newsletter

Autogas

Continually rising petrol prices and demand for motor vehicles driven by new technologies have triggered a veritable boom in gas-fuelled cars and helped to make the engines that drive them more and more popular. In essence, two types of gas are used to drive cars, namely LPG and CNG.

The material characteristics of liquefied gas

LPG – Liquefied Petroleum Gas – also known as liquefied gas or autogas, consists predominantly of propane/butane, i.e. C3/C4, and is liquid at pressures above 10 bar (at between 20° and 30° C). When large quantities of it are released, LPG can initially be discharged in liquid form (in an accident, for example, or in case of a leakage). But vaporisation or the deposition of vapour from a tank results in the formation of a cloud of heavy gas which, if ignited, can produce a vapour cloud explosion (VCE). As a heavy gas, LPG accumulates in depressions, cavities and subterranean areas (underground garages).

CNG (Compressed Natural Gas) is composed mainly of methane, hence C1, and is stored in gaseous form at a pressure of around 200 bar. Rather like hydrogen, CNG is lighter than air when discharged and would, in the absence of any ventilation in a closed space, accumulate in the vicinity of the ceiling.

LNG (Liquefied Natural Gas) comes into being through refrigeration down to minus 162° C and is not, as a rule, used in private motor vehicles.

Potential hazards of liquefied gas

Although the use of liquefied gas has become commonplace, the danger of explosion it presents is frequently underestimated when considering protection against fire. If there is any awareness of the risk, it is prompted only by a few, mainly unconfirmed, reports of LPG-fuelled cars exploding and notices banning them from underground car parks.

The essential fact to be borne in mind is that LPG (liquefied petroleum gas), with its particular combination of material characteristics – being highly flammable and heavier than air – presents an increased risk of explosion.

Although there is indeed a risk of LPG-fuelled vehicles exploding, the limited volume of the fuel tank and the stringent safety requirements imposed on their fuel tanks, piping and fuelling systems mean that it is comparatively low.

Where petrol stations are concerned, though, this assessment has to be made with some reservations. The quantities stored at petrol stations are considerable, and certainly bear comparison to those found in a petrochemical processing plant or in certain high-risk areas of an oil refinery. There is also an increased risk associated with the use of tanker lorries for deliveries.

In the field of industrial property insurance, there are numerous documented losses arising from catastrophic scenarios sustained as a result of devastating vapour cloud explosions involving LPG and its particular risk potential. Around the world, there have been documented examples of buildings virtually reduced to dust and of total destruction to a radius of several hundred metres as a consequence of the explosion of a vapour cloud from only a few tonnes of LPG, giving rise not infrequently to claims totalling hundreds of millions of euros.

LPG in underground car parks

The specific combination of material characteristics (highly flammable and heavier than air) raises the issue of what potential risks are associated with "autogas engines" and with the gas in cars in underground car parks. There is particular interest in the questions as to whether driving a car with liquefied gas stored in its fuel tank should be classed as dangerous (from the point of view of a potential crash rupture) and whether such vehicles should be allowed to enter underground car parks or not (ban of access).

In many covered car parks, signs are to be found prohibiting the parking of "pressurised gas-driven vehicles". Drivers of vehicles running on gas are still confused as to whether they are invariably permitted to drive them into underground garages and other closed buildings.

Statutory provisions

In Germany, the parking of gas-powered motor vehicles in underground garages and multi-storey car parks is governed by the individual federal states' regulations on garages. The "Muster-Garagenverordnung" (Model Garage Ordinance) of March 1993 – a non-binding draft submitted to the individual states – suspended all existing prohibitions on parking and permitted the parking of gas-powered motor vehicles even in underground car parks. This Ordinance took account of the high safety standards in the field of gas-powered vehicle technology.

If one looks, however, at the regulations on garages actually passed into law by the German states, one sees that they do not take a uniform view on parking pressurised gas-powered motor vehicles in garages, and that there are at the least conditions imposed on it in some of them; in Bremen and the Saarland, for example, a parking ban on LPG-powered vehicles is still, officially, in force.

Comparisons across Europe reveal that the potential risk is assessed in different ways in different places; Austrian garage regulations are, like their German counterparts, provincial laws and are not uniform across the whole country, so there are also different rules applicable to the parking of vehicles run on natural or liquefied gas. There are no restrictions at all on parking gas powered vehicles (LPG/CNG) in multi-storey car parks and underground garages in Belgium and Switzerland; in Italy and France, LPG gas vehicles may not be driven into underground garages and multi-storey car parks unless they are fitted with a safety valve as specified in ECE Regulation 67.01. In Hungary, on the other hand, there is a general ban on gas-powered vehicles being parked in underground garages.

The restriction placed on the parking of vehicles driven by pressurised gas is in line with the assessment by the *Bundesanstalt für Materialforschung* (BAM – Federal Institute for Materials Research), which sees definite risks associated not only with the parking of gas-driven vehicles but also with the use of LPG and CNG. This assessment takes account of the material characteristics of LPG referred to above, i.e. that this is a gas that is heavier than air and behaves rather like a liquid, accumulating on the ground rather than dispersing into the air.

Elsewhere in Europe, regulations made under private law allow owners and/or operators outside the public sector to apply different rules to the use of their underground garages and multi-storey car parks. The divergent – and sometimes contradictory – interpretations placed upon scientific studies and the misunderstandings apparent in some comments on the subject may explain why it is that many garage owners apply their own rules and affix signage prohibiting the parking of gas-powered vehicles.

Information for the underwriter

The main dangers arise from the physical and chemical properties of liquefied gas. Vapour cloud explosions (VCEs) and fires resulting from them can cause serious damage to persons and property.

When assessing whether a substance is hazardous to waters it is assigned to a water hazard class (in German, WGK) in accordance with the German administrative regulations on substances hazardous to water. In this respect it must be noted that, for substances of low solubility (less than 100 mg/l), only their effect in relation to water solubility is evaluated. Autogas (butane), for example, is immiscible with water and has a solubility in water of 61 mg/l. As a consequence it is assigned to water hazard class 0 (not hazardous to water). Nevertheless, a leakage from an underground storage tank definitely does have the potential to contaminate the surrounding soil with hydrocarbons.

In view of the increasing demand for liquefied gas, which makes it necessary to ensure that it is available everywhere, many petrol stations are being upgraded and installing gas filling stations. It naturally follows that they are then obliged to store large quantities of liquefied gas on their premises, the quantities in question being very often in excess of 10 tonnes. “Installations for the storage of combustible gases in containers with a capacity of 3 tonnes or more” are listed in Appendix 1 (fig. 78) of the German Environmental Liability Act (UmweltHG), and are therefore subject to strict liability for hazardous activities.

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