



LPG TRUST THE SAFETY CARRIERS EXPERTS



Move Forward with Confidence



A LONG-TERM PARTNER **TO THE LPG** **TRANSPORTATION** **INDUSTRY**

The versatility of liquefied petroleum gas (LPG) makes it vital to a number of industries, from petrochemicals to agriculture and transport. Bureau Veritas supports the global LPG carrier market, promoting safety and efficiency at sea.



Safety of crew, vessel and cargo is the number one concern for owners and operators of liquefied petroleum gas (LPG) carriers.

The high density of LPG vapors makes them collect at ground level in case of a leak, resulting in a strong risk of flammability and explosion. In this context, taking the right steps to avoid leaks and collisions is extremely important.

Bureau Veritas is a longstanding partner to the LPG industry, with over 60 years experience classing LPG carriers, and involvement throughout the LPG value chain.

Our mission is to promote safety at sea. As such, we offer dedicated class rules for LPG carriers, as well as added-value services to maximize safety and performance.



STRATEGICALLY PLACED TO ADVISE ON NEW SHIPS

We work closely with other members of the industry, and the International Maritime Organization, in developing new safety regulations. From July 2016, new LPG carriers are impacted by revisions to the IMO's IGC Code, the international standard setting out design and construction rules for ships transporting liquefied gases in bulk.

Bureau Veritas was deeply involved in the IGC code revision, both as a member of the steering committee, and chairing and participating in the various working groups. Our clients benefit from this involvement as a result of our detailed gap analyses, training and seminars for clients, and updated class rules.

WHY CHOOSE BUREAU VERITAS?

▼
Protect your ship, your crew and the environment

▼
One of the leading classification societies for LPG carriers

▼
The Bureau Veritas brand: a mark of confidence

▼
Industry-leading research, knowledge and technical expertise

▼
In-depth knowledge of regulations

▼
Access to ship surveyors across an extensive geographical network

RESPONDING TO A FAST-CHANGING MARKET

The LPG transportation market faces numerous challenges, from changes in supply routes as a result of the US shale gas boom, to volatile prices. The market has been fast to respond : with orders, on the one hand, for very large ships able to travel long distances, and on the other, for versatile lower-to-midsize vessels capable of carrying ethane and ethylene. These gases have much lower boiling points (-89° C and -104° C versus -48° C for LPG), posing specific challenges in vessel design.

Bureau Veritas has strong experience in classing these flexible carriers, as well as large multipurpose gas carriers able to transport both LPG and LNG. We also support owners in managing operating costs, for example via services to improve energy performance.



CLASSIFICATION AND CERTIFICATION

CONFIDENCE IN THE **SAFETY** **OF YOUR VESSEL**



In a high-risk industry such as LPG, classification goes beyond compliance. It provides reassurance to shipowners and charterers that they have taken the right measures to keep crew, asset and cargo safe.

Bureau Veritas has been a leading classification society for LPG vessels since 1953, when we classed the first modern pressurized LPG carrier to be built in Europe. Today more than 200 vessels worldwide are classed to BV rules.

Shipowners choose us for our commitment to safety, our experience and our technical expertise. Bureau Veritas' rules provide dedicated sections covering liquefied gas carriers, as well as issues with particular relevance to LPG carriers, such as fire protection and fatigue analysis.

We regularly update our rules to reflect the strict demands of the LPG industry. This includes, for example, our rules update to take into account revisions to the IMO IGC Code (revision date: July 2016). Revisions to the Code



cover a number of areas, from cargo control, through containment and piping systems and fire safety. One of the main design impacts of the revised Code is on ship arrangement, notably the protective distance between the shell and the cargo tank. As well as updating our rules, we carried out an in-depth gap analysis, which we have shared with clients.

The aim: to support yards and owners in designing compliant vessels.

Finally, Bureau Veritas is able to issue statutory certificates on behalf of flag administrations charged with applying international rules relating to safety, some of which relate specifically to gas carriers.

