



Efficiency
by MMG

Precision meets perfection.



Customer Excellence

MMG focuses on a complete and constant fulfilment of all customer requirements which is our primary goal.

We combine our extensive experience and customer ideas in order to create specific and flexible solutions. As an international operating company MMG offers a tailor made integrated concept in cooperation with competent specialists for more efficient and innovative solutions.

In collaboration with our professional agents MMG provides full service – at all times and worldwide.



Mecklenburger Metallguß GmbH
Teterower Str. 1 · 17192 Waren (Müritze) · Germany
Phone +49 3991 736 160 · Fax +49 3991 736 210
sales@mmg-propeller.de



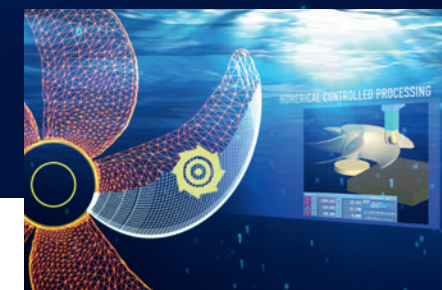
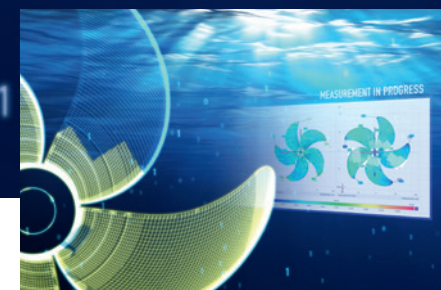
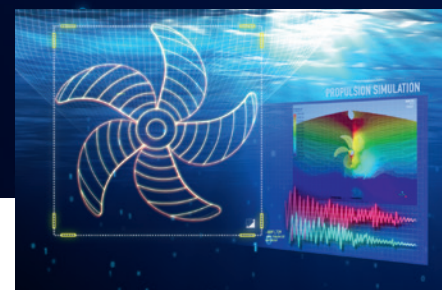
MMG – Digital technologies

for the highest quality and efficiency.



Many ship owners are redefining their requirements against a background of rising fuel prices. Efficiency becomes particularly important for slow steaming.

The »Efficiency by MMG« label denotes a new generation of products, which produce powerful propulsion, save valuable resources, lower costs and reduce CO₂ emissions.



Secure a clear competitive edge in maritime trade – save up to 14 % in fuel with digitally optimised 5D Propulsion from MMG.

MMG is setting new standards in the field of high-efficiency propeller drives with the innovative »5D Propulsion« concept. The key to success is the highest precision: by using five innovative digital technologies we guarantee design quality and production accuracy for our products that are unique worldwide.

The result: an unrivalled high level of efficiency and a fuel saving of up to 14 percent.



Individual propellers in perfect alignment with the ship's operating profile are our response to the increasing economic and environmental challenges in shipping.

MMG no longer limits propeller design to the standard parameters such as the hull, engine and rudder, but also includes load, draught, drift angle, running speed, current, wind and swell on the planned route. Classic calculation methods cannot cope with these requirements. However, MMG has developed an innovative algorithm in collaboration with the Hamburg University of Technology (TUHH), which enables us to incorporate 2,000 operating points. And we are the only propeller manufacturer in the world with this capacity. We can achieve unprecedented design quality thanks to this innovation.



MMG developed Numerical Propulsion Simulation (NPS) to increase the design accuracy by obtaining the hull-propeller interactions directly.

This unique technology means we can quickly and cheaply compare alternative propeller designs as often as we like already at an early development stage of the project. Like in a model test we can run the propeller designs at different vessel speeds under different loading conditions looking for the most efficient configuration. This is how we find the most efficient solution for the ship owner's requirements. Classic model tests performed at ship model basins confirm the NPS results.



Whether the potentials of the propeller design can be exploited depends largely on the technological implementation. Using Optical Precision Measurement (OPM) MMG guarantees the highest design accuracy in all dimensions.

The propeller is scanned with an accuracy of up to 1/100 mm – from the cast blank to the final grinding – using fringe pattern projection and an optical sensor. The propeller is only awarded the »Efficiency by MMG« certificate when the results of the OPM are in perfect alignment with the design geometry from the Multidata Design Concept. So we guarantee that our propeller will achieve the calculated and predicted performance in full scale on all oceans.



