

Ask Not What Your Heat Treater Can Do for You...

When sending gears to be heat treated, manufacturers can end up unwittingly making mistakes that slow down turnaround time. We talked to some heat treaters to get their best advice on how you can help them help you.

Alex Cannella, Associate Editor

Turnaround time is one of the most discussed facets of manufacturing that we talk about here at *Gear Technology*. Every month, there's always news about a new product or technique that promises to improve that metric, and we're constantly giving advice on how to make your business run faster and leaner. But at the end of the day, there are certain steps of the process that are largely out of the manufacturer's hands.

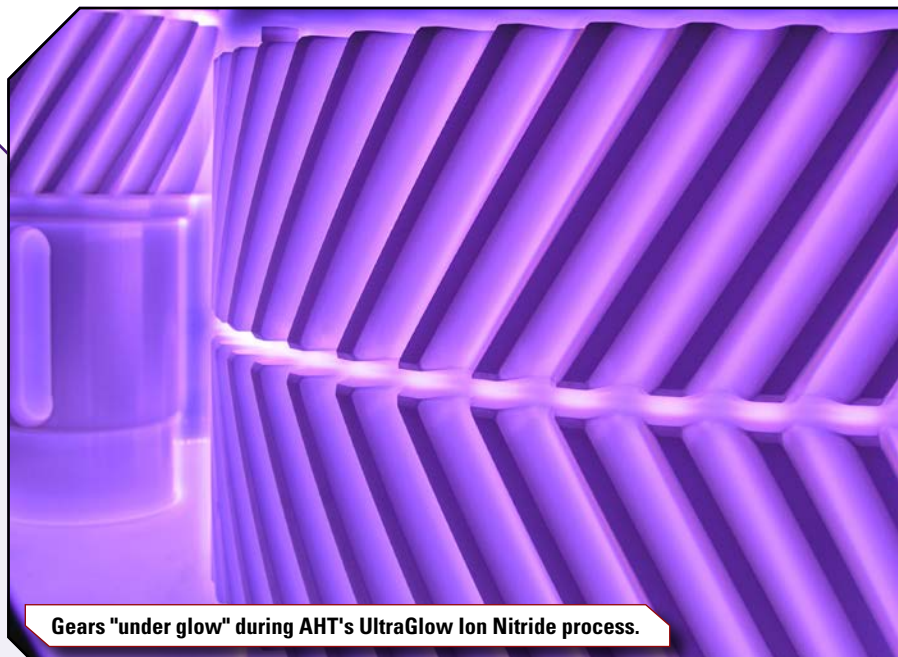
At first glance, sending gears to be heat treated might seem like one of them. After all, manufacturers can certainly shop around and look for the right heat treater for them, but at the end of the day, giving your gears over to a heat treater requires a degree of trust that the job will be done professionally and expediently, and the reality of the business world is that expectations aren't always met.

But the ball isn't entirely in the heat treater's court, and often when the heat treat process hits a snag, it can actually be due to errors that stem from the manufacturer's side. Every heat treater has nightmare stories; improperly documented or tested gears, gears with different specifications than the treater was expecting and even specification demands that are just plain impossible to meet are all issues that they can and do regularly face.

Every one of these problems complicate a heat treater's job, and by extension slow down work and force an increase in turnaround time. When gears come in with different specifications than previously expected, for example, all the prep work they've already done for the gears is wasted, and they have to invest additional time taking it from the top again. And on the flip side, manufacturers can sometimes, depending on the situation, actually help heat treaters skip steps and work faster just by providing the appropriate information.

We reached out to heat treaters both big and small to ask them about the most common mistakes they see gear manufacturers make and their best tips to avoid making them. Here are some of the best ways you can make your heat treater's life easier, and in doing so, improve your own turnaround time.

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Gears "under glow" during AHT's UltraGlow Ion Nitride process.

What Can You Do for Your Heat Treater?

Rule Number One: Communicate!

Every heat treater we talked to, without fail, stressed the importance of communication first and foremost.

"Optimizing turnaround is all about communication," said Phil Harris, marketing manager at Paulo. "The more you let your heat treater know about your process and the next steps in the supply chain, the better. We have seen mutual benefit from coordinating lot sizes with furnace capacity, in some cases holding furnaces for customer delivery times, shipping directly to the next step in the supply chain, or taking on additional processing steps in our facilities."

All heat treaters, be they ion nitriders, vacuum carburizers or otherwise, are willing to discuss the needs and specifications of your application, and their number one piece of advice is to take advantage of that. The more heat treaters know about your gears, the better they can leverage their expertise. They can confirm that your gears can reach the demanded specifications and, in the event that they can't, work with you until they can. The more you're on the same page with your heat treater, the less likely it is you'll run into hiccups when it comes time to send your gears to be treated.

It sounds like painfully obvious advice, but almost every problem a heat treater runs into has to do with a failure of communication in one way or another. Just taking the time to make

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sure that you're on the same page as your heat treater can prevent any number of major delays before they have an opportunity to happen.

