



Taking your VVT component production to a higher level

Powder metal material solutions engineered for VVT applications

New applications require new solutions

Variable valve timing (VVT) or cam phaser (VCP) systems allow for the perfect combination of performance increase, better economy and improved emission control. However, the components in a VVT or VCP system are typically highly complex in design and challenging to manufacture as they require extremely tight tolerances and good machinability.

Offering just this, powder metallurgy (PM) has proven to be a robust and attractive alternative for quality- and cost-driven system manufacturers.



Engineered for VVT

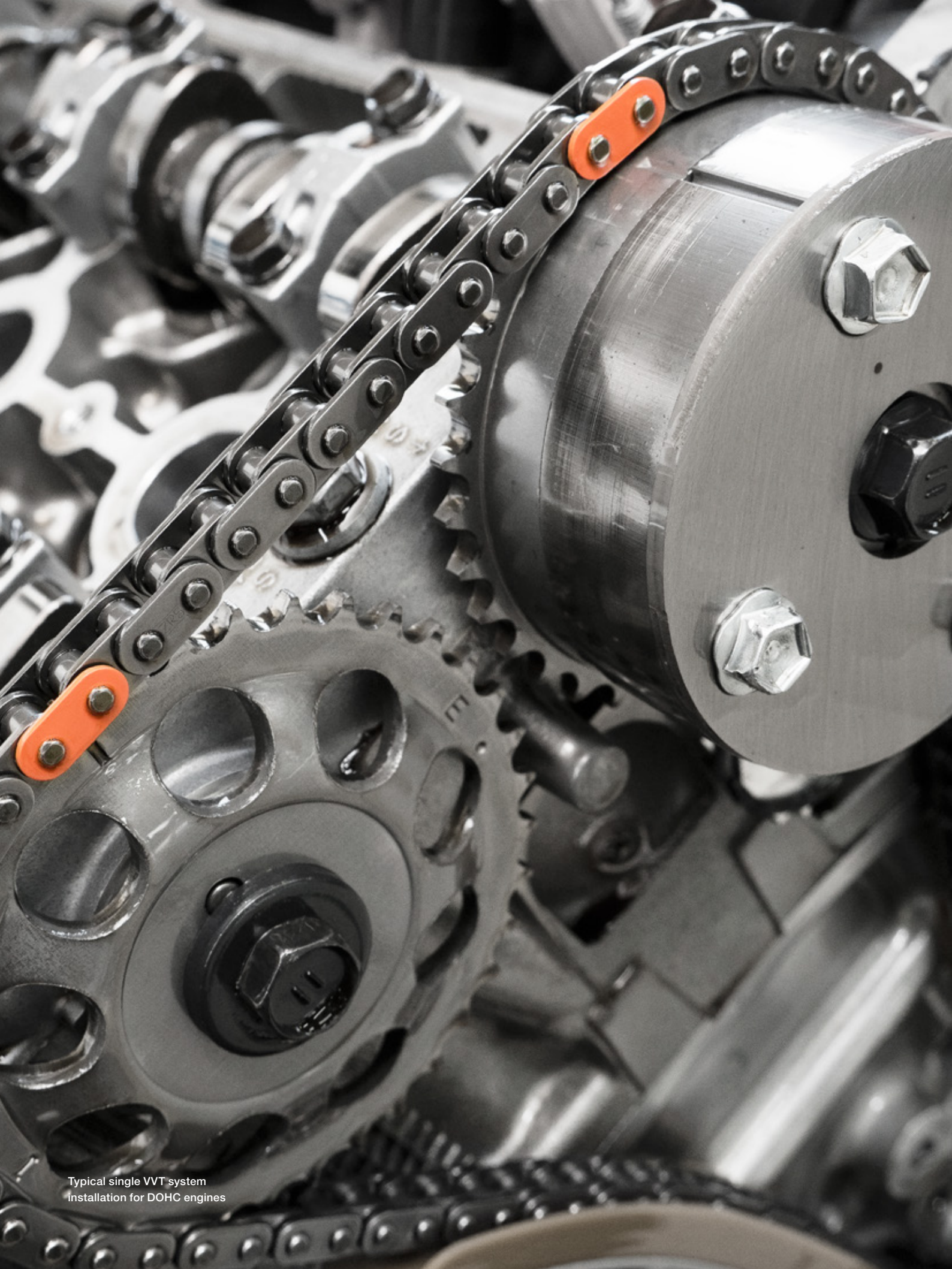
Being the world leader in metal powder technology, Höganäs is the main driver of new metal powder solutions. The latest addition to our extensive material solution portfolio is the high precision toolbox that greatly extends the competitiveness and application spectrum for cost-effective Fe+Cu+C press-ready powder mixes.

Based on this new material toolbox, we are now able to offer PM material formulations engineered specially for VVT or VCP component applications. These tailor-made powder mix formulations can help you improve final product quality, reduce scrap levels, facilitate green machining, enhance productivity and optimise your machining and post processes. In short, they offer you the lowest total cost.



Höganäs' own VVT rotor for production tests.





