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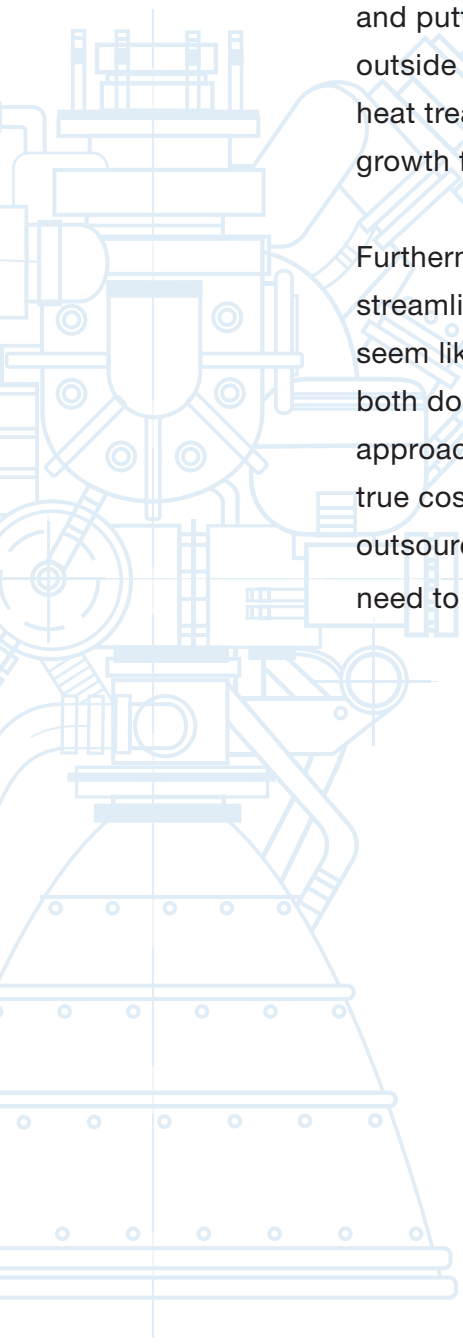
Heat Treating:

Is it Time to Outsource?



Are you considering outsourcing your heat treating operations? Manufacturers often struggle with this decision, and for good reason. Keeping heat treating in house allows operators complete control over thermal processing results. Relinquishing that control and putting a critical manufacturing step into the hands of an outside partner is a daring step—but with the right commercial heat treater, it can be a decision that leads to the next phase of growth for your manufacturing company.

Furthermore, outsourcing heat treating safeguards profitability and streamlines operations. While keeping heat treating in house may seem like the less expensive option, there are hidden costs—in both dollars and time—that many business owners overlook when approaching this decision. In this white paper, we will outline the true costs of in-house heat treating, and we will highlight how outsourcing it can spark the improvements and innovation you need to take your business to the next level.

The Costs of In-House Heat Treating

Some of the costs of running your heat treating operations in house are obvious: capital expenditures of purchasing equipment, renting space, and hiring someone to run the furnace. However, there are many costs to in-house heat treating that aren't as apparent... and to make a solid business decision, all the ramifications should be considered.

We will cover several areas of commonly overlooked costs, including: labor, technical expertise, support and maintenance, insurance and depreciation, furnaces and auxiliary equipment, safety, facilities, operations and environmental concerns.

Labor

You have already factored in the cost of hiring a furnace operator, but there are other professionals you will need to ensure the quality and accuracy of the heat treatment of your parts. A few examples include:

- Supervision
- Metallurgical support
- Mechanical support
- Quality control

In addition, hiring any employee comes with a slew of not-so-obvious costs that extend well beyond their salary. According to the U.S. Small Business Administration, the true cost of an employee is typically 1.25 to 1.4 times their annual salary. You'll incur these costs in the form of benefits, training, and certifications, to name a few.

Let's do the math. Say you're a manufacturer who operates 24/7 and runs furnace operators on all three shifts. What are the costs?