MMG relies on Numerical Controlled Processing (NCP) for highly accurate machining used at all stages of production.

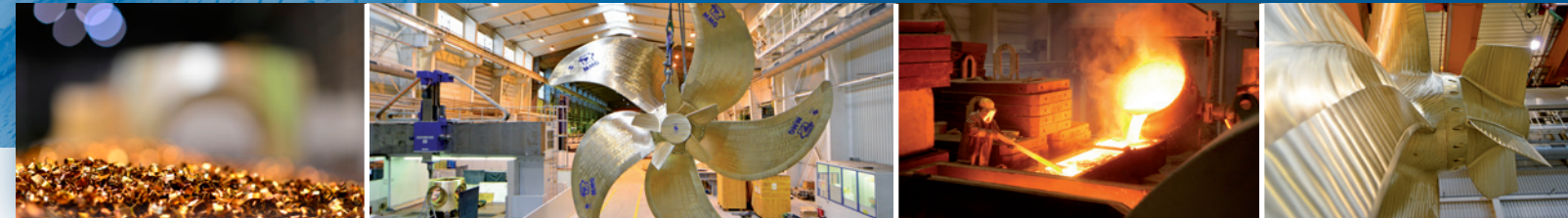
NCP involve all numerical processes MMG propeller passing through during construction and manufacturing. With the most accurate free formed surfaces using modern CAD software the basis is set for all geometrical evaluation – whether for best fit algorithm just after casting, as a basis for CAM works or as a rule for the final quality check.

This ensures that MMG's design quality can be kept during all necessary processes in order to give the propellers best efficiency even in full scale.



MMG has developed the Virtual Contact Test (VCT) to reduce expenditure on propeller assembly. With VCT the conical hub bore of the new propeller is measured precisely down to a hundredth of a millimetre and aligned with the design data of the existing shaft while still in the MMG works. The propeller is supplied ready for fitting. The MMG engineers will test the dimensions of the ship's shaft using a mobile measuring unit if required.

The VCT, which is recognised by the leading classification societies, makes the traditional spot check fully superfluous – in both redesign programmes and on new ships.



% Elaborate fin design reduces torque losses and saves up to 3 percent in fuel

€ Return on Invest after 3 months

 For existing propellers, redesign programmes and new ships

5D
Innovative 5D Propulsion for the highest production precision



Fast and cost-effective installation

The innovative Energy Saving Cap (MMG-escap[®]) from MMG enables ship owners to increase the efficiency of their propulsion system by up to 3 percent. In contrast to conventional propeller caps, the MMG-escap[®] has an elaborate fin design. It straightens the hub vortex and reduces torque loss. The MMG-escap[®] is not just suitable for new propellers, however. It is also the ideal solution for making existing propellers more efficient. And because the investments required are manageable, the return on investment can be achieved in less than six months.

An investment with multiple pay-offs

As model tests show, the average saving potential for a 7,000 TEU container ship running between Asia and Europe with the Energy Saving Cap is approx. 3 percent. For a vessel speed of 17 knots and a price for IFO 380 of 600 USD per ton the operating cost on an Asia round trip will be deducted by USD 96,000. The return on investment, for example, is achieved in less than 3 months. Another significant benefit: the optimised flow behaviour reduces cavitation on the rudder and hull, reduces wear and tear and, thus, increases service life time of the vessel.

In perfect alignment with every propeller

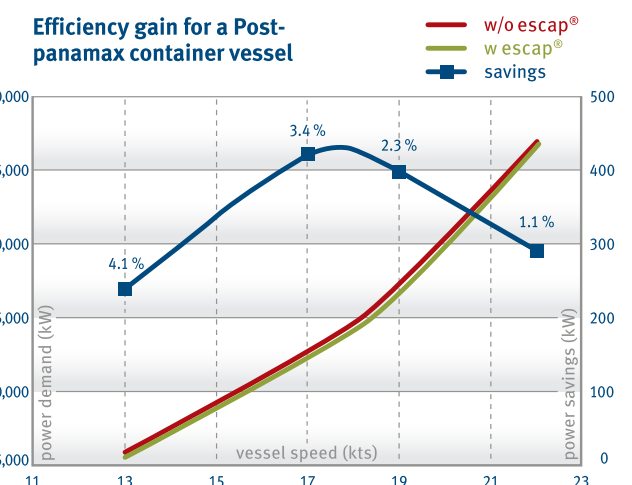
MMG has been setting standards in development and production precision for more than 70 years to exploit the potential of the design completely. Each MMG-escap[®] is individually customised for the propeller and the ship's specific operating profile. This is facilitated by the firm's production equipment, including the largest induction furnace in the world for copper alloys, computer-controlled five-axis milling machines and high-end machining centre. Experts use the latest laser measuring techniques to monitor quality. The MMG-escap[®] does not receive the Efficiency by MMG certificate until everything is perfect.

