

# Heat-Treat Trends

## Coping with a Labor Shortage, Looking into 3D Printing

Joseph L. Hazelton, Contributing Editor

**Jim Oakes and Tom Morrison agree: The U.S. heat-treat industry is in the middle of a labor shortage. Morrison sees a silver lining, though, a coming solution to the present problem.**

For both men, a problem in the heat-treat industry is a real concern. Oakes is board president of the Heat Treating Society, an association located in Materials Park, OH. Oakes is also vice president of business development at Super Systems Inc., Cincinnati, OH, a company that makes products for the heat-treat industry.

Meanwhile, Morrison himself is chief executive officer of the Metal Treating Institute, also a heat treaters association, located in Jacksonville, FL.

### A Labor Shortage

“We’re in the midst of an incredibly competitive labor market, where companies are feverishly looking for staff,” Oakes says. He describes the staffing problem as affecting captive heat treaters (heat-treat departments inside larger companies) and affecting commercial heat treaters (companies that heat treat parts made by other companies).

Oakes adds that the problem isn’t confined to the office or to the shop floor, it includes metallurgical engineers, equipment operators, and managers: “It’s actually everywhere.”

Accepting that there are few qualified workers to spare, companies still have to be mindful of workforce development. However, they also have to be mindful of how to work around the labor shortage.

“The problem of workforce development is an eight-year problem,” Morrison says. He sees the shortage as an eight-year problem because he expects that’s when it’ll end. “In eight years, there’s going to be about 30 million new millennials in the workforce, and they’re going to be more experienced. So, there are going to be plenty of workers out there,” he says. “We’re going to have more qualified workers than there are jobs out there.”

Given this outlook, there is a question for businesses. “What do you do between here and there to grow your company?” Morrison says. “Gear manufacturers and commercial heat treaters have to figure out how do they grow their throughput for the next eight years without a lot of new employees.”

**Jim Oakes**, board president of ASM Heat Treating Society. (Photo courtesy of ASM International)



**Tom Morrison**, chief executive officer of Metal Treating Institute. (Photo courtesy of MTI)



### More Capacity Through Automation

A solution is automation. “The most effective heat treaters in the next 10 years are going to be those that can take gears in receiving and push them out shipping with the least amount of human touch,” Morrison says.

Oakes agrees: “An alternative to labor, of course, is automation.”

Now, automation may mean robots, like pick-and-place machines in a facility. However, it may also mean only that a company make greater, more effective use of production information by running the data through sophisticated analysis software.

To do that, a company wouldn’t need robots, it would need sensors and software. The sensors would be attached to production machines to gather process data, and the software would analyze the data by using complex algorithms. The sensors and software would turn production machines into smart machines and production facilities into smart facilities.

Now, in this case, increased capacity could result from using the machine data and analysis software to achieve greater process optimization, which could lead to greater precision, which could lead to less rework and less scrap. “Specific to heat treating,” Oakes says, “what people are trying to do is reduce or eliminate rework and scrap.”

A company could also increase capacity by using the machine data and analysis software to automate preventive maintenance. Specifically, data and software could be used to monitor the machine itself, to monitor its operating conditions and how long it operates under those conditions in order to more precisely gauge when technicians should perform preventive maintenance. That greater precision could maximize machine uptime not just by streamlining preventive maintenance, but also by avoiding unexpected machine failure.

“Those all yield efficiencies when it comes to heat treating,” Oakes says.

### Training Workers: Education Courses

Now, when the labor shortage ends, companies will need to train their new employees.

Naturally, many of the new hires will arrive as metallurgical engineers fresh from universities, as heat-treat technicians fresh from trade schools, or as engineers and technicians who already have a few years of work experience. No matter the case, they’ll need additional training during their careers, on-the-job training and career development.

“Training becomes a significant component of getting people up to speed and making sure that they understand what the heat-treating process is for and what they’re trying to accomplish,” Oakes says.

Two sources of career development courses are the Metal Treating Institute and the materials association ASM

International. ASM and the Heat Treating Society are affiliated organizations and are both located in Materials Park, OH.

ASM offers four types of educational courses: classroom and lab courses; online courses; certificate programs; and customized, on-site courses. MTI offers online courses that can be taken individually

or can be taken within four certificate programs. Also, each association provides educational opportunities at its trade expo and technical conference. MTI

did so at Furnaces North America 2018. ASM and HTS will do so at Heat Treat 19, which will be held Oct. 15–17 in Detroit, MI (see sidebar *Heat Treat 19* on page 28).

Back in Materials Park, among ASM's on-site offerings are classroom and lab courses on additive manufacturing, also called 3D printing. Specifically, the courses are about the materials used in 3D printing and designing for 3D printing.

