

# Products

# 2



**MÄRKISCHES WERK**

Your Engine. Our Ingenuity.™

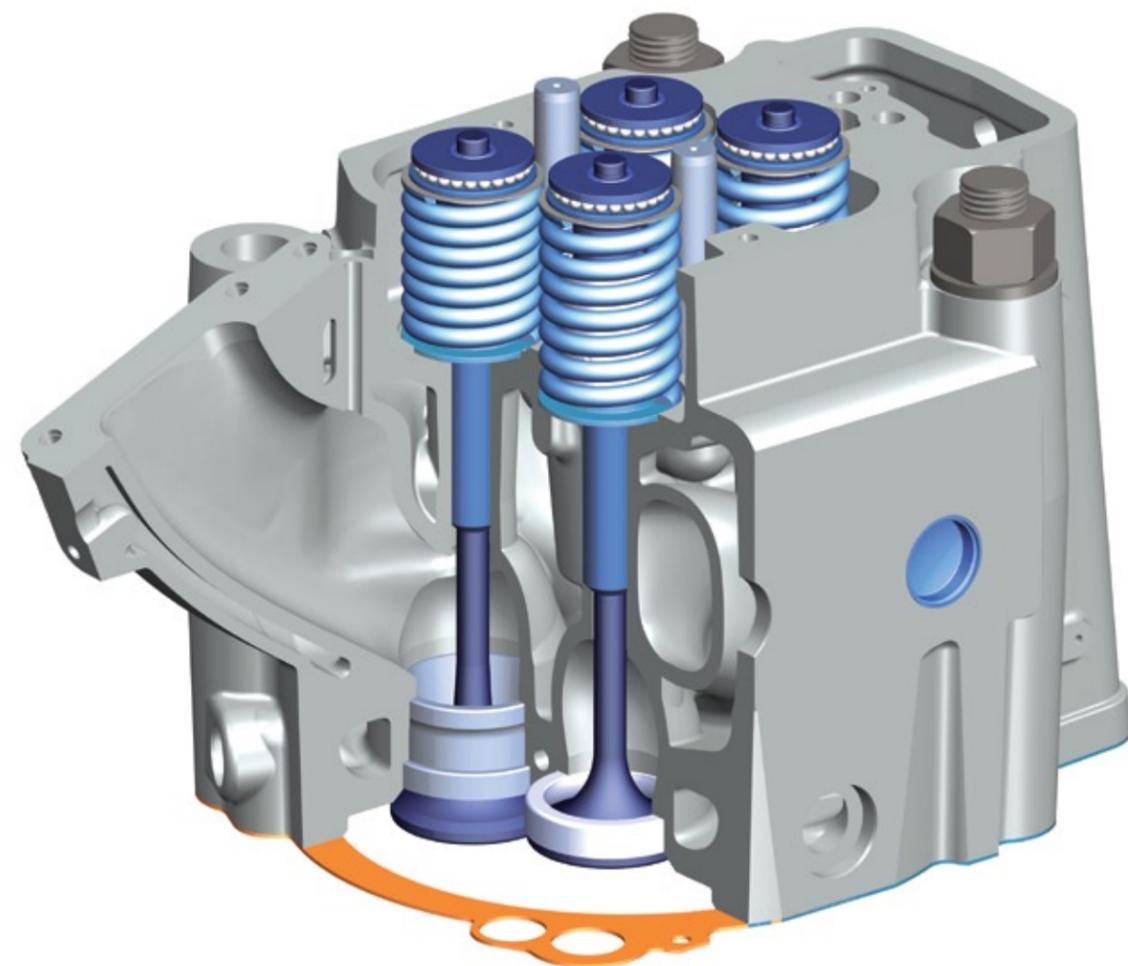
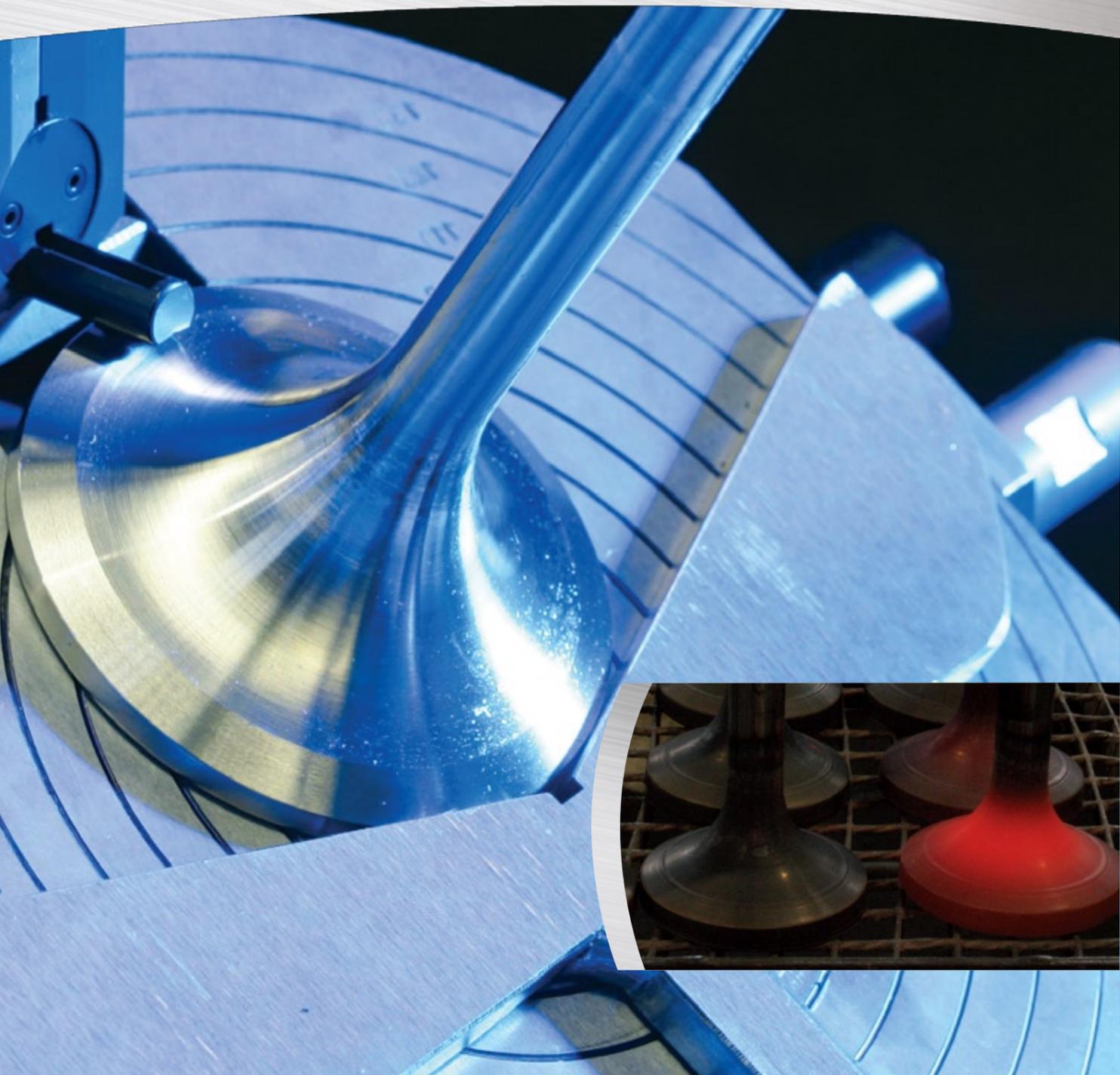
# Worldwide Provider of Cylinder Head Systems for Large Combustion Engines.