Furnace operator hourly rate: **$17.18**
Furnace operator base salaries cost per year: **$144,312**
Actual cost of running 3 shifts of furnace operators per year: **$180,390**
(conservative x1.25)

Technical Expertise

Heat treatment isn't simply heating up and cooling off metal parts. Some cycles are complex, requiring extensive controls, monitoring, and problem solving. Today, most materials in use require specialized processes for optimal heat treating. Further, if new materials are selected for your parts, you will likely struggle to meet specifications without metallurgical support.

So, you'll be faced with a decision: can you afford to bring on the metallurgical support in house? Many manufacturing operations cannot justify the cost of a dedicated metallurgist. However, any commercial heat treater worth their salt will have a team of metallurgists and quality control professionals dedicated to the problem solving, monitoring, and adjustments we mentioned earlier.

Support & Maintenance

You have probably factored routine equipment maintenance into your budget for in-house heat treating, which is critical to your ability to produce repeatable results from your processing. Like any piece of manufacturing equipment, heat treating furnaces begin to wear and deteriorate from the moment they are put into operation.

You can count on repairs to refractory, replacement of high temperature alloy components, and maintenance of electrical, hydraulic, and pneumatic systems...in addition to routine replacement and recalibration of sensors. Further, as heat treating standards evolve and IT advances, control systems can become obsolete and require extensive updates.

As if all of this wasn't enough, truly effective heat treating requires support beyond furnace maintenance. You'll need plant engineers

for equipment upgrades and improvements and equipment calibration services to make necessary adjustments.

And what about the times when you experience challenges in achieving results? In that case, you'll need to bring in outside consultants to perform problem solving. The same is true for energy efficiency concerns.

The employees performing your heat treating are going to need support, too. Depending on how much heat treating you are doing in house, you may need to consider bringing on additional human resources support.

Carbon atoms can't normally squeeze in between the iron ones, but when temperatures exceed roughly 1,350 degrees Fahrenheit, the carbon atom fits and carbide dissolves. The steel temporarily becomes one substance. Once these materials are cooled—in the process known as quenching—the carbon atoms remain trapped between the iron atoms. This keeps the steel a solid solution until the carbon atoms are once again forced out during tempering. The rate at which this cooling occurs will have a direct effect on what properties are preserved in the finished product.

The different effects that can be achieved, through a combination of different heating and cooling techniques, explain why steel as an alloy and heat treating as a process are so valuable to the manufacturers who make the parts in our cars, buildings and critical infrastructure, among a huge variety of other applications.

$86,000
average annual salary for a manufacturing plant engineer

$1,500 fee+ $200/hour
cost for outsourced testing

$100,000+
average cost of furnace rebuild

Insurance & Depreciation

What effect will a heat treating operation in your facility have on your premium? Will you be able to recoup the cost of investing in your equipment when it comes time for an upgrade, after depreciation?

Furnaces & Auxiliary Equipment

Heat treating furnaces are rarely standalone pieces of equipment. Usually, they require support equipment for material handling and loading, water or air-cooled cooling systems for quenchants, and storage facilities for quenchants.

You'll also need to consider atmosphere generators and/or bulk gas storage solutions for nitrogen, argon, hydrogen, or other gases used for atmosphere and gas quenching. Finally, most parts also require pre- and post-cleaning for a complete heat treating process.

Average footprint of equipment for common furnace configurations:

- Vacuum + Cooling ≈ 500 ft2 / furnace
- Belt Furnace ≈ 2,500 ft2 / furnace
- IQ Furnace + Oil Cooler ≈ 265 ft2 / furnace
- Temper ≈ 65 ft2 / furnace

How much revenue does each piece of production equipment generate?

By using valuable plant space for heat treating, you may be incurring opportunity costs. If you could replace your heat treating equipment with another machine tool, what would that mean for your capabilities, efficiency, and throughput?

Safety

There are constant opportunities for catastrophic accidents with heat treatment operations. Furnaces operate at temperatures higher than hazardous incinerators. They are often full of explosive gases in close quarters with thousands of gallons of oil. It would be a gross understatement to say that safe operation, strict compliance with operating procedures, and knowing how to respond to an emergency are critical.

Furthermore, the safety systems on your furnaces need to be tested and repaired regularly. Many repairs require expertise in dealing with high voltage systems...and they must be performed within enclosed spaces.

