

Choosing the Right Heat Treater

Getting the right provider for your job.

Kurt Hawker

Heat treating is a critical operation in gear manufacturing. It can make or break the quality of your final product. Yet it is one that frequently gear manufacturers outsource to someone else. Then the crucial question becomes, how do you know you're getting the right heat treater? How can you guarantee your end product when you have turned over this important process to someone else?

The answer is a straightforward one, but one which in my experience is overlooked far too frequently. The secret to buying good heat treating service is to do your homework. Ask lots of questions and demand clear and *documented* answers.

This documentation is crucial. In the present competitive environment, when more and more of your customers are seeking some kind of quality system registration, like ISO 9000, QS-9000 or NADCAP (National Aerospace Defense Contractors Accreditation Program), and demanding the same of you, a heat treater who is also registered or who can provide detailed documentation of his or her processes is becoming almost a necessity.

Even if you or your customers don't absolutely require such documentation, its existence will certainly help you to sleep at night.

But documentation alone is not enough. You need answers to over a dozen important questions before deciding on the right heat treater. The easiest way to get them is to ask your heat treater (or potential heat treater) to fill out a supplier survey (see sidebar on page 00), which should contain the answers to most of them. If a heat treater can't or won't take the time to do that, maybe you should be taking your business elsewhere.

Here are some of the questions that might be included in your survey.

1. *Are the company's operations certified for quality?* If so, by whom? When was it last audited? The last is the most important. Programs like ISO 9000 and QS-9000 require regular audits, and your potential supplier should be current. At the same time, beware of the buzz words in company literature to the effect that "... we have processed work for Ford" or "GM processing capabilities." Maybe the heat treater did one job for Ford or GM 15 years ago. Find out



Good heat treaters have good, documentable quality control systems.

specifically what this phrase means to the company.

2. *What kind of quality system is in place?* How closely is it followed? There should be four parts to this system: A quality control manual explaining the entire system; clearly outlined procedures that are followed consistently; job instruction sheets for each job and controls on portions of the job that involve outside suppliers.

Kurt Hawker

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SAMPLE QUESTIONS FOR A HEAT TREAT SUPPLIER SURVEY

I. GENERAL

- | | | |
|--|-----|----|
| 1. Do you have a written quality policy? | Yes | No |
| 2. Who is responsible for quality assurance and planning _____? | | |
| 3. Is management committed to quality and the use of statistical methods to control quality? | Yes | No |
| 4. Is there a management statement in the manual? | Yes | No |
| 5. Is the quality policy reviewed at least annually, and are actions taken to assure compliance with the policy? | | |
| 6. May we see your quality manual? | Yes | No |

II. ORGANIZATION—ADMINISTRATIVE

- | | | |
|---|-----|----|
| 1. Does a current formal organizational chart exist that defines responsibility and authority? | Yes | No |
| 2. Do departments other than quality participate in the quality planning? | Yes | No |
| 3. Are statistical/analytical or other new techniques used in the planning process to improve process capability? | Yes | No |

III. TRAINING

- | | | |
|---|-----|----|
| 1. Is there a documented quality training program for management, quality and production personnel? | Yes | No |
| 2. Are written test and inspection instructions readily accessible to operators and inspection personnel? | Yes | No |
| 3. Are these updated and reviewed? | Yes | No |

IV. LOT CONTROL

- | | | |
|---|-----|----|
| 1. Are lot control procedures documented? | Yes | No |
| 2. Is product identification maintained throughout the process? | Yes | No |
| 3. Is traceability maintained throughout the operation? | Yes | No |

V. INCOMING PRODUCT/MATERIAL, PROCESS CONTROLS

- | | | |
|---|-----|----|
| 1. Are adequate incoming/receiving inspection procedures and/or instructions available? | Yes | No |
| 2. Is incoming material approved and properly identified prior to release to production operations? | Yes | No |
| 3. Is nonconforming material properly identified prior to release to production operations? | Yes | No |
| 4. Are materials awaiting inspection properly identified and segregated from previously inspected materials? | Yes | No |
| 5. Are in-process routing sheets, process sheets or routing cards used to control material throughout the manufacturing process? | Yes | No |
| 6. Are written operator and inspection instructions that include frequencies and sample sizes available at control points or the proper area? | Yes | No |
| 7. Is statistical process control used for significant product characteristics and process parameters? | Yes | No |

VI. PRODUCT VERIFICATION

- | | | |
|---|-----|----|
| 1. Do all finished materials receive a final audit/inspection? | Yes | No |
| 2. Is there a written procedure outlining final inspection including sample size? | Yes | No |
| 3. Is the final audit performed by the quality department? | Yes | No |
| 4. Is supplier willing to certify conformance to requirements? | Yes | No |

VII. HOUSEKEEPING

- | | | |
|---|-----|----|
| 1. Is there a system to assure plant cleanliness and to assign responsibility for housekeeping? | Yes | No |
| 2. Are the company's facilities clean, well-lighted and properly marked? | Yes | No |
| 3. Do plant, offices and personnel reflect a positive image? | Yes | No |

This form should also contain information about the total number of employees, number of shifts worked, number of q.a. personnel, building size and contact names.

