Moving Forward

Leading the way for sustainable solutions

Testing Services For Power Plants

As a trusted partner in the energy industry, VPS understands the critical importance of safety, reliability, environmental responsibility, and efficiency. Our mission is to safeguard our customers, assets, people, and the environment. Through rigorous testing, inspection and monitoring of transformer insulating oils, lubricating oils and fuel oils, we provide expert advice aligned with legislative and technical specifications. This guidance empowers our clients to enhance business performance, optimise resource utilisation, minimise environmental impact, and operate sustainably. With a diverse range of services, VPS supports numerous power plants worldwide.

Partner with VPS for industry-leading solutions that elevate your power plant's operational excellence and environmental stewardship.

EXPERIENCE ▶ INNOVATION ▶ SUSTAINABILITY

Introduction

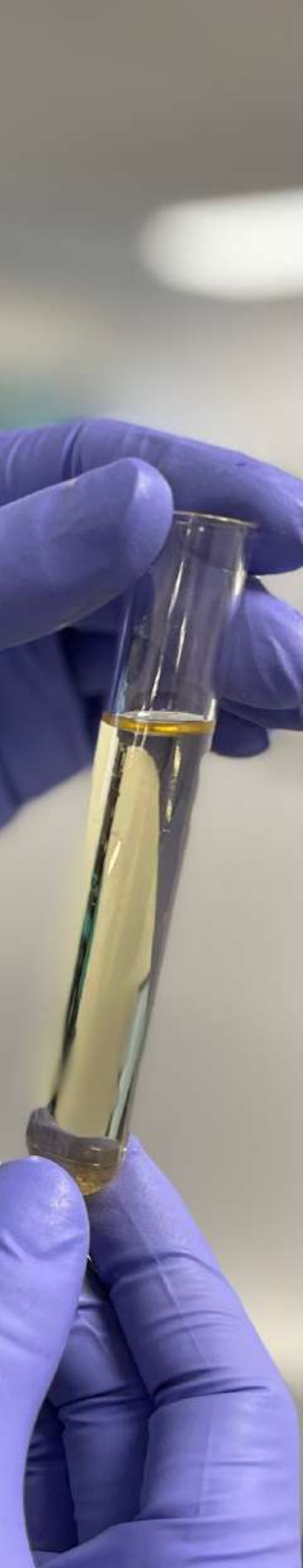
VPS is a world-leading decarbonisation testing and advisory services company, providing independent, international testing across five wholly-owned, ISO 17025 accredited laboratories, strategically located in Singapore, Rotterdam, Fujairah, Houston, and Manchester. VPS is certified to ISO 9001, ISO 14001, and ISO 45001 standards for the testing of transformer oils (TOT), oil condition monitoring (OCM), and fuel oils (FQT).

VPS offers a wide range of testing services to Power Plants, which are inclusive of sampling kits, technical support, access to the customer portal, and sample shipping:

Transformer Oil Testing

Oil Condition Monitoring (Lubricating Oils & Greases Testing)

Residual Fuel Testing (HFO)



Transformer Oil Testing (TOT)