Fast installation. Global service.

Whether as a retrofit for an existing propeller, in combination with a redesign or as an extra for a new propeller on a new ship – MMG fits the MMG-escap[®] quickly and all over the world.

Propulsion for the shipping of tomorrow

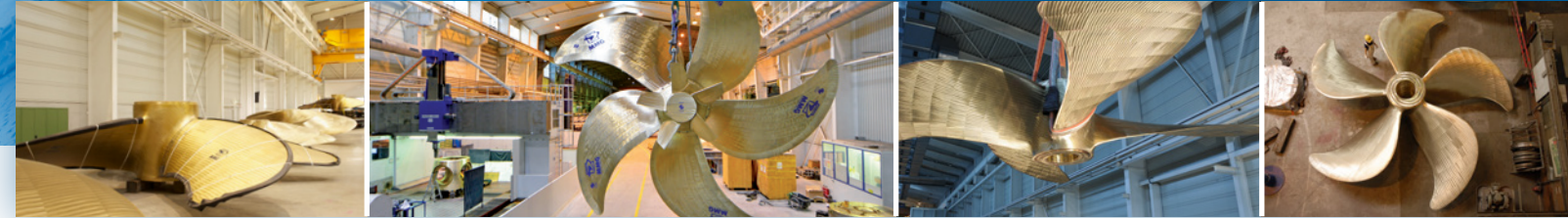
MMG is continually researching new technologies and methods. We implement our ideas as specific and tangible innovations for shipping. We develop integrated concepts in collaboration with specialists and partners for more efficient mobility at sea.



MMG espro

energy saving propeller

Individual propellers for more efficient propulsion.



%
10 % less fuel consumption
than standard propellers

max.
Up to 160 tonnes
in weight and
11.6 metres in diameter



Global
service

η
Highest efficiency thanks to
customised production for every vessel
type and size, and for the specific
operating profile

5D

2D

Innovative 5D Propulsion for the
highest production precision

HQ

Highest alloy quality for an
extended operating life

Ship propellers from MMG have been setting standards for more than 70 years in terms of size, quality and efficiency. We are also leaders in the development of highly damping alloys, e.g. for naval and research ships. Our Silent Propulsion solutions reduce noise emissions from propellers. We design propeller drives under the »Efficiency by MMG« label which are in perfect alignment with the ship, the engine and the operating profile. We achieve the highest design and production accuracy with our unique »5D Propulsion« digital technology. This facilitates fuel savings of up to 10 % compared to conventional propeller designs.

Top design for every type of vessel

Whether container ships, tankers, bulk carriers, cruise ships, naval vessels or supply ships – MMG designs and manufactures propellers up to 160 tonnes and 11.6 metres in diameter for all ship classes and sizes. We guarantee the highest reliability by using copper alloys, the quality of which goes far beyond the standards required by the classification societies.

Custom-fit for the specific operating profile

Each MMG-espro is individually customised for the planned operating profile of the ship. Load, draught, drift angle, speed, current, wind and swell on the planned route – all play a crucial role in the conceptual design. MMG is able to incorporate over 2,000 operating points into the unique Multidata Design Concept (MDC). MMG not only sets new standards in data volume, but also exceeds the standard in terms of data quality. Weather data, for example, are broken down into the smallest detail, rather than just being recorded wholesale. MMG integrates empirical data from more than 70 years' experience in propeller manufacturing. For above-average efficiency on slow or fast journeys, with a full or reduced load.

