



Turbo- charger power systems

MAN Energy Solutions
Future in the making

A guide to
maximum engine
performance



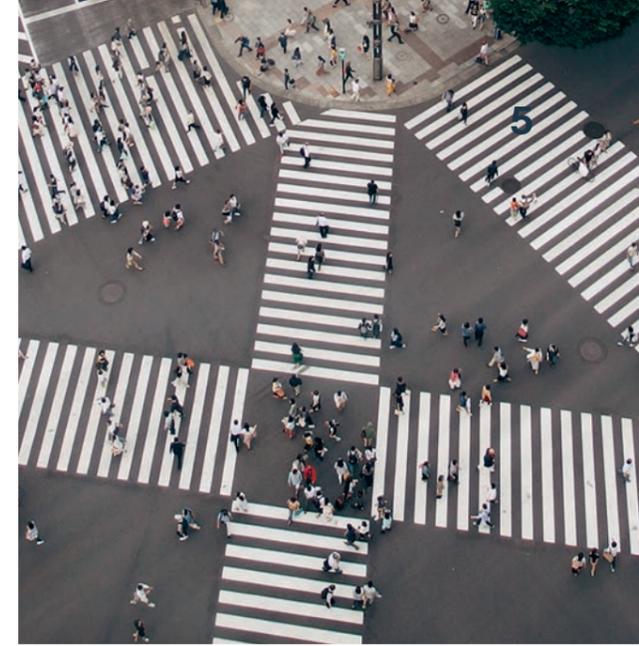
Future in the making

Our engineers and digital specialists focus on crosslinking engineering with the possibilities of today's world: we shape the advancement of power generation, marine transport and industrial engineering. Whether engines, components or complex systems – we aim to deliver intelligent solutions that assure your competitiveness for years to come.

This mission is reflected in our new company name: MAN Energy Solutions. Our products and services utilize the latest technologies. We don't react to trends; we create the next step. As your partner, we connect the dots in an ever-changing world, providing you with long-term solutions that boost your business and help to bring the world a step closer to carbon neutrality.

MAN Energy Solutions: Future in the making.

To follow, or to lead?



The world in which we live is changing more rapidly than ever. A growing population and increasing demand for energy requires the shift towards more sustainable forms of energy generation. We are ready to tackle this challenge.

With the invention of the diesel engine, our visionary founder transformed the entire industry by creating a mechanism of – at the time – unknown efficiency. Transformation is in our genes. Today, the setting has changed, yet our pioneering spirit remains. We lead the industrial world towards a more sustainable future by combining our world-class engines, turbines, turbochargers, compressors, propellers, and reactors with the possibilities of the digital era. And we want you to join us. As your partner, we create customized solutions for your specific needs and support you in this time of change and transition. Together, we can pave the way for a climate-neutral yet economically successful future. Let's get started.



Envisioning tomorrow

The starting point of all our innovation is you. We focus on the individual requirements and goals of our customers and work on solutions to meet even the most specific needs. We benefit from our in-depth knowledge in the sectors of mobility, transport and energy, and draw from decades of technical and operational experience.

We are known for offering the industry's most advanced products, which boast legendary quality. Closing supporting our customers with expert advice when it comes to developing the best possible solutions is one of our core competencies. When it gets tricky, we start to feel at ease.

Converting companies to more environmentally friendly and cost-efficient operation is a key issue for most of our clients. Our goal is to provide our customers with solutions that gradually reduce the consumption of fossil fuels. We don't think "product"; we envision holistic solutions that meet our clients'

requirements and comply with even the most stringent legal regulations.

If you are looking to make your company future-proof, count us in.



Pushing the limits

To think ahead means to think holistically. That's why we offer complete systems that are uniquely reliable for lasting performance. We support our clients to help them achieve their goals in rapidly changing environmental and regulatory conditions.

Digital and data-based technologies are the cornerstones for the development of future-proof drive and power generation systems. Take our intelligent energy management solutions for example. The energy management system in our battery-hybrid propulsion solutions controls the generation, storage and distribution of power onboard the ship. This optimizes the overall performance, further increases safety and system reliability, and results in maximum efficiency and lower operational costs.

Another application is to improve the availability of renewable energy: wind and solar power can be made more reliable by storing surplus power and using instant power top-ups from engine and turbine gensets fuelled by gas or bio fuels. Renewable energy systems can even be added to power plants to act as fuel savers and hybrid island power systems – digital solutions that will drastically help to reduce the carbon footprint.



