



75 Pioneering Years

05/10/2009

MAN Diesel Celebrates Turbocharger Anniversary

Following MAN Diesel's 2008 celebration of Rudolf Diesel's 150th birthday, the Augsburg company has further cause to celebrate in 2009. In 1934, exactly 75 years ago, the leading designer and builder of large diesel and gas engines started to design and produce one of the most central technologies to the evolution of its current range of low-emission, high-efficiency power units – the exhaust gas turbocharger.

“By providing additional air for combustion, turbochargers allow more fuel to be burnt and hence more power to be produced from a given size of engine,” notes Ralf Grosshauser, head of the MAN Diesel Turbocharger Business Unit. “At the same time the additional air promotes more complete combustion of the fuel and hence optimised exhaust emissions and better fuel consumption. Using its own state-of-the-art turbochargers on the latest MAN Diesel two- and four-stroke, low- and medium-speed engines, a massive 300% increase in power can be achieved while also offering the best emission and fuel-consumption levels in the combustion-engine field. Low fuel-consumption translates into optimised greenhouse-gas emissions in addition to compliance with the most stringent legislation for noxious exhaust emissions.”

The turbocharger was the brainchild of inventor Alfred Büchi, who was awarded a German patent for the idea of using exhaust-gas energy to drive a turbine sitting on the same rotating shaft as a compressor wheel. The earliest turbochargers produced a very useful 40% increase in engine power, prompting MAN Diesel to pioneer turbocharging on four-stroke engines in 1934.

Typically for MAN Diesel, the company soon established itself as a technology leader and technical milestones followed at regular intervals. Among the most significant was the 1940 adoption of plain bearings for the rotor shaft, located between the turbine and compressor wheels, i.e. “inboard” of them. Sooner or later, this pioneering feature that gives optimum shaft support, durability and ease of access to the turbine and compressor wheels was adopted by all turbocharger manufacturers instead of ball or roller bearings at the ends of the shaft (i.e. “outboard”).

MAN Diesel Group
Teglholmegade 41
DK-2450 Copenhagen SV
DENMARK
www.mandiesel.com

Group Marketing
Further information:
Peter Dan Petersen
Tel.: +45 33 85 14 70
peterd.petersen@man.eu

Graphics and images:
Mia Glarborg
Tel.: +45 33 85 15 90
mia.glarborg@man.eu



Further innovations followed. For example, in 1955 MAN Diesel began the development of high-efficiency turbochargers with radial turbines and in 1992 adopted uncooled casings to greatly simplify turbocharger installation on the engine.

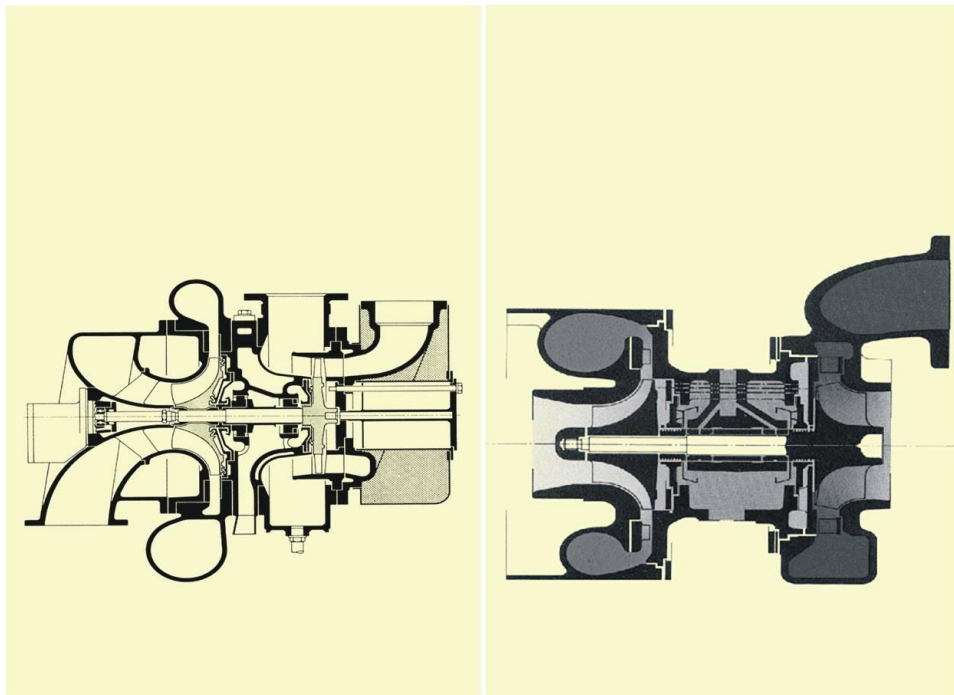
Significantly, the 2001 introduction of a new axial turbocharger generation – the TCA series – and the 2004 introduction of the new radial TCR series were ideally timed to assist engines from MAN Diesel meet tightening emissions legislation, including the International Maritime Organisation IMO Tier II limits for oxides of nitrogen (NOx). Likewise, they continue to be a major factor in MAN Diesel's response to the global warming challenge with improvements to fuel efficiency, i.e. reductions of carbon-dioxide emissions, the greenhouse gas.

