



## **World's Most Powerful Four-Stroke Engine Revealed**

Augsburg, Sept. 13th, 2017

- **New power generation flagship boasts 26 MW output**
- **Fully digital control system**
- **Leverages full potential of two-stage turbocharging**

MAN has revealed the latest addition to the company's 4x line of high-performance diesel engines: the MAN 20V45/60 comes with a limit-pushing power output of 26 MW. Furthermore, the company was able to considerably reduce fuel consumption compared to its predecessor, the MAN 48/60. "26 MW in output is unprecedented – this is the most powerful four-stroke engine in the market", said Wayne Jones, Chief Sales Officer of MAN Diesel & Turbo.

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### **Game-changing power density and efficiency**

"The 20V45/60 expands the current performance range of MAN's 4x family of diesel engines by more than 4 MW, while offering a best-in-class fuel efficiency of more than 50%", added Jones. "Hence, it allows our customers to save both investment and operational costs. With this engine, innovative engineering meets the vast experience of a world market-leader in four-stroke engine design. MAN's 4x family has accumulated millions of operating hours all over the world and we have listened closely to the needs of our customers. Accordingly, we knew exactly where we wanted to go in engineering the next generation of this global success story: We were aiming for a game-changing level in power density and efficiency, and we accomplished that mission."

"Next to a frontloading approach, using thermodynamic engine process calculations, we used computational fluid dynamics to simulate and optimize the combustion process. Also finite elements analysis was used to optimize the engine's mechanical strength and vibration behavior. We then put the power unit to the test on the world's largest four-stroke, single-cylinder test bed and started the experimental optimization and validation phase", said Dr. Gunnar Stiesch, Head of Engineering Engines at MAN Diesel & Turbo.

The new engine is also a new centerpiece of MAN's extended systems approach which reflects in the company's latest generation digital Safety and Control System, SaCoS 5000. Following a decentralized design concept, SaCoS 5000 offers unprecedented data availability and optimized alarm visualization and diagnosis. "Thanks to the new SaCoS, the MAN 45/60 is not only online-ready but also equipped for the digital future of power generation", stated Stiesch.



The two-stage turbocharger module rounds off the MAN 20V45/60's superior profile. MAN Diesel & Turbo is the pioneer in developing and operating two-stage turbocharging for large-bore engines, a concept which achieves excellent efficiency thanks to a low-pressure and a high-pressure turbocharger arranged in series. "We are the only company in the market that develops both engine and turbochargers", says Stiesch. "This unique, in-house competence allows us to truly tailor-design this engine for optimized two-stage turbocharging and to unleash its full potential. Operators thus profit from maximized peak pressure and optimal utilization of the Miller Cycle."

### **Perfect fit for power generation in remote locations**

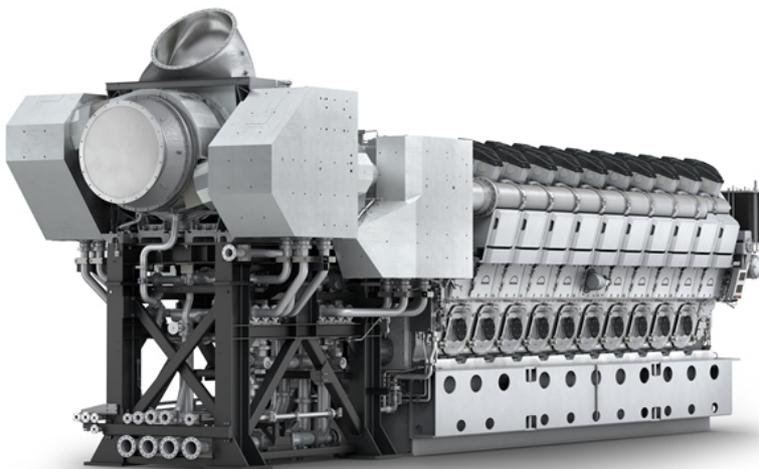
Adding MAN's outstanding track record in designing particularly robust and reliable engines, the 20V45/60 is a perfect fit for power generation in remote locations and islands where a gas supply is not available. Its sturdy design and construction withstands extreme site conditions like hot ambient temperatures and high altitudes, and makes the engine an excellent solution for captive power applications in climatically-demanding locations. "The two-stage turbocharging prevents derating even at 2,500 meters above sea level and the engine shows no decrease in output even in ambient temperatures of up to 53° Celsius", said Alexander Stöckler, Global Head of Sales for the power plants business at MAN Diesel & Turbo.

Plant operators benefit from the engine's high power-density, which significantly reduces capital expenses, as fewer engines and less space are needed to reach a plant's desired overall output. An extremely competitive fuel-oil consumption adds to the sustainability of the engine's environmental footprint, which meets the World Bank 2 (2007/2008) emission standard for heavy fuel oil (HFO), marine gas oil (MGO), and marine diesel oil (MDO). A solution with integrated selective catalytic reduction (SCR) is under preparation and will further reduce NOx emissions by up to 80%. Here, MAN Diesel & Turbo will once more bring to bear its extensive in-house competence regarding integrated SCR solutions.

The worldwide rise of decentralized energy generation and renewable energy has significantly changed the capability profile that thermal power plants need to match. Consequently, the new 45/60 is ideally suited for base load as well

as peak-shaving applications. “Operational flexibility has become essential for power plant operators these days”, Stöckler said. “State-of-the-art plants need to be able to master repeated and rapid startups and the ability for load-following operation. The 45/60 reaches full load in a short time, effortlessly handles load reversals, and allows for high fuel-efficiency even when operated in partial load.”

Gas and dual-fuel versions of the engine are currently under preparation. Also, more cylinder configurations will be added to the 45/60 engine family in the future.



(MAN\_20V\_45\_60.jpg)

**About MAN Diesel & Turbo**

MAN Diesel & Turbo SE, based in Augsburg, Germany, is the world's leading provider of large-bore diesel and gas engines and turbomachinery. The company employs around 14,500 staff at more than 100 international sites, primarily in Germany, Denmark, France, Switzerland, the Czech Republic, India and China. The company's product portfolio includes two-stroke and four-stroke engines for marine and stationary applications, turbochargers and propellers as well as gas and steam turbines, compressors and chemical reactors. The range of services and supplies is rounded off by complete solutions like ship propulsion systems, engine-based power plants and turbomachinery trains for the oil & gas as well as the process industries. Customers receive worldwide after-sales services marketed under the MAN PrimeServ brand.