Wärtsilä HY
The Wärtsilä HY has been granted Approval in Principle by both the Lloyd’s Register and ABS marine classification societies.

The Wärtsilä HY uniquely captures these opportunities to enhance the performance of your vessels. It is designed to cut operating costs, optimize energy efficiency and increase safety, while always meeting the most stringent environmental rules.

The development of effective energy storage technology has been a key enabler of hybrid propulsion systems. By being able to utilize either engine power or batteries for propulsion, the dual targets of efficiency and sustainability can be met effectively.

The use of hybrid technology is central to achieving a cleaner, safer, more efficient, and profitable future.

The Wärtsilä HY is the result of mastering the synergies made possible by Wärtsilä’s unique range of in-house competences in engine technology, propulsion, electrical & automation, as well as digital and smart technologies.

For the first time in marine industry equipment development, each individual component, including the engine, the power drives and the energy storage system, has been specifically engineered for the purpose.

The hybrid power module combines the various components through an innovative and highly sophisticated, fully integrated Energy Management System (EMS) - the “brain” of the system. This controls the energy flows between the different power sources, and connects to the onboard navigation system, enabling an entirely new level of onboard interaction.

This kind of total control is unique to the Wärtsilä HY. It is not possible with conventional systems where the energy storage system is simply added to the mix without all the corresponding components working in unison.

Perfect integration
The unrivalled features of the Wärtsilä HY derive from the company’s broad portfolio of products and systems. This increases the

Wärtsilä HY: establishing a new benchmark in maritime efficiency and sustainability

The world is moving very fast for owners and operators in today’s marine industry. Environmental awareness and changing energy needs are playing a vital role in creating new challenges while opening the door to exciting opportunities.
system’s robustness by reducing the number of interfaces between sub-systems, thereby ensuring optimal performance throughout the whole power distribution chain. The implementation of predictive tools, such as Eniram’s advanced solutions, enables the system to know in advance the overall requirements of the vessel, and to adapt accordingly in order to provide maximum efficiency.

The Energy Management System is the enabler of this perfect integration. It provides the most innovative operative features, such as:

- **Green mode with zero exhaust emissions**: when selected by the operator, power is supplied exclusively through the energy storage system until the pre-set minimum state of charge is reached.
- **Start & stop**: at low loads, the power is supplied exclusively by the energy storage system until it reaches a pre-set minimum state of charge. At this point the engine is automatically activated, providing power to the ship and simultaneously re-charging the energy storage system.
- **Instant load taking**: the module is able to react instantly to fast and significant changes in the power demand.
- **Cold system start-up**: the energy storage capacity eliminates the need to wait for the engines to warm-up, thus providing instant ship readiness.
- **Peak shaving**: load fluctuations are absorbed by the energy storage system, allowing stable operation of the machinery.
- **Power boost**: the engine and energy storage system can supply power at the same time, thus enabling an instant power boost in output.

- **Automatic power back-up**: an increased level of safety is reached through emergency back-up algorithms and built-in redundancy of the power sources.
- **Smokeless operation**: visible smoke emissions can be avoided by the synergy between the energy storage system and the engine.
- **Wireless charging**: an electro-magnetic field is used to transfer energy between two conducting coils, enabling 2 MW of power to be transferred within a range of 15-50 cm between the coils.
- **Automated operations (auto-docking)**: Among the various possibilities for fully integrating and optimizing the Wärtsilä HY power module with the navigation systems, is the recently introduced “SmartDock” auto-docking function.

**Guaranteed performance**

The Wärtsilä HY operates with multiple modes to optimize the system’s response to changing conditions. This flexibility notably enhances the vessel’s fuel efficiency and overall performance.

Compared to conventional solutions, the Wärtsilä HY has a higher level of redundancy, which allows the engine to operate closer to its optimum design point, and with minimal emissions.