**MWH delivers products you can trust. Our innovation and cutting-edge technology have earned the loyalty of 90% of the large engine builders around the world who demand the highest level of performance and service.**

**Leveraging decades of experience, we develop reliable products for large 2- and 4-stroke combustion engines, setting new benchmarks for efficiency, lower running costs and dependability. Expect more from MWH.**

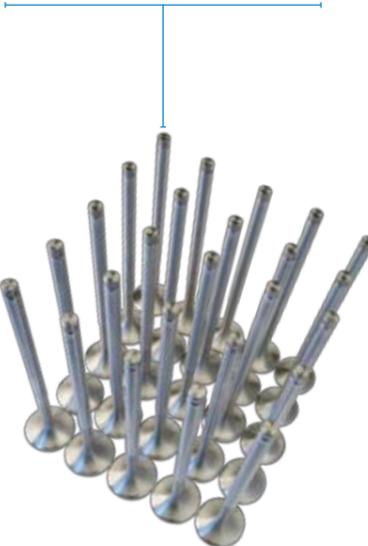
## 4-Stroke Cylinder Head Systems



**MWH manufactures superior quality 4-stroke cylinder head components for a wide range of applications and fuel-types including diesel, MDO, heavy fuel, natural gas, and propane. Our customers can rely on us for all critical-to-function components including valves, seats, guides, springs, valve rotators, and clamping cones. Selecting a complete MWH system ensures optimum form, fit and function for maximum performance and reliability.**

**Valve Spindles**

MWH offers a wide range of high quality valve spindles for the most demanding engine applications. Because durability starts from within, MWH material specifications are more demanding than industry norms. From the raw material to the dozens of microstructure-altering manufacturing steps, our experience and superior process control are your peace of mind.