Highest production precision thanks to digital technologies

Whether the design potentials can be exploited depends on extraordinary measures on technical feasibility. The innovative 5D Propulsion guarantees unrivalled high production precision. We use highly accurate digital technologies, such as Numerical Propulsion Simulation (NPS), Optical Precision Measurement (OPM) and Numerical Controlled Processing (NCP). For maximum design accuracy and maximum efficiency.

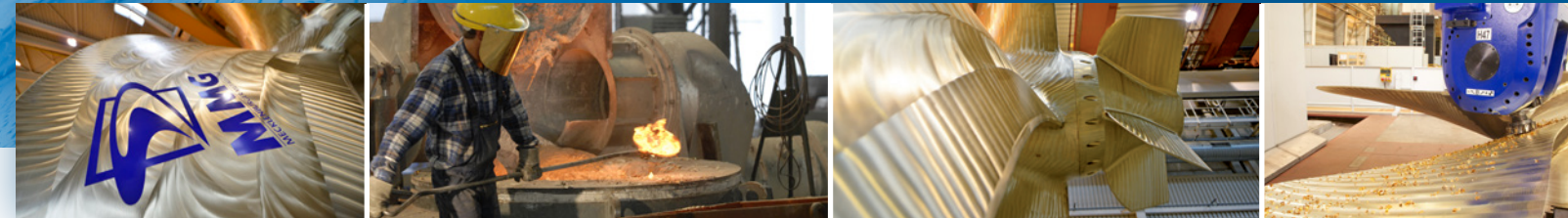
Production under one roof

We have the largest continuous production line for ship propellers in the world with an annual capacity of 14,000 tons, facilitating an array of production possibilities. With the world's largest induction furnace for copper alloys, computer-controlled five-axis milling machines and high-end machining centre, we are well equipped for all requirements. Experts use the latest laser measuring techniques to monitor quality. The MMG-espro does not receive the »Efficiency by MMG« certificate until everything is perfect.

MMG redesign

redesign programme

Optimising your operational fleet. Up to 14 % fuel saving.



MMG buys your
old propeller



Return on Invest
after 6 months



Save up to 14 % in fuel across your
fleet by adapting the propeller to the
ship's changed operating profile



Quick propeller
replacement



Worldwide and
lifelong service

Overcapacity, falling cargo rates and rising fuel prices have been putting pressure on maritime trade for years. Many ship owners are already using slow steaming to reduce fuel costs and bring more ships in charter. Many shipping companies have now fully exhausted the potential savings of reduced speed with the existing technology. MMG redesign offers additional saving potential. Swapping the ship's propeller for one aligned with the new operating profile increases efficiency and reduces consumption. In combination with the MMG-escap®, ship owners can achieve fuel savings of up to 14 percent. An additional plus: MMG rebuys the old propeller. Thus, the return on investment is achieved in just six months.

For a secure investment: Model test reviews saving potential

MMG performs extensive calculations to determine the achievable saving potential of the redesign programme for every ship. We are the only propeller builder able to incorporate over 2,000 operating points thanks to our Multidata Design Concept (MDC) – from real-life ship speeds to weather and load conditions. We test the predicted saving potential with our Numerical Propulsion Simulation (NPS). Model tests performed at ship model basins confirm the NPS results.

Perfection down to the last detail.

MMG is setting new standards in production precision with digitally optimised 5D Propulsion to exploit the potential of the design to the full scale. The firm has the largest induction furnace in the world for copper alloys, computer-controlled five-axis milling machines and high-end machining centre, facilitating an array of production possibilities for ship propellers. Experts use the latest measuring techniques to monitor quality. The propeller is only delivered once everything is perfect.

Quick replacement. Complete service.

MMG has developed the Virtual Contact Test (VCT) to ensure that propellers can be replaced within one docking interval. With VCT the conical hub bore is measured precisely down to a hundredth of a millimetre and aligned with the design data of the existing shaft while still in the MMG works. The MMG engineers will test the dimensions of the ship's shaft using a mobile measuring unit if required.