We also issue certificates of compliance with the US Coast Guard and specific terminal regulations.



CLASSIFICATION NOTATIONS ISSUED TO LPG CARRIERS BY BUREAU VERITAS

LPG carriers are covered by the Rules for the Classification of Steel Ships (NR 467), and particularly Part D Chapter 9. Some of the classification notations commonly used for LPG carriers are:

Class symbol and construction marks:	I ✕ HULL ✕ MACH
Service notation:	Liquefied gas carrier
Environmental management:	CLEANSHIP, GREEN PASSPORT
Other notations:	✕ Veristar Hull CM FAT 25 years, ✕ AUT-UMS, MON-SHAFT, CPS (BWT), INWATERSURVEY, Unrestricted navigation.



Visit the Bureau Veritas client portal

www.veristar.com

for a full list and detail of classification notations and statutory services.



VALUE-ADDED SERVICES

MAXIMIZE PERFORMANCE

You can benefit from our wide range of advisory services, or those of our subsidiaries, whether or not your vessel is classed to BV rules. Our experts are on hand to support safe operation and improve the performance of your vessel.

Assessment of structure and fatigue analysis

SAFEGUARD STRUCTURAL INTEGRITY

Structural integrity is a key concern for large carriers over 170m. Our advanced proprietary software and guidelines enable us to support shipowners in maintaining the structural integrity of their assets and avoiding fatigue. For large ships with Type A cargo tanks, we use our Veristar Hull software to carry out comprehensive 3D FEM fatigue analysis on structural members, including cargo tank supports and domes.

Energy efficiency services

CONTROL COSTS AND COMPLY WITH REGULATIONS

Improving energy efficiency and hydrodynamics enables charterers to lower costs while complying with IMO regulations. Bureau Veritas' powerful software tool, SEECAT, models your ship, captures energy flows and usage, predicts exhaust gas emissions and fuel consumption and enables you to calculate the ship's energy efficiency. Our specialists in Computational Fluid Dynamics (CFD), carry out a range of studies and calculations to assess performance and resistance, in order to optimize hull and trim. The result: compliance, improved efficiency and lower operating costs.

Vibration and shaft alignment analysis

IMPROVE SAFETY AND COMFORT

Incorrect shaft alignment can result in bearing failure or loss of propulsion, with possible catastrophic human and environmental consequences. Shipboard vibration and noise can also affect the safety, functionality and comfort of ships. Specialist software helps you increase safety by identifying the cause of the problem, analyzing the most suitable repair method and procedure and providing a permanent solution. Bureau Veritas has also developed a dedicated ESA notation to prevent shaft alignment problems for large ships.

Emergency Response Services

BE PREPARED FOR AN INCIDENT

At sea, an emergency situation can strike at any time, with high risk of loss of life, and damage to your ship and the environment. The first few hours following an incident are critical. Bureau Veritas' Emergency Response Service, available within 2 hours for vessels enrolled in the service, provides technical assistance 365 days per year. It brings owners and operators confidence that, in the case of an incident at sea, they can rely on a fast response and precise advice from an experienced team.

Condition Assessment Program (CAP)

DEMONSTRATE SEAWORTHINESS

Industry players, from oil and gas majors to charterers and receivers, rely on Bureau Veritas' condition assessment surveys to gain a detailed evaluation of ship condition. Surveyors who are experts in LPG carriers provide clear and detailed CAP reports, photographic records and certification. Assessments may be carried out in dry dock or in water according to requirements.

SUPPORTING INNOVATION

We support innovation, putting our experience, strong technical expertise, and advanced tools at the service of the LPG transportation industry.

ETHYLENE CARGO VAPOR AS FUEL

Shipowners and charterers seek to maximize energy efficiency and prevent pollution. Bureau Veritas has classed a series of innovative ethylene carriers that burn a mix of standard liquid diesel fuel, and vapors from the cargo in the diesel generator sets.

