Tankers hold LPG under pressure and in thin skins, thanks to a European derogation. As Mediterranean temperatures reach these shores, Steve Banner asks whether this arrangement should be reconsidered

THIN-SKINNED

At 3pm on Tuesday 19 July, 2022, RAF Coningsby in Lincolnshire entered the history books. The temperature there reached a blistering 40.3°C – the highest figure ever recorded in the UK in what was a blazing-hot summer.

With British summers predicted to get steadily hotter over the next few years, one cannot help but wonder what implications this may have for road tanker design; and especially for tankers designed to transport liquefied petroleum gas (LPG).

When new cross-border regulations governing the construction of welded steel pressure vessels for LPG road tankers came into force in the UK some two decades ago, Britain obtained a derogation on climate grounds.

"Under Annex C of BS EN 12493 we were allowed to use thinner and lighter tanker barrels on trucks used purely on domestic work on the grounds that this country's average temperatures were far lower than those encountered in some European countries," says Richard Hakeem, director of technical and safety policy at trade association Liquid Gas UK. That derogation remains in force.

Being able to fit barrels that are 10mm rather than 12mm thick but without compromising safety has delivered both commercial and environmental advantages, points out John Williams. A leading industry consultant with close ties to LPG supplier Flogas and Liquid Gas UK, he also carries out work for the World LPG Association. He says: "The reduced thickness means you can move roughly 8.4 tonnes of product on an 18-tonner, as opposed to around 8.0 tonnes," he says. "If you're running at 26 tonnes using a DAF 6x2 rear-steer chassis, then you can transport approximately 12.1 tonnes rather than 11.5 tonnes."

That means better productivity with fewer vehicle movements; and if you reduce vehicle movements, you cut exhaust emissions as well as the risk of accidents.

PARTNERSHIP

AvantiGas, one of the UK's leading suppliers of LPG, has partnered with Halcyon for a five-year contract to transport LPG and aerosol propellants to large commercial customers and to support their domestic delivery fleet at times of peak demand. This new partnership is set to begin February 2023.

"There are two types of LPG – propane, which is transported at a pressure of six bar, and butane, which is transported at just over one bar," he says. A 10mm barrel can cope with both, he adds, and plenty of space is left at the top of the tank for the LPG to expand if there is a fire and the barrel starts to heat up. He adds that tanks have to end up 98% full before their pressure relief valves start to lift. They are set at 17.8 bar.

THE BUT

The drawback is that tankers with 10mm barrels cannot be sent outside this country to collect or deliver product.

So, will rising summer temperatures mean that Britain will have to introduce 12mm barrels? That is most unlikely, says Williams.

"The reference temperature we use is 50°C; we're still way below that, and in any event it takes a long time for LPG in a road tanker to heat up," he says. "I'm more than confident that 10mm barrels will continue to cope."

The way in which LPG tankers are designed has little or no bearing on petrol and diesel tanker design, stresses Tankquip director and owner, Dave Stanley. "They're completely different products and fall under different standards, with no read-across from one to the other," he stresses. "Fuel tankers operate at atmospheric pressure, and LPG tankers don't."

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While LPG tanker barrel thickness seems unlikely to change in the foreseeable future, other aspects of the rules governing the design and operation of LPG tankers continue to evolve, says Williams. "From 2023 onwards under ADR (the Agreement Concerning the International Carriage of Dangerous Goods by Road), all tankers fitted with pressure relief valves will have to display an SV (for safety valve) marking to the rear and on each side," he says. "And in the latest edition of BS EN 12493, the weld acceptance criteria have been deleted and BS EN 12972 – 'Tanks for the transport of dangerous goods – testing, inspection and marking of metallic tanks' – is referenced instead.

The latest version of BS EN 12493 will enter into force in the 2023 edition of ADR and was approved for use in Britain in July. A number of practical changes to LPG tanker design and operation have been made in recent years, says Williams, and are covered in the Liquid Gas UK Code of Practice. They include various alterations to valve design, with the key components of valves used for filling and vapour balancing now mounted inside the tank rather than externally, so that they will not be torn off if there is an accident.

Brake interlock systems are being fitted to minimise the risk of tankers accidentally rolling away, and drivers are being issued with handheld remotes that in effect act like a dead man's handle.

"They're used primarily when a tanker is being discharged at a customer's site – into a small tank in somebody's garden or at a pub for instance, when drivers are likely to be working on their own 90% to 95% of the time," says Williams.

They have to press the button on the remote every so often to show that they have not been incapacitated. "They get a warning that tells them when they need to do so," he says. Fail to respond, and the discharge will stop automatically. "The engine will shut down and the valves will close," says Williams.

MATERIALS

"A change that is referenced in ADR is the need for pressure relief valves to withstand a force of 100G," he continues. "It's the consequence of an accident that occurred in Ireland some years ago."

Welded steel is likely to remain the favoured method of LPG tank construction for some time to come, he believes. "Stainless steel has been tried, but not very successfully," he observes. "There were a lot of problems with cracking.

"So far as tanks made from composite material are concerned, the cost would be through the roof, and you wouldn't get sufficient benefits to justify it," he adds.

The nature of the product LPG tankers transport is changing as gas producers look to make the content more sustainable. This includes the increased use of renewable dimethyl ether (rDME) says Williams, which can be produced from a variety of feedstocks. They include sewage sludge and animal and municipal waste, says LPG producer AvantiGas. The rDME content of LPG could eventually be between 10% and 20%. "Its use will have no impact on the design of welded steel tanks at all," says Williams. "However it is denser than LPG, and that has implications for the weight of the load being carried."

Finally, an ongoing programme of tests on LPG tanker pressure relief valves being conducted under the auspices of Liquid Gas UK and the Department for Transport (DfT) is hoped to permit valves to be physically tested and replaced if necessary every six years, with an intermediate three-year visual inspection, as opposed to a requirement to conduct a full physical test every three years. TE