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