So, what should you be telling your heat treater? Harris has a few suggestions.

"Ensuring we know what material your gears are and that the hardness specification is achievable is a great start," Harris said. "Remembering to send test coupons can prevent us from cutting a gear, depending on the testing requirements. We need to work together to understand distortion, especially with higher temperature processes. Let your heat treater know about cutting fluids and rust preventative, as those fluids can impact our surface treatments. Lastly, communicating test locations is often missed, but can cause a lot of headache if we end up measuring different areas of the gear."

Test locations are a helpful piece of information heat treaters aren't always provided. It can be important for them to test the same location on the gear that the customer does. If, for example, the gear manufacturer tests the tooth tip but the heat treater tests the tooth root, it's possible to get different results, which leads to delays as the heat treater scratches their head and has to try and get in touch with the customer. And in situations where gears require different case depths at different locations on the tooth, it can become doubly important to specify the test location when you provide your test information.

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Rule Number Two: Start Early and Keep up to Date

While the idea of keeping in touch with your heat treater isn't a revolutionary one, not as many gear manufacturers know when they should start to open that line of communication. The answer is to do so as early as you can. And when heat treaters say early, they mean before you even start manufacturing the gears.

"Gear manufacturers need to incorporate the help they receive from their heat treat facility early in the program," said Frederick Otto, president at Midwest Thermal-Vac. "Thousands of times (and I am not exaggerating) a particular gear ends up at the heat treater with pre-determined specifications that cannot be done. If only this was brought to the table before any gear cutting was started."

"Talk early on and have some head to head meetings and so forth on design," said Gary Sharp, chairman and CEO of Advanced Heat Treat Corp. "Get some development done on prototypes as early as possible so we can get [the gear manufacturer] samples so that they can do some initial testing in case further adjustments need to be made."

Every advantage achieved by talking to your heat treat supplier is compounded by making sure you start talking to them as early as possible and, almost as importantly, keep them informed as your own gear designs change, as that affects their own process.

"Another situation is lack of internal specifications with the correct revision," Otto said. "The correct revision is not sent up front, wasting days of communication and valuable heat

treating time, while waiting to receive the requested information. Then only to find out that temperatures, quench media and other specifications that tie a heat treater's hands add unnecessary cost."

If making sure your heat treat servicer is informed is the number one way to prevent unnecessary delays, then making sure that you talk to them early and often is the best way to make sure they're informed. The more you dedicate yourself to keeping your heat treater apprised of your gears' specifications, the better and faster they can do their job and send your gears on to the next step of production.



A titanium gear after undergoing AHT's ion/plasma nitriding process.

Rule Number Three: Vet Your Material Supplier

A mistake can happen anywhere on the supply chain, and that includes with the material supplier. According to Enrique Lopez, sales and marketing director - North America for ALD Thermal Treatment Inc., one of the leading problems ALD encounters is when a gear manufacturer sends gears made of poorly mixed or low quality material. It's also an error echoed



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by Otto, who described “consistently” getting gears made from the wrong material altogether.

“I know it sounds like a basic thing,” Lopez said. “But you would be surprised how often that happens, even with big customers where you’re supposed to have high quality materials.”

It’s a mistake that ultimately rests with the material supplier (or, perhaps, even further up the supply chain), but it’s also one that gear manufacturers don’t always notice when cutting their gears. But even if low quality materials make it through the gear cutting process without being noticed, the problem will always rear its head during heat treatment when the treater doesn’t get the results they’re expecting. And when it does, it forces pro-

duction to halt.

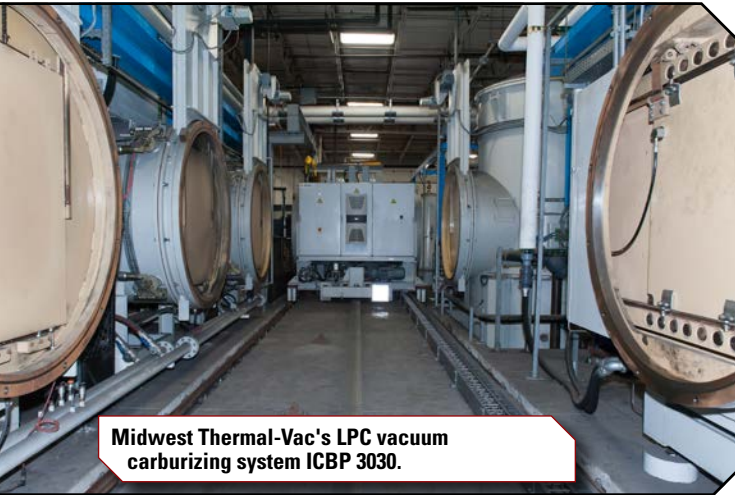
“When we do the heat treatment, of course we will have different results,” Lopez said. “And then we will start scratching our heads and figuring out what is happening, wasting a lot of time doing trials, correcting recipes and doing all that, just for the next load coming having again a different situation.”

Once a gear manufacturer runs afoul of this problem, it’s not necessarily a total loss. According to Lopez, there are a few options going forward to deal with the situation, but they both consume time in their own way.

