



WHITE PAPER

Transportation Industry Gas Challenges: From From Manufacture to Storage and Filling

▶ The transportation sector is one of the largest industrial sectors in the world, spanning many applications. The industry provides services concerned with the movement of people and cargo of all types. This spans air freight and logistics, airlines and airport services, road and rail, transportation infrastructure, trucking, highways, rail tracks, and marine ports and services. As a result, the dangers facing those working in the transportation industry are also wide ranging. With this in mind, it is important to raise awareness about all the wide-ranging risks. This white paper will provide information and education enabling

a proactive approach to the health and safety of the workforce to be taken. Understanding risks in the working environment and taking preventative measures when and where they are needed to ensure they are mitigated is one of the central principles of health and safety. Conversely a lack of understanding, training or knowledge about the dangers in the transport industry would be concerning and potentially place workers and others at risk, with the unfortunate knock-ons of compromising safety and not meeting compliance requirements, and relevant legislative rules.

Applications

Transport infrastructure includes tunnels which may be constructed in areas of high populations, as in underground networks beneath some cities. Air is a limited commodity beneath ground, and as a result, any incidents that occur within tunnels can have a serious impact on the people within them, and sometimes other surrounding infrastructure. Both the construction of transportation tunnels, and the movement of vehicles within them once they are completed, can lead to many gas hazards. These need to be fully understood to ensure the continued safety of operations and movements.

Another application is car parks. With vehicles always moving in and out of them, and people in the locality, these can be hectic environments. Hazardous gases can be generated by some vehicles, and by vehicle fires or after collisions especially if hazardous materials are being transported.

Fuel filling stations are, of course, imperative as they ensure vehicles remain powered as they travel from and to their destinations. Vehicles are supplied with and dispense of a range of fuels such as petrol, diesel, CNG and LPG.

As well as ensuring vehicles are filled with fuel, there are also the applications which involve the storage of this fuel. Sites with storage tanks can contain vast amounts of petroleum or petroleum products, flammable liquids, gases or other fuels.



Gas hazards and their dangers

Across the above applications, and within the production and use of vehicles there is always the possibility of gas hazards, fires, explosions and a range of other dangers. Wherever there is chemical energy stored or used there is a risk of gas hazards. In transport that energy is needed for movement – it is as simple as that.

We now explore the gases commonly found in transport systems and around vehicles, and the risks they pose. Gas hazards are prevalent within a range of applications, from production facilities where individual components are manufactured, vehicle assembly, to tunnels, and parking garages where exhaust gases sometimes find it hard to escape and can build up.

The most common gases within road tunnels are that of Nitrogen Dioxide (NO_2) Nitrogen Monoxide (NO) and Carbon Monoxide (CO). NO and NO_2 are created within combustion engines burning fossil fuels, and are often found within tunnels. Although often it is reported that the concentration of nitrogen monoxide found in road tunnels isn't hazardous this does not take into account the way in which NO oxidises into NO_2 where there is oxygen and humidity in the air. When this occurs, nitrogen dioxide levels can steadily rise and as a result impact the respiratory systems of those working or passing through in the environment, triggering asthmatic responses, and causing symptoms like coughing and difficulty breathing.

Within the manufacture of, and powering of, some vehicle types butane is used as an alternative fuel source. However, butane can be an extremely hazardous gas due to being an explosion hazard. A fire is caused when gaseous fuel or vapours ignite from a variety of sources, such as heat, spark, open flame or a hot surface. Understandably within manufacturing operations this is a very serious risk which needs to be monitored to avoid explosions. As butane is heavier than air it can travel long distances downhill and accumulate near an ignition source in an unexpected location.

Within the transport sector, the risk of oxygen deficiency is another serious hazard. It happens when oxygen is used up by combustion engines, and is far more likely within confined spaces where the oxygen is harder to replenish from the atmosphere. Oxygen constitutes one-fifth of the

air we breathe, and so when the oxygen in the air reduces to 19.5%, deemed as a deficient level, below 17.5% by volume there is a serious impact to human health. With less oxygen available to breathe, less oxygen in the cells incapacitates an individual very quickly. Breathing becomes challenging, confusion and reduced coordination occurs, individuals can vomit or feel nauseous and the heart can be placed under considerable strain. As levels decrease below 16% individuals can even lose consciousness or die. Without effective detection equipment it is difficult to understand if individuals are safe.

The presence of hydrogen is a risk, specifically within shipping where it is becoming more frequently used, transported and stored. This is because it is extremely combustible. Hydrogen is easier to ignite than most other chemicals and if fed from a hydrogen source is hard to extinguish.

Chlorine is an example of a hazardous substance which, when compressed into a liquid during transport and storage, can cause damage in the event of a leak. When released it quickly turns back into gaseous form, where it causes ENT issues, breathing problems, lung damage, eye damage and respiratory diseases, not to mention significant environmental damage.