Even when the load varies, the advanced Energy Management System logics are able to improve fuel consumption and overall system performance by optimizing the energy supply. Annual fuel savings have proven to be as much as 20%, depending on the vessel typology and configuration of the engines.
Suitable for all kinds of ships

The Wärtsilä HY is designed for both diesel-mechanical and diesel-electric propulsion, meaning that vessels of all kinds can benefit from the innovative HY technology. These include tugs, ferries, cruise ships, dredgers, icebreakers, fishing boats, and many others. Furthermore, Wärtsilä elaborates and configures the system according to the specific operating profile and needs of each vessel.

Wärtsilä HY for Tug

One of the first beneficiaries of the Wärtsilä HY revolution have been tug owners, recognizing the huge advantages this innovative product offers. Cold start up, smokeless operation, the start and stop feature, and the extra power boost elevate tugs to the next level.

With this new set up any tug is able to assist ships, regardless of the conditions, with unprecedented operational effectiveness and environmental performance.

Reference

New icebreaking tug for the Port of Luleå

The Swedish port of Luleå has ordered two Wärtsilä HY power modules for its new icebreaker escort tug. The hybrid diesel-electric mode will allow the number of prime movers utilized to be reduced to just one for various operational tasks, including ship assist, with a 90 tons bollard pull on two main engines in diesel-mechanical mode.

The Wärtsilä HY can guarantee extra flexibility and safety using the start & stop feature and power boost mode, which provides a bollard pull of 100 tons. Smokeless operation and the green mode ensure enhanced environmental performance, and compliance with both local and international legislation.
Wärtsilä HY for **Cruise**

Wärtsilä HY for Cruise is the solution that enables a ‘zero emissions’ future and a new ultra-efficient way of powering cruise ships.

It is a system that goes beyond the standard vessel’s power production concept. The capability to combine different fuels with different energy transformers and an Energy Storage System (ESS) is the key element in creating an eco-friendly vessel with enhanced safety, flexibility, and versatility.

Thanks to its reduced smoke emissions and the green mode feature, it is the perfect solution for all cruise operations in even the most sensitive environmental areas, enabling compliance with the most stringent emission limits.

It is scalable to any size of vessel, from small yachts to huge cruise vessels, and can be applied to any Wärtsilä engine size and type, covering a broad power range, up to 100 MW and beyond.

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Wärtsilä HY for **Ferry**

By combining and integrating the Wärtsilä HY with the extensive Wärtsilä propulsion portfolio, ferry operators can achieve a greatly reduced environmental impact on the port communities they serve, while ensuring better passenger comfort. Engine noise, vibration, and smoke are all drastically reduced, or even entirely eliminated, when in port and during shorter sailing routes (green mode). At the same time, excellent maneuvering performance, huge fuel savings, and less maintenance requirements are assured.

The green mode is illustrated below for a ferry equipped with diesel mechanic propulsion, two main propellers, bow thrusters, and rapid ESS wireless induction charging. The estimated payback time for this configuration is approximately 4 years, depending on fuel and shore power prices.

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**Reference**

The Norwegian car ferry ‘Folgefonn’, which has also been retrofitted with a full-scale hybrid and plug-in solution. In plug-in hybrid operation, the fuel savings are between 20 and 30%, while in pure plug-in operation, zero fuel is consumed.
**Wärtsilä HY for Dredger**

Dredger operators can derive significant benefits from the Wärtsilä HY, thanks to the increased load taking capability and enhanced reliability, which provide smooth and continuous operations, and which avoid high stress conditions for the mechanical components.

The Energy Management System (EMS) ensures instant load taking and dynamic power demand, and can be further tuned for performance optimization to meet different dredging operation requirements. The operating costs are considerably lower than with a conventional machinery arrangement, because the EMS control provides increased energy efficiency with the engines running at optimal and stable load for better fuel consumption. With greater fuel efficiency, fewer engine cylinders, and reduced engine running hours, the payback time can be as short as 1-3 years, depending on the actual operational requirements.

**Wärtsilä HY for Offshore**

The key enablers provided by the Wärtsilä HY for offshore vessels include reliable and flexible operations. The Wärtsilä HY for offshore offers reduced fuel consumption, especially in dynamic positioning operations, while the extended time between overhauls enable a higher rate of vessel utilization. The ESS redundancy increases even more the safety levels of offshore operations.

