

Boeing Metallurgist Calls for Vacuum Carburizing Standard

Gear manufacturers and heat treaters: If you can vacuum carburize, you may be missing out on business opportunities because you lack an industry specification for this heat treatment. There are companies that design gears suitable for vacuum carburizing, but they may not use the process on their parts because they don't have a way to assure reliable quality.

An industry specification would provide a way. It would establish procedures for proving companies' vacuum carburizing processes are capable of carburizing gears uniformly, so customers could rely on the quality of those gears. Such confidence would promote wider use of the heat treatment.

This is the situation that was suggested Nov. 4 by The Boeing Co.'s Dale Weires in his keynote address, "Potential Applications of Low Pressure Vacuum Carburizing for the Rotorcraft Industry." Weires, a Boeing associate technical fellow for metallurgy, was speaking to suppliers and users of vacuum carburizing equipment at "Practical Uses and Applications of Vacuum Carburizing," held in Chicago, IL. The conference included more than 70 attendees.

In his speech, Weires described the



"We need to look at some standardization of our methods," said Dale Weires, a metallurgist for The Boeing Co., about vacuum carburizing.

opportunity presented by Boeing's Chinook helicopter. The CH-47D is the primary product, the biggest volume product, in Weires' division, Boeing Philadelphia. The Chinook drive system includes 70+ major parts that are atmosphere carburized, but are suitable for vacuum carburizing. The parts include 10 bevel gears and 19 spur gears.

"Gears are an integral part of this drive system," Weires said.

Moreover, Boeing knows it could benefit from vacuum carburizing. The aerospace company evaluated the process in the '90s, Weires said, and learned it could reduce cycle times for heat treating the Chinook drive parts.

The times weren't sufficient reason to

start vacuum carburizing the parts. Boeing could rely on the quality of its atmosphere carburized parts, Weires later said, and switching to vacuum carburizing wouldn't have reduced the company's costs.

Weires' example pointed up a main problem that vacuum carburizing faces: It can be difficult to displace a successful, standardized process when the alternative is not similarly standardized. In the past, the lack of an industry specification has often restricted the use of vacuum carburizing to captive or specialized heat treat shops, Weires said, so:

- Each shop's furnaces were unique and depended on their heat treaters' knowledge of vacuum carburizing.
- The companies viewed their process knowledge as proprietary, so they limited their sharing of it.
- The number of knowledgeable vacuum carburizers was very limited.
- The availability of vacuum carburizing was limited.

Given these circumstances, it's easy to imagine that companies would view consistent quality as a hit-or-miss proposition. Weires, however, offered a way to spread the use of vacuum carburizing: "We need to look at some standardization in our methods."

In his opinion, standardization could be accomplished through a new industry specification. Weires acknowledged that AMS standard 2759/7 addressed carburizing, but it didn't distinguish between its two types: atmosphere and vacuum (low pressure).

"I see nothing out there that I can push a gear manufacturer to use," he said.

According to Weires, the specification would need to include:

- a method for qualifying vacuum carburizing furnaces,
- definitions for the elements of a process "recipe,"
- definitions of process changes and significant repairs, and
- more frequent quality control checks.

The specification, Weires said, would give companies an important ability. They would be able to tell suppliers of their drive parts: Use this specification.

To create and publish a specification, though, companies would have to share what they know about vacuum carburizing. Sharing could include publication of information in trade journals, Weires said. The information would have to document vacuum carburizing's benefits in

process cost and quality and its reduced maintenance costs, he added.

Weires also remarked that publishing information would help vacuum carburizing become more widely accepted and used: "Published data spurs interest."

The conference was sponsored by Heat Treating Society, an ASM International affiliate, and was held at the Illinois Institute of Technology, home to the Thermal Processing Technology Center, a consortium that includes nine member companies, such as Dana Corp.