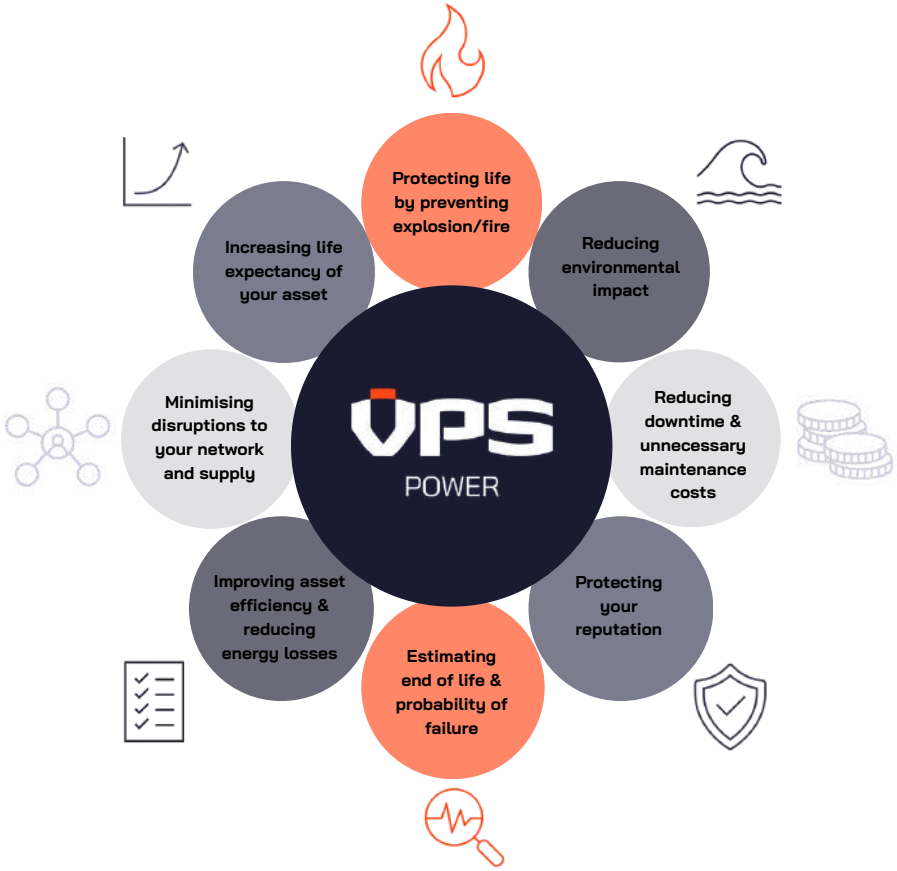
Our Transformer Oil Testing provides a bespoke service, to prevent transformer failure, ensuring consistent electricity supply. In addition, it can support the protection of the environment and the safety of people.

Testing the transformer insulating oil provides valuable information on the condition of the transformer and its oil, providing an early warning system for preventative action. It is a proven loss prevention technique that can form a key part of any condition-based predictive maintenance program.

Analysis of transformer insulating fluids provides an early indication of fault detection which can help reduce unplanned power outages and improve plant reliability. Our TOT is performed to internationally recognised test methods and standards using the most up-to-date and innovative analytical equipment.

Our technical team provides valued support to customers and advises on the most suitable testing requirements for your electrical assets including Transformers, Shunt Reactors, Tap Changers & Switchgear. Test suites cover fluid, gas, insulating paper, environmental and investigative assessments. Given the nature of the industries we serve, we provide a 24-hour emergency support hotline for urgent customer testing requirements.

Benefits of TOT



VPS is a registered member of Achilles UVDB, BSI, and the BSI GEL10 technical panel. VPS participates in Proficiency Test Schemes and has established an internal data monitoring process, using quality control samples and certified reference materials, to ensure the constant validity of our test results.

Fluid Quality Analysis

In our TOT, each parameter is analysed to provide diagnostic information on the transformer insulating fluid as detailed below:

Colour and Appearance

Changes in colour and the physical appearance of the insulating fluid can highlight changes within the asset. The change in appearance, presence of physical particles or free water or the turbidity of the fluid can all be identified with a visual assessment.

Acidity

Oxidation of the insulating fluid will occur during its service and form acidic products. Often noticed with a darkening of the fluid colour and if left unchecked can cause internal corrosion, degradation of paper, and ultimately the formation of sludge.

Water Content

Elevated levels of water can damage the mechanical strength of the paper insulation and deteriorate the insulating fluid. Ingress can be from external sources (poor maintenance activities) or internal degradation of the paper or fluid. Once lost, the paper does not recover its mechanical properties. It is worth noting that doubling the water content can half the working life of a transformer.

