DEMACO

Erik Admiraal, Demaco, the Netherlands, outlines the benefits of vacuum insulated pipeline systems in LNG transfer.

A long time coming

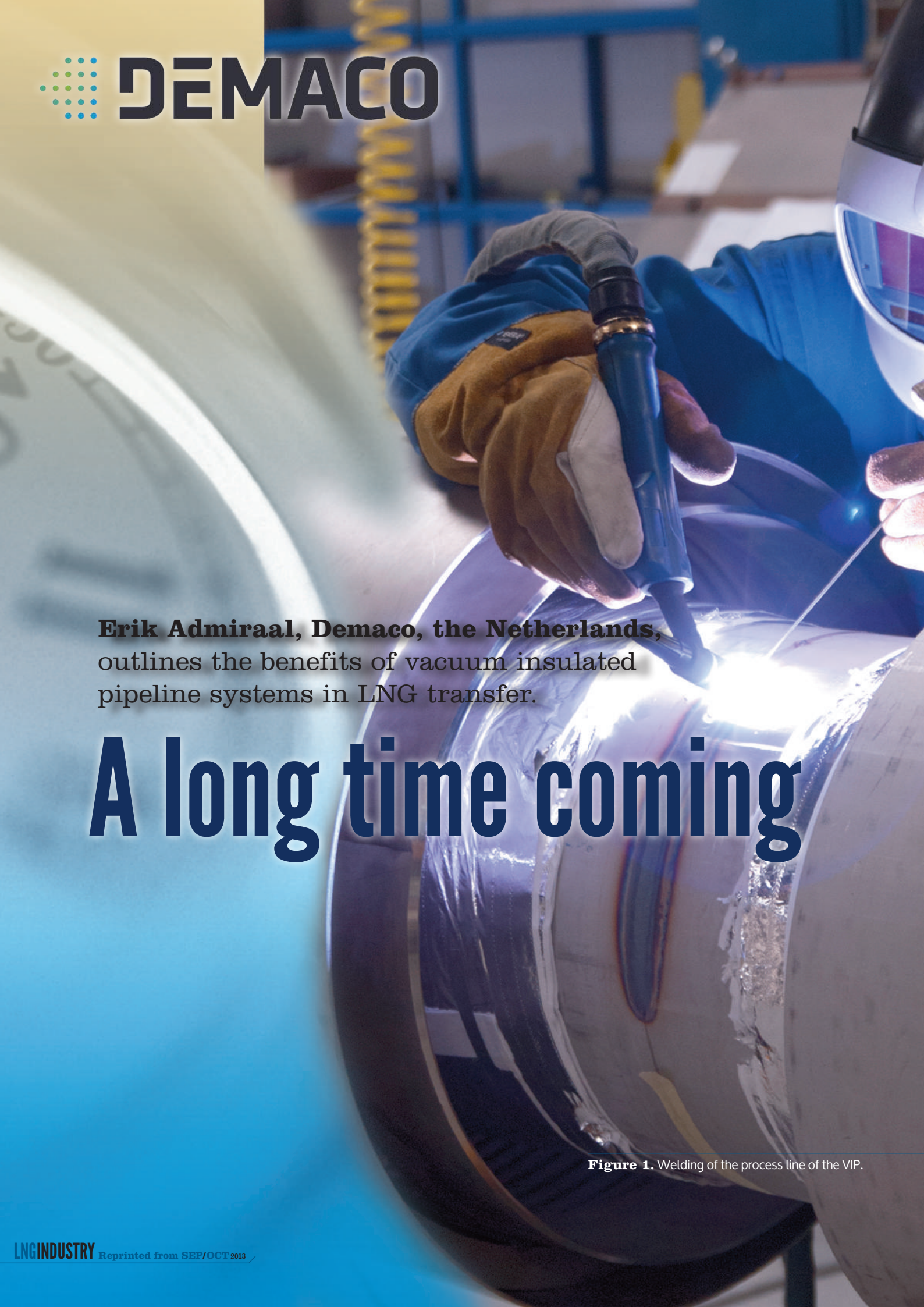


Figure 1. Welding of the process line of the VIP.

Figure 2. Multiple sections at the final evacuation stage.