The right fit, performance and simplicity



MAN turbochargers are designed to deliver peak performance throughout their working lives – under some of the harshest conditions encountered anywhere in the world. This is achieved by combining three elements: simplicity, flexibility and reliability.

Simplicity

We develop and build our turbochargers to make installation, operation, servicing and maintenance as easy and efficient as possible. This reduces your initial capital investment and results in lower life cycle costs.

Flexibility

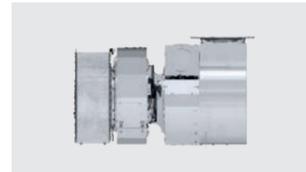
MAN turbocharger technology enables exceptional flexibility when striving to find the perfect blend of performance and energy efficiency. Aligning turbocharger specifications with engine requirements plays a key role. But it is not just about the maximum possible product ratings. It is about the best fit. We have a comprehensive product portfolio, and are proven experts in precisely matching the right turbocharger to the engine.

Reliability

As a global leader in pioneering turbocharger technology, we have built our reputation on the quality, efficiency and reliability of our products. Today, the average MAN turbocharger is designed for ultra-long times between overhauls for maximum flexibility and minimum maintenance requirements and downtimes. We extensively test all our turbochargers before they are launched, ensuring that you enjoy the highest standards of safety and reliability.

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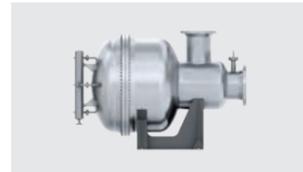


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The specialist performer

MAN TCR

Smaller, lighter, more powerful

The latest generation of MAN TCR turbochargers offers reduced size and weight while delivering greater efficiency, performance and reliability. Advanced materials ensure extended overhaul intervals, easier maintenance and a longer life.

Benefits

Modular design

Fulfills all relevant engine requirements

Easy to maintain and service

Maintenance can be carried out with standard tools

Variable turbine area optionally available

Airflow through MAN TCR turbochargers can be controlled by MAN VTA technology

Condition-based component maintenance

Parts are replaced on the basis of component condition, increasing component life and lowering costs

Easy installation

Compact, pipeless design ensures easy installation



The cutting edge

MAN TCR turbochargers were created to address the very special challenges faced by HFO, MDO, biofuel and gas engines. Products are available for the entire engine power range, from 350 kW to 7 MW per turbocharger. MAN TCR turbochargers are IMO Tier III compliant, and represent a robust, versatile modular platform – suitable for a wide variety of high, medium and low speed engine applications.

Applications

Marine propulsion
Marine GenSets
Power generation
Construction
Mining
Off-road vehicles
Locomotives
Mechanical drives
Industrial
Offshore

State of the art solution

MAN TCT

Full performance under environmental pressure

The MAN TCT is specifically designed for IMO Tier III two-stroke engines. The latest MAN axial turbocharger generation offers significant downsizing together with easier maintenance and higher charging efficiency.

The combination of new and proven design features ensures high charging efficiency, a high specific airflow and a high air pressure.

Benefits

Higher performance

5 % higher charging efficiency,
10 % higher specific airflow and
25 % increased charging pressure