**Valve Seats**

The valve seat is the tribological mate of the valve and must be manufactured to exacting tolerances and material standards. Coolant leaks, prematurely worn valves, and recessed and dislodged seats are common signs of valve seat failure. MWH has perfected reliable solutions to these problems including cooled and non-cooled seats with hard-facing, hardening techniques, as well as various innovative coatings.

**Valve Guides**

MWH valve guides are engineered to provide extended service life and the lowest lifecycle costs. The fit between the valve, guide, and cylinder head, and the tribological properties of the guide and valve shaft all play critical roles in the reliability of the cylinder head system. MWH offers innovative iron-alloy valve guides proven over decades of field experience.



**Valve Rotators**

MWH developed the industry standard Turnomat, the only valve rotator offering forced rotation, controlled seat-polishing, and tunable performance to meet the needs of your engine. Reliable rotation provides uniform temperature distribution around the valve head, a necessity with today's hard-working modern industrial engines. MWH offers valve rotators for a wide range of engine types.

**Valve Cages**

MWH is the premier manufacturer of valve cages. With a thirty year history and the experience of more than 100,000 cages, MWH can be trusted to produce this complex system to exacting standards. Our engineers have combined manufacturing and field experience to introduce innovative functional improvements to many of the most popular cage types.

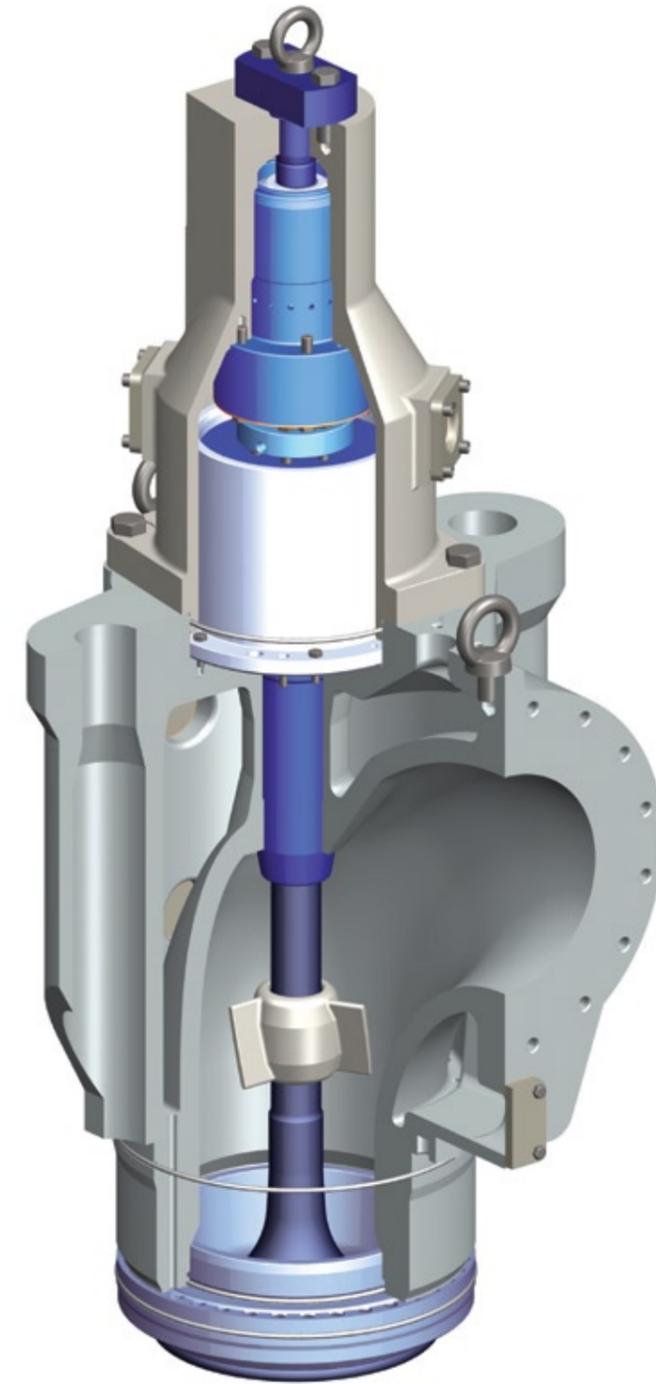


**Valve Springs**

MWH supplies valve springs with outstanding dynamic performance for unsurpassed valve longevity. Our springs are dynamically tuned to the valve train to prevent resonance and valve bouncing. We offer single- and dual-coil systems manufactured exclusively from world class "superclean" materials.