3. *What are the company's capabilities? Can this heat treater do your job? Are his or her furnaces big enough? What about ancillary equipment? For example, if you have very large gears to be worked on, does he have sufficient equipment and facilities to handle your parts without damaging them? Does she have enough personnel to do your job in the time frame you require?*

4. *Can you get a statement of liability? This comes down to the question of whether this heat treater will stand behind his work. If something goes wrong, if there is a catastrophic failure of one of your gears that can be traced to the heat treating process, does this supplier have an umbrella insurance policy to cover losses and damages? In what amount? What happens if your job is damaged or lost in the heat treater's plant? Are you going to be left holding the bag?*

5. *Is there a metallurgist on staff? The answer to this question will tell you a lot about how seriously this heat treater takes quality control. Heat treating is a metal structural transformation process, and someone on staff who is well-versed in the science of metals can solve a lot of small problems before they become big ones and can avoid a great many of them altogether. A metallurgist also can be critical to assessing liability. Supposing a batch of gears fails because of defects in the metal. A heat treater may compensate you for the damages, but with a trained metallurgist on staff, you might discover that the material house was really responsible for the failure.*

MANAGEMENT MATTERS

The compensation should have come from them. Furthermore, this leads to a question you might otherwise not have asked—do I need a different *material supplier*?

6. *Will this company provide you with an organizational chart, and does it show how many departments are really involved in quality control? Who is responsible for quality at this company? What other responsibilities does this person have? Is he or she a full-time quality person, or does he also double as the receptionist and the delivery driver? Does more than one person have input into quality issues? What kind of reporting system exists? What kind of communication takes place between departments? Are there quality checks in every department as a matter of routine?*

7. *How well-trained are the people at this company? How long have they been employed? What kind of ongoing training does the company provide? How do you know the company doesn't routinely call up the local day labor provider and ask for "five loaders and five furnace operators today"?*

8. *What kind of process and lot control goes on here? Are instructions conveyed by word-of-mouth or are computer-generated job instruction sheets assigned to each job that follow it through its time at the facility? A modern plant will have a system of identification and control that tracks a job from the moment it enters the plant until it leaves again. Job instructions may be locked into a computer, with changes to procedures, except by supervisors, prevented. Does*

this company have any way to track its rate of repeatability? How consistent is its work? Can anyone from the company document the answer?

9. *How thorough are the company's inspection procedures? How many samples from each job are checked? Is this number adequate to the size of your job? If the company checks two pieces per load, and your job consists of 10,000 pieces, is that a sufficient sample? Will it meet the documentation requirements of your customer? How often does this heat treater check and calibrate his instruments and furnaces? How new are they?*

10. *How far back are records kept? My company keeps records for seven years or for the life of a program. Do you need that level of documentation? Can this heat treater provide the level you need?*

11. *What about the company's housekeeping practices? This involves more than just keeping a clean and tidy shop, although that is important. How safe is this plant? Is it well-lit? Well-ventilated? Well-organized? Is it in danger of being shut down by OSHA?*

12. *Does this company have a locked and bonded holding area? Short of that, does it have some verifiable method of preventing bad gears from slipping back into the system? Companies that produce aerospace parts will often have a gated area where rejects are kept under lock and key until the customer can be notified of inconsistencies.*

13. *Does this plant do inspections of incoming product? If there is a prob-*



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lem with your gears upon delivery to the heat treater, will you be notified, or will this supplier just go ahead and heat treat them anyway?

14. *Will this heat treater let you come to the plant to see product samples run? Will they allow an on-site inspection?*

After The Vendor Survey

An on-site inspection is really the next step in the procedure. Getting a vendor survey is only the beginning of choosing a good heat treater. You should visit the plant. I'm always surprised at how many manufacturers want to seal the heat treating deal over the phone without ever seeing where their product is going to be sent or how it's going to be handled once it gets there.

You should pay a visit, and your potential heat treat supplier should welcome it. Bring along the important people who will be involved with the production of your gears. These should include your quality control manager, the purchasing manager, the production manager, the expediter and anyone else who's going to be interfacing with the heat treater. They should be able to see a sample of your product run

through the heat treater's system, see how the product's handled and then evaluate what they've seen.

Each of them should be evaluating the heat treater's system from his or her point of view. Is the quality control manager satisfied with the inspection process and equipment? What about the level of documentation? Does your production manager feel good about the way the product is handled on the shop floor? Is your expediter comfortable with what he's seen in the warehouse in terms of both incoming and outgoing product and storage and handling in between?

