

INTEGRATED SOLUTIONS FOR OFFSHORE PRODUCTION AND STORAGE UNITS

ENERGY
ENVIRONMENT
ECONOMY



Wärtsilä's integrated solutions include power generation, propulsion, vessel positioning and product handling as well as customized design covering Wärtsilä and Wärtsilä Hamworthy product ranges. We offer and integrate e.g. diesel electric systems, engines, thrusters, electrical and automation systems, telecom and navigation, bridge, dynamic position systems (DP), compressors, nitrogen generators, emission control systems, water treatment systems, oil & gas handling, inert gas systems, pumps and valves.

Wärtsilä has the capability to take comprehensive responsibility for the delivery and commissioning of integrated offshore solutions. We deliver proven designs, engineering, products and concepts integrated into total solutions. Our worldwide service network provides lifetime support for the units in operation.

Wärtsilä's integrated projects incorporate oil & gas and marine operational skills, as well as substantial know-how. For the offshore drilling and production market we deliver integrated solutions for the following types of unit:

- FPSO, FSO • FLNG • FSRU • FSU
- Semi-subs • Fixed platforms • Drilling units (jack-ups, ships and semi-subs)
- Well intervention and well test units

At Wärtsilä, we are passionate about optimising lifecycle value by offering precisely what each of our customers need. We can deliver on this promise because we provide integrated solutions, products and services for every phase of oil and gas exploration, production, transportation and refining worldwide – both onshore and offshore. Even though this brochure is just

a beginning to learn why we are involved in bringing more than 5 million barrels per day to the market, which is more than 6% of the total world oil production, it still demonstrates how we are able to customise our comprehensive offering in order to give customers a crucial competitive edge. Whatever the conditions, we deliver world-class efficiency, fuel flexibility and environmentally sound solutions.


WÄRTSILÄ

A POWERFUL ALLIANCE TO SERVE THE OFFSHORE MARKET

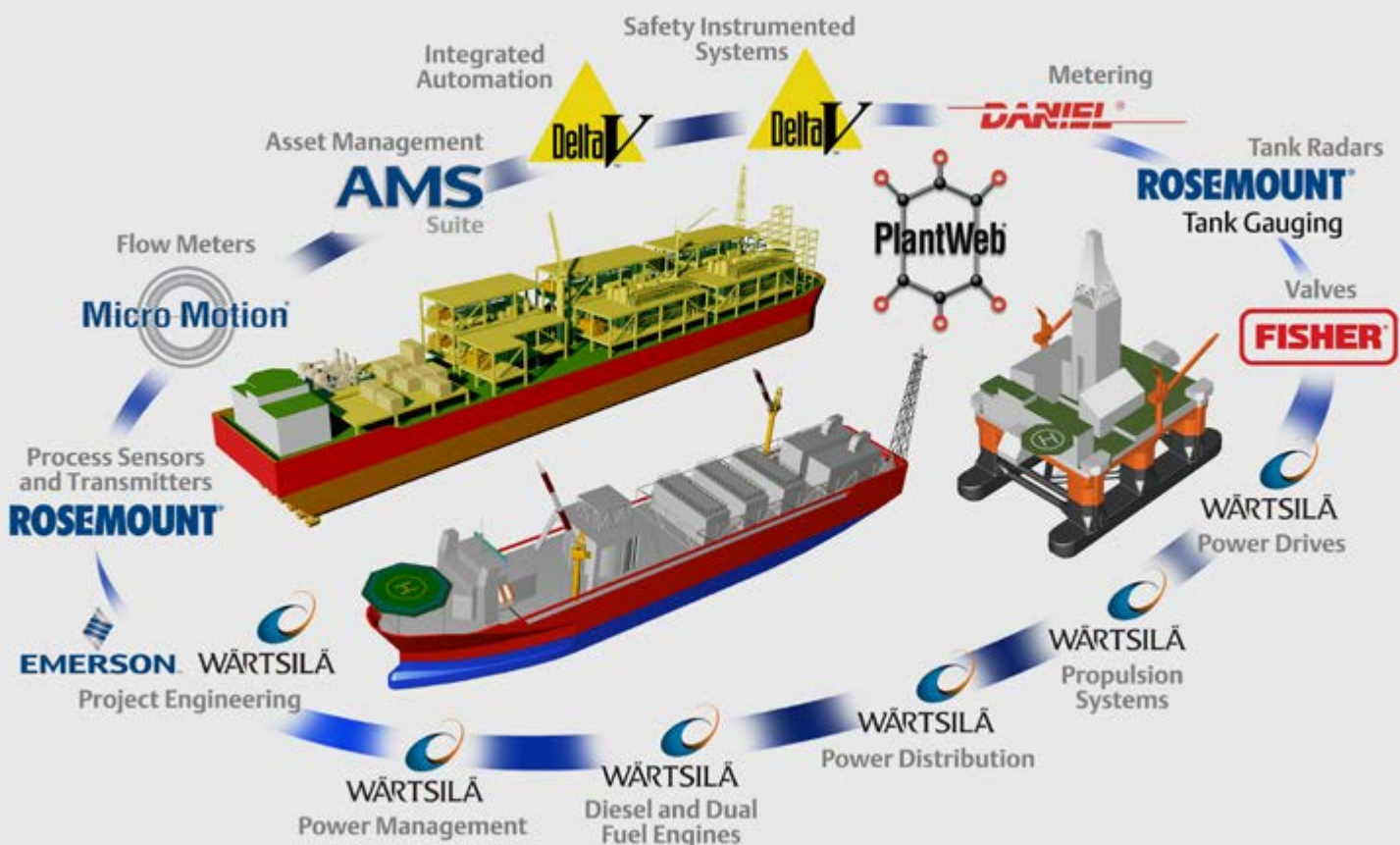
Both Wärtsilä and Emerson are major suppliers to the offshore industry, and by combining our strengths, technologies and capabilities we form a unique partnership.

