

Background information on Trifleet's Cryogenic Business
February 2021

Trifleet Cryogenics and Management

Launched early 2018, Trifleet Cryogenics is the latest business extension of Trifleet Leasing. The first batch for the 2018 investment comprised twenty 40ft tanks, each with a volume of 46,000 liter and designed to offer superb operational capabilities. In the first half of 2019 Trifleet extended the cryogenic fleet by twenty 20ft cryogenic tank containers for liquid gases; each with a volume of 22,000 liter. With those investments Trifleet is offering one of the largest cryogenic fleets available for leasing. In addition to state-of-the-art tanks with superior design, Trifleet's cryogenic business also offers additional equipment, such as cryogenic pumps, hoses, valves, installation systems and related technical support; all based on the existing infrastructure, processes and expertise of the well-established Trifleet organization. This means that the company is the ideal technical partner for a customer's cryogenics infrastructure.

The cryogenic business is managed by Jaap Kuijpers Wentink. Prior to joining Trifleet, Kuijpers Wentink was Managing Director at the Crynorm Group, a manufacturer of Liquefied Natural Gas (LNG) integrated systems such as tank systems, LNG/CNG truck fueling stations, LNG liquefaction plants, LNG bunkering systems, marine LNG fuel systems, and vaporizers; all of which were cryogenic-related. Before that he worked as Managing Director at tank lessor Cryotainer. He started his career as Manager Chemistry at Linde Gas, part of the Linde Group.

The Trifleet Cryogenic Tank Container Fleet

A cryogenic tank container is a framed multi-modal tank designed for the storage, handling, and transportation via road, rail and sea, of cryogenic substances, such as air gases and LNG. Volumes of the 20ft and 40ft cryogenic containers range from 19,000L to 46,000L.

Currently the Trifleet cryogenic tank container fleet consists of:

- Trifleet Cryogenics UN Portable for the transport of refrigerated gasses class 2: General Specifications
 - Nominal capacity: 22,000L tolerance -150L + 1,5%
 - Tare Mass: 7,500 – 8,300 (17,2 - 22 Bar) kg tolerance +/- 1%
 - Max. Gross. Mass: 36,000 Kg
 - Size and type code: 22K7 (EN-ISO6346)
 - Dimensions to ISO: L=6058mm W=2438mm H=2591mm
 - ISO Corner castings: 20' x 8' x 8'6"
 - Max. All. Work. Pressure: EN 17,2 – 22 Bar g
 - Max. All. Work. Pressure: ASME 250 – 320 psi
 - Design Temperatures inner vessel: -196 °C / +20°C
 - Design Temperature outer vessel: -196 to -40 °C / +50°C
 - Baffled with 2 sets (ADR) baffle plates.

These tank containers have a lower tare weight and higher payload capacity of 22,000 liter. Compared to the previous generation the weight has been reduced by 500 kg (from 8,000 down to 7,500 kg) in case of the 20ft 17.2 bar tank containers, and even by 1,250 kg (from 9,550 down to 8,300 kg) in case of the 20ft 22 bar tank containers. All CO₂ cryogenic tank containers are provided with a pump unit.

- Trifleet Cryogenics ISO Tank Containers: General Specifications
 - Nominal capacity: 46,000L tolerance -150L + 1.5%
 - Tare Mass: 11,800kg tolerance +/- 3%
 - Max. Gross. Mass: 36,000kg
 - Size and type code: 42K7 (EN-ISO6346)
 - Dimensions to ISO: L=12,192mm; W=2,438mm; H=2,951mm
 - ISO Corner Castings: 40' x 8' x 8'6"

- Max. All. Work. Pressure: EN 7-10 Bar g
- Max. All. Work. Pressure: ASME 7 Bar g
- Design Temperatures inner vessel: -196°C / +20°C
- Design Temperature outer vessel: -196°C to -40°C / +50°C
- Baffled with 6 sets (ADR) baffle plates.

