MAN Diesel at SMM

VTA Turbo Fuel Savings Proven in Practice

23rd September 2008. The Business Unit Turbocharger at MAN Diesel is using SMM 2008 to exhibit its latest VTA "Variable Turbine Area turbocharger technology for the first time at a major marine trade show. Indeed, due to its fuel saving potential in times of high oil prices, the new VTA turbochargers are expected to be a show highlight among propulsion technology exhibits.

VTA Technology

VTA denotes a system of adjustable nozzle ring vanes which replace the fixed vane nozzle rings fitted in MAN Diesel's standard axial TCA and radial TCR turbochargers. Adjusting vane pitch regulates the pressure of the exhaust gases on the turbocharger turbine to vary the output of the compressor.

With VTA the quantity of charge air entering the cylinder can thus be more precisely matched to the quantity of fuel injected, so that combustion can be optimized at all points on the engine's operating profile. In this way specific fuel consumption and related emissions can be minimized at all engine speeds and loads, combined with improved dynamic behaviour of the engine-turbocharger system i.e. better engine response.

Control of vane position is fully electronic and a wide range of control signals can be used in both closed-loop control systems with feedback or open-loop systems with mapped vane adjustment. A comprehensive range of control signals can be used, for example charge air pressure after the compressor and exhaust gas temperature before and after the turbocharger.

MAN Diesel Group
Group Marketing
Marketing Communications
Stadtbachstrasse 1
86224 Augsburg - Germany
Phone +49 (0) 821 – 322 41 79
Fax +49 (0) 821 – 322 42 30
Internet: www.mandiesel.com

For further information,
please contact:
Jonathan Walker
Techncial Communications Manager
Phone +49 (0) 821 – 322 41 79
jonathan.walker@man.eu

For graphics and images,
please contact:
Annelise Brincker
Tel.: +45 33 85 15 90
annelise.brincker@man.eu

In this way, MAN Diesel states, it is confident that VTA turbochargers can be precisely tailored to a wide range of applications, including both mechanically and electronically controlled two and four stroke engines.

Retrofit

MAN Diesel also stresses that VTA technology can be readily retrofitted to turbochargers already in the field. For such applications the Business Unit Turbocharger offers complete upgrade packages including the VTA nozzle ring and the associated actuation and control systems.

Slow Steaming

These capabilities are, of course, extremely topical: in view of extremely high fuel oil prices ship owners and operators are reducing vessel speeds to save costs – so-called slow steaming. With VTA technology, charge air delivery can be precisely matched to the power output demanded from the engine at a given load condition. In this way there is no deterioration in the emissions behaviour of the engine and fuel consumption is saved not only by running the engine at a lower output, but also by optimising combustion at the appropriate load point.

Successful First VTA Application

The first turbocharger with VTA technology to be tested in a marine application is on a slow speed, two stroke, six cylinder, 46 cm bore MAN B&W brand 6S46MC-C engine. The 6S46MC-C burns HFO, was built by MAN Diesel's Croatian licensee Brodosplit and features mechanically controlled fuel injection and mechanical exhaust valve actuation. It is one of two engines installed in the twin engine propulsion system of the 70,000 ton, shallow draught tanker Stena President.

To obtain a clear comparison, the Stena President's second 6S46MC-C engine features a standard TCA55 turbocharger.

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MAN Diesel reports that inclusion of VTA technology on the axial TCA55 turbocharger allows up to 0.5 bar variation in compressor output pressure at part load.
Experience with VTA technology during field tests has been extremely favourable, both in its effect on engine operation and its resistance to fouling and wear in the hostile environment of an HFO engine exhaust.

At the time of writing the VTA system aboard the Stena President has operated for over 5,000 hours and is delivering even higher fuel savings than expected - depending on engine load, the reduction in SFOC on the engine fitted with VTA has been measured at as much as 4.4 g/kWh compared with the engine fitted with the standard turbocharger - or well over 2.5%.

