



Dual-fuel engines

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## **MAN Diesel & Turbo Scores Significant Dual-Fuel Reference**

Five dual-fuel MAN 51/60DF engines to form diesel-electric propulsion plant for new LNG vessel 'Castillo de Santisteban'

**STX Offshore & Shipbuilding, the South Korean shipbuilder, recently delivered the 'Castillo de Santisteban' to Empresa Naviera Elcano, the globally active Spanish shipping group. Five MAN dual-fuel 8L51/60DF engines will power the 300-metre long LNG carrier with each delivering 8,000 kW at 514 rpm. The newbuilding has been assigned by her charterer, Spanish energy company Repsol – Gas Natural LNG (Stream), to the Peruvian Camisea/Pampa Melchorita gas project, the first natural-gas liquefaction plant in South America. The carrier has a carrying capacity of 173,600 m<sup>3</sup> LNG.**

Klaus Deleroi, Senior Vice President, MAN Diesel & Turbo SE, said: "When it comes to ship-propulsion technology, the future is gas. Not only for LNG carriers, but also for cargo vessels, ferries and even cruise liners. Knowing this, it is important for MAN Diesel & Turbo to have a strong reference already at sea with our new 51/60 dual-fuel engine, and that is exactly what we have with the Castillo de Santisteban."

The Castillo de Santisteban recently passed extensive gas and sea trials before the hand-over to its owner. Its entry into active service represents a milestone for MAN Diesel & Turbo in that the order for the ship's dual-fuel engines, registered in 2007, was the very first received for this engine type. The engine is especially designed for propulsion systems for LNG carriers and gas-fuelled ships, and focuses on the safety requirements stipulated by classification societies for gas operation.

The LNG Carrier's new propulsion system is designed to give the vessel a higher degree of redundancy in terms of maintenance while sailing, and takes advantage of the 51/60DF engine's multiple fuelling options, MAN Diesel & Turbo states.

**MAN Diesel & Turbo SE**  
Teglholmegade 41  
DK-2450 Copenhagen SV  
DENMARK  
[www.mandieselturbo.com](http://www.mandieselturbo.com)

**Group Marketing**  
Further information:  
Peter Dan Petersen  
Tel.: +45 33 85 14 70  
[peterd.petersen@man.eu](mailto:peterd.petersen@man.eu)

Graphics and images:  
Mia Glarborg  
Tel.: +45 33 85 15 90  
[mia.glarborg@man.eu](mailto:mia.glarborg@man.eu)



The 8L51/60DF engines were built at MAN Diesel & Turbo's own works in Germany. They can run on gaseous (for example, vaporised LNG) or liquid fuels of a wide range of qualities (HFO/MDO/MGO) and have low emission levels.

At 1.5 g/kWh (IMO cycle E2) in gaseous-fuel operating mode, the 51/60DF already complies with future IMO Tier-III limits for NO<sub>x</sub> by a considerable margin without the need for exhaust-gas treatment or any other countermeasures.

### **The MAN 51/60DF engine**

MAN Diesel & Turbo's 51/60DF dual-fuel engine offers a market-leading 1,000 kW/cylinder output at 514 rpm for 60-Hz generator sets in both its gaseous and liquid-fuel operating modes. For marine applications, it is offered in inline versions with 6, 7, 8 and 9 cylinders and V- configuration versions with 12, 14, 16, and 18 cylinders in a power range from 6,000 to 18,000 kW.

MAN's new engine model uses the 'common-rail' micro-pilot fuel-injection system for liquid fuel that is necessary when running on gas to ignite the air-gas mixture. This system ensures independent control of injection timing, injection pressure and injection volume.

When running on liquid fuel, the 51/60DF works with a conventional fuel-injection system, injecting the fuel oil through a separate main fuel injector in a camshaft-actuated pump-line-nozzle system. The fuel injection control is integrated within the engine's SaCoS<sub>one</sub> (Safety and Control System).

### **SaCoS<sub>one</sub>**

The SaCoS<sub>one</sub> safety and control system allows safe engine operation in both liquid and gas mode with optimal fuel consumption and exhaust-gas emissions. In gas-mode, the system controls the various parameters for each cylinder independently, including air/fuel ratio, load, valve timing, pilot-fuel injection and charge-air temperature. This facilitates an optimal combustion while allowing operation within a wide range of the air/fuel ratio and avoiding incomplete-ignition failures, misfiring and knocking.



**About Elcano**

Empresa Naviera Elcano, S.A is based in Madrid and engaged in the shipping of bulk products, both solid – such as coal, ore and grain – and liquid – such as LNG, LPG, oil, oil products and chemical products. The Spanish company is the parent of an international shipping group with subsidiaries in Spain, Portugal, Brazil, Argentina among other countries. Elcano was founded in 1942 and manages its own fleet of 27 vessels.



*The LNG carrier Castillo de Santisteban is powered by five dual-fuel MAN 8L51/60DF engines*



*View of the engine room with its dual-fuel engines*

# Press Release

## MAN Diesel & Turbo



Press Release

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### **About MAN Diesel & Turbo**

MAN Diesel & Turbo SE, based in Augsburg, Germany, is the world's leading provider of large-bore diesel engines and turbomachinery for marine and stationary applications. It designs two-stroke and four-stroke engines that are manufactured both by the company and by its licensees. The engines have power outputs ranging from 450 kW to 87 MW. MAN Diesel & Turbo also designs and manufactures gas turbines of up to 50 MW, steam turbines of up to 150 MW and compressors with volume flows of up to 1.5 million m<sup>3</sup>/h and pressures of up to 1,000 bar. The product range is rounded off by turbochargers, CP propellers, gas engines and chemical reactors. MAN Diesel & Turbo's range of goods includes complete marine propulsion systems, turbomachinery units for the oil & gas as well as the process industries and turnkey power plants. Customers receive worldwide after-sales services marketed under the MAN PrimeServ brand. The company employs around 12,700 staff at more than 100 international sites, primarily in Germany, Denmark, France, Switzerland, the Czech Republic, Italy, India and China. MAN Diesel & Turbo is a company of the Power Engineering business area of MAN SE, which is listed on the DAX share index of the 30 leading companies in Germany.

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