



MAN Diesel Turbochargers Enable IMO Tier II Compliance

Turbochargers for next engine generation

7 May 2009. The Business Unit Turbocharger at MAN Diesel has recently announced that its complete ranges of TCA axial and TCR radial turbochargers are available for both two and four-stroke engines complying with IMO Tier II emissions legislation. Indeed, the Augsburg-based engine and turbocharger specialist stresses, the requirements of IMO Tier II engines were designed into the TCA and TCR turbochargers from the first.

Importantly, to eliminate additional work for engine builders, the new, higher performance IMO Tier II turbocharger versions from MAN Diesel retain the same external and connection dimensions as versions for IMO Tier I compliant engines. In this way, no changes are needed to the existing turbocharger mounting arrangement when upgrading an ongoing engine series to IMO Tier II compliance.

The major change with the IMO Tier II versions of TCA and TCR turbochargers has been to increase pressure ratios to enable Miller cycles of varying intensity as a means of substantially reducing the formation of oxides of nitrogen (NO_x). On four-stroke engines this involves closing the inlet valve early to allow the incoming air to expand and cool and thus eliminate the combustion temperature peaks responsible for the majority of NO_x

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formation. On low-speed, two-stroke engines the same effect is achieved by reduction of compression volume, increased scavenging air pressure and late closing of the exhaust valve, in some cases combined with optimisation of the fuel system. Higher pressure turbocharging ensures that an equivalent amount of air enters the cylinder, thus leaving engine power, torque and response unaffected.

For two-stroke engine applications MAN Diesel reports that the necessary increase in pressure ratio is achieved exclusively via minor changes to the internal flow components of the turbochargers. On the four-stroke side, the new high-pressure turbocharger versions feature a revised design of compressor wheel with enhanced performance, as well as a number of further internal revisions.

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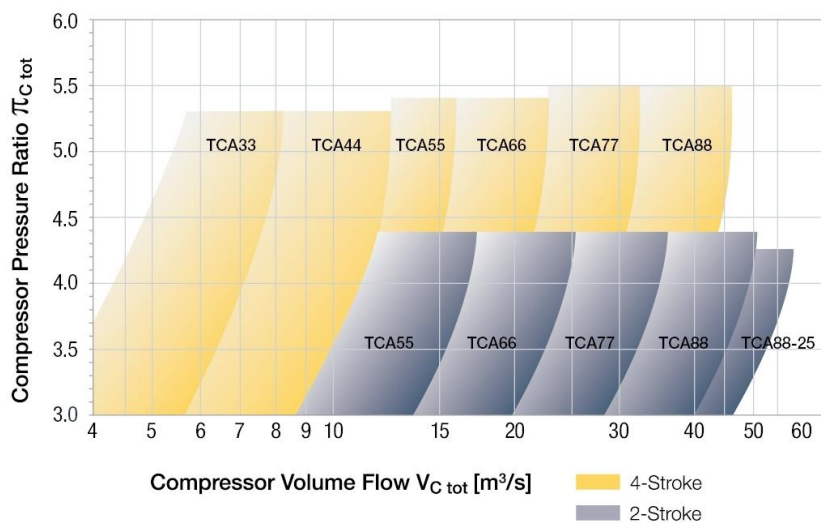
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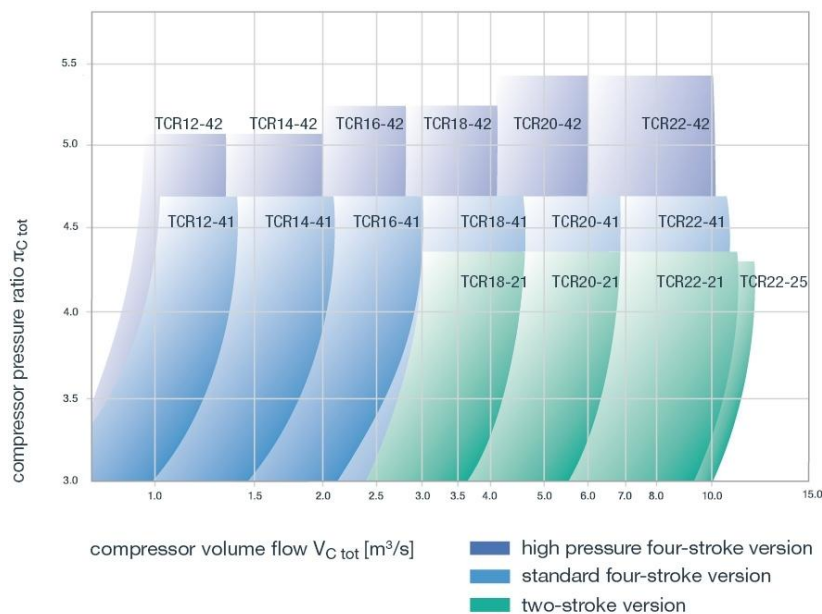
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Performance diagrams for the high-pressure, IMO Tier II variants of MAN Diesel's axial TCA and radial TCR turbochargers. MAN Diesel turbochargers cover an overall performance range of 400 to 30,000 kW of engine power per turbocharger



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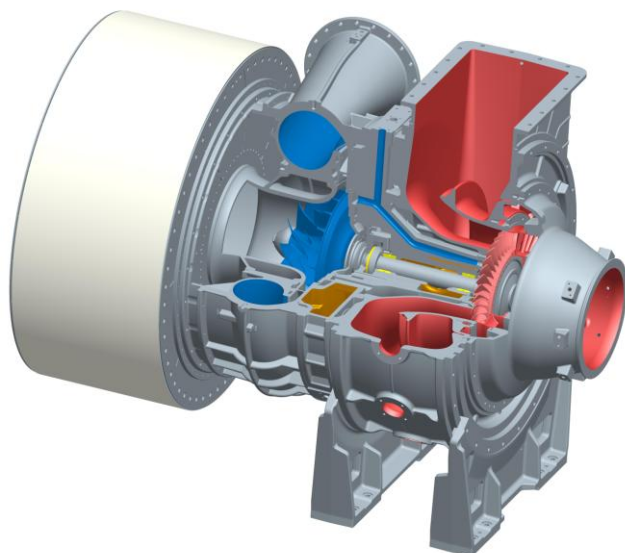
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Major changes on the IMO Tier II versions of MAN Diesel TCA (seen here) and TCR turbochargers centre on increased pressure ratios to enable Miller cycles of varying intensity as a means of substantially reducing NO_x formation

About MAN Diesel

MAN Diesel is the world's leading provider of large-bore diesel engines for marine and power plant applications. The company designs two-stroke and four-stroke engines, generating sets, turbochargers, CP propellers and complete propulsion packages that are manufactured both by MAN Diesel and its licensees. The engines have power outputs ranging from 450 to 97,300 kW. MAN Diesel employs approx. 8,000 staff, primarily in Germany, Denmark, France, the Czech Republic, India and China. The global after-sales organisation, MAN Diesel PrimeServ, comprises a network of the company's own service centres, supported by authorised partners. MAN Diesel is a company of MAN AG, which is listed on the DAX share index of the 30 leading companies in Germany.

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