Proving leak before burst for small-scale LNG transfer hoses (project phase 2)

Publieke samenvatting / Public summary

Summary

The increasing use of liquified natural gas (LNG) to fuel trucks and vessels will lead to more storage and transfer in urban areas. However, current safety distances for LNG fuelling and bunker operations are based on failure scenarios and occurrence probabilities that are largely determined by the gross failure (rupture) of transfer hoses and loading arms. These distances limit the deployment of a small-scale LNG distribution system. This project proved that, for small-scale LNG transfer systems, the full bore rupture scenario is much too conservative.

Background

This project was executed in two phases. In the first, it was proven that, for several hoses, two incident scenarios do not necessarily result in a full-bore rupture. These results were reported in TNO report 2015 R 10689. It was then decided to strengthen these results by conducting additional tests in a second phase. This report documents the results of that second phase. The project was carried out on behalf of the LNG Safety Platform of stakeholders in the small-scale LNG supply chain.

Project objective

The approach was to prove that there are credible failure scenarios that, while they may result in leakage, do not lead to a full-bore rupture. The authors hoped that authorities, based on the project

Projectinformatie / Project information

Projectnummer / Project number
TKITOELNG Safety JIP
Subsidiebedrag / Grant amount
€ 360.116,00

Algemene informatie / General information

Penvoerder / Secretariat
TNO

Volg Topsector Energie op X / Follow Topsector Energie on X

@TSEnergie

results, would update their QRA calculation procedures with specific leak scenarios.

Project results

The first phase of the project found that the fatigue failure of a composite hose may cause leakage. However, it also found that this would not necessarily lead to a full-bore rupture. In phase 2, four composite hoses were fatigue loaded until server leakage was present. This test found that the residual burst strength of these fatigued hoses appears to be higher than the maximum operating pressure of a small-scale LNG system. From this it is possible to conclude that while significant fatigue damage to a hose will cause leakage, this is likely to be detected whenever the remaining pressure capacity is higher than the maximum operating pressures of the system. In other words, it is possible to prove that operators will be able to detect a leak in a particular multi-composite hose under normal conditions and before a full-bore burst occurs.

This finding covers the two potential critical failure scenarios that were investigated (crushing and fatigue), while normal conditions means where the residual pressure resistance is higher than the normal operating pressures (10 to 18 barg). The report recommends further testing of different types of hoses and scenarios, plus the standardisation of tests.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.
Voor meer informatie over de Topsector Energie, ga naar **www.topsectorenergie.nl**.

Voor meer informatie over de TSE / Energie-Innovatie regelingen die RVO aanbiedt, ga naar **www.rvo.nl/tse**.