## 2-Stroke Exhaust Valve Systems



A 2-stroke exhaust valve is a highly complex system whose many highly-loaded components must be precisely synchronized in form, fit and function. Metallurgy, tribology, hydraulics, pneumatics and dynamics all play crucial roles in the long-term reliability of the 2-stroke valve. Who better to manage this intricate interaction than the experts at MWH?

## Valve Spindles

MWH offers a wide range of high quality valve spindles for the most demanding engine applications. Because durability starts from within, MWH material specifications and microstructure specifications are more demanding than industry norms. Despite their massive size, MWH 2-stroke spindles are manufactured to the same exacting geometric tolerances as its 4-stroke valves.



## Seat Rings

The valve seat is the tribological mate of the valve and must be manufactured to exacting tolerances and material standards. Coolant leaks, prematurely worn valves, and recessed and dislodged seats are common signs of valve seat failure. MWH has perfected reliable solutions to these problems including cooled and non-cooled seats with hard-facing, hardening techniques, as well as various innovative coatings.

## Valve Guides

MWH 2-stroke valve guides are engineered to provide extended service life and the lowest lifecycle costs. The fit between the spindle, guide and valve housing, as well as the tribological properties of the guide and spindle shaft play critical roles in the reliability of the 2-stroke exhaust valve system.



## Sentry Rotator

This innovative, patented 2-stroke valve rotator is the first of its kind. It provides forced valve rotation through an ingenious mechanism housed within the valve drive unit. Rotation rates can be tuned to the needs of the engine and rotation can be set to occur on valve opening or closing. The Sentry Rotator provides a controlled polishing effect between the seat and valve spindle, continuously removing the combustion deposits that cause catastrophic blow-by. The Sentry Rotator decreases lifecycle costs and increases reliability.

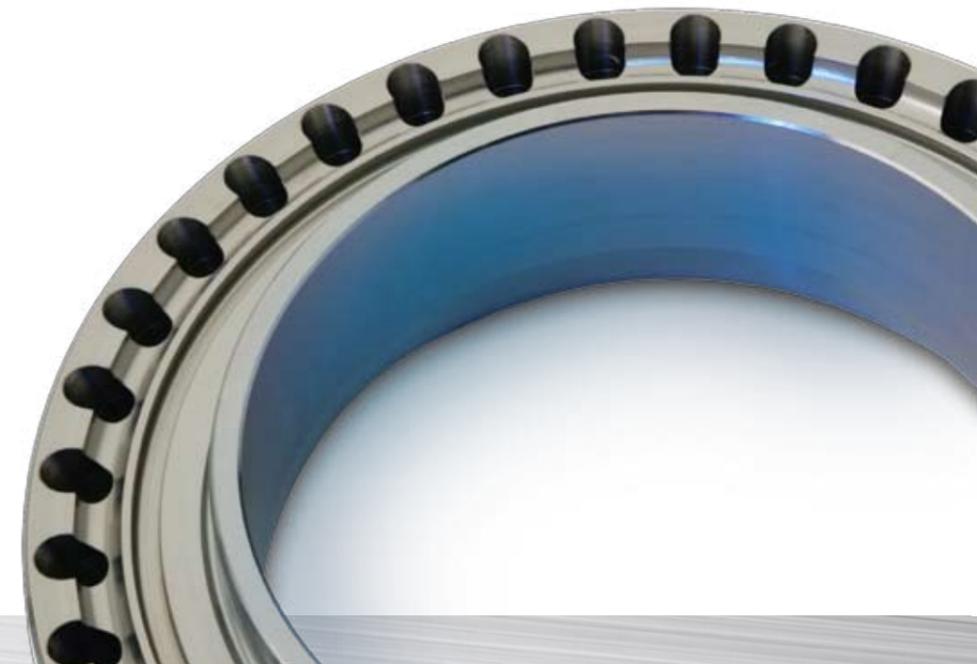
## Valve Drives

The valve drive is the workhorse of the 2-stroke exhaust valve system. It must provide massive opening and closing forces in perfect timing to ensure the proper combustion performance and efficiency of modern 2-stroke engines. MWH valve drives are available with class approval, as stand-alone units or completely assembled with all components.