Typical single VVT system
Installation for DOHC engines

A solution based on your application and process

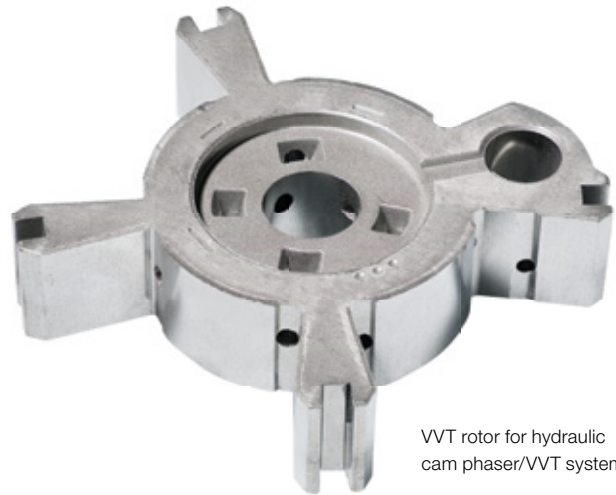
The key components in a hydraulic cam phaser based VVT-system employ complex inside and outside geometries and tight tolerances. High dimensional accuracy is therefore of utmost importance. So is good machinability – both in green and sintered state. In addition, the demands are constantly increasing due to new designs, raising cost pressure and higher efficiency requirements. Höganäs presents the world's first PM material solutions specially designed for VVT component production.

Meeting the highest demands

Successful large volume production of high-tolerance VVT components requires a tailored composition of metal powder mixes that delivers high quality and consistent results. The powder solution has to be properly designed to optimise powder handling, compacting, sintering and machining properties, heat treatment response and, eventually, final product quality and total manufacturing cost.

Höganäs' tailored metal powder solutions for VVT component production are based on our new high precision toolbox for Fe+Cu+C mixes. We make it possible for you to meet the most demanding precision and performance requirements while at the same time improving your key manufacturing performance indicators. Featuring the latest powder technology advancements, our VVT solutions also enable you to reduce the impact on the environment.

Let's show you how ...



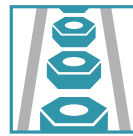
VVT rotor for hydraulic cam phaser/VVT system.

The benefits of our new

Our new high precision toolbox brings the following advantages for VVT component production:



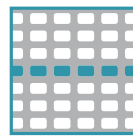
Improved powder flow characteristics enable faster and better cavity fill quality and more homogeneous density distribution. As a result, weight and height scatter of the compact will be minimised, which directly translates into better dimensional control and less out of spec parts. Better flow also allows higher fill shoe speeds, enabling higher press productivity and better equipment utilisation.



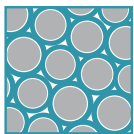
Better dimensional stability thanks to our advanced powder bonding techniques and improved copper- and pore distribution. The result is a more robust material behaviour that will improve sintered tolerances and process stability for sizing, and may even reduce machining efforts. VVT parts that need subsequent heat treatment, such as induction hardening, will additionally benefit from minimised heat treatment distortions.



Higher green strength facilitates cost-effective green machining and minimises the risk for green part handling or clamping damages. The results are lower green scrap rates and less material chipping off during green machining. Faster machining speeds and feeds also help improve your machining productivity.



Our established world-class mixing technology also leads to **better batch-to-batch consistencies**, further improving your process robustness and thus minimising your process variations. Bottom line – your total cost of non-quality will be reduced.



Höganäs' highly compressible base powders in combination with our latest generation of efficient lubricants are a pre-requisite for **uniform and high compacted densities**. Optimum lubricity during compaction and ejection minimises the risk for green crack initiation and reduces tool wear. The results are shiny surfaces and trouble-free compaction operation.



Versatile in use, our tailored VVT mix solutions work well in compaction, both at room temperature and under warm die conditions. This allows you to reduce the amount of lubricant used. A single Höganäs VVT mix formulation suits different processing conditions, thus supporting your material standardisation strategy.

high precision toolbox



Our newly developed state-of-the-art machining additives will help **improve your machining processes**, especially when interrupted cutting, deep hole drilling or tapping of VVT components is involved. When machining typical Fe+Cu+C matrix microstructures and hardness levels, burr formation will be minimised and tool service life prolonged, thus reducing tool replacement cost. Non-hydroscopic in nature, unlike traditional additives, our tailored machining enhancers are also more corrosion resistant and do not tend to form stains or rust.



Our lubricant formulas and powder bonding technologies are completely free from metal stearates. Thereby they **reduce the impact on the environment**. Zinc emissions to the atmosphere are eliminated. In addition, clean lubricant burn off minimises typical furnace deposits and reduces furnace maintenance costs.



Using Höganäs' tailor-made mixes for VVT applications means enhanced productivity, improved product quality and optimised processes, resulting in **lowest total cost**.



Typical VVT rotor/stator assembly configuration.

Power of Powder®

Metal powder technology has the power to open up a world of opportunities. The inherent properties of metal powders provide unique possibilities to tailor solutions to match your exact requirements. Our ambition is to constantly widen and grow the range of metal powder applications. That's what we call Power of Powder®. With our leading position in metal powder technology, Höganäs is perfectly placed to help you explore these opportunities.

To find out how you can benefit from the Power of Powder®, please contact your nearest Höganäs office.



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