Other speakers were:

- Frederick Otto, president of Midwest Thermal Vac;
- Dan McCurdy, director of North American business development for Bodycote Thermal Processing;
- Dennis Beauchesne, general manager of ECM-USA Inc.;
- William R. Jones, CEO of Solar Atmospheres Inc.;

- Gerald D. Lindell, corporate engineering metals specialist with Twin Disc Inc.;
- Steve Ellison, president of North American Cronite Inc.;
- Tony Wu, president of ALD Thermal Treatment Inc.;
- Thomas Wingens, vacuum product manager of Ipsen International Inc.;
- Janusz Kowalewski, HPQ group leader of SECO/Warwick Corp.;
- Ralph P. Poor, director of standard heat treat products with Surface Combustion Inc.

TECHNICAL CALENDAR

February 2-3—Smart Solutions for Metal Cutting Conference.

Dorint Sofitel Quellenhof, Aachen, Germany. Held in both German and English, this conference will focus on the most recent developments in powder metallurgy. International manufacturers of HSS/HSS-PM and cutting tools will provide their views on the latest technology. 495 euros includes conference documents, snacks, lunches and an evening festivity. For more information, contact WZL-RWTH Aachen by e-mail at k.marso@wzl.rwth-aachen.de or on the Internet at www.aachen-tourist.de.

February 7-10—Gear School 2005.

Gleason Cutting Tools facility, Rockford, IL. This fundamentals course covers cutting, gear inspection, gear geometry, nomenclature and inspection. \$895 includes handbook and materials, lunches and a group dinner. For more information, contact Gleason Cutting Tools at (815) 877-8900 or on the Internet at www.gleason.com.

February 22-24—Expo Manufactura.

Cintermaz Expo Center, Monterrey, Mexico. Mexico's largest machine tool and metalworking exposition. Sponsored by AMT, registration is free. For more information, visit the show's website at www.expomanufactura.com.mx.



March 7-10—National Manufacturing Week.

McCormick Place, Chicago, IL. Broken into ten segments: Aluminum, CleanTech, Design Engineering, Enterprise IT, EnviroTech, Industrial Automation, Legal Issues, Management & Manufacturing, Micro Systems, and Plant Engineering and Facilities Management. Registration before Feb. 4 ranges from \$75-\$595, depending on the level of conference participation. Registration after Feb. 4 is listed from \$95-\$695. For more information, visit www.nationalmanufacturingweek.com.

EVENTS

March 14–16—AGMA Gear School for Gear Manufacturing Technology.

Star SU LLC, Hoffman Estates, IL. Presented by the Gear Consulting Group, this three-day course concentrates on a logical approach to troubleshooting the gear manufacturing process, concentrating on hobbing, shaping and inspection procedures and the relationships between the process, inspection results and the underlying gear geometry. Suitable for all grades of personnel from machine operators to engineering and management staff. For more information, contact the Gear Consulting Group by mail at P.O. Box 647, Richland, MI, 49083, by telephone at (269) 623-4993 or by e-mail at gearconsulting@aol.com.

March 17–19—Schleifring Grinding School.

ExpoCenter, Thun, Switzerland. Technology presentations involving 25 grinding machines will be offered as well as lectures that will be translated into four languages. For more information, contact United Grinding Technologies by telephone at (937) 859-1975.

SAVE THE DATE

September 14–16—3rd International Conference on Gears. Munich, Germany. Co-sponsored by the AGMA, ASSIOT, CMES, FVA, JSME, KIVI-NIRIA, UNITRAM and VDMA.

CALL FOR PAPERS

2005 AGMA Fall Technical Meeting—Abstracts due Jan. 7 at AGMA headquarters on the following topics—Noise/vibrations; heat treatment (including distortion control); tribology; load distribution; calculations; lubrication; dynamics; effect of finish, grinding or profile modification on surface durability; applications; micropitting or failure analysis case studies. Send a page-long abstract to Amy Lane by e-mail at lane@agma.org.

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- **Industry News** – We'll help you spread the news about your company's recent new hires, promotions, plant expansions, ISO accreditations, mergers, acquisitions, new product lines, distribution arrangements, expanded capacities and so on.
- **Events** – If you're holding an event that's applicable to gear industry people, we'll let them know in advance.

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