Reduced cost of ownership

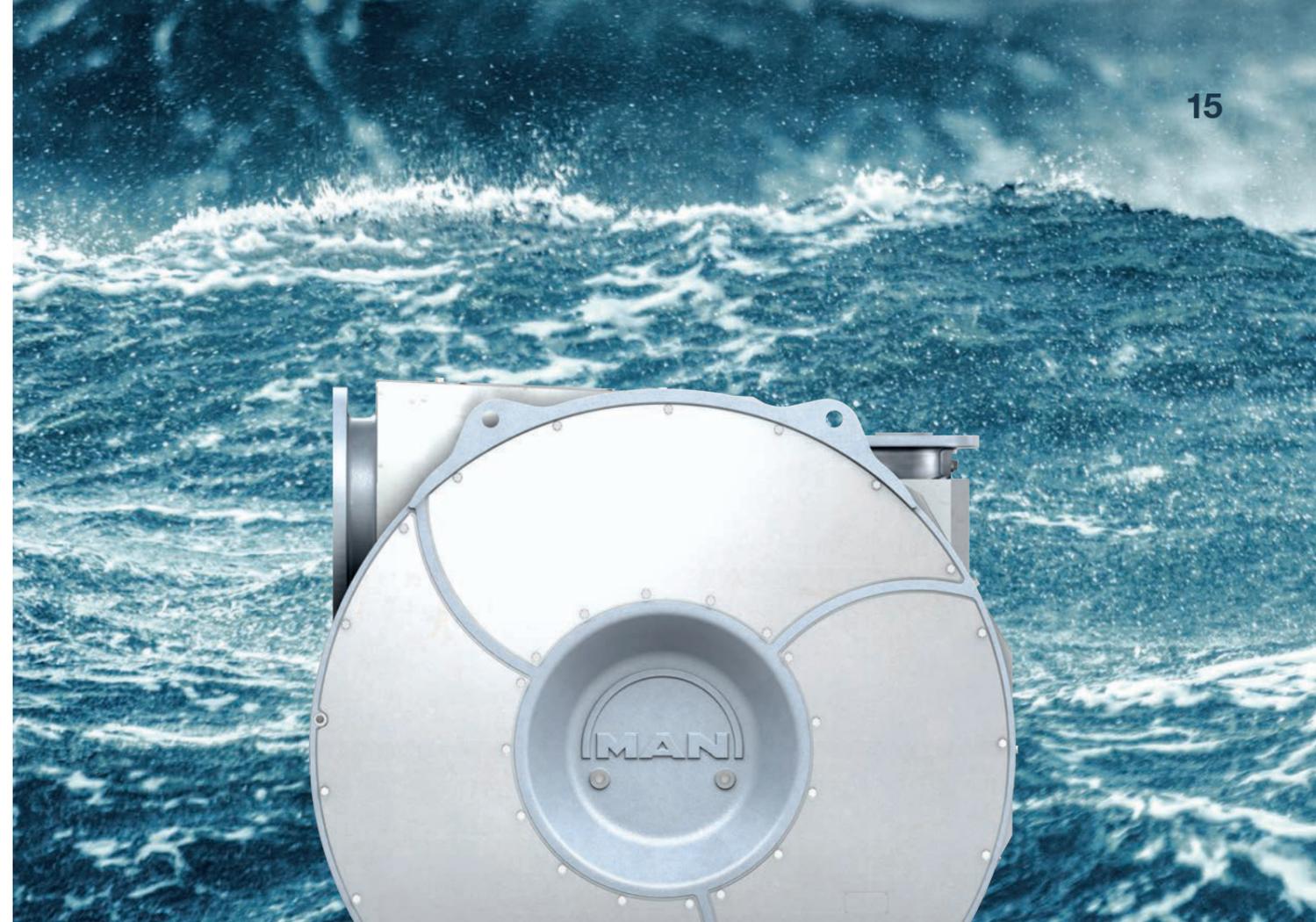
Extended service lifetime,
improved maintenance concept
and long service intervals

Reliability

Building on proven components from
MAN's 80-year turbocharger heritage
such as high-performance plain
bearings

Compact design

Up to 40 % decrease in weight and
30 % decrease in size, compared to
previous turbocharger series