The Trifleet Cryogenics tank containers play a crucial role in sustainable value-added chains, enable economic development and are, for example, used for the storage and transport of LNG, which is considered to be the cleanest fossil fuel. They comply with ISO worldwide standards and are environmentally friendly. Furthermore, a tank container requires less transloading, resulting in fewer risks as well as minimum product handling and contamination. This means that tank containers are very reliable and safe.

The Expertise Required for the Cryogenic Tank Container Business

The development, specification and manufacturing of cryogenic tank containers and related equipment is not only expensive, but, in particular, a demanding technical challenge. And working in this field requires a great deal of in-depth knowledge about the tank, the market, and the transported goods. Jaap Kuijpers Wentink, Director of the Cryogenic Division, and his Trifleet technical team, all of whom are trained and certified to work with cryogenic/LNG tank containers, provide this expertise.

What makes the design of cryogenic tank containers particularly challenging is the plethora of differing market demands and respective design options. Cryogenic tank containers are vacuum with multilayer super insulation and have expensive cryogenic valves that need to be fire safe, and are designed for extremely low cryogenic temperatures of -196°C. All Trifleet cryogenic tanks have double wall stainless steel (inner and outer tank). In addition, cryogenic tank containers need more approvals and certificates than common tank containers. Altogether, this makes the engineering complicated and results in six-digit prices for cryogenic tank containers.

Given the complexity, a lessor needs considerably more than just capital to offer cryogenic tank containers and related equipment. To ensure it can bring just as much to the table as its partners, Trifleet acquired considerable expertise in the market requirements, the design and the manufacture of cryogenic tanks and equipment. This gives Trifleet the knowledge to develop superior design tanks with detailed technical specifications, which enhance the operational advantages for customers. These advantages cover for example:

- Fast loading and unloading, because of the size of the pressure build-up vaporizers;
- Long holding time of for example approximately >100 days in case of LNG;
- Stainless inner and outer tanks, resulting in a better vacuum;
- Best-quality valves (herose);
- Provision for double bottom fill (20ft 17.2 Bar cryogenic tank containers)

The Cryogenic/LNG Market

In the rapidly growing market for liquid gases market, there is an increasing need for transport storage capacity in the form of intermodal tank containers. Liquid gases are in particular liquid natural gas (LNG), liquid oxygen (LOX), liquid nitrogen (LIN), liquid argon (LAR), and CO₂. All of those gases experience a significant market growth. And, as an alternative fuel for ships and trucks, LNG is soaring in particular. LNG is considered to be the most environmentally friendly fuel for the coming decades. The worldwide small-scale LNG market is projected to reach US\$51.9 billion by 2026, which shows a CAGR of 7% (*source: TechSci Research*). The increasing demand for LNG as low emission fuel, and therefore addressing environmental concerns, is driving the cryogenic equipment demand. Accordingly, numerous research institutes forecast a significant increase of the cryogenic equipment market. According to MarketsandMarkets estimations, the cryogenic equipment market will grow to US\$22.42 billion by 2021 (compared to US\$16.18 billion in 2016), while Grand View Research estimates a figure of US\$25.05 billion by 2022. As tanks are the most expensive cryogenic equipment,

they also make up the largest part of the cryogenic equipment market share. According to Grand View Research, tanks accounted for over 55% of the overall revenue in 2014.

The supply of, for example LNG, requires flexible storage, which can be achieved by operational leasing. What's more, in view of the significant investment involved in LNG installations – of which stationary tanks are responsible for the majority of this – the need increases when it comes to turning capital expenditure into operational expenditure by leasing storage through intermodal tank containers.

Going beyond LNG Trifleet cryogenic tank containers are used for more cryogenic gases, such as CO₂, liquid oxygen, liquid nitrogen and liquid argon. For all cryogenics market research institutes forecast positive growth figures. For example: According to Million Insights (August 2018) the global liquid nitrogen market is predicted to grow at a CAGR of 4.4% during 2018 to 2025. The worldwide CO₂ market is expected to grow at CAGR of nearly 7% in the period 2018-2022 (source: Technavio, December 2018). The small-scale LNG market is projected to reach US\$51.9 billion by 2026 worldwide, which shows a CAGR of 7% (source: TechSci Research).