“In our case, we offer the customer two ways,” Lopez said. “They can either have the material back, or we can figure out what to do with this material. Sometimes, the material is so mixed that even within one load, you have good parts and bad parts. Some other times, you can effectively find a breakpoint where you can say ‘well, the loads received between [these days] are problematic; and then you can pull that apart and develop a specific recipe to modify and deal with that usually lower DI. So you can save the materials, you can have good parts, it’s just a matter to composite differently.”

According to Lopez, the best way to avoid the problem altogether is to just regularly check the materials you’re receiving from your supplier.

“I think if a customer relies on their sources, it is still a good idea to have some checks, regular audits, and very good control just to keep a certain level of uniformity in the material they use,” Lopez said.



Midwest Thermal-Vac's LPC vacuum carburizing system ICBP 3030.

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Rule Number Four: Protect Your Gears in Transit

According to FPM Heat Treating's Vice President, Jim Feltner, one of the most frequent mistakes they see is improperly packaged gears that arrive at the facility damaged.

"Unfortunately [some gear manufacturers] do not realize how much a skid or tub of parts can bounce around on the truck which could lead to potential damage or scrap if the gears come in contact with each other," Feltner said.

Standard shipping companies accidentally damaging gears is one thing, but according to Otto, gears can sometimes be damaged even when they're being transported by heat treaters' own local shipping services.

Gears that show up damaged on arrival are yet another potential snag in production, and as with anything else unexpected that happens in the heat treatment process, requires the heat treater to take time to consult with their customer before they can proceed. To avoid this, Feltner advises making sure your gears are securely packaged with the assumption that the container will be bouncing while in transit.

What Can Your Heat Treater Do for You?

Of course, productivity and turnaround time isn't solely on the gear manufacturer. There are a number of ways that heat treaters have been working to make sure orders are done swiftly and precisely, not least among them being systems like Paulo's Production Information Customer Service (PICS). PICS tracks orders through Paulo's entire facility from the moment they arrive until they leave. When a shipment of gears arrives, they



AHT's UltraOx Layers heat treatment process provides added protection against corrosion as well as the black matte finish you see here.

already have an order number, complete with an already established design process. Coupled with the fact Paulo can hold furnaces for specific shipments, this allows the company to trim a significant amount of setup time.

"PICS stores part numbers and the related heat treatment recipe, so when your order arrives there is no scrambling to design a process and no operator error inputting that recipe," Harris said.

Paulo is, of course, not the only company with such a setup. ALD has a comparable system at their own facilities, including their automatic carburizing lane. According to Lopez, even though ALD specializes in high volume shipments, they can still turn around most jobs in 72 hours.

"You just have to scan it," Lopez said. "And the system will know perfectly what to do...At the end of the line, we'll have a product that didn't have any hiccups or delays at any point."

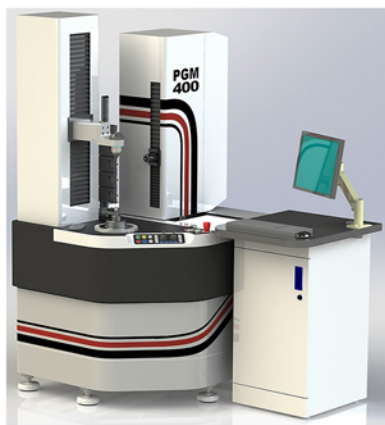
Midwest Thermal-Vac, on the other hand, offers CMM measuring both before and after heat treatment, which Otto notes



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also can improve turnaround time, and recipes stay programmed in the company's furnaces after their first use, which guarantees a repeatable heat treatment cycle on subsequent orders. Midwest Thermal-Vac also runs their furnaces 24/7.

"If repeating the CMM measuring process, this would prevent having to ship multiple times from the heat treater to the manufacturer," Otto said. "This would save valuable time and eliminate shipping costs. CMM measuring also provides critical information to be able to move ahead to the heat treating trial. This service edge eventually provides a faster turnaround time with superior quality."

Advanced Heat Treat, on the other hand, opts for the quantity approach. With over 50 nitriding furnaces that the company keeps running 24/7, AHT President Mike Woods is confident in his company's ability to match its competitors in turnaround time while remaining flexible. FPM adopts a similar approach by maintaining a high amount of redundant equipment between three separate locations.

You may have noticed, however, that many of these turnaround-improving processes are still dependent on one thing: that the heat treater knows exactly what they're getting ahead of time. Processes like Paulo and ALD's automatic tracking systems are predicated on the assumption that the gears they receive will be exactly what advance documentation told them they would be. And while companies like Advanced Heat Treat and FPM may pride themselves on their flexibility, differing test results will still force them to spend additional time coordinating with a gear manufacturer before they can proceed. This all drives home just how important the gear manufacturer is in the heat treatment process, even if they aren't the ones performing the actual process, and that if you want a smooth heat treatment with a quick turnaround, the most important thing you can do is remember to talk to your heat treater. ⚙️

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