Optimized for two-stroke engines

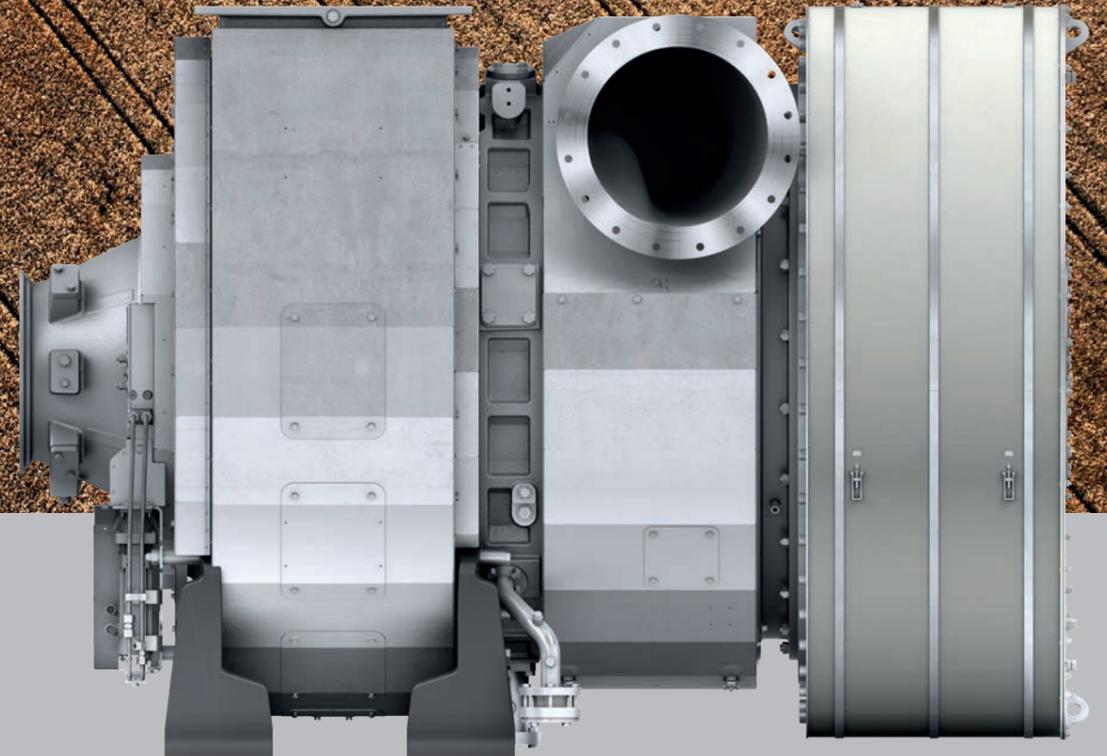
MAN TCT turbochargers are suitable for conventional fuel and dual fuel two-stroke engines in applications ranging from 6 MW up to 24 MW output per turbocharger. The core components of the MAN TCT are the compressor and the turbine. MAN's turbocharger experts used computational flow simulations (CFD) that make it possible to achieve multiple targets at the same time: wide compressor maps, high flow rates, high stability margins and exceptionally high efficiencies. The design is optimized for IMO Tier III requirements in whatever solution customers require.

Applications

Marine propulsion
Power generation

Power and reliability in one

MAN TCA



Hard-wearing simplicity

MAN TCA turbochargers are high-performance solutions characterized by ease of maintenance and long overhaul intervals. Modular design and a reduced number of components, suitable for all fuels and gases, have contributed to outstanding life cycle costs. MAN TCA turbochargers are compliant with IMO Tier II and III.

Benefits

Long intervals between overhauls and long component life
Drydock-to-drydock operation

Condition-based component maintenance
Parts are replaced on the basis of component condition, increasing component life and reducing costs

Easy to maintain and service
Maintenance can be carried out with standard tools

Variable turbine area optionally available
Airflow through MAN TCA turbochargers can be controlled by VTA technology

The benchmark

MAN TCA turbochargers are suitable for four-stroke and two-stroke gas, diesel and dual fuel engines in applications ranging from 3MW up to 30MW output per turbocharger. Using fewer parts than any other generation of MAN axial turbochargers has reduced maintenance and service times, ensuring lower life cycle costs. MAN TCA turbochargers meet all the latest environmental emissions standards.

Applications

Marine propulsion
Power generation
Marine GenSets
Offshore

Kinder to the environment

MAN ECOCHARGE

Two-stage turbocharging

As a compact two-stage unit, the MAN ECOCHARGE delivers outstanding turbocharging efficiency. A variety of product types and sizes are available, ensuring the perfect turbocharger-to-engine fit. Higher scavenging air pressure and efficiency allow improved Miller timing, enabling compliance with IMO Tier III emissions legislation.

Benefits

Lower specific fuel oil consumption (SFOC)

Increased turbocharging efficiency for reduced SFOC

Lower exhaust emissions (NO_x)

