# Embracing High Pressure Demands In The Marine Sector

White Paper

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# Introduction

In 2016 the International Maritime Organisation (IMO) announced requirements for significant reductions of marine fuel sulphur by 2020. Under the new requirements, the sulphur content in marine fuel must be no more than 0.5% versus the current limit of 3.5%. Emissions standards have already been tightened to a cap of 0.1% for designated Emission Control Areas (ECA's) for coastlines in the US and Northern Europe. These new emissions standards are driving strong growth in demand for LNG as a shipping fuel. LNG has been used as a marine fuel on a relatively small scale for decades, but following ECA legislation coupled with the high price of fuel, it has attracted increased attention over recent years and is proving to be an practical, environmentally friendly and cost-effective alternative to oil as a marine fuel.

## High-pressure fuel gas systems requirements

The purpose of the marine Fuel Gas System is to fill, store and vaporise LNG and to supply natural gas to engines on a ship. 100% of FGS's used so far have been low-pressure systems with a maximum system pressure of 10Bar pressure and there are a wide range of companies which can supply cryogenic valves for these systems. However, with the introduction of the MAN ME-GI, 2-stroke gas engine, high-pressure FGS are now set to become a familiar sight in the engine rooms of a variety of ships. The supply of equipment for high-pressure FGS is a much more specialist area as these systems operate up to 430Bar pressure.

The MAN ME-GI engine that was launched in recent years requires the gas to be injected at around 320Bar into the engine cylinders to ensure effective combustion of the gas. MAN have also been developing the same engines to burn ethane and these require the gas to be injected at over 400Bar pressure. This has led to a requirement for cryogenic valves to be developed which can withstand these even higher pressures and Parker Bestobell Marine is well placed to be involved in this market sector.

The latest MAN ME-GI engines enable efficient ship propulsion and offer lower emission values that can assist with meeting current environmental limits in ECA areas. They also contribute to an overall improvement in energy efficiency. A high-pressure gas injection dual fuel two-stroke engine with higher system efficiency offers a significant reduction in emissions for LNG Carriers, as well as other ocean-going vessels.

## Understanding marine rules

This has created a market opportunity for specialist marine cryogenic valve manufacturers, like Parker Bestobell Marine, to respond with high-pressure valves. Innovation within our product portfolio means Parker Bestobell Marine has developed a new range of Class 2500 valves and are developing a range Class 4500 valves that can operate at these pressures. These valves are required to be prototype tested and Type approved by the relevant marine classification societies. This is a rigorous process and one where experience in the marine sector is vitally important.

Manufacturers of high-pressure cryogenic valves that may be looking to expand their markets by moving into the marine sector, would have to adapt their products to suit marine requirements and, more importantly, to understand how to get their products approved. For companies that do not already operate in the marine sector, this is a huge learning curve to understand marine rules and there is great difficulty in doing so, as the requirements of the marine classification societies are very exacting.

## Specifying high-pressure valves

There are many considerations for the marine industry when specifying high-pressure valves. Valves must have a valid prototype test certificate issued by one of the major Classification Societies – this means being tested to 1.5 x design pressure. They must also have a Type Approval from each of the major Classification Societies. In addition, they must be fire safe – so all components can withstand a temperature of


925 Degrees centigrade or above, without leaking. All valves must be of stainless steel design, with butt weld end connections for the liquid phase. One hundred percent ambient testing may be required of the seat and body of the valve, and 10% cryogenic testing of each size and type of valve. In addition, full 3.2 document/certification traceability is required on all casting and billets.

A barrier to entering this market is that the requirements of the Classification Societies will not be understood by companies that do not have marine cryogenic valve experience. Parker Bestobell Marine has huge experience in this area having supplied, or contracted to supply valves to over 200 ships, and have over 35,000 cryogenic valves fitted on ships. This type of experience cannot be matched by new entrants into the marine sector. All valves – whether high or low pressure - need to comply with the Classification Society rules.

## MAN ME-GI engines across the world

There has been a surge in orders for the MAN ME-GI gas engines in recent months, with upwards of 30 new vessels contracted that will use this type of engine. This means that there is now a new requirement for 30 high-pressure FGS to supply the gas for these engines. Parker Bestobell Marine is actively involved with the FGS equipment builders and aim to be involved in a majority of these projects. In total, there are around 50 vessels contracted with MAN ME-GI engines across the world.

MAN ME-GI engines have now been adopted by DSME for its LNGC ships, and is offered to owners in conjunction with DSME's Hi-VAR FGS, that includes a partial reliquifaction system. This can liquefy excess boil off gas (BOG) from the cargo tanks that is not used for the fuel. It has proven to be very attractive to ship owners, as it offers them substantial savings in running costs of the vessels and as a result of this, DSME has taken a much larger share of the Korean new build market for LNGC compared to its competitors.

## Marine valves for fuel gas systems

As mentioned previously, Parker Bestobell Marine has developed a Class 2500 range of valves that can work up to 370Bar pressure and as a company, we are now developing a Class 4500 range of valves to operate over 600Bar pressure. This new set of valves are required for FGS where ethane is used as the fuel. Liquid Ethane has not traditionally been carried on ships, but with the development of the shale gas fields in the USA, not only are there large quantities of methane (natural gas) but also wet gases like ethane, propane and butane, which could also be used as a fuel when carried as a cargo.

In the future, there is set to be significant growth in the marine sector for high-pressure cryogenic valves as more ship owners are adopting the MAN ME-GI engines for their new build vessels. MAN is also working proactively to market these gas engines to ship owners, securing a higher level of sales. It is currently only the MAN engine that requires the high-pressure gas injection, so the application is only limited, in terms of the overall gas engine market, to the ME-GI engine. However MAN does command about 80% market share of the 2 stroke engine market, so there are major opportunities here.





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