ Direct mass flow measurement, independent of fluid properties
- ◆ High accuracy, excellent repeatability
- ◆ Multi-range; easy on-site re-ranging via digital interface
- ◆ IECEx and ATEX approval II 2 G Ex d e IIB T6 Gb
- ◆ Metal-sealed construction
- ◆ Bi-directional measurement

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OG: Oil and Gas
02: On-shore oil and gas exploitation and research