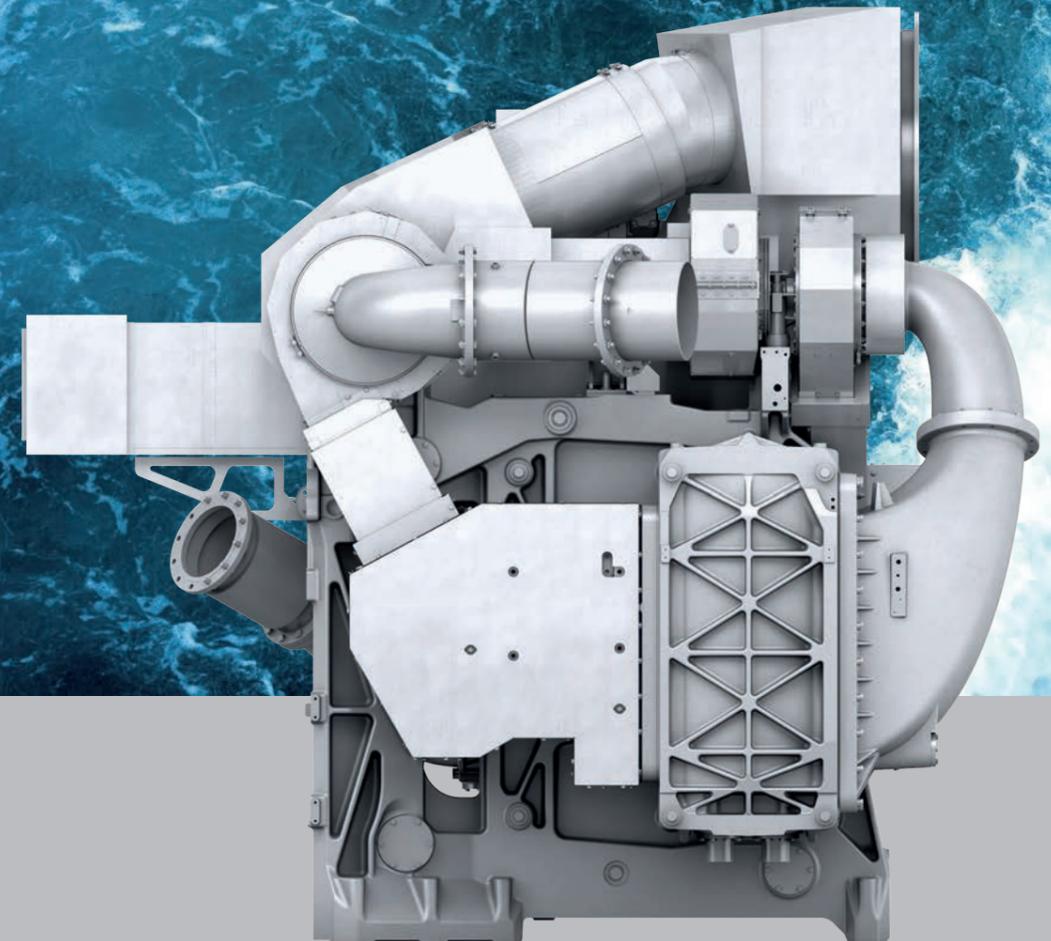
Higher scavenging air pressures of up to 10.5 bar allow improved Miller timing with lower NO_x emissions

Compact design

Integrated modular design reduces the overall dimensions of the MAN ECOCHARGE unit

Improved dynamic response

Smaller high-pressure stage turbocharger with reduced mass inertia for improved dynamic response



Reducing costs and emissions

MAN ECOCHARGE two-stage turbocharging is suitable for high and medium speed engines of all fuel types in applications for all engine power ranges. Extremely high efficiency and pressure ratios enable increased power density and allow improvements to key engine parameters. For example, it is possible to use a smaller engine for the same required power output, or to achieve lower NO_x emissions and lower specific fuel oil consumption (SFOC).

Applications

Marine propulsion
Marine GenSets
Power generation
Locomotives
Mechanical drives
Offshore

Cutting NO_x in after- treatment

MAN SCR-HP

High-pressure selective catalytic reduction

The MAN SCR-HP is available for two-stroke engines of all bore sizes and reduces – through internal catalytic reaction – NO_x exhaust emissions to IMO Tier III limits. With specially developed honeycombs and honeycomb

materials, as well as an integrated mixing unit, the overall size of the reactor has been drastically reduced compared to typical market designs and its medium speed counterpart.