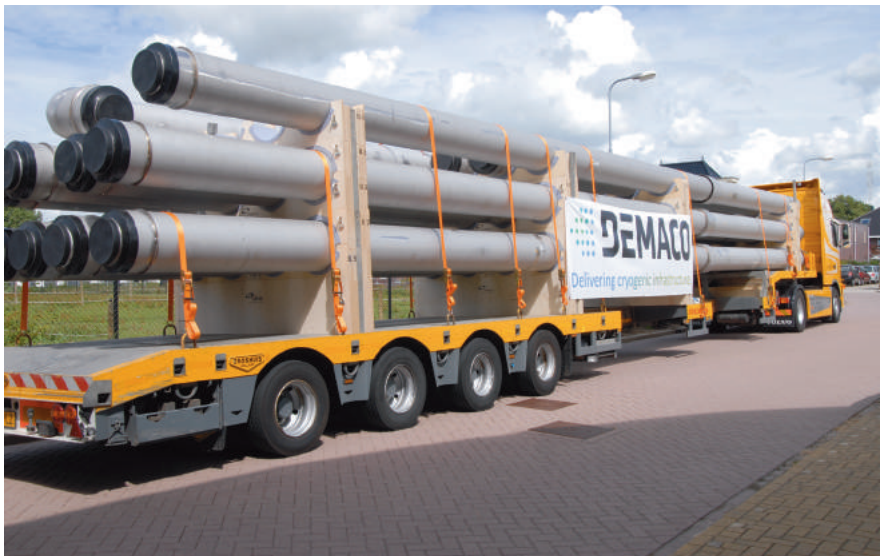


Figure 3. First transport of the VIP to Lysekil LNG terminal.

- Conduction: pipe in pipe system with a minimum of contact points. Where contacts are necessary, they are either lengthened with heat bridges or materials with the lowest thermo conductive properties are used.
- Convection: the space between both pipelines is vacuumed to a static vacuum better than 1 x 10-5 mbar. There are hardly any particles left to transport the heat loads. A long-lasting high insulation vacuum level is kept by means of getter materials.
- Radiation: around the process line, a highly reflective foil is wound with multiple layers (MLI). This creates a radiation shield reflecting the infrared radiation.

For many years, LNG has been transferred by conventionally insulated pipeline systems. Only over the last decade have vacuum insulated pipeline (VIP) systems gained popularity within this market. Why is it that it took so long before this happened?

Only recently have the bigger industrial gas companies, such as Linde, Air Liquide and Air Products started their own activities within the LNG sector. Within the industrial gas market it has been conventional to use VIP for the transfer of cryogenic liquefied gases such as nitrogen, oxygen and hydrogen, etc. However, within the oil and gas market, only 'proven technology' has been used, which probably slowed down the introduction of VIP.

For optimal insulation, there are three 'roads' of heat transfer that need to be blocked: conduction, convection and radiation. A VIP blocks all of these 'roads' in the following ways:

Aside from superior insulation values, there are other factors that encourage the use of VIP.

Energy efficiency

Reduced loss of LNG due to heat in leak will provide a more energy-efficient system. This will subsequently save day-to-day costs for the operator and result in significant savings on the lifetime of the terminal.

Short installation time

Conventionally insulated pipeline systems are historically field fabricated. This usually adds months to the installation schedule. Since the VIP is being pre-fabricated in spools up to 30 m, the installation period is significantly shortened with only the field connections between the spools to perform.

Small footprint

The space on the pipe racks at LNG terminals is always limited. The VIP only has a 2 in. wider jacket line than the process line. Comparing this to the thick layers of conventional insulation, it is clear that there are significant space savings. The support structures for the VIP are also smaller and low cost compared to the bulky supports used on the conventionally insulated lines.

Endurance

Conventionally insulated pipelines start to deteriorate from the moment they are in use. The cryogenic LNG will create tensions in the insulation when cooling down and heating up. This cycling will create cracking of the moisture barrier, allowing moisture in, which freezes at cooling down and will initiate further cracking. This will result in further maintenance costs. VIP has no deterioration at all due to its stainless steel design, while the getters and molecular sieves keep the vacuum level consistent for optimum insulation.

Secondary containment

The pipe-in-pipe system provides a secondary containment for the LNG. The jacket line is also constructed of stainless steel, capable of keeping the LNG inside.

When the public thinks of LNG, the word hazardous immediately springs to mind. A secondary containment certainly provides ease of mind for both the operator and the public.

Environment

Many LNG terminals are being constructed in environmentally sensitive coastal areas. The VIP is a stainless steel construction, which requires little local work and keeps environmental disturbance to a minimum. It is also recyclable. Another future development is the sub-sea VIP, which will offer environmental advantages as it will not be necessary to create the jetty within an entire harbour.

Example projects

The use of VIP has led to Demaco being awarded several larger LNG transfer projects recently.

Lysekil LNG terminal

Demaco has acquired an order to build LNG transport pipelines for the largest LNG receiving terminal in Scandinavia, to be built by Cryo AB for Skangass in Lysekil (100 km north of Gothenburg). Besides delivery of LNG to a refinery, a truck loading facility will be built in connection to the terminal. The terminal will also become an important hub for distribution of LNG as fuel for ships. The gas will come from the LNG plant at Risavika near Stavanger. LNG will be delivered to Lysekil using the Skangass LNG carrier, *Coral Energy*. Demaco will build 1.7 km of VIP with inner diameters ranging up to 12 ft.

Risavika LNG ferry terminal

Demaco has acquired an order to build the LNG transfer lines for a ferry bunker system operated by Skangass. The system will be realised in the Norwegian port of Risavika. The company will bring its cryogenic expertise to the project and will be responsible for engineering, producing and installing vacuum insulated transfer lines within the LNG bunker system. Demaco will help set up a system for Skangass to facilitate the loading of ferries that sail between Norway and Denmark. These ferries use LNG as fuel for their propulsion systems. Before the end of this year, the company will supply and install approximately 0.75 km of transfer lines in Norway.