Performing heat treating in your facility poses an immense amount of risk. A heat treating accident can result in injuries, property damage, and even loss of life. Business that operate without a team of the proper heat treating experts (think back to when we discussed plant engineers and mechanical support) are taking a huge gamble. Our opinion? It isn't worth it.

Facilities

The facilities-related costs of in house heat treatment don't stop at the floor space required for equipment or storage costs for materials. Heat treating in house leads to facilities management challenges. Furnaces run hot and dirty, which can cause deterioration of ceilings, floors, and walls. Within your ventilation systems, deterioration can begin to occur quickly if you are constantly running furnaces.

Operations

You know furnaces don't run for free, but energy costs are only the beginning of what it takes to run them. Other costs to consider include:

- Atmosphere gases
- Quench oil
- Cleaners
- Equipment overhaul
- Parts
- Quality control supplies
- Rework and spoilage
- Material handling
- Personal protective equipment

Environmental

Waste oil disposal, quench oil spill cleanup, and facility air quality permits and fees should be expected expenses in heat treating operations. If you've been heat treating for some time, then past years can be used as benchmarks to plan for future expenses. What's also important to consider is your organization's disaster plan or what may happen in the event of environmental contamination originating from your facility.

Environmental Contamination Can Have Disastrous Results

One gallon of refined oil lubricant can contaminate 100,000 gallons of groundwater

$25,000 per day fine for negligently discharging oil or hazardous substances into bodies of water or drinking sources in the U.S.

The Outsourced Advantage

Experienced heat treating companies have undergone and planned for all of the above contingencies. Because heat treating is their core business, they are usually better equipped to handle these extra costs than in-house operators.

Expenditures for the gas, electricity, environmental compliance, labor, maintenance, and replacement parts are incurred above and beyond your usual operations cost when you perform heat treating in house. However, these costs represent the core of the business for commercial heat treating companies, so they are able to optimize their spending better than in-house operators. In addition, because heat treating companies can run furnaces at full loads for long periods of time, the start-and-stop of in-house shops means they usually operate less efficiently.

Standards, Certifications, & Audits

And it isn't just about getting the processing right to yield parts that meet specifications. According to the Metal Treating Institute (MTI), companies who perform heat treating are responsible for meeting more than 30 form-completion deadlines for 12 regulations in order to remain compliant with government heat treating standards.

These regulations include OSHA's Hazard Communication Standard and the EPA's regulations regarding used oil, underground storage tanks and water treatment, RCRA small quantity generators and the Clean Air Act. There are also standards governing confined space entry, hazardous material handling, equipment lockout/tagout, emergency response, and plant air quality.

Maintaining compliance with these complex regulations and certifications can be a full-time job. And once you earn the required certifications and comply with standards, you must maintain them.

For heat treating companies, if they lose a certification or fall out of compliance with government regulations, the ramifications can be catastrophic. That's why heat treaters take every possible precaution to maintain standards relative to heat treating at all times...in many cases, they will employ entire teams whose sole focus is to ensure compliance.

Focus on Your Core Business

All of the costs and regulatory complexity associated with in-house heat treating can drain your financial resources and distract you from continuous improvement, innovation, and customer service.

For business owners who have already made investments in in-house heat treating, making the switch to outsourcing allows them to…

- Distance themselves from complicated regulations
- Sell off heat treating equipment
- Reduce capital expenditures
- Mitigate the risk of environmental accidents
- Simplify their maintenance program

Without in-house heat treating draining resources, companies who outsource are left with more time to focus on the core purpose of their businesses. Over time, it becomes clear how innovation leads to increased competitive advantage...and it becomes clear that business dollars are much more effectively spent in this way rather than on an in-house heat treating operation.

Ultimately, while there are many factors to consider when budgeting for a heat treating operation, there's only one price to consider when outsourcing the work: the cost per project. Which option seems like the better decision for your business?

Let's talk.

Are you ready to discuss the potential benefits of outsourcing your heat treating needs? AST-Paulo is well-equipped to guide and support you. Get in touch with us to schedule a consultation today.

For more information visit: paulo.com or call **(314) 647-7500**