Built by Sekwang for Lauritzen Kosan, the first of the seven carriers was delivered in 2006. They provide 8,000 cu m capacity in 2 cylindrical type C tanks, and are able to transport liquified ethylene at a temperature of -104°C and maximum pressure of 5 bars.

The use of ethylene cargo vapor as fuel was previously untested for marine applications. Ethylene is a low flash point fuel not previously approved for this purpose. Bureau Veritas assessed the generator sets, equipment and ship design to convince the ship flag administration to approve this innovative application, which is made possible thanks to three generator sets installed in the engine room.



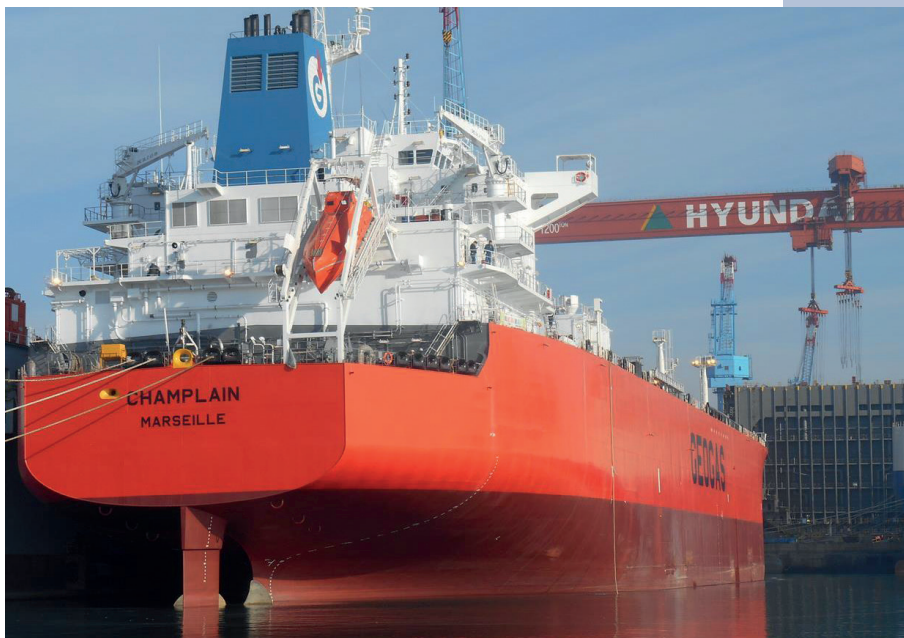
The ships were the first vessels to comply with IMO Green Passport Concept and CLEANSHIP notation for pollution prevention. The first ship "Isabella Kosan" was awarded "Ship of the Year" at the Lloyd's List London Awards 2008.



ETHANE-FUELED CARRIERS TO TRANSPORT SHALE GAS FROM US TO EUROPE

Bureau Veritas classed the first ever ethane-powered ships, JS Ineos Insight, JS Ineos Ingenuity, JS Ineos Intrepid and JS Ineos Inspiration. The 27,500 cu m ships form part of a series of eight multi-gas vessels being built for Evergas. When complete, the fleet will transport over 800,000 tonnes of ethane gas at -90° C across the Atlantic each year.

The vessels are configured for transport of liquefied ethane (LEG), LPG or LNG. They can also run on ethane, natural gas and conventional diesel power. Using ethane requires extra engine room ventilation and additional gas detection, plus modifications to the main engines including a lower compression ratio, different turbocharger nozzles and de-rating of the engine to cope with the lower knocking resistance of ethane. However the gains in terms of efficiency and environmental performance are significant.



VERY LARGE GAS CARRIERS (VLGCs)

Changes in world shipping routes as a result of the boom in US shale gas and expansion of the Panama canal have led to orders for ever-larger vessels. Many of these vessels are built in shipyards in Korea and China, with whom Bureau Veritas has strong relationships and experience of delivering large carriers.