This is the time to watch for discrepancies. If a heat treater has said he can handle your 40" gears, but all you see on his floor are small furnaces, this should raise questions. Is he sending your product out to be done by someone else? This sometimes happens, but it's not an acceptable practice without your prior approval. If another supplier is involved, who is it? What kind of quality and documentation can you count on from him? What kind of security can you be assured of? Is your product going to end up running right next to



When evaluating a heat treater, ask how recently his inspection machinery was calibrated.

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that of your competitors? What other parts of the process are being outsourced? To whom?

This is also the time to be getting answers to other important questions. When a heat treater says he offers 48-hour turnaround, what does that mean? Does it mean in Friday and back Monday, or in Friday and back Wednesday because the heat treater doesn't work weekends? Does this heat treater offer 24/7/365 service, or does he close on weekends and holidays? That's something you'll want to know if you don't want to find your product accidentally held hostage because the heat treater has closed for the two weeks over Christmas or for a summer vacation.

If you've had a problem with getting product back consistently in a timely manner, the reasons may lie here. If the product is being outsourced, the delay may be with the other vendor or with the fact that your heat treater has built-in delays in her schedule you didn't know about.

**Is All This Effort
Worth It?**

This may seem like a lot of hassle, especially if you're not making aerospace quality gears. If your customers don't demand this level of documentation and quality, why should you care?

Because in this era of increasing global competition and more and more demanding customers, you can't afford not to. Remember that in the end, with your customer, it's *your* reputation that's on the line. He or she is going to buy the excuse that the problem lies

with your heat treat supplier only once—if that.

In the long run, it always pays to get the best heat treater you can afford—one who, ideally, exceeds your expectations. You can get away with heat treating on the cheap for some time, but in the end, the practice will catch up with you. It takes the loss of only one big, expensive job to bad heat treating to cost far more than you would have paid to go with a quality product to begin with.

You can benefit from dealing with an aerospace-quality heat treater for your AGMA 8 or 10 gears in another way. You get his expertise and quality practices without have to pay the aerospace tariff. His or her practices will be the same on your gears as on aerospace gears because the quality is built into the plant systems, and the prices will be competitive because your gears don't require the liability coverage that aerospace gears do. Finally, there's the intangible of having the security of dealing with a company that has a proven quality track record. What is that worth to you and your customers?

The In-House Question

Many gear manufacturers today are addressing the question of getting documented quality heat treating on time and within budget by exploring the option of bringing the whole operation in-house. They think, and not without reason, that there is no better way to ensure the job is done the way they want it done.

But making the decision to bring heat treating in-house is a big one. The ultimate

equation is a simple one—are the costs involved going to be more or less than what you spend on outside heat treating now?—but the variables complicate the issue.

Much more is involved than choosing a furnace. First, generally speaking, you need to be doing a significant amount of heat treating to make bringing the process in-house worthwhile. Also remember that the cost of the furnace is only the beginning. What's a turn-key operation is going to cost; i.e., what is the price of the furnace, the installation, the plumbing, the extra materials like appropriate gases, and the backup equipment to keep it running?

Then there's the question of the skilled labor necessary to do heat treating and to keep the equipment running. Do you have this kind of personnel available? Can you get it? Can you afford the kind of trained personnel it requires to run the machines and manage the department? And there's the issue of what to do if your one furnace breaks down or needs extended maintenance. If you have only one furnace, and it goes off-line for some reason, all of a sudden your entire delivery schedule for this job is in jeopardy. At that point, you have to go to an outside source for one or two jobs, and you'll go to the end of the line after all his or her regular customers have been serviced.

If you can answer all these questions in a way that makes sense to you economically, then maybe bringing heat treating in-house is the answer. But that may not be as likely as you think.

One way that some very large customers address the control problem is to negotiate with a heat treater for a dedicated furnace at the heat treater's site. This can be a mutually beneficial arrangement for both parties, but again, it requires someone with a lot of product to be heat treated to be worthwhile.

In the end, buying quality heat treating is just like buying any other goods or services. It's a matter of doing your homework, taking the time to get the answers to all your pertinent questions and making certain cost/value decisions. As with most other transactions, you get what you pay for.

Good quality gears are the end result of a lot of hard and expensive work. After you've gone to all the trouble and expense of designing and cutting the best gears you can, do you want to jeopardize the whole operation with sloppy heat treating? Scrap is expensive, not only in terms of lost revenue, but also in terms of increased frustration, lost time, missed deadlines and damaged customer relations.

When heat treating is such an important component of building a quality gear, can you afford to settle for anything less than the very best you can afford? ☉

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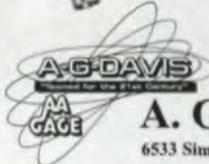


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