

# LNG offshore transfer: work to be done

Demand for the transfer of LNG at sea creates new engineering questions. TNO is working on solutions together with equipment suppliers, shipping and operating companies on the development of a special Dutch LNG test and technology centre.

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LNG, Liquid Natural Gas, is becoming increasingly more important for the energy sector, with LNG being conveyed by ship in more and more places around the world, with the frequency of shipping increasing as a result. The dynamic LNG environment, due in part to the spot market for natural gas, is raising all kinds of engineering questions.

The increasing incidence of the transfer of LNG at sea, from ship to offshore terminal and from ship to ship, makes severe demands of transport pipelines, given the relative movements between ships and the floating hoses in the beating waves. The Rotterdam based hose supplier Gutteling worked with TNO to develop an extensive test protocol for its flexible hoses for the ship-to-ship transfer of LNG. Focal issues included heat insulation, flexibility, fatigue, current resistance and resilience to damage, high pressure and extreme cold (natural gas liquefies at -162 degrees Celsius). TNO undertook extensive tests. Gutteling should soon be the first company in the world to receive the EN-1474-II certificate for this innovative product.

## SLOSHING IN LNG TANKS

Another interesting development is the construction of *liquefaction* installations on natural gas platforms at sea. Liquefying the gas directly on the platform cuts down on expensive pipelines and enables the gas to be loaded aboard the ship straightaway. TNO is also active in this area.

A third issue is *sloshing*. LNG ships used to be either empty or fully laden, but now, in the light of the spot market, they also sail half-full. The sloshing of the liquid gas can generate all sorts of undesired forces on the ship's structure.

Safety requirements for LNG are very high, and this has kept the number of accidents involving LNG extremely low. TNO carries out all kinds of safety research, also for the Ministry of Home Affairs, where safety risks along with preventive and incident-reducing measures are investigated.

TNO investigates LNG transfer from a range of different disciplines and research fields, examining not only offshore LNG transfer but also land transfer for customers throughout Europe.

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## TEST CENTRE

Due to the huge demand for new LNG technology, TNO has taken the initiative to develop a special test centre: the *LNG Test and Technology Centre*. Companies like SBM, Shell, Gasunie, Bluewater and Vopak support the idea of such a centre and are prepared to invest in it. TNO will also invest in knowledge development in this field. The Ministry of Economic Affairs underwrote the importance of such a centre in 2008. A feasibility study has been finalised and a proposal for the first phase realisation is currently under way.