Dielectric Strength

In-service insulating fluids must withstand electrical stress without failure. Contaminants such as water, particles, polar compounds, fibers can reduce the dielectric strength of the fluid.

Interfacial Tension (IFT)

Determines the presence of soluble polar material and products of fluid degradation. Changes to IFT values suggest fluid degradation, or perhaps incompatibility with transformer materials (varnishes) or other materials (gaskets etc.)

Dielectric Dissipation Factor (DDF)

Measure the current leakage in the insulating fluid. Directly affected by the level of polar contaminants in the fluid. During service, the DDF value tends to increase.

Resistivity

Measure of the fluid's ability to resist the flow of direct current. Directly affected by the level of polar contaminants in the fluid. During service, the resistivity value tends to reduce.

Furanic Compounds

Organic compounds formed during the degradation of the paper insulation. Tool to determine the remaining useful life of the paper insulation via a relationship with the degree of polymerisation value of the cellulose.

Estimated Degree of Polymerisation (DP)

The estimated DP value indicates the average paper condition across the whole of the transformer. Provides an indication of the remaining useful life of the paper insulation and consequently the transformer.

Polychlorinated biphenyls (PCB)

Organic chlorinated compounds, previously used as transformer insulating fluids but subsequently banned due to health and environmental concerns. Now classified as Persistent Organic Pollutants and controlled as part of the Stockholm Convention. All transformers should be tested to determine the PCB content.

Transformer Health Analysis

Dissolved Gas Analysis (DGA)
Under electrical or thermal stress insulating fluids break down generating gases. The types and amount of gases generated indicate the type and severity of the fault, allowing for specific faults (thermal, arcing, partial discharges) to be detected and therefore early maintenance actions to be scheduled. VPS uses several internationally recognised diagnostic tools (Roger ratios, Duval triangles, and pentagons) for our expert interpretation.

Additional Analysis

Particle Counting
Insulating fluid cleanliness is affected by paper degradation and external contamination. Particle counting measures particles present in the fluid often unseen by the human eye, reducing dielectric strength and catalysing further oil degradation.

Metal Analysis
Pumps, fans and other components can undergo wear and can contaminate the insulating fluid with wear metals. These can catalyse further fluid degradation and reduce the dielectric strength.

Corrosive Sulphur
Metallic sulphides can be formed at high temperatures on hot surfaces which leads to a reduction of the electrical insulation properties.

Oil Condition Monitoring | Lube Oil Testing

The main function of lubricating oil is to reduce friction and wear, cool parts, and form seals. Lubricants also absorb shock loads, dampen noise and act as cleaning agents. Degradation of the lubricating oil occurs naturally over time as the protective additives are consumed and engine breakdown products build up. By testing the oil, diagnosing the results, and trending this data over time, valuable information on the condition of an asset may be obtained. This allows the early detection of lubricant deterioration and identification of unusual mechanical wear, enabling proactive action to prevent breakdown. Oil Condition Monitoring (OCM) provides an early warning system helping to avoid costly asset failure and downtime and therefore has an important role in preventive maintenance programs in Power Plants.

In the Power sector, asset performance and reliability is extremely important. OCM provides two principal benefits – it reduces mechanical failure and downtime and extends the lifetime of the lubricant, resulting in substantial savings on repair overhaul cost and usage of lubricating oil. Regularly scheduled lubricant testing and expert advice provides our clients with comprehensive information on the condition of the lubricating oil and the health of the asset. This information can then be used to replace the lubricating oil before it fails, optimizing usage and to identify mechanical problems and mitigate costly failure and unscheduled maintenance.

Testing a sample of lubricant to assess the health of an asset is like testing a sample of blood to assess the health of a patient.