Benefits

Improved compact design

The improved compact design, compared to conventional reactors, leads to considerable benefits for engine builders, shipyards and ship owners

One-source solution

A perfect fit thanks to MAN's expertise in propulsion systems from funnel to propeller

Proven technology

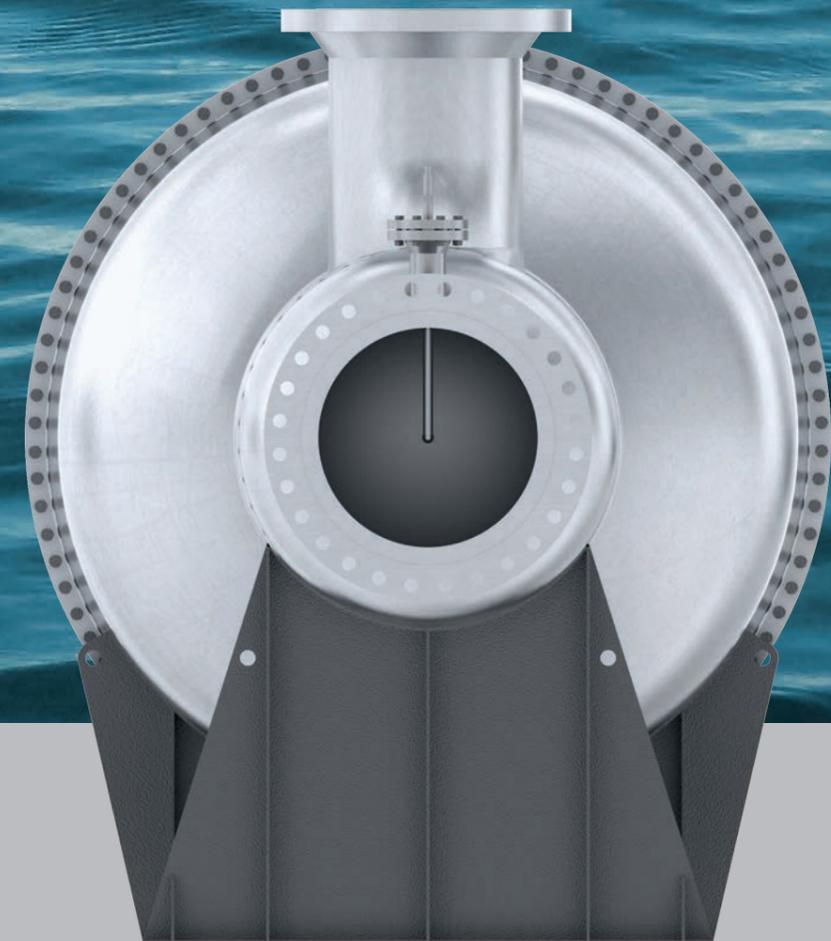
Based on MAN's in-house competence with four-stroke engines

SCR for two-stroke engines

The MAN SCR-HP is a small and compact NO_x emission reduction system. The compact design allows for easy integration, and the few frame sizes will cover the entire two-stroke portfolio up to 25 MW per SCR reactor. The integrated mixing unit reduces the overall length and volume. The specific honeycombs ensure a compact design. The MAN SCR-HP can be mounted in all positions and is capable of running on all fuels. Auxiliary components like the urea injection lance, urea dosing unit and urea pump module are from MAN's well-proven SCR-LP system.

Applications

Marine propulsion
Power generation



Robust IMO Tier III performance

MAN ETB Electrical turbo blower

Reducing NO_x through recirculation

The MAN ETB features a highly efficient blower wheel, optimized for low pressure ratios. The materials used are designed to withstand corrosive agents. High blower availability and variable speed operation ensure IMO Tier III compliance in emission control areas (ECAs).