In detail, MAN Diesel reports that no major problems were encountered prior to a 3,000 hour inspection in early 2008. At the inspection all the components of the TCA55-VTA turbocharger were visually inspected and all components were found to be in good working order. There was no abnormal wear, in fact very little wear was measured at all. The power needed for vane actuation has been monitored during the trial and in spite of operation in HFO exhaust gases, the vane adjustment mechanism still moved freely. Indeed, it could be actuated using hand pressure only, MAN Diesel reports.

Overall results show the expected improvements at part load in terms of fuel consumption, as well as reductions in emissions of soot and unburnt hydrocarbons and improved engine response under load changes.

Accordingly, MAN Diesel's VTA turbocharger technology is creating considerable customer interest at a time when slow steaming is becoming more and more common.

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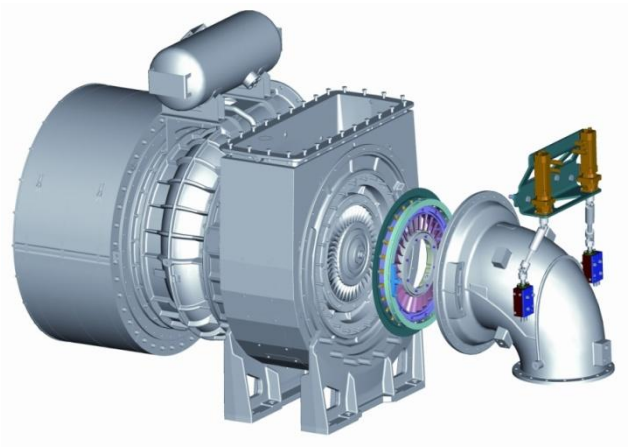

VTA turbochargers from MAN Diesel feature a nozzle ring with adjustable vanes. Seen here is the axial variant for the TCA axial turbocharger. The system is modular and occupies the same position as a fixed nozzle ring. It can be retrofitted to turbochargers already in the field.

View of a VTA-equipped turbocharger showing the microprocessor controlled positional motors used to actuate the adjustable nozzle ring vanes. Turbocharger matching is simplified to setting maximum and minimum vane angles via the control software.

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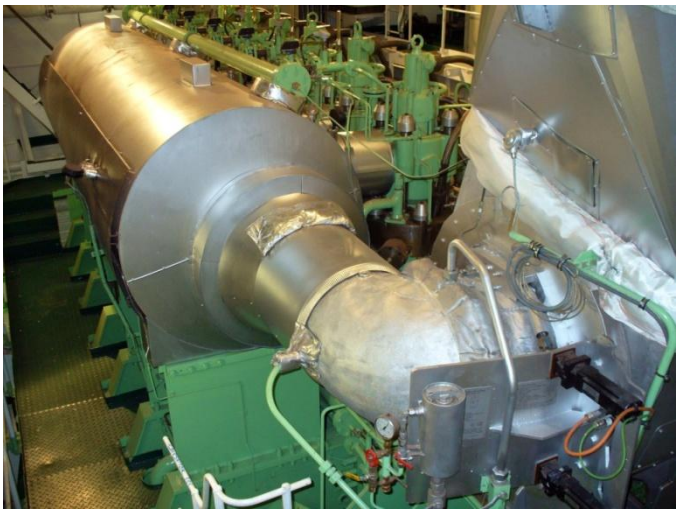

The MAN Diesel VTA system aboard the shallow draught tanker Stena President. The field test followed extensive test-bed testing on the six cylinder, 46 cm bore 6S46MC-C engine at MAN Diesel's Croatian licensee Brodosplit.

The 70,000 ton, shallow draught tanker Stena President is powered by two MAN B&W brand 6S46MC-C engines. For comparison purposes, one of the engines is fitted with a TCA55 turbocharger featuring the VTA adjustable vane nozzle ring and one with the standard, fixed nozzle ring.

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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 over 7,700 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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