

POWDER NEWS

SPECIAL ISSUE: POWDERMET2010, Fort Lauderdale, Florida

JUNE 2010



Power of Powder pushes PM forward

North American Höganäs works with its customers to utilize the Power of Powder, driving innovation together to establish powder technology in new applications.

North American Höganäs is primed for innovative partnerships to find new, more competitive PM solutions, both in the automotive sector and emerging segments such as water treatment, energy and food fortification and preservation.

Our presentations at PowderMet 2010 reflect how we are helping customers to compete for high-performance applications

by optimizing material systems: improving machining with the new machinability enhancer, SM3; developing new lean, cost-effective alloys such as D.AQ and Astaloy™ CMN, and achieving tight tolerances with Starmix® Boost.

To find out more, visit us at booth 400 at PowderMet 2010.

Enhance machinability to improve competitiveness

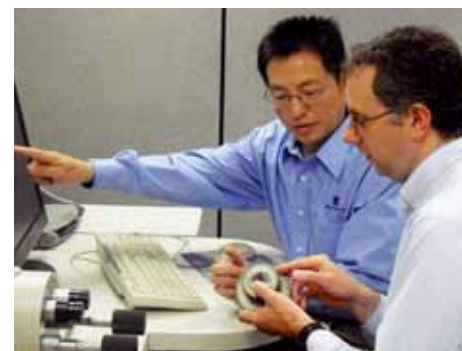
SM3, a new machinability enhancer developed by NAH, is designed to improve the machining of high-performance PM materials. ... 3

Feeling the heat on alloy costs?

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A leaner solution for high performance

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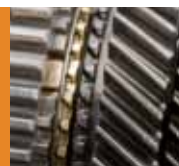


Starmix® Boost: succeeding in production

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Avinash Gore, Roland Warzel and Sydney Luk.

Perspectives on Power of Powder



The Power of Powder opens up endless possibilities for innovation. Three leading figures at North American Höganäs give their views on seizing new opportunities for PM.

The PM industry has a history of innovation, of entering new markets with products such as powder-forged connecting rods and PM bearing caps. Partnership is the key to unlocking the Power of Powder. Finding innovative ways to collaborate successfully within the PM industry is a necessity if powder technology is to fully exploit opportunities.

Cooperate to be competitive

“The industry needs to think how to leverage the inherent advantages of PM. We must make more progress on machinability additives, lubricants and lean alloys. The industry also needs more patience working on long-term developments,” states **Avinash Gore**, President of North American Höganäs.

“Our competition is not other powder companies or PM parts makers, but casting, forging and other shaping technologies.

We have to challenge our competition on performance, quality, near net shape, lower cost and highlight the advantages of porosity and infinite alloying possibilities.”

Opening doors

Roland Warzel, Manager Application Development at North American Höganäs emphasizes that: “We can use the Power of Powder to open new doors for PM.”

“We work closely on different projects with customers to find ways to give them a competitive edge over other technologies. The bonded mix system Starmix® Boost and the new lean alloys the Höganäs Group has developed, such as D.AQ, are good examples of giving customers the right tools to move into new applications, make better components and expand the PM market.”

Improving the environment

“The North American market is set to remake itself. Greater environmental awareness means people are looking for a better life in terms of the water we drink, the food we eat and the air we breathe,” comments **Sydney Luk**, Vice President Technology at North American Höganäs.

“PM can innovate its way into new growing markets such as water treatment, food enrichment and preservation, and green energy sources. We have done a lot of research work at the North American Höganäs Tech Center on water purification, making water safe to drink and taste good. Food enrichment is a growing area and we are developing innovative ways to keep food fresh longer. We are also making progress in new energy and environmental applications.”

Enhance machinability to improve competitiveness



A new machinability enhancer, SM3, is designed to improve the machining of high-performance PM materials – low-alloyed and sinter-hardened components

Machining is often necessary to meet tolerance and surface finish requirements for PM components. A major advantage of PM technology is the ability to customize material compositions, however, as alloying content increases, the machining of PM components becomes more difficult and traditional machinability enhancers become less effective.

“We are addressing this challenge with the development of a new machining enhancement additive, SM3, which aims to improve the machinability of prealloyed PM materials at low addition levels without adversely affecting material characteristics,” says Bo Hu, Manager Research Specialty Applications at North American Höganäs.

Positive findings

The latest findings on SM3 will be presented at PowderMet 2010 in **The Use Of A New Machinability Enhancer for Improving the Machinability of Pre-Alloyed Powder Metal Components Without Detrimental Effects on the Material Characteristics**, a joint paper contributed by North American Höganäs and Cloyes Gear and Products.

This study compared SM3, developed by North American Höganäs, with a traditional machining enhancer (MnS) and a bonded mix with no additive in machinability tests carried out on sintered rings and sprockets made from a common prealloyed PM material.

The results have been very positive, states



Bo “We have been able to show that SM3 can significantly improve machinability without a negative impact on sintered strength. Furthermore, this is accomplished without staining and while maintaining the same corrosion resistance as the material without any additive.”

SM3 can support efforts to grow PM, as it is designed for the PM materials that can offer the performance to compete for new applications.

“Low-alloyed and sinter-hardened materials play a great role in expanding powder metallurgy technologies to higher levels of applications that require stronger material performance,” says Bo. “The findings of this paper provide good machinability solutions for these type of materials, enabling them to be even more competitive.”



Feeling the heat on alloy costs?



A new diffusion alloyed material, D.AQ, offers a leaner, more cost-effective solution for achieving

excellent properties in a wide range of applications where heat treatment is needed.