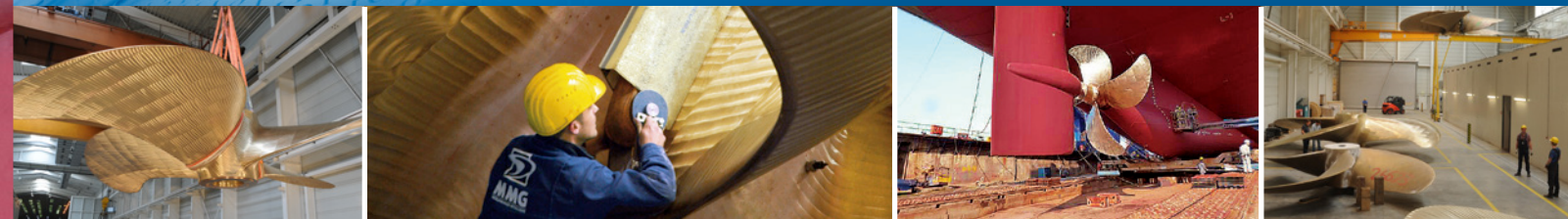
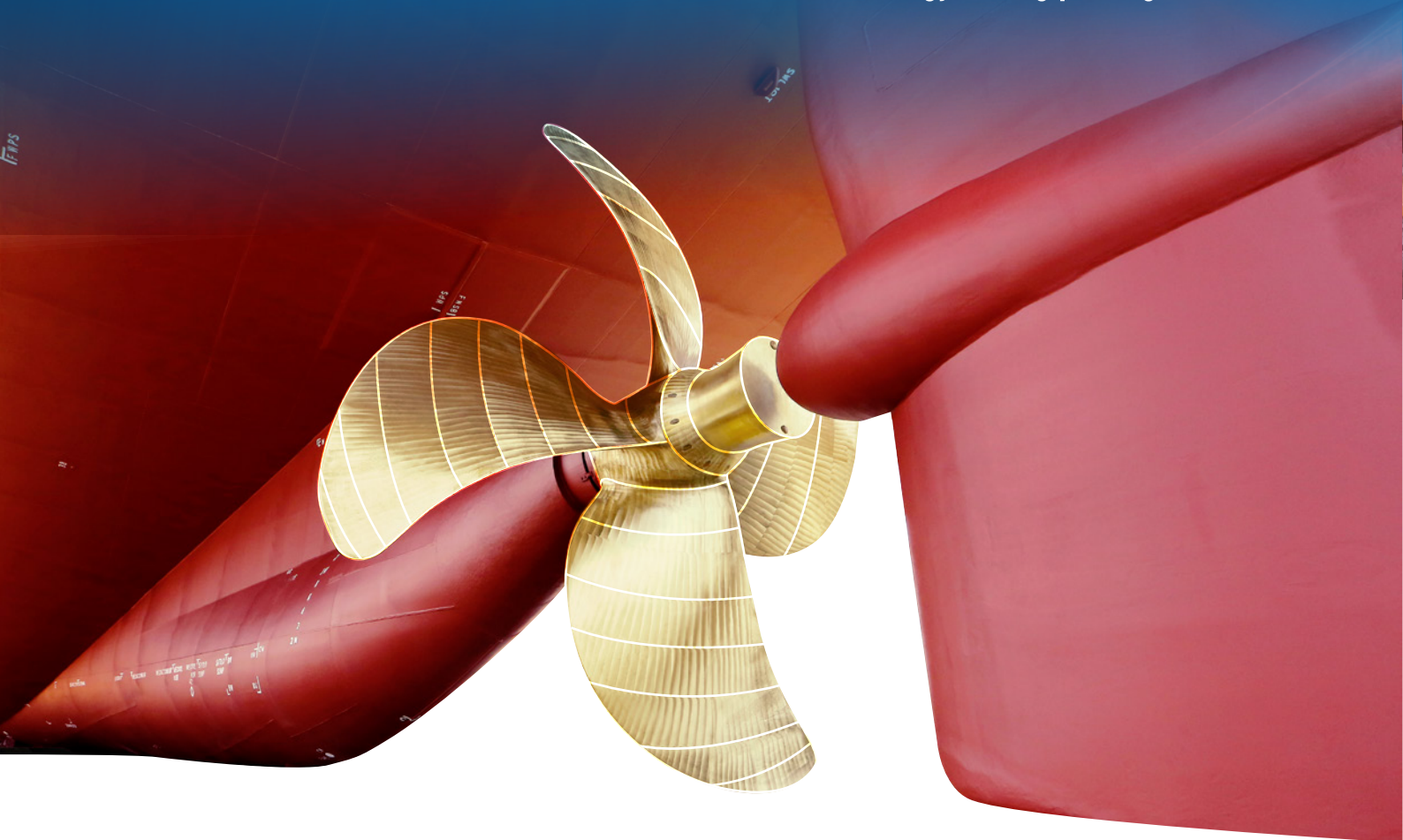
The VCT makes the traditional spot check for fit accuracy between the propeller and shaft cone fully superfluous.