The OCM report includes information on lubricant quality for mechanical equipment based on several tests including viscosity, flashpoint, Total Base Number (TBN), Total Acid Number (TAN), water content, particle count and wear metals. The report captures the previous test results and the analysis of this data, trending, and technical comments assist our clients in making a decision on whether to continue the use of the lubricant or make partial/complete renewal, thus optimizing performance since complete renewal of oil is a costly affair because large assets may contain thousands of liters of oil. In practice, the oil remains in the sump as long as the quality permits, with fresh oil added from time to time to compensate for the losses. Monitoring oil condition maximizes the life of the lubricant and minimizes the oil related machinery damage. With its global network of offices and technical experts integrated with three wholly owned testing laboratories located worldwide, VPS can assist clients with expert and impartial advice on oil usage and identify any tell-tale signs of major damage so that preventive measures can be taken.

Benefits of OCM | Lubricating Oil Tests

Market leader with impeccable track record of over 30 years

VPS has years of experience in testing lubricating oils for engine makers, power plants and sea-going vessels.

Strong global team with extensive lubricating oil experience

VPS is actively involved in testing oil samples and provides expert advice.

Independent third-party analysis

VPS does not sell lubricating oil. Hence, there is no conflict of interest and the expert advice on the oil usage is impartial.

Independent assessor

VPS is an independent assessor. Such assessment carries value in a damage investigation, especially in a warranty claim situation.

Early identification of damage to reduce downtime

VPS assists clients in identifying signs of damage at an early stage so operators can take preventive measures and avoid costly breakdowns and repairs.

Trending analysis

Comprehensive report with trending analysis and tailor-made comments by our expert technical advisers.

Competitive and market-oriented pricing structure

VPS has a comprehensive package suitable for damage investigation. It also has the flexibility to be adapted to routine OCM or combined with FQT as a package.

Highest quality

VPS laboratories are equipped with sophisticated, state-of-the-art testing instruments and strict quality controls are in place to maintain the highest accuracy in test results.

Global Footprint

VPS operates a global network of offices and technical experts integrated with three, ISO 17025-accredited, wholly-owned OCM testing laboratories located in Rotterdam, Singapore and Houston.

Seamless Transportation

Seamless transportation of samples is ensured by our global logistics service.

Residual Fuel Testing | HFO

Heavy Fuel Oil (HFO) power plants, demand special fuel handling to ensure efficient combustion and prevent equipment damage. Safety considerations govern the storage and handling of heavy fuel oil. Fuel treatment processes eliminate impurities before combustion. Large tanks store heavy fuel oil and proper fuel handling procedures are crucial for optimal performance. By adhering to these procedures, heavy fuel oil power plants can operate smoothly and generate electric power effectively. Moreover, in accordance with the terms of the contract, companies are required to test their fuel to maintain documentation of fuel suitability and the EPA regulations that require compliance.

Heavy Fuel Oil (HFO) is a viscous, residual fuel commonly used in power plants, where the quality and composition of the fuel can vary widely depending on its source and production method. To ensure the HFO meets the required standards and specifications for safe and efficient combustion, plus minimizing any environmental impact, it is important to perform testing as per international quality standards. The Heavy fuel oil (HFO) test services offered by VPS will allow power plants to comply with the legislation and standards established in the regulations, as well as issuing a status diagnosis of its components. The test results are compared to the limits and criteria specified in such standards, to determine the quality and suitability of the HFO for its intended use. Depending on the test results, the HFO can be treated, blended, or disposed of safely and legally.

Beyond fuel quality testing, VPS in-house technical experts are always at the forefront of developing extended analytical services which can be used to provide troubleshooting support when needed through our global network of offices we offer unmatched 24/7 service across all time zones with fast and reliable advice from an experienced international team of fuel experts. As a service to our clients, we also provide circulars and technical newsletters which help our customers keep abreast of the latest developments, trends, and regulatory changes.

Benefits of Residual Fuel Testing | HFO Testing

Quality assurance
(Cleanliness and purity of fuel truck deliveries and fuel stored in tanks)
Every new delivery of fuel needs to be tested to ensure it's quality. Fuel stored in tanks needs to be tested at least twice a year. Factors such as heat, humidity, and oxygen have an impact on the condition of stored fuel. Consider that fuel stored for long periods can start to degrade in as little as three months.