The Wärtsilä Emerson Alliance produces and delivers products and systems that range from power generation, power distribution, and propulsion, to a completely integrated

control and safety system. We take projects from the feasibility study phase, to the front-end engineering and design (FEED), all the way through to the system's delivery and installation, and then continue by offering lifecycle support during operation.

The complete scope includes EICT (electrical, instrument, control and telecom),

power generation and thruster systems. Wärtsilä and the WE alliance also offer engineering services, and take responsibility for the complete detailed interface engineering of the EICT, power plant and propulsion package. This makes it easier to handle the challenges related to multiple interfaces, fragmentation of responsibility and reduces the risk of delays.



RELIABILITY AT EVERY STAGE

Today Wärtsilä is the leading power generation provider with a wide range of engines that are able to run on various fuels. For example, Wärtsilä's dual-fuel technology means that engines can be powered by treated gas or crude from the reservoir, whenever possible. We offer crude and gas handling systems, fire- and seawater pumping, and safety and emissions reduction systems such as inert gas and hydrocarbon blanketing. We also offer separation solutions to enhance production and waste water management systems. For FLNG vessels we offer modular LNG liquefaction plants, based on nitrogen as single refrigerant media, and complete LPG and condensate handling systems.

We also supply technology to safely capture and handle flare gas, VOC recovery systems to reduce VOC emissions by 100% and solutions to relieve boil-off gas and return LNG back to cargo tanks.

Wärtsilä's reliable systems have an excellent track record. Reliability is a prerequisite for safe operations and high availability at all times. Our offshore solutions enable drilling rigs and production units to operate smoothly even in remote areas and under the most demanding conditions.

WÄRTSILÄ DELIVERS SUPERIOR CUSTOMER VALUE IN OFFSHORE PRODUCTION THROUGH OUR:

- Early involvement and knowledgeable support
- Best-in-class, comprehensive products integrated into solutions
- Extensive experience in project management and site support
- Global presence, offering worldwide local support and services throughout the unit's lifecycle.

REFERENCES



100 MW OF FLEXIBLE POWER

The P-63 will be the first FPSO to utilize gas engines to produce more than 100 MWe of power. The Wärtsilä 50DF engines offer true fuel flexibility as three different fuels can be employed: natural gas, marine diesel oil and crude oil.

The complete package consists of 3 power modules designed and produced with Wärtsilä as the EPC contractor. Each module has two 18-cylinder Wärtsilä 50DF trifuel engines with alternators and all required auxiliary equipment. The contract includes commissioning, start-up and operational supervision. The power modules were installed on P-63 in December 2011 and oil production is scheduled to begin in 2013. The vessel will operate on Brazil's new Papa Terra oilfield, located some 110 kilometres off the coast of Rio de Janeiro in the southern Campos Basin.



A SAFE CONVERSION

The 'Petrojarl Cidade de Rio das Ostras' was converted into a floating production storage and offloading (FPSO) vessel in 2007.

This former tanker is now capable of processing up to 15,000 barrels a day. Currently, it is producing oil from the Siri reservoir, some 85 kilometres off the Brazilian coast.

The conversion included the installation of a bow offloading system, a flare tower, mooring arrangements, a variety of oil processing modules, a riser balcony and

laydown area, a boiler with auxiliaries, forward and aft offshore cranes, an extended control room, lifesaving appliances and a helideck.

Wärtsilä was also responsible for the engineering of electrical, automation, instrumentation and telecom systems. Safe operation of the FPSO vessel is enhanced through shutdown systems that can be triggered automatically or manually. The integrated control and safety system was provided by Wärtsilä's Alliance partner Emerson.

THE WORLD'S LARGEST DRILL SHIP

Wärtsilä delivered the integrated power and control solution for the world's largest ultra-deepwater drillship/FPSO vessel, the Dalian Developer. The Dalian Developer will be drilling in water depths up to 10,000 feet with a maximum drilling depth of 30,000 feet. It is also designed for extended well testing and production with an extensive deck space and large variable deck load capacity accommodating process facilities and a capability of storing up to one million barrels of oil.



EXAMPLE OFFERING FOR A FPSO

- Engines – propulsion and gensets
- Thrusters and propulsors
- Power distribution
- Automation
- Engine room pumps
- Pump room systems
- Seawater lift pumps
- Deepwell cargo / offloading pumps
- Firewater pumps
- Inert gas and nitrogen systems
- Hydrocarbon blanketing systems
- Oil separation
- Flare gas recovery
- Waste treatment systems
- Seawater valves
- After sales services



REFERENCE

TOTAL INERT GAS SOLUTIONS FOR TOTAL

Four FPSOs for French super-major Total currently feature Wärtsilä Hamworthy's inert gas systems. Each vessel has a storage capacity of 2 million barrels. Two of them will be based offshore Angola and the other two in Nigeria. Commissioning of the IGS on the DALIA FPSO has also been completed, while the already commissioned AKPO FPSO has reached the 'first oil' stage. Two further systems underwent full scale tests at Wärtsilä Hamworthy's test generator in Moss, Norway, before they were installed in the PAZFLOR FPSO and USAN FPSO. Wärtsilä Hamworthy has also been contracted to deliver a fully assembled inert gas system to the Goliat FPSO, located in the Barents Sea, and on an FPSO for the challenging Clov oil complex of Angola, also for Total.

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