



MAN Smart HYBRID Experience with up to 2,500 hp

Munich, 01/09/2021

World premiere in Cannes – degree of hybridization up to 56 percent – MAN Engines supplies a complete system – Individually configured on the basis of series components

At the Cannes Yachting Festival 2021, MAN Engines will showcase the MAN Smart HYBRID Experience to the public for the first time. This completely new hybrid system marks a turning point when it comes to modern marine drives, and underlines MAN Engines' status as pioneers in this technology.

MAN Truck & Bus
Dachauer Straße 667
D-80995 Munich

Should any questions arise, please contact:
Florian Schaffelhofer
Phone: +49 151 11766475
Florian.Schaffelhofer@man.eu
www.man-engines.com/press

The electric motor generator unit from the MAN Smart HYBRID Experience can produce a rated power of 184 kW or 368 kW, at an extremely high efficiency rating of up to 96 percent. The permanent-magnet synchronous motor/generator is 160 mm long at 184 kW, or 320 mm at 368 kW. Its diameter is 560 mm. It is positioned on the diesel engine in front of the marine drive and can be separated from the diesel engine by an electromagnetic clutch. This results in a clear advantage for the customer, in that the operating mode can be changed without stopping the engines. In fact, this changeover can be made during operation (including as an emergency function) without interrupting the power, making operation much more convenient.

The MAN Smart HYBRID Experience can be combined with all the MAN marine engines in the current D2862 (V12), D2868 (V8) and D2676 (in-line six-cylinder) series, and allows for enhanced power outputs. This enables overall system outputs for each driveline ranging from 474 kW to 1,838 kW (644 hp to 2,500 hp), from the smallest in-line six-cylinder series to the most powerful V12. Depending on how the components are assembled, the hybrid system can thus account for up to 56 percent of the vehicle's overall power output.

MAN Truck & Bus is one of Europe's leading commercial vehicle manufacturers and transport solution providers, with an annual revenue of more than 9,5 billion euros (2020). The company's product portfolio includes vans, trucks, buses/coaches and diesel and gas engines along with services related to passenger and cargo transport. MAN Truck & Bus is a company of TRATON SE and employs more than 37,000 people worldwide.

Press Release
MAN Truck & Bus



With the MAN Smart HYBRID Experience, MAN Engines is the first engine supplier to offer a complete hybrid system from a single source. MAN Engines supervises shipyards and boat designers from the planning and concept phase through development, consultation on installation and technical implementation including control software, to service and maintenance. This means that B2B partners benefit from more than just intensive consultation and simplified processes throughout all stages. An additional point in MAN Engines' favour as a system supplier is the perfect coordination of complex components such as diesel engines and electric motors, batteries, power electronics and the on-board voltage system, both with one another and with the application itself. "At MAN Engines, we believe it is crucial to not only perform development work on our test benches, but also conduct extensive tests in field trials. This is how we continue to ensure our high quality standards, even when developing completely new products," says Werner Kübler, Head of Development at MAN Engines. Ultimately, the end customers, too, appreciate all of these advantages, as they can rely on a perfectly aligned and tested overall system, provided by a market leader. Furthermore, the MAN Smart HYBRID Experience's innovative concept has been recognised by independent bodies, who honoured it with the "German Innovation Award 2021". Meanwhile, its design received the "Red Dot Award: Product Design 2021".

Maximum flexibility and attention to the customer's needs – that is the MAN Smart HYBRID Experience's motto. Alongside power levels that can be scaled to almost any level thanks to the wide range of diesel engines, the degree of hybrid power can be tailored to the customer and expressed in the system design principles of performance, comfort and efficiency. "We combine our expertise with the countless technological possibilities at our disposal, providing an MAN Smart HYBRID Experience that is individually tailored to every customer," says Reiner Roessner, Head of Sales at MAN Engines. To achieve this, MAN Engines makes use of a wide range of technically mature series components. All the possible drive configurations such as V-Drive, IV-Drive, parallel drives and down angle can also be connected to the MAN Smart HYBRID Experience.



The performance, efficiency and comfort system design principles are tailored to specific applications on the basis of the Zero Emission, Diesel-Electric, Cross-Over, Hotel, Boost and Diesel operating modes. With the main diesel engines, on-board generator sets, high-voltage (HV) batteries and a land connection as power sources, the advantages of the MAN hybrid system (combined or in isolation) can be exploited in a targeted way. This enables, for example, highly economical operation, an increase in range, access to ECAs (Emission Controlled Areas) thanks to emission-free operation, or additional power as a power boost. In hotel mode, the battery capacity can also be used when the boat is docked. The plug-in hybrid's HV battery is charged via the integrated land connection, and through the diesel engines or on-board generator sets when the boat is on the move.

For its MAN Smart HYBRID Experience, MAN Engines uses battery systems from different manufacturers for specific applications, which are connected in series in modules. As high-energy cells, they are designed with a high energy density at a voltage > 600 V, enabling flexible battery operation between 500 V and 750 V in the intermediate circuit. This enables quick charging of the batteries, and provides the basis for major energy consumers such as the boost function. At the same time, the highest safety standards are guaranteed as the drive system has been approved by classification societies.

The different modes are as follows:

- Zero Emission mode: No emissions and ultra-quiet – in Zero Emission mode, the energy for propulsion and electrical power consumption is provided exclusively by the battery. The battery can be charged in three ways: land connection in the harbour, on-board generator sets, main drive engines
- Diesel-Electric mode: In Diesel-Electric mode, the electrical power supply and drive power are provided by the available on-board generator sets, supported by the battery. This reduces the amount of time that the boat runs on the main drive engines.
- Cross-Over mode: In Cross-Over mode, both drivelines are operated in different operating modes in a two-engine system. Here, one



driveline operates in diesel mode, while the electric motor functions as a generator and supplies the electric power for the boat. In the second driveline, the diesel engine is disengaged so that the electric machine receives its energy from the first diesel engine. It operates in motor mode in this case and provides the drive energy.

- Hotel mode: In the convenient Hotel mode, the power supply is provided only by the battery and the diesel engines are switched off. The innovative technology ensures that power consumption is possible for an extended period without diesel engines. Independently of this, the batteries can be charged in parallel via a charging connection.
- Boost mode: In this mode, the combustion engines and battery-operated electric motors work together and complement each other. If power is needed, the electric motor provides energy from its power reserves. Boost mode therefore offers the highest power density and permits maximum power output. Combined operation of the 12-cylinder diesel engine and electrical drive thus makes it possible to achieve an output that corresponds to that of a pure 16-cylinder engine.
- Diesel mode: In classic diesel mode, the drive energy is provided by the conventional diesel engine or diesel engines in multi-engine systems. In this mode, the electric motor runs without any function and no power is generated. In diesel mode, electricity can also be generated to charge the batteries. When this happens, the boat spends less time powered by the gensets.

At its Jetée 183 stand in the old harbour (Vieux Port) at the Cannes Yachting Festival 2021, MAN Engines will exhibit the MAN Smart HYBRID Experience on the basis of its i6 in-line six-cylinder engine, boasting an electric motor generator unit with an output of 184 kW.