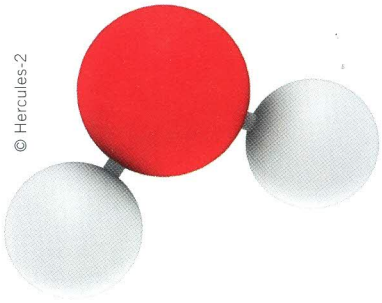
Hercules-2 | **Engine R&D Programme**

Aiming to combine the latest technologies and using integrated solutions to undercut legislated limits on fuel consumption and exhaust emissions, the EU supported Hercules engine R&D project is to enter a second phase. The declared goal of Hercules-2 is to develop a fuel-flexible marine engine that is optimally adaptive to its operating environment. The project will be divided into four Work Package Groups (WPGs), with WPG 1 covering a fuel flexible engine; WPG II new materials for engine applications; WPG III an adaptive power plant for lifetime performance; and WPG IV a near zero emissions engine. The project will involve 32 European partners (30 % industry, 70 % academic and research institutes), led by Wärtsilä, Winterthur Gas & Diesel and MAN Diesel & Turbo and coordinated by National Technical University of Athens. Between 2004 and 2014 the A, B and C stages of the original Hercules project led to several advanced systems now in use on commercially available, IMO Tier II and Tier III compliant engines.



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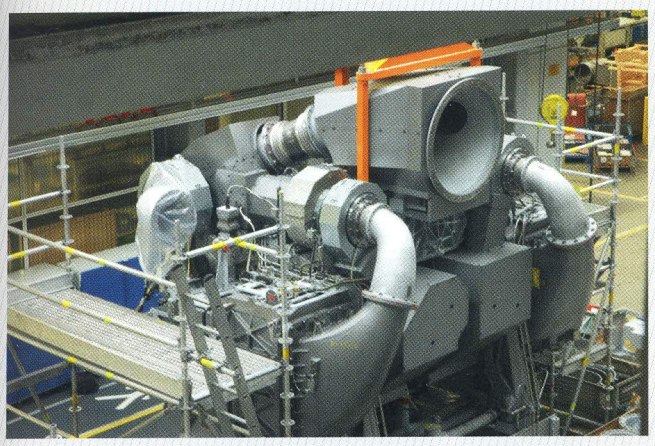

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MAN Diesel & Turbo | **Two-stage Turbocharging**

MAN Diesel & Turbo's Ecocharge two-stage turbocharging project, targeting high pressure ratios on both diesel and gas engines, has completed a first run on an MAN 12V35/44 gas engine on a test bed at the company's works in Augsburg, Germany. With the combination of the MAN TCR20 radial turbine turbocharger for the low pressure stage and the specially developed MAN TCX17 turbocharger with mixed flow turbine as the high pressure stage, charge air pressures in the range 5 to more than 10 bar are achievable at high turbocharging efficiencies. The system's benefits are high power density and, in conjunction with the Miller cycle, reduced exhaust emissions and lower fuel consumption.

ABB | **Electric Propulsors**

ABB has added the Azipod D to its gearless marine thruster family. Offered in open propeller and ducted versions, the Azipod D is suited to a range of electrically propelled vessels including offshore, merchant and special purpose ships requiring unit powers up to 7 MW. With its gearless construction, the Azipod D is designed to reduce fuel consumption by 10 to 15 %. As well as a 3 to 6 % increase in internal efficiency, the thrusters can be powered either by permanent magnet synchronous motors or asynchronous motors, with the permanent magnet option benefitting efficiency by a further 2 to 10 % depending on operating conditions. Electric motor performance is increased by up to 45 % via an innovative hybrid cooling system which combines direct sea water cooling and internal air cooling.

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