Prevention of catastrophic failures
Contaminated fuel can damage the components and fuel systems. For example, fuel injectors can become clogged by impurities and fail. The impurities can also cause abrasion and increase the rate of component wear. This leads to early replacement of expensive engine components. Serious contamination can be devastating – even simple fuel treatments cost $1,000s, and take critical assets out of operation during treatment.

Maximise power output
Impurities can prevent fuel from burning efficiently. This limits the machinery's power output and can have a significant effect on productivity. It can also increase fuel consumption and ultimately drive down profits.

Diagnosis of possible conditions
Fuel testing can also help identify the root cause of many issues including, asset performance concerns, reduced combustion efficiency, increased corrosion of fuel components, fuel filter plugging, injector damage, EPA compliance etc.

Fuel System Check | Fuel Oil Cleaning System

Even if a delivered fuel meets the ordered specifications, it is imperative that the fuel treatment plant is operating at maximum efficiency, or asset damage may occur. Sampling from a fuel system when a problematic fuel is delivered will also help indicate the efficiency of the treatment plant and thus assist the plant staff in taking preventive action, if needed. Sampling before and after separators is also considered the only feasible condition and performance monitoring of the fuel. Periodic sampling from the fuel treatment system will also identify such problems as water ingress from storage tanks, and leaking heating coils. A good fuel management system would include such sampling and analysis at least once a year. Experience gained by VPS and our customers since the introduction of the VPS Fuel Quality Testing program, coupled with studies and research, confirms that fuel treatment systems are not always operated at optimum efficiency.

Fuel contamination may also occur in the plant's fuel system and tanks due to, say, defective steam heating coils or water ingress resulting from badly located or damaged vent pipes. Efficient centrifuge operation is essential for the removal of heavy fuel oil contaminants. With the FSC samples, malfunctions and defects in the centrifuges can be identified. The purpose of the FSC samples is to monitor the power plant fuel system, i.e., the 'gap' between the plant's manifold and the engine in a systematic manner. This is achieved by analysing samples drawn from key locations to assess the total fuel oil system operational condition.

For example, a specified limit, indicates 60mg/kg Aluminium + Silicon (Al+Si) as the maximum amount of catalytic fines (catfines) permitted in the higher viscosity HFO grades as delivered. However, major engine manufacturers recommend less than 15mg/kg Al+Si at the engine inlet. Hence, assuming a delivered fuel contains 55mg/kg Al+Si, the fuel treatment plant has to operate at an efficiency level capable of removing over 70% of these highly abrasive materials, in order to meet the engine manufacturers' requirement.

Risks of Abrasive Particles | Catfines

Engines wear and damage

Catalytic fines remaining in the fuel oil after separation and filtration have the potential to cause abrasive wear and damage to the engine. With a high content of cat fines in the fuel oil, the engine will require maintenance more often and the risk of damage and unsafe operating conditions is larger. Less cat fines means less wear, so the amount of cat fines should be always kept as low as possible.

Pre-heaters

Pre-heaters raise the fuel oil temperature to the correct separator inlet temperature. If the pre-heaters surface are clogged by cat fine deposits it will limit the heating capability and will lead to a reduced separator inlet temperature and, eventually, poor separation and failing separators.