Many companies are interested in 3D printing. Consequently, ASM knows it needs to provide information about additive manufacturing to contribute to industry's understanding and use of the manufacturing process, including the heat treating of 3D-printed parts.

"Heat treating for additive manufacturing—the requirements and capabilities to effectively execute heat treating for a part that's additively manufactured—that's still a developing

**Bill Mahoney**, chief executive officer of ASM International. (Photo courtesy of ASM International)



capability in our market space," says Bill Mahoney, chief executive officer of ASM.

### 3D Printing: Mass Production?

Like Mahoney, Oakes and Morrison are also mindful of 3D printing and how it could affect the heat-treat industry.

In 3D printing, a part is made from a powdered material, a metal or plastic, and from a computerized, 3D design of a part. The powder and design are used by a 3D printer to build the three-dimensional part, the printer laying down small, successive amounts of material to make all of the part's aspects to their correct dimensions.

Now, 3D printing is a manufacturing process, not a heat-treating process. However, its effect on the heat-treat industry could be significant.

Right now, 3D printing can be useful in prototyping, when a company needs only one part or only a small number of them. In those cases, companies may save time by 3D printing. "Instead of going through the numerous manufacturing steps, they're 3D printing it to reduce the time," Oakes says.

3D printing can also be useful as a regular manufacturing process if a company needs to make only a small number of parts, especially a small number of complex parts. "Right now," Oakes says, "it's isolated to very sophisticated designs that may be higher in cost to produce and have multi-steps to actually make those parts, where it makes sense maybe to have those printed."

But, what if 3D printing were developed so it could be used in high-volume production? Then its effect on the heat-treat

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industry would likely be significant. Right now, there is research-and-development work being done on 3D printing to see if its potential includes high-volume production. "Is it a legitimate manufacturing process that can be utilized in high-volume applications," Oakes asks.

If, one day, the answer is yes, there could be noticeable shifts in the heat-treat industry. Morrison provides examples of two possible shifts. First, there's the really complicated component that consists of many smaller parts, an aerospace component, for example. If a company makes the parts and assembles and heat treats them to create the final component, that's fine. But, what if the company makes the parts, then sends them out to a heat-treat company?

If 3D printing were a mainstream manufacturing process, that really complicated component, a company may be able to make it as one whole thing, not as an assembly of many smaller parts. In that case, there would be only one component to heat treat, not many parts. A commercial heat treater would get less business. "That's millions of dollars that go away," Morrison says.

Moreover, he isn't describing a hypothetical situation. Morrison was touring an aerospace company, got a chance to see its additive manufacturing, and learned about the complicated component that the company was now making as one whole thing. Morrison adds that he asked the tour guide: "If you only had to manage one piece, would you think about buying furnaces and putting them in-house and just doing that heat treating in-house?"

Morrison says the guide's answer was: "That's part of the discussion."

If the heat-treating were done in-house, then a commercial heat treater would get no work from that component.

Another possible shift could lead to commercial heat treaters becoming manufacturers themselves. In this scenario, Morrison sees the possibility of companies deciding not to invest in 3D printers themselves, but to outsource that manufacturing. In that case, to make up for lost heat-treat work and to ensure against further loss, commercial heat treaters could buy 3D printers and offer that service to customers. That way, a company could outsource both 3D printing and heat treating to one outfit, a heat-treat company that's also a 3D-printing house.

Right now, though, 3D printing isn't an option for many high-volume applications, so the possible shifts in the heat-treat industry are only possible shifts.

However, Morrison says, "Gear manufacturers and commercial heat treaters need to be really opening their minds up and really checking into how their customers feel and how their markets feel about 3D printing of something like a gear."

Also, he cautions industry, manufacturers and heat treaters, against thinking that 3D printing will never become a high-volume manufacturing process. "It may never happen," he says, "but you can't say never 'cause if someone figures it out, you're behind the curve." ⚙️

**For more information:**

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## Heat Treat 19

Organized by ASM HTS, an expo and conference to exhibit new heat-treat technology and to provide educational courses



When:	Oct. 15–17, 2019
Where:	Detroit, MI
Exhibitors:	More than 180
Technical sessions:	More than 100
Co-located with:	Motion + Power Technology Expo 2019 (previously Gear Expo), organized by the AGMA (American Gear Manufacturers Association)
Reason to attend:	"There's an opportunity to, in both the technical programming and the expo, to learn." — Jim Oakes, board president, ASM Heat Treating Society

[www.asminternational.org/web/heat-treat-2019](http://www.asminternational.org/web/heat-treat-2019)