For example, Bureau Veritas has recently classed Champlain, an 84,000 cu m LPG carrier built by Hyundai Samho Heavy Industries for GEOGAS in South Korea. Its sister ship, the 84,000 cu m LPG carrier Pointis, is still under construction for Geogas. Other recent VLGC deliveries include the Flanders Liberty (84,000 cu m) for Exmar.



190 YEARS OF **CLIENT** **CONFIDENCE**

We are driven by a single
commitment: to keep our clients'
crew and assets safe, every day

Bureau Veritas is a leading
classification society and a trusted
partner to the shipping industry
since the early 19th century. What
makes us different? The technical
expertise we offer and our deep
commitment to the marine and
offshore sectors.

WE ARE OVER 2,600 EXPERTS IN MARINE & OFFSHORE

We are experts in our chosen fields
with a common thread: our thorough
knowledge of Marine and Offshore
industries. We continually develop
and reinforce our expertise through
training, the experience we gain by
working with our clients and our
leading-edge research projects.

OUR MISSION IS TO KEEP OUR CLIENTS' CREW AND ASSETS SAFE, EVERY DAY

Protecting our clients' people, ships
and offshore structures from accident
drives every decision and action we
take. This deep sense of purpose
makes us go beyond the scope of
individual projects to find new ways to
anticipate and manage risk, promote
health & safety, and protect the marine
environment.





BUREAU VERITAS

A global leader in testing, inspection and certification, Bureau Veritas serves clients' needs in quality, health, safety, environmental protection and social responsibility.

For 190 years, our clients across all industries have looked to us to provide technical support, verify compliance, or obtain certification. Our network of over 1,400 offices and laboratories ensures we meet their needs, wherever they are in the world.

WE PROVIDE OUR CLIENTS WITH THE SUPPORT AND KNOWLEDGE THEY NEED

Our teams apply their knowledge and expertise every day to help our clients solve complex technical problems, meet regulatory requirements and optimize safety and performance. We develop advanced technology and tools, which we share with our clients.

WE WORK HAND-IN-HAND WITH OUR CLIENTS

Our relationships are built on years of service, transparency and trust: we work alongside our clients, providing the advice and calculations they need, and sharing our knowledge through training and technology. We work closely with the entire marine community: designers, yards, equipment manufacturers, contractors, shipowners and administrations around the world.

WE ARE CLOSE TO OUR CLIENTS, WHEREVER THEY ARE

We operate as a global network, following global standards, but able to react to our clients' needs locally. With 16 regional plan offices, five offshore technology centers, three research centers and 180 survey offices, we are always within reach. Information-sharing platforms across our network and with our clients, combined with our open, transparent way of working, mean we are set up to manage projects internationally.

WE ARE DEEPLY INVOLVED IN THE MARINE INDUSTRY

We seek to share our knowledge widely, and use our extensive work with clients, industry bodies and authorities to bring about positive change. Our people are proud of the role they play in creating long-term value for our clients, supporting innovation and helping the industry move forward safely. In return, our clients recognize and value our commitment to service and technical excellence.

HISTORICAL PARTNER TO THE MARINE INDUSTRY

Bureau Veritas was founded in 1828 for the initial purpose of collecting, verifying and providing maritime insurance companies with precise and up-to-date information about the condition of ships and their equipment around the world.

OVER 1,000 ACCREDITATIONS AND AUTHORIZATIONS

Our wide range of accreditations and authorizations across a range of industry sectors prove that we operate professionally and that our reports and certifications are recognized and respected. We hold 150 delegations of authority on behalf of national maritime authorities.

EXPERTISE IN UNDERLYING BUSINESSES

Our testing, inspection and certification services go beyond shipping. Bureau Veritas offers comprehensive QHSE certification services for the tourism and services industries. These cover quality, environmental, energy efficiency and food safety management, and have already been applied as an integrated voluntary scheme for cruise companies.



Move Forward with Confidence

Bureau Veritas - Marine & Offshore

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