Benefits

Low consumption

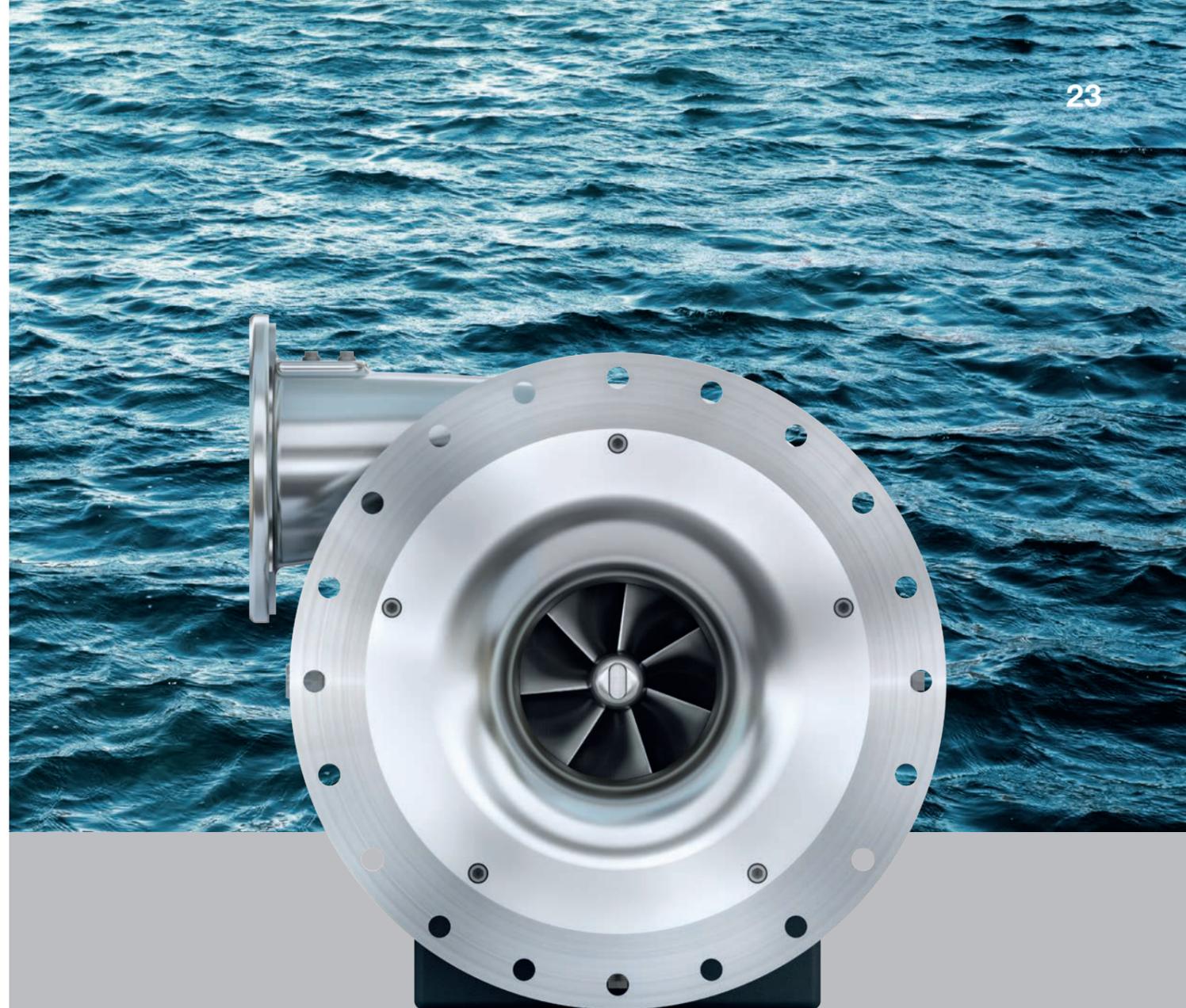
Improved thermodynamic efficiency allows extremely low energy consumption

High durability

All materials have been designed for highly corrosive atmospheres

Smart control for stable EGR flow

EGR flow is controlled by a high speed electric motor. The MAN ETB is integrated into the engine control system



Exhaust gas recirculation blower

The EGR blower MAN ETB is suitable for exhaust gas recirculation (EGR) engines of all fuel types in all application ranges. Specifically designed for EGR systems, the MAN ETB's active control plays an important role in enabling these systems to reach IMO Tier III emission standards. The required EGR operating conditions are achieved by using a high speed electric motor directly coupled to the compressor wheel and controlled by a frequency converter.

Applications Marine propulsion

Flexible turbo-charging

MAN VTA

Minimizing consumption and emissions

MAN VTA (variable turbine area) allows charge air delivery to be optimized to demand for charge air precisely, steplessly and continuously at all engine loads and speeds. VTA minimizes fuel consumption and related exhaust emissions.

Flexible air and fuel management is key to meeting the emissions legislation of the future while increasing engine performance and reducing specific fuel oil consumption (SFOC). In heavy fuel oil applications, VTA technology has a powerful and positive role to play.