MMG also offers extensive services after fitting. Whether supervision, modification, consultation or repair after an accident – LifeCycle Management applies for the entire service life of the propeller. You can rely on MMG. On all oceans. That's »Efficiency by MMG« too.

MMG espacTM

energy saving package

Doubly efficient – propeller and rudder in perfect alignment.



Global challenges require integrated solutions. In its drive to increase the efficiency of ship propulsion and reduce emissions MMG looks at far more than only the propeller itself. In partnership with Van der Velden Marine Systems, MMG has developed a fully optimised propulsion concept: the Energy Saving Package (MMG-espacTM). Optimised interaction between propeller and rudder improves propulsion efficiency and manoeuvrability significant. This enables ship owners to save up to 14 % in fuel.

Comprehensive know-how for ground-breaking solution

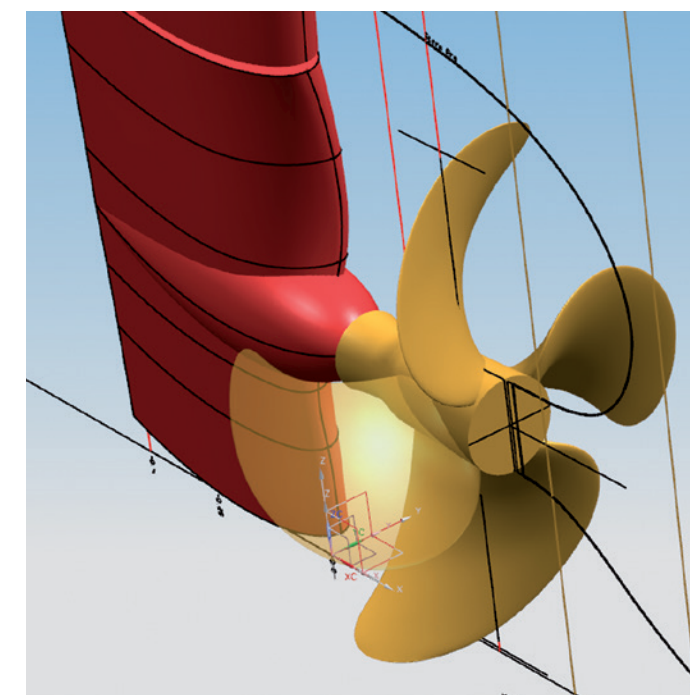
MMG, the world's leading propeller manufacturer, and Van der Velden Marine Systems, the rudder technology specialist, have pooled their joint expertise in MMG-espacTM, bringing tangible benefits for the shipping industry. Propeller and rudder are developed as an integrated and perfectly aligned system. This results in more efficient propulsion and much lower consumption. An additional plus: the optimised flow behaviour substantially reduces cavitation and, in so doing, extends the operating life of the vessel. For more economical fleet operations.

Propulsion for the shipping of tomorrow

MMG is continually researching new technologies and methods. We implement our ideas as specific and tangible innovations for shipping. We develop integrated concepts in collaboration with specialists and partners for more efficient mobility at sea.

Perfection down to the last detail

MMG is setting new standards in development and production precision for ship propellers with its innovative 5D Propulsion. The Multidata Design Concept (MDC) facilitates highly accurate designs. We are the world's only propeller manufacturer to incorporate over 2,000 operating points, e.g. load, draught, drift angle, speed, current, wind and swell on the planned route. Design accuracy down to the smallest detail is guaranteed by Numerical Propulsion Simulation (NPS), Optical Precision Measurement (OPM) and Numerical Controlled Processing (NCP). For maximum efficiency of the MMG-espacTM.



Return on Invest
after 5 months



Fuel saving up to 14 %
compared to standard
configurations



Perfect alignment of propeller and
rudder for optimised flow behaviour,
highly efficient manoeuvrability
and reduced cavitation



Innovative 5D Propulsion for the
highest production precision