Fuel injection system

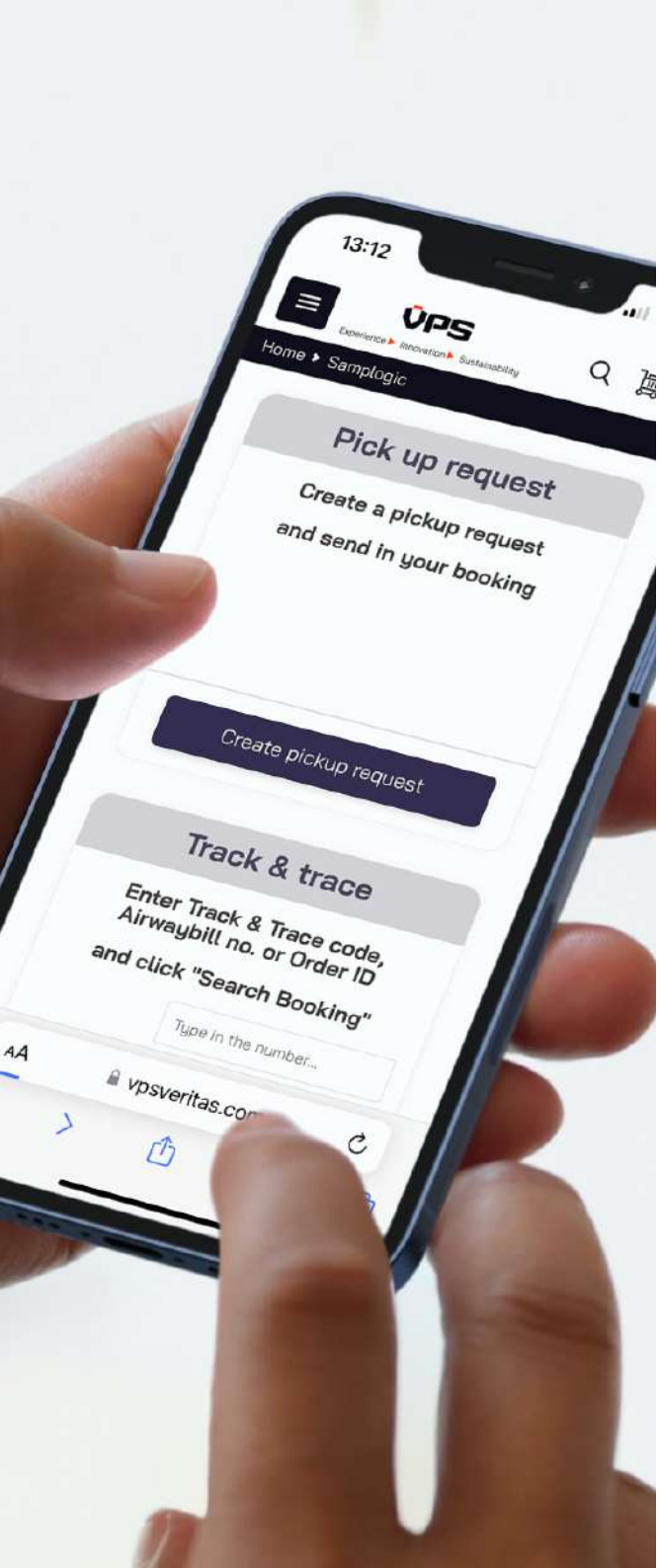
The fuel nozzles are normally the first part to be damaged from abrasive particles. Abrasive particles change the size and shape of the injector holes. Any change of the holes alters the injection spray pattern of the fuel oil, which will cause poor combustion, fouling and consequential damage such as sticking and broken valves, damaged turbochargers, etc. In the fuel pump, abrasive particles will be trapped between the plunger and barrel and may cause wear or even seizures. Excessive wear of the plunger and barrel affects the injection pressure and timing and, thereby, causing poor engine performance, limiting the power output.

Combustion chamber

When the engine is running, the cat fines from the fuel will be trapped between the piston ring and groove or between the piston ring and liner causing wear to develop quickly on these components. In severe cases the piston and liner will wear out in a very short period of time, even down to a few hundred hours of operation. The symptoms are low compression pressure and high lube oil consumption.

