**Management Summary**

# Guide to LPG Use in Waterborne Vessels

LPG EXCEPTIONAL ENERGY

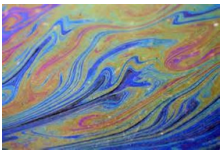
GOOD INDUSTRY PRACTICES

WLPGA

# The *WLPGA Guide to LPG Use in Waterborne Vessels* addresses an application where LPG offers great benefits

The target audience for this guide are all LPG stakeholders who have an interest in the choice of fuel for water borne vessels. There are three main objectives of this guide:

- Provide a toolbox of information, data and compelling arguments in support of using LPG as the fuel of choice in water borne vessels
- Explain the practical issues of safely sourcing, storing, handling, and distributing LPG in these applications using case studies and practical illustrations
- Discuss the opportunities for using LPG in water borne vessels, from small recreational boats to large ocean going tankers, and consider the challenges that might be faced



The guide presents a strong case for using LPG in marine applications based on its properties that are well suited for use as an engine fuel in waterborne vessels. The ease in which LPG can be safely stored, handled and distributed make it an ideal fuel for vessels, especially if a spillage does occur. A comparison of LPG versus other fuels such as distillate fuel and natural gas is also included.

LPG dissipates readily with no mess. The consequences of a major diesel or marine fuel spillage can be disastrous for marine life and the environment. Even small leaks from recreational craft can be a nuisance and cause embarrassment.

LPG has exceptional clean burning properties producing virtually zero particulate matter and very low NOx.

Another benefit of an LPG marine engine is its quietness compared to a diesel engine which operates at higher compression ratios leading to increased noise. LPG fuel tanks are much less messy to refuel.

With the increasing focus on diesel emissions by governments mariners are now turning to LPG as a real option for displacing marine diesel and fuel oils.

One of the challenges however is that LPG vapour is heavier than air and if there is a leak of LPG on board there will be a tendency for it to dissipate at low levels. The document highlights this and there are guidelines to mitigate this risk through good design and sound maintenance.

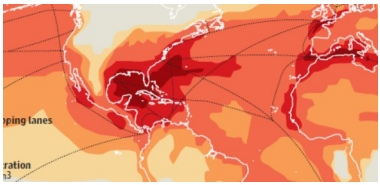
# The *WLPGA Guide to Good Industry Practices for LPG Use in Waterborne Vesels* promotes the concept of using LPG for marine applications

The guide explains that there is no technical reason why LPG cannot be used in any water borne vessel; from the smallest recreational craft to the largest ocean going tankers. Water borne vessels are generally distinguished based on size, shape and cargo, or passenger carrying capacity. They are found on lakes, rivers, waterways or canals, seas and oceans for a variety of activities, such as the transport of people or goods, fishing, recreational activities public safety and warfare.

The guide explains that engines classified as low speed typically operate up to 300rpm, medium speed engines operate in a range of 300 to 1000 rpm, and high speed engines operate at 1000 rpm and above.

The guide describes the different types of marine applications and their different characteristics including recreational, commercial, and ships.

The guide points out that emissions from marine traffic has not only worsened, with the increased number of ships and sea miles travelled, the impact of the pollution is more evident. The spotlight is now on how to improve air quality on major shipping lanes and this opens a big opportunity for cleaner gaseous fuels to displace these marine fuels.



Particulate Matter pollution overlaid on the world's major shipping routes *Source: (American Chemical Society 2007)*

The decision to implement a global sulphur cap of 0.50% m/m (mass/mass) in 2020 was taken by the IMO, the regulatory authority for international shipping, during its Marine Environment Protection Committee (MEPC), meeting for its 70th session in London.

The impact of this reduction of sulphur on marine fuel prices is unclear but it is likely that these lower sulphur fuels will be more expensive, making LPG a more attractive, low emission option, that meets these new limits.

Several owners of very large gas carriers (VLGC's) have already taken steps to introduce LPG as a marine bunker fuel.

# The *WLPGA Guide to Good Industry Practices for LPG Use in Waterborne Vessels* discusses some key design features for marine applications

Operating any type of engine in a marine environment is tough on the equipment. There are three main factors that need to be considered:

- Corrosion (from sea water)
- Vibration
- Constant movement of the vessel

Engines and the fuel equipment are protected against these harsh conditions through a process called ”marinising”. This is achieved through design, or redesign, including the testing of products specifically required for long term survival in a marine environment. The guide explains how this can be achieved, including the use of corrosion resistant alloys and stainless steel, galvanising and coatings, and other commonly used materials and techniques.

If a vessel is to be converted to LPG a thorough inspection of the engine and fuel system should be done before any decision is made to proceed. If the engine is mechanically sound it will continue to perform well when converted.

Finally the guide includes two case studies where vessels have been successfully converted to run on LPG. The first describes where Wärtsilä, Finland, retrofitted its Wärtsilä AQUARIUS®UV ballast water management system for the ‘Marola’, a 37,000cbm fully refrigerated Liquefied Petroleum Gas (LPG) vessel of the Carbofin SPA, Italy fleet. The second case study describes the Civitas project in Venice, Italy, which shows an interesting development for LPG as a marine fuel for the gasoline driven private recreational boat markets.

---

The complete *Guide to Good Industry Practices for LPG use in Waterborne Vessels* and all other WLPGA publications, can be found here: www.wlpga.org/publications

---



WLPGA, 182 avenue Charles de Gaulle, 92200 Neuilly sur Seine, France
www.wlpga.org