Finally, the very latest - and increasingly popular - turbocharger technology from MAN Diesel is set to continue this pre-eminence in high-efficiency turbocharging. Again, it is ideally timed to meet a new era of low engine-emissions and low fuel-consumption.

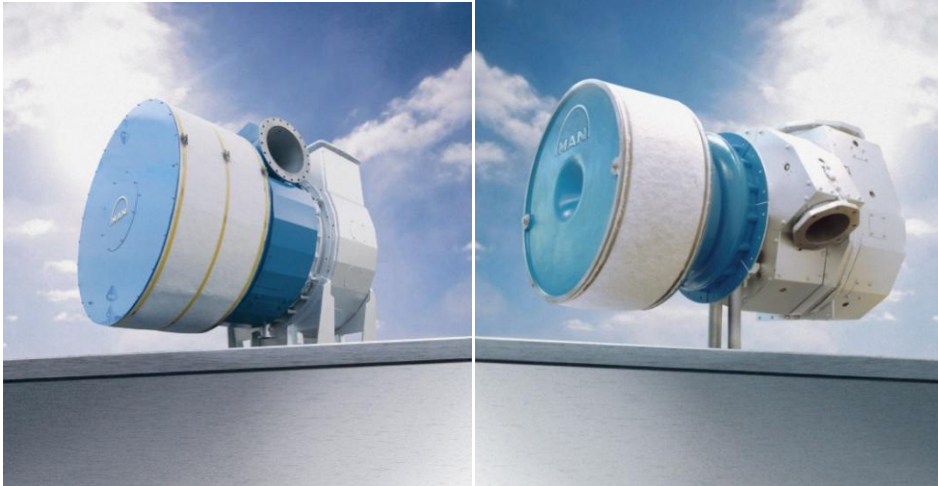
The latest TCA and TCR turbochargers with VTA "Variable Turbine Area" employ a system of adjustable vanes upstream of the turbocharger turbine that allow the amount of air compressed by the compressor wheel to be flexibly varied. The so-called charge air can thus be more precisely matched to the quantity of fuel injected and hence combustion optimised at all the engine's operating speeds and loads. VTA's variability exactly matches flexibility of MAN Diesel's electronically controlled fuel-injection systems, e.g. common rail, and allows fuel consumption and related emissions to be minimised while the engine's ability to respond to load changes is greatly improved. Significantly, VTA technology can be both supplied on new turbochargers or retrofitted on units already in the field.

Such a capability is, of course, extremely topical: in view of high fuel prices, ships are reducing speed to save money – so-called slow steaming. Grosshauser concludes, "Reducing a vessel's speed by decreasing engine power below its design point will mean that although lower, fuel consumption is not optimised at the new load-point. Likewise, emissions will be adversely affected. The correct procedure would be to rematch the turbocharger to the engine's new operating profile, but this process then needs to be reversed if slow steaming is no longer desired for some reason.

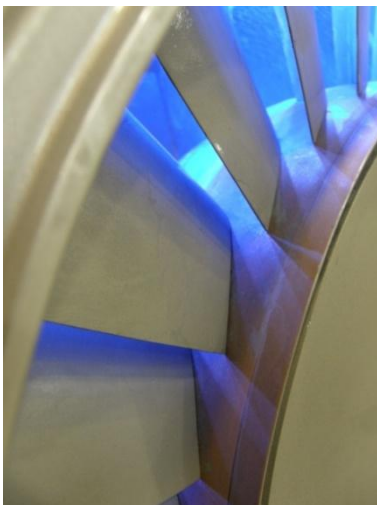
With our VTA technology, by contrast, the quality/efficiency of power produced by the engine can be optimised towards the amount of power needed by the ship. Ensuring efficient combustion of the fuel in this way further reduces fuel consumption and ensures compliance with emission limits.”



(left) Man Turbocharger 1940 – trendsetting from the first: MAN Diesel pioneered the use of inboard plain bearings to support the turbocharger rotor shaft. Today all manufacturers use this design; (right) MAN Radial NR12 – in 1955 MAN Diesel began development of high-efficiency turbochargers with radial turbines



MAN Diesel introduced its advanced TCA axial (left) and TCR radial (right) turbochargers in 2001 and 2004 respectively



Ideal technology in times of high fuel prices and tightening emissions legislation: in 2007, TCA and TCR turbochargers were equipped with VTA "Variable Turbine Area" control to allow the air quantity compressed by the compressor wheel to be precisely varied for optimised combustion

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 SE, which is listed on the DAX share index of the 30 leading companies in Germany.

Ref no 6510-0143