Although sinter hardening is increasingly used for high-performance components, many parts still require quench and temper heat treatment. Heat-treatable alloys often contain high amounts of copper, molybdenum and nickel to achieve required hardenability. Recent fluctuations in metal prices have made it necessary to protect competitiveness by developing leaner diffusion alloyed steels for heat-treated applications.

Excellent properties

D.AQ, a newly developed lean diffusion alloyed material designed to meet this need, was launched by North American Höganäs in the North American market in March.

“It has been developed to combine excellent properties in the heat-treated condition with high compressibility, high workability and improved machinability in the sintered condition while maintaining the trademark stability and robustness of diffusion alloying,” says Roland Warzel, Manager Application Development at North American Höganäs.

“D.AQ offers good strength and hardness to compete with heavier alloyed systems. With 0.5% nickel and 0.5% molybdenum, it offers good performance at significantly lower alloy levels than other diffusion alloys.”

“Good performance at significantly lower alloy levels”

Find out more at The PowderMet presentation: **Lean Diffusion Alloyed Steel for Heat Treated Applications** by Roland Warzel, Alex Klekovkin, Sydney Luk (North American Höganäs) & Robert Frykholm, Sven Bengtsson (Höganäs AB).

Key conclusions

The study shows that the newly developed machinability enhancer, SM3:

- has no adverse effects on the mechanical properties of the material system.
- has no detrimental effect on the corrosion resistance of prealloyed PM materials and provides significant improvement in surface corrosion resistance compared to the conventional machinability enhancer.
- provides good tool protection during machining operations, allowing high productivity machining and/or extended tool life.
- offers significant improvement in the machinability of pre-alloyed PM materials and at lower addition levels (0.15%) than conventional machinability enhancers.

A leaner solution for high performance

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Astaloy™ CMN, a lean Cr-Ni alloy, offers a cost-effective alternative to achieve the properties necessary for high-performance applications such as PM gears.

The attractiveness of high-performance alloys containing high amounts of nickel, copper, and molybdenum has been adversely affected by sharp increases in metal prices, which has triggered a shift towards development of leaner materials.

One product that truly reflects the lean approach is Astaloy™ CMN, a pre-alloyed base powder that utilizes low-cost chromium and drastically reduces nickel and molybdenum alloy content. Earlier research on the excellent heat treated properties of Astaloy™ CMN has now been complemented with a comparative study.

“We now have a good idea of how

favourably CMN compares with other materials in terms of dynamic and static properties for high-performance applications,” says Sydney Luk, Vice President Technology of North American Höganäs. “It provides identical performance to higher alloyed systems while offering cost advantages.”

At PowderMet, Sydney Luk will present the paper: **Comparison of Cost-Effective Cr-Ni Steel with Common High-Performance Powder Metal (PM) Steels** co-authored with Alex Klekovkin, Roland Warzel, (North American Höganäs) & Sven Bengtsson, Senad Dizdar (Höganäs AB)

Key conclusions

The study shows that Astaloy™ CMN:

- is suitable for conventional heat treatment and shows excellent hardenability and uniform microstructure. Its strength and hardness are similar to, or slightly better than high-performance PM material systems such as FL-4400.
- achieved a tooth root bending fatigue limit identical to FL-4400 in tests on gears warm die compacted to a density of 7.3 g/cm³ using 0.5% Intralube® E (Höganäs AB) as the lubricant.
- has the ability to generate a hard surface and tough core, which combined with the apparent hardness, strength and fatigue properties, makes it suitable for PM gear and other high performance applications.

Starmix® Boost success stories

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New case studies show Starmix® Boost is helping customers achieve tight tolerances and production excellence.

The Starmix® Boost bonding system was launched two years ago to provide a better solution for meeting the tight tolerance requirements needed to compete for new PM applications.

One case study shows the tolerance improvements gained in pulley production by using Starmix® Boost rather than a premix. Another outlines how the better flow and fillability of Starmix® Boost was

used to eliminate a cracking problem in component production. A third study details how tolerances and dimensional consistency was improved in sawtooth manufacturing for chainsaws.

The production case studies feature in the PowderMet presentation; **High Performance Components Utilizing Bonded Mixes** by Roland Warzel, Paul Hofecker, Denis O’Keefe (North American Höganäs).

PRESENTATIONS

AT POWDERMET2010,
FORT LAUDERDALE

JUNE 27 – 30

Monday, June 28

Session 04

• 0053 U.S.A. & Sweden

Comparison of Cost-Effective Cr-Ni Steel with Common High-Performance Powder Metal Steels

Authors: Alex Klekovkin, Roland Warzel, Sydney Luk, North American Höganäs, Inc. and Sven Bengtsson, Senad Dizdar, Höganäs AB.

Speaker: Sydney Luk

Session 06

• 0175 U.S.A. & Sweden

Lean Diffusion Alloyed Steel for Heat Treated Applications

Authors: Roland Warzel, Sydney Luk and Alex Klekovkin North American Höganäs, Inc. Sven Bengtsson and Robert Frykholm Höganäs AB.

Speaker: Roland Warzel

Tuesday, June 29

Session 14

• 0054 U.S.A. & Sweden

High-Performance Components Utilizing Bonded Mixes

Authors: Roland Warzel, Denis O’Keefe and Paul Hofecker, North American Höganäs, Inc.

Speaker: Roland Warzel

Session SIP 6

• 0055 U.S.A. & Sweden

The Use of a New Machinability Enhancer for Improving the Machinability of Pre-alloyed Powder Metal Components without Detrimental Effects on the Material Characteristics

Authors: Bo Hu and Roland Warzel III, North American Höganäs, Inc. Suresh Shah, Gilbert Schluterman Jr., and Jerry Falleur, Cloyes Gear and Products, Inc.

Speaker: Sydney Luk