Conclusion

Worldwide, the LNG business is growing both upstream and downstream. LNG is being recognised as an extremely economic energy carrier and alternative to the energy mix. In addition to this, many countries prefer to be independent from a pipeline. Now that the technology is available, LNG imports are an excellent option. **LNG**

Postal address:

Demaco Holland BV
Postbus 4
1723 ZG Noord-Scharwoude
The Netherlands

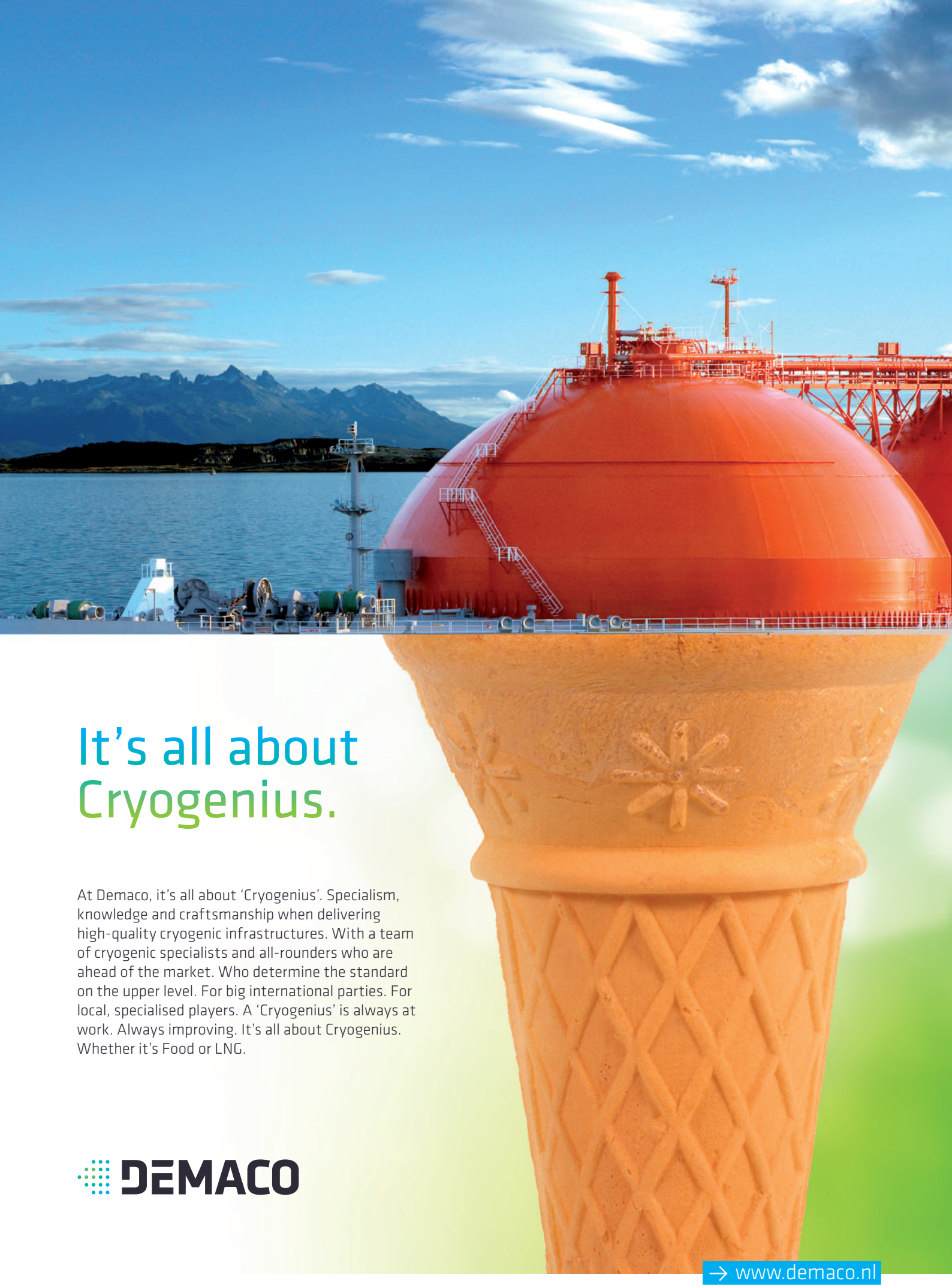
Visiting address:

Demaco Holland BV
Oester 2
1723 HW Noord-Scharwoude
The Netherlands

Contact:

www.demaco.nl
info@demaco.nl

Tel: +31 226 33 21 00



It's all about Cryogenius.

At Demaco, it's all about 'Cryogenius'. Specialism, knowledge and craftsmanship when delivering high-quality cryogenic infrastructures. With a team of cryogenic specialists and all-rounders who are ahead of the market. Who determine the standard on the upper level. For big international parties. For local, specialised players. A 'Cryogenius' is always at work. Always improving. It's all about Cryogenius. Whether it's Food or LNG.

DEMACO

→ www.demaco.nl