Benefits

Reduced consumption

Up to 5 g/kWh lower fuel consumption

Reduced emissions

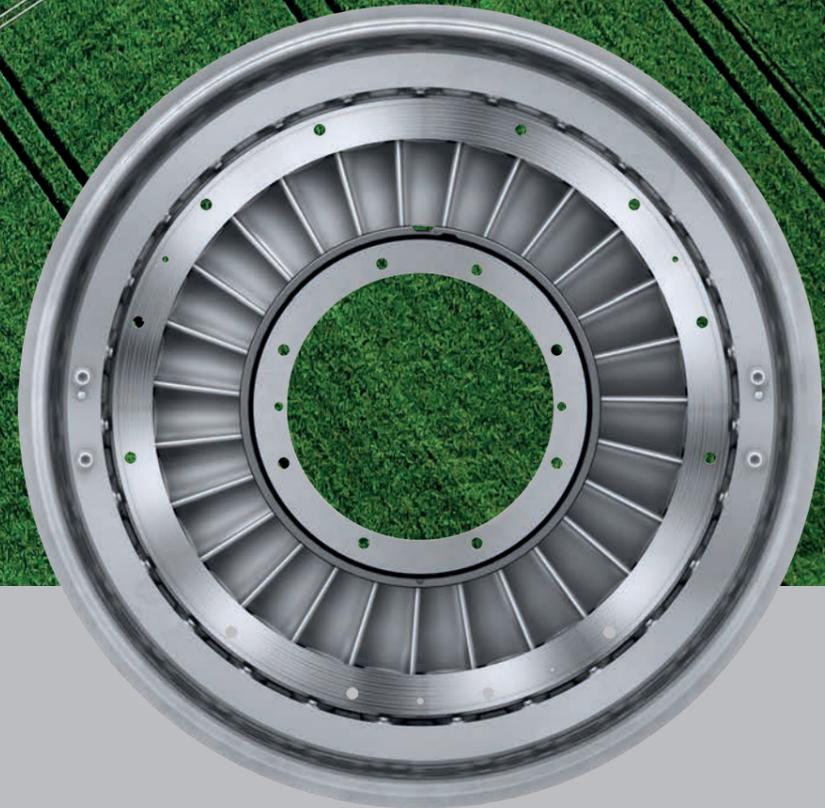
Lower soot and smoke emission and lower particle emissions

Easy application

Suitable for TCA and TCR turbochargers and retrofit packages

Flexibility for large engines

The MAN VTA system can be optionally fitted to both MAN TCA and MAN TCR turbochargers. It enables the charge air volume to be precisely matched to the quantity of injected fuel across all points of an engine's load and speed range. The result is increased engine efficiency, reduced SFOC, lower HC and CO₂ emissions and improved engine response.



MAN PrimeServ

Service with passion



24
hours a day

365
days a year



MAN PrimeServ is the dedicated MAN Energy Solutions service brand. Via a network of over 100 service centers worldwide, MAN PrimeServ provides 24/7 service across the globe. Our range of services includes technical support, consulting and OEM spares, as well as maintenance, repair and comprehensive individualized service plans.

MAN PrimeServ's aim is to provide

- Prompt delivery of high-demand OEM spare parts within 24 hours
- Fast, reliable and competent customer support
- Individually tailored O&M contracts
- Ongoing training and qualification of operators and maintenance staff
- Global service, 24 hours a day, 365 days a year
- Diagnosis and troubleshooting with our high-performance online service

Worldwide service

100
service centers
worldwide

We offer retrofitting and upgrade services to bring engines and turbochargers already in service up to the very latest standards of performance and efficiency.

Using the latest digital technology, we enable you to maximize the performance and availability of your MAN equipment by accessing real-time data analysis, remote support and rapid solutions. We also offer an extensive range of training courses at MAN PrimeServ academies around the world.

Our service does not vary according to location. We know that a vessel may be built in Asia, operated in Europe for ten years and then move to Africa for the next ten years. That does not alter our focus on dedicated training, fast delivery of strategic spare parts, a comprehensive approach, or our tailored maintenance contracts.

For more information please visit
www.man-es.com/primeserv

MAN PrimeServ

The heart of your engine ...



An interactive experience

Download our MAN Brochure Store app from the App Store or Google Play Store. Use its exciting interactive features to explore our complete range of products and services. Suitable for iPhone, iPad and Android.



Explore our latest news via an app

DieselFacts brings you the most recent news from the world of two-stroke and four-stroke engines, including the latest technical papers, in-depth features and videos.

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