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Other hazards

It is not just gas hazards that are a concern within the transport industry. The movement of such hazardous materials also comes with its own problems. Transporting hazardous materials can cause accidents. These accidents are far more likely when they are flammable. Transporting explosives, gases, flammable liquids, flammable solids, oxidising substances, toxic substances, radioactive materials, corrosive substances and miscellaneous dangerous goods each pose their own problems. These are the nine areas of classification for concern as categorised by the United Nations (UN).

The biggest cause for concern in the transportation of other non-flammable non-toxic gas is asphyxiation. A slow leak in a storage container can displace all of the oxygen in the air and cause the individuals in that environment to suffocate.

In motor vehicles, burning of fossil fuels and subsequent emissions of Carbon Monoxide (CO) can have adverse effects on human health if breathed in. Within the vehicle cabin atmosphere the concentration should remain low, but if there is a leak near an air intake the atmosphere may become compromised or if the vehicle drives through a contaminated area where gas from previous motor vehicles has been allowed to build up, more than the normal level of carbon monoxide may be experienced. Adverse side

effects start in the short term at 20 ppm of CO, or if the oxygen level decreases below 19%. If this happens drivers and passengers are at risk of the effects of dizziness, feeling and being sick, tiredness and confusion (not ideal whilst driving), also stomach pain, shortness of breath and difficulty breathing. Ensuring there is proper ventilation with good breathable atmosphere, supported by good extraction systems and gas detection devices is imperative to ensure the safety of all involved.

Within air transportation cabin combustion and fuselage fires are a real risk. Although flame retardant materials are always used, if a fire does start the cabin's trim and fittings can still emit toxic gases and vapours which could be highly dangerous to people. Inhalation of harmful gases caused by a fire in these environments can lead to fatalities.

Leaks of aviation fuel within aircraft hangars and fuel storage areas is something that must be monitored to avoid fires, equipment damage, and consequent harm. It is necessary to choose a suitable gas detection solution that mitigates the risks and avoids false alarms, efficiently uses sensitive detectors, and covers large areas.



Legislation and Regulation

Within the UK there are a range of legislative rules that businesses need to adhere to. The Gas Safety (Management) Regulations 1996 apply to the movement of natural gas (such as methane) through pipes to domestic and other consumers. They relate to and lay out rules surrounding the safe management of gas flow through a network, how to deal with supply emergencies, how to tackle reported gas escapes and gas incidents, and that of gas composition.

When it comes to compliance in the UK, there is a plethora of legislation relating to the use of workplace transport. Two of the main laws include the Health and Safety at Work etc Act 1974 and the Construction, Design and Management Regulations 2015. Further information about the relevant UK laws relating to the transport sector can be found on the HSE website. Within the EU there are many legislative requirements within the transport sector. The European Commission details the importance of safeguarding not just the individuals within the transport sector, but also the environment. They specify the relevant

emission standards on air pollutants from road transport, ships, combustion machinery, and renewable fuels, alongside the policy about sustainable transport systems.

In the USA there are strict laws surrounding the transport of gases across borders, and any vehicle crossing such borders with hazardous gas and materials require presidential permits. Elsewhere OSHA has set standards around the transportation of Hazardous Materials.

The European EH40 document states concentrations of many gas types above which people are not allowed to work for safety reasons.



Crowcon's products monitor the surroundings and help to warn of and thereby help prevent health issues.

Our products

Gas detection equipment is important due to the wide ranging and complex risks in need of mitigation, and the possibility of transportation sector workers suffering after exposures to harmful gases. Crowcon's products monitor the surroundings and help operators to minimise exposure and hence prevent health issues.

The Fixed detection range, spanning [Xgard](#) and [Xgard Bright](#), [Xgard IQ](#) and [control panels](#), can detect flammable, toxic and oxygen gases, as well as report their presence and activate alarms or associated equipment when levels are dangerous. With a proven track record within the transport sector, as well as many other industries, Crowcon's [fixed detection](#) offering ensures effective gas detection where reliability, dependability and lack of false alarms are imperative.

The Portables range, including the [Tetra 3](#), [Clip SGD](#), [Gasman](#), [Gas-pro](#) and [T4](#), offer those on the move the capacity to stay safe from, and aware of a wide range of sector-specific gas hazards. Alongside long lasting portables, Crowcon offers [Clip SGD](#), an industrial gas detector designed for use in hazardous areas, provides a shorter fixed life span in a compact, lightweight and maintenance-free package. [Clip SGD](#) has a 2-year life and is available for hydrogen sulphide (H_2S), carbon monoxide (CO) or oxygen (O_2).

Whether it's single gas or multi gas hazards that need to be measured, these detectors offer the variety and reliability required. This equipment will also help business's meet their display and certification expectations.

To keep your team safe, meet compliance and legislative requirements, whilst ensuring operational efficiency, gas detection is the key. For more information about which solution works best within your environment, please visit our [industry page](#) or [get in touch](#) with our team.

