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Thermal Efficiency Systems

Advanced Turbocharger Technology Applied to Thermal Efficiency Systems

20th November 2006. In addition to developing new products in its TCA and TCR series of axial and radial turbochargers, the Turbocharger Business Unit at MAN Diesel has also committed major resources to the transfer of technology from the advanced turbines of its TCA and TCR turbochargers to its Thermal Efficiency Systems (TES).

“The current high price of fuel oil has lead to increased demand for systems which increase the efficiency of two-stroke diesel engine arrangements,” notes Dr. Herbert Schmuttermair, head of application engineering at the Turbocharger Business Unit. ”In addition, we saw the opportunity to increase the fuel saving benefits of our existing TES product range by equipping them with improved power turbines, based on the turbines from our latest turbochargers. For example, our TES systems now feature advanced power turbines with wide chord blades and no damping wire, as used in the axial TCA turbocharger series.”

The MAN Diesel TES range consists of two main products – a turbo-compound system with power turbine and generator (TCS-PTG), and a combined diesel generator set and exhaust gas power turbine (CODAG). “When either the TCS-PTG or CODAG solution is used in combination with an MAN Diesel

high efficiency turbocharger on the main engine, additional electrical power equivalent to 3% to 5% of main engine power can be recovered. Depending on fuel oil prices, a pay-back period of 2 to 5 years is feasible," Dr. Schmuttermair states.

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TCS-PTG

The MAN Diesel TCS-PTG system consists of an exhaust gas power turbine, a generator and auxiliary systems. With its efficient power turbines, the system allows a maximum of 4,850 kW of additional power to be recovered in two-stroke engine applications. "In the TCS-PTG stand-alone solution the output of the TES system is matched to the output of a vessel's generator sets. In this way the TCS-PTG system can replace a gen-set during downtimes and so allow maintenance on auxiliary engines to be carried out without any loss of electrical power," Dr. Schmuttermair points out.

In combination with MAN Diesel turbochargers on the main engine, 10% to 13% of the gas flow from the exhaust receiver can be diverted to the power turbine. The power turbine of the TCS-PTG system is connected to a gearbox, which reduces its output speed to the synchronous speed required by the TCS-PTG system generator to produce 50 Hz or 60 Hz electrical power.

CODAG

The MAN Diesel CODAG system, on the other hand, is designed to be integrated onto a diesel generator set. It consists of an exhaust power turbine, reduction gear

and clutch and as with the TCS-PTG, engine exhaust gas is diverted to the power turbine before the main engine turbocharger. “The power turbine is mounted on the gen-set frame and connected to the generator via a clutch and reduction gear which delivers the output shaft speed required for 50 Hz or 60 Hz electrical power generation,” Dr. Schmuttermair explains. “A major customer benefit of the CODAG system is that only small changes have to be made to a ship’s engine room to allow the supply of additional electrical power to the onboard grid, leading to considerable reductions in fuel consumption.”

Captions:

1. The MAN Diesel TCS-PTG thermal efficiency system consists of an exhaust gas power turbine, a generator and auxiliary systems. It allows a maximum of 4,850 kW to be extracted from the exhaust gases of a two-stroke engine.
2. Schematic of an MAN Diesel CODAG thermal efficiency system
3. Rated outputs of MAN Diesel PT power turbines and PTG power turbine and gearbox combinations.

About MAN Diesel
MAN Diesel is the world’s leading provider of large-bore diesel engines. The company designs two-stroke and four-stroke diesel engines, generating sets and turbochargers, for manufacture by MAN Diesel and its licensees. The engines have outputs ranging from 450 to 97,300 kW. MAN Diesel has approximately 6,400 employees, located in Germany, Denmark, the UK, France, the Czech Republic and China. The company’s worldwide service organisation, MAN Diesel PrimeServ, consists of a network of own service centres,

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supported by authorised partners. MAN Diesel is a subsidiary of the German industrial group MAN AG which is listed on the DAX stock index comprising the 30 largest companies in Germany.

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