A New Material for High-Speed Hobbing

The SpeedCore material for cutting tools developed by LMT Fette provides longer service life and increased production capacities.

By Thomas Falk
WITHOUT THEM, OUR WORLD WOULD NOT MOVE. WATCHES, CARS, BOATS, WIND TUR-BINES—THEY ARE ALL DRIVEN BY GEARS. FOR MORE THAN 100 YEARS HOBBS HAVE BEEN USED TO MANUFACTURE ALL TYPES OF GEARS. EVER SINCE, LMT FETTE HAS DRIVEN THE DEVELOPMENT AND MANUFACTURING OF INNOVATIVE GEAR CUTTING TOOLS. WHETHER CYLINDRICAL GEARS OR HELICAL GEARS, THE PRODUCTION GOALS ARE ALWAYS THE SAME: REDUCE PRODUCTION TIME AND SETUP TIME TO MINIMIZE PRODUCTION COSTS AND IMPROVE THE QUALITY OF THE MANUFACTURED GEAR. WITH LMT FETTE GEAR CUTTING TOOLS, ALL THESE GOALS CAN BE ACHIEVED. TO STAY AHEAD OF THE CHALLENGING REQUIREMENTS WE ARE DEVELOPING INNOVATIVE GEAR CUTTING TOOLS TO OPTIMIZE YOUR PROCESSES AND TO MANUFACTURE GEARS OF THE HIGHEST QUALITY.

NEW CUTTING MATERIAL
In manufacturing, all modern machine tools offer high potential for productivity improvement. State of the art gear cutting machine tools allow higher cutting speeds. Most of the machines are already designed to utilize carbide hobs and work under dry conditions. With the newly developed material SpeedCore—a cutting material in a class of its own—LMT is now at the stage to accelerate the machining conditions dramatically for the benefit of the customer.

Higher cutting speeds increase the mechanical and thermal loads of the hob. The HSS materials are limited to a range of cutting speeds due to their limited high temperature hardness. The new SpeedCore hobs from LMT Fette are manufactured out of a new cutting material that overcomes the barriers of high temperature hardness, at the same time offering sufficient toughness. With hobs using the new SpeedCore material, the cutting speed can be increased by at least 30 percent, if not more. The customer gains by being able to produce significantly more parts in less time. The machine tools will be utilized more efficiently. Nearly no additional investment is necessary to increase the productivity, just the new SpeedCore material.

INTERMETALLIC PHASES
The core of the new material is made out of carbon-free iron cobalt and molydenum. This new composition, as well as the powder metallurgy manufacturing method, allows an increase in high temperature hardness of the material compared to the traditional PM-HSS materials. The hardness of this material is generated by special nanostructures, which are in an intermetallic state.

LMT has tested the capability with the support of the technical university of Magdeburg in Germany. The newly developed material was tested at cutting conditions that are normally used for solid carbide hobs. The results prove the high temperature resistance of SpeedCore. In the laboratory tests machine real components, the SpeedCore materials was used at cutting speeds up to 350 m/min without any thermal overload of the cutting edge. The tool length achieved 7 m; these are conditions where PM-HSS materials would fail.

Translating these result into the manufacturing environment means, customers can increase the cutting speed more than 30 percent to improve the efficiency of the gear cutting process. There are two options: the cutting speed is increased to achieve a predetermined tool life; or the process is adjusted to the capability of the SpeedCore material. In both cases the customer will achieve lower costs per workpiece.

SPEEDCORE CAPABILITIES
The production of gears is usually a high-volume operation. For example, transmission manufacturing requires a large quantity of gears. The obvious relationship occurs that as car production increases, so does the corresponding demand for gears. But how can gear suppliers achieve more capacity for production, while at the same time minimizing the cost per part (CPU)? One particular solution was implemented by the gear experts from LMT-Fette at a customer’s facility in Germany. With a hob made from the innovative new SpeedCore material, Stelter Zahnradfabrik increased their output and decreased their costs. The amazing performance achieved by this hob was the solution.

Gear production requires high pre-
cision, which the experts at Stelter have optimized through decades of experience. Their customers are international companies in the automotive, energy, and heavy industry sectors. They have a broad product mix, ranging from large wind energy gears to a small 8mm transmission gears, all produced at the manufacturing facility in Bremen. Even given the range of products, all the parts have the similar demand: a zero-defect strategy. With the applied high tech know-how they secure the minimal tolerances required in the production of each gear.

Stelter incorporates special checks for their tools used in gear production. They need to confirm a high quality level, which ensures efficient and fast production. The production engineers from Stelter successfully tested the new SpeedCore hob from LMT Fette as the product was being launched. After all, the
promised performance from the LMT Fette experts was intriguing. The results were amazing. The cutting speed (SFM) was increased by 30 percent, compared to a regular powder metal hob. The basis for the improvement lies with the SpeedCore cutting material.

INCREASED PRODUCTIVITY
Did the customer confirm these advantages? “Absolutely,” says Karl-Heinz Wilkens, production engineer at Stelter. “These enormous performance increases were proven during a test for a 1.71 module gear.”

In comparison with a conventional PM-HSS hob, the SpeedCore hob increased the cutting speed from 492sfm up to 738sfm. The production time per part was reduced from 0.54 to 0.35 minutes. “When you consider that this gear is running
in large lots, and the production line is running six days 24 hours per day (6/24), you can imagine the possibilities you will have with the new SpeedCore hob. At the end, there is a much higher production output of gears on the same machine,” according to Torsten Oellers, application engineer in gear tools at LMT Fette.

In addition, LMT Fette offers a complete systems solution to support gear production. This includes part-specific tooling design, as well as value enhancing service. With locations in Germany, the United States, India, and China, LMT assures a worldwide reconditioning capability to bring used tools back to the original manufactured quality. Stelter is also using this resource. The used SpeedCore hobs at Stelter are reconditioned and recoated by LMT Fette in Schwarzenbek, which is near Hamburg, Germany. The system solution fits perfectly to the overall capability of the SpeedCore hobs. The unique SpeedCore capabilities open many possibilities in gear production potential, leading to greatly increased production volumes and reduced costs. As the demand for gears increases in many industries, SpeedCore hobs offer unlimited opportunities.

MAXIMUM PERFORMANCE
The new SpeedCore hobs are ideally suited for high-performance coatings such as the LMT Nanosphere. Apart from cutting materials and coatings LMT also offers application-specific engineering and a comprehensive range of services for its new hob cutting system.

By combining the new substrate SpeedCore with a high-performance coating, peak performances are achieved while maintaining ease of implementation and high reliability. The advantages of Speedcore are:

• Improved productivity of up to 70 percent;
• Process reliability (like HSS-PM);
• Easy to implement also on older or unstable machines;
• Regrinding and coating possible.

The new LMT Fette generation of hobs is officially introduced to the international market during the world’s premier trade fair for metalworking technology EMO 2011 in Hannover/Germany. LMT Fette gets the MM award for the most innovation product 2011 with SpeedCore.

CONCLUSION
With its worldwide reconditioning and coating network with locations in Germany, the USA, India and China, LMT guarantees the reconditioning of hobs to the original manufacturer’s quality. This complete system helps users to optimize their gear cutting processes and to achieve sustainable competitive advantages.

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