Trifleet – The Organization

Trifleet's cryogenic business is part of the well-established Trifleet organization. With a current fleet of 18.000 plus tank containers. Trifleet has a worldwide network of offices, agents, depots and surveyors. Headquartered in Dordrecht (Main Port Rotterdam, the Netherlands), Trifleet has additional offices in Houston (USA), Singapore, Hamburg (Germany), Shanghai (China) and Paris (France).

Trifleet's philosophy is 'Committed to Sustainable Excellence'. The company continuously strives to provide excellent tank containers and service. Trifleet offers a complete range of global services, from advice to leasing, and from maintenance to repair. The company continuously invests both in the development of tank containers and in the training of its workforce and technical support staff. For example, upon entering the cryogenic market, Trifleet provided its people with the respective training, making sure that the team has the global certificate to work with cryogenic / LNG tank containers by the time the first tanks were leased out. Trifleet follows transparent and well-documented procedures that specifically cover on-hire and off-hire processes. As a result, Trifleet tank containers are always at peak safety and quality levels for customers. Accordingly, customers regularly rate Trifleet as 'excellent' on its four cornerstones of excellence: responsiveness, professionalism, reliability and innovation.

Trifleet does not compromise on sustainability. The company emphasizes a responsible balance between long- and short-term business, safety, and environmental and social concerns. The professional expertise that Trifleet has amassed over the past 30 years means that it is a safe, environmentally responsible, and ethical company. Trifleet only works with partners who act professionally in their line of business and are known to abide by laws and regulations. The company has its own strict rules to ensure that it acts ethically and is legally compliant in all countries where Trifleet has tank containers. Trifleet also has a framework for ethical decision-making. Business principles like these form a crucial part of the code of conduct.

Following the 'cradle-to-cradle' principle, Trifleet evaluates and invests in tank containers that are designed and manufactured to be as low waste and efficient as possible. The company has lifetime procedures in place for its tank containers, culminating in a carefully constructed scrapping program. Industrial risks, particularly with regards to hazardous goods, safety performance, operational security and on-hire issues, are minimized. Trifleet proves this through ISO9001 certification for its Quality Management System and SGS inspections and certifications that Trifleet has carried since 1992. All Trifleet tanks comply with applicable regulations and undergo mandatory inspections as prescribed by IMDG and ISO, and certified by Lloyd's and Bureau Veritas.

Trifleet is committed to continuing on this path of Sustainable Excellence, and thus to building long-term partnerships with customers, employees, suppliers, investors and other parties.

Eighty percent of its customers renew their contracts with Trifleet. At the same time Trifleet is loyal to its valued suppliers and partners, such as depots, agents, manufacturers and other service providers. Furthermore, the key staff stays in the company and provides stability as well as development of experience and expertise.

About Trifleet Leasing

Founded in 1990, Trifleet Leasing is the largest privately-owned and owner-managed global tank container leasing company today. With approximately 18.000 plus tank containers, the company is a global Top 5 player, with stable long-term growth. Trifleet acts within a worldwide network of offices, agents, depots and surveyors. Headquartered in Dordrecht (Main Port Rotterdam, the Netherlands), Trifleet has additional offices in Houston (USA), Singapore, Hamburg (Germany), Shanghai (China) and Paris (France).

Trifleet's tank containers are leased by the chemical, industrial gas, energy, food grade and pharmaceutical industries, as well as by tank container operators and shipping lines. We lease both standard tank containers ranging from 14,500 to 26,000 liters in size, and special tank containers such as cool tanks, swap bodies, over-wide tanks, various types of lined tanks, electrically heated tanks, as well as cryogenic tank containers. In addition to leasing tank containers around the world, we also offer related services, such as Fleet Service Management. Trifleet's cryogenic business also offers equipment, such as cryogenic pumps, hoses, installation systems and related technical support.

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