Recommendation

HFO fuel should be cleaned, and abrasive particles removed before it is used in the engines. Poor fuel oil cleaning may result in severe damage and expensive repairs and downtime. For long lifetime of components and trouble-free operation of the engines, fuel cleaning system efficiency is important and should be checked every third month as a minimum. Therefore, to check the efficiency and ensure low levels of abrasive particles, drawing samples from before and after the separators and sending for lab analysis is very essential.



VPS | Added Value

Bespoke Tests

For us to remain ahead of the continuing evolution of fuel and oil types, plus ever-increasing environmental legislation, we constantly look to develop new analytical tests to help keep our customers on the right side of change. Our innovative approach and anticipation of future requirements, help us drive testing forward. To this end, our bespoke test method developments, such as Wax Appearance Temperature Testing, GCMS, Lube Oil Particle Count, and Oil Compatibility testing, are now established, value-added tests, which our customers rely upon, to help protect and improve their business and environmental requirements.

Bespoke Technology

Our innovative approach and anticipation of future requirements, help us drive, IT systems, automation, and robotics forward. To this end, our bespoke developments, such as robotic sample handling, lab automation, Laboratory Information Management Systems (LIMS), and "big data" services, are seen as value-added technologies, which improve the efficiency and effectiveness of our own, plus our customers, business, and environmental requirements.

VPS Customer Portal

Client's analysis reports are available 24/7 online at the VPS online Customer Portal. VPS' online password-protected Customer Portal allows clients to view their test results round-the-clock. This internet-based service is continuously updated with the latest results from all VPS laboratories. Historical data of client's samples tested within the last two years can be retrieved.

VPS SampLogic

Client or their local agents can activate sample collection world-wide via our online shipping tool. Shipping documents will be auto generated by the system bringing added value and convenience to the user. No login is required. URL: http://samplogic.v-p-s.com. For sample dispatch to our laboratories, we partner with reputable international courier companies (i.e., DHL, FedEx, and TNT) for the worldwide transportation of samples.

Contributing to Global Sustainability Development Goals

We are delivering four key UN SDGs by working to improve the quality of the air we breathe, helping create sustainable energy, lessening the effect of climate change, and improving the way we treat our oceans. For forty years we have made a positive difference to how we grow sustainably – and we're committed to delivering even greater change in the future.

ENSURE HEALTHY LIVES AND PROMOTE WELL-BEING FOR ALL AT ALL AGES

- Our services are essential for compliance with the IMO's 0.5% S Cap to help give us all cleaner coastal air.
- Our services are vital for compliance with the Stockholm Convention reducing Persistent Organic Pollutants.

ENSURE ACCESS TO AFFORDABLE, RELIABLE, SUSTAINABLE AND MODERN ENERGY FOR ALL

- We work with a number of partners on R&D projects to support the development of green marine fuels.
- Our services help ensure a reliable and consistent supply of electricity to industrial and domestic consumers.

TAKE URGENT ACTION TO COMBAT CLIMATE CHANGE AND ITS IMPACTS

- Our services ensure fuel is burnt efficiently in vessels' engines for optimal propulsion, minimising GHG emissions.
- We support the renewables sector, servicing wind farms, solar energy and bioenergy.

CONSERVE AND SUSTAINABLY USE THE OCEANS, SEA AND MARINE RESOURCES FOR SUSTAINABLE DEVELOPMENT

- Our services are critical to reducing ocean acidification by minimising CO2, NOx, SOx emissions into the atmosphere.
- Our services are vital to reducing marine pollution by preventing leakage of fuel into the ocean during bunkering.

Join us on this journey

Join us in the journey towards a greener, more sustainable maritime industry. At VPS, we are committed to accelerating the shift towards a low-carbon future, and we invite you to be part of this transformative change. Let's collaborate to reduce your carbon footprint and make your operations more eco-friendly. With VPS, you will gain access to data-driven solutions, expert advice, and digital tools that guide you along the path to sustainability. Together, we can create a more environmentally responsible and economically efficient maritime sector.

Contact us today and let's pave the way to a cleaner, greener future for the maritime industry.

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