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**References**

The ‘North Sea Giant’, one of the world’s largest and most advanced subsea construction vessels, which is now able to maneuver on fully electric power following the retrofitting of a Wärtsilä HY system.

The ‘Viking Princess’, an offshore supply vessel with the new energy storage solution, which replaced one of the vessel’s four generators to provide balancing energy to cover load peaks.
HY Zero

Wärtsilä zero operations represents an innovative utilization of alternative energy carriers through carbon neutral fuels (such as Hydrogen, Ammonia, and the use of other Energy Storage Systems, including Electrically Charged Batteries).

Wärtsilä has developed an all-electric power module, capable of utilizing electric batteries in combination with fuel cells, which can be driven either by Hydrogen or LNG to deliver carbon-free operations.

The Norwegian ferry ‘Folgefonn’ and the offshore supply vessel ‘Viking Lady’ are both excellent examples of ships operating with zero emissions, thanks to Wärtsilä innovations.

Wärtsilä HY Upgrade

Hybrid solutions are not only for new build vessels. Existing ships can be retrofitted to benefit from Wärtsilä’s advanced hybrid technology. A hybrid retrofit reduces the vessel’s energy consumption, operating costs, and exhaust emissions. By using a hybrid-battery system to provide the back-up and redundancy power, the ship’s operational engine can be used closer to its optimal load, with more stable load on the engines and lower maintenance costs.

Wärtsilä completed its first hybrid conversion project already in 2014. The ‘Viking Lady’, a platform supply vessel owned by Eidesvik Offshore, was fitted with a Wärtsilä Low Loss Hybrid system, enabling fuel savings of 15% and consequently fewer exhaust emissions. The system allows one engine and a single battery to operate at the most efficient loading point, since the battery is used to reduce frequent load variations on the engines with a charge/discharge strategy.

Why Wärtsilä HY?

Operational optimization is the target for owners and operators around the world in today’s challenging business environment. The need to reduce fuel costs, improve performance, and comply with local and international emissions legislation is driving the move towards hybrid technologies.

Look at the benefits:

- Lower fuel costs through reduced engine use
- Less maintenance of the engines since operating time is reduced
- Minimized levels of exhaust emissions – even zero emissions in ‘green’ mode
- Smokeless operation is possible, thanks to Wärtsilä’s patent-pending automation procedure
- Improved noise and vibration levels for unrivalled on-board comfort
- Enhanced systems redundancy
- Greater flexibility of the vessel’s systems.

Central to all these advantages is the increase in operational efficiency they make possible. It is not surprising, therefore, that hybrid propulsion is expected to represent a significant percentage of all contracted ships within the next decade.

Wärtsilä’s purpose is to enable sustainable societies with smart technologies. Using high levels of connectivity and digitalization, Wärtsilä intends to lead the shipping industry’s transformation towards a smart marine ecosystem.

By leveraging its strengths as a technology leader, Wärtsilä has developed a series of innovative hybrid power products that create levels of efficiency and environmental sustainability not possible with conventional hybrid systems.

Services

Wärtsilä Services supports its customers throughout the lifecycle of their installations by optimizing efficiency and enhancing their operations, thereby helping to grow their business. Wärtsilä’s service network of approximately 11,000 professionals in 160 global locations is unmatched in the marine and energy sectors, delivering services to more than 12,000 customers every year.

Wärtsilä Services’ portfolio of solutions and services is the broadest in the industry, ranging from supplying spare parts to optimizing customer operations and providing performance guarantees. Wärtsilä is committed to providing high quality, expert support, and to making its services available in the most environmentally sound way possible, whenever and wherever needed. By developing close relationships with customers, Wärtsilä enables an in-depth understanding of their business so as to extend the value of its services accordingly.

The Wärtsilä HY represents an important step forward along the path towards a greener and smarter marine ecosystem.
Wärtsilä is a global leader in smart technologies and complete lifecycle solutions for the marine and energy markets. By emphasising sustainable innovation, total efficiency and data analytics, Wärtsilä maximises the environmental and economic performance of the vessels and power plants of its customers.