## Valve Housing

The valve housing is the backbone of the complete 2-stroke exhaust valve system. MWH valve housings are available with class approval as stand-alone units or completely assembled with all components.



# Coating and Welding Technology



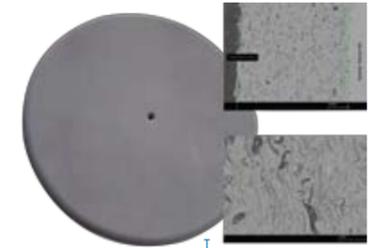
## Nimalike

Nimalike is an exclusive, computer-controlled process which leverages MWH's years of experience welding superalloys to provide a protective layer on the wear surfaces of 2-stroke spindles. Nimalike originated as a remanufacturing process for large 2-stroke, nickel-based exhaust valve spindles. The technology is now also applied to the manufacture of new exhaust valve spindles.



## Cold CorrosionCoat

Cold Corrosion Coat, or C<sup>3</sup>, is an innovative coating which provides a stable barrier to prevent acidic cold corrosion of engine components. C<sup>3</sup> extends time between overhauls, decreases in-service component failures, and dramatically increases component lifetimes.



## MW-C<sup>2</sup>

MW-C<sup>2</sup> is an innovative thermal barrier coating that effectively protects against hot corrosion of components directly exposed to the combustion chamber and exhaust gases. Unlike a ceramic coating, MW-C<sup>2</sup> won't crack and flake off over time. It can be applied to valves and other engine components, increasing time between overhauls and reducing running costs.

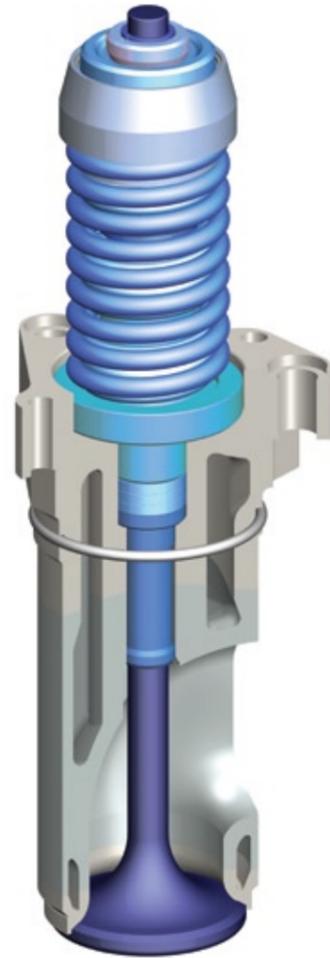
**At MWH, we believe that innovation is at the heart of increasing performance and extending time between overhauls. We are dedicated to developing expertise in the area of specialty coatings which fight the degrading effects of heat and friction.**

**Cages:**

MWH is the world's leading supplier of cages and cage components with 30-years and over 100,000 cages of proven success. Manufacturing cages requires expertise in casting, forging, brazing, welding, heat-treatment, and machining. The complex interaction of all components in a cage must be guaranteed for acceptable lifetime. MWH's metallurgical expertise, manufacturing excellence, and years of experience remanufacturing cages are all assurances that MWH cages will perform reliably in your engine.

**Kits:**

MWH's customized kitting solutions allow our customers to simplify their operations by eliminating dunnage, overstock, picking and sorting. Kits are packaged in color-coded, reusable containers and are exchanged at your dock for "cubes" of empty kit containers – a simple, easy solution that will save you time and money.



Delivering reliable cylinder head systems requires precision and control in every process. At MWH, our disciplined, scientific approach allows us to consistently achieve the highest quality standards while reducing processing time. From our Rule-Based Inspection (RUBI) and Computer Aided Valve Engineering (CAVE) to our Product Improvement Service (PRISE), we employ the most exacting technology and processes to exceed your quality requirements.

Superior engine components also demand the highest quality materials. MWH material standards exceed industry norms, and our expertise in material science ensures that both the material and the subsequent processing are tightly controlled. We test the properties of our products throughout the manufacturing process, from raw material to finished product. Optimal quality requires serious science.





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