Methanol in the hydrogen economy – energy source with challenging risks

Methanol is becoming increasingly important as a versatile energy carrier in the advancing hydrogen economy, particularly in the mobility sector and especially in shipping. It has the advantage that both established production processes and existing infrastructures can be used to transport methanol. Its low boiling point makes it more easily transportable in liquid form than hydrogen, and its higher energy density enhances its practicality. However, despite these advantages, methanol poses specific risks as it is highly flammable and toxic. Advanced safety technology effectively mitigates these risks and supports the use of methanol as a sustainable energy source.

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Methanol production, storage and transport
The safety risks associated with methanol production, especially sustainable production from hydrogen and CO_2, should not be underestimated. CO_2, in particular, when handled in large quantities, requires strict safety precautions against overpressure and contamination, as a release can not only cause environmental damage but also pose health risks to the workers involved. Proper handling and storage of methanol is essential, as methanol is toxic and can release harmful vapours if stored incorrectly. Transportation places high demands on safety technology due to the difficulty of extinguishing a fire and the risk of leaks that can cause environmental damage. Therefore, early leak detection systems and special fire protection measures are essential to ensure human and ecological safety during transport.herheitsrisiken nicht zu unterschätzen.

Safety challenges

In green methanol production, hydrogen also plays an essential role as a starting product, so its risks, such as flammability and explosiveness, high risk of leakage or invisible flame, also need to be considered. Compared to the highly flammable hydrogen, the ignition energy of methanol is significantly higher. However, methanol poses several safety challenges due to its toxic properties and the difficulty of extinguishing fires.

Toxic
Methanol is toxic. It affects specific organs and the central nervous system, which can lead to long-term damage or death. Symptoms may include coughing, headache, dizziness, nausea, or blurred vision. Methanol is readily absorbed by all routes of exposure, including the skin. Local occupational exposure limits must be observed. As methanol is a low-boiling substance, suitable AX filters or self-contained breathing apparatus must be used when handling methanol.

Dispersal behaviour
Methanol is slightly denser than air (32 versus 28 grams per mole). The vapour often follows the movement of air. But if methanol is warmer than the surrounding air, it will rise. If it is cooler, it sinks and accumulates near the ground. Sensor positioning should, therefore, be individual, taking into account local conditions such as ventilation systems.

Flammable
Methanol is a highly flammable gas and can be ignited at concentrations between 6% by volume (LEL) and 50% by volume (LEL). Spontaneous ignition occurs at 440°C. At 9 °C, the flash point is relatively low.
Above this temperature, vapours may form a flammable mixture with air.

Pale flame
Methanol burns with a barely visible bluish flame.
Flame detectors are therefore necessary and provide early warning.

Reaction to fire
The low flashpoint, bound oxygen, good water miscibility and pale flame make methanol fires challenging to extinguish. Conventional foam will decompose, so alcohol-resistant foam should be used. The flame's low heat radiation allows extinguishing at close range, but the pale flame requires a portable thermal imaging camera.

Floor liquid
If cool liquid methanol is leaked, it can form vapour. This can spread near the ground and accumulate in deeper areas. It is, therefore, particularly important to clear the tanks and containers before entering.

Detection technologies and solutions for safe methanol handling

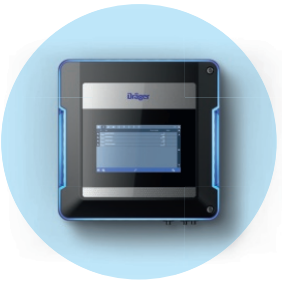
The right equipment, materials, and protective measures can meet these special safety challenges. Dräger provides comprehensive safety solutions, from portable gas detection devices to fixed fire and gas detection systems, from consulting and project planning to maintenance services. For any questions regarding methanol measurement, please contact your local Dräger sales organisation.

Fixed gas detection:

Dräger Polytron® 8700 IR
Flammable Gas Detector

Dräger Polytron® 8100 EC
Detector for toxic gases and oxygen

Dräger Flame 1500 (IR3)
Flame Detector
for hydrocarbon fires



REGARD® 3000
Controller

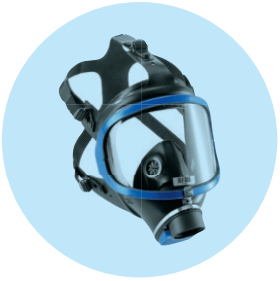
Portable gas detection:

Dräger Pac® 8000
Single Gas Detector

Dräger X-am® 5800
Multi Gas Detector

Dräger X-am® 8000
Multi Gas Detector

Personal protective equipment:



Dräger X-plore® 6300 & 6530
Full Face Mask with AX-Filter

Dräger CPS 5800
Chemical Protection Suit

Saver CF/PP
Emergency Escape Breathing Apparatus
Dräger PAS® Colt
Short-duration breathing apparatus

Further information on methanol safety can be found here:
www.draeger.com/methanolsafety

Drägerwerk AG & Co. KGaA
Moislinger Allee 53–55
23558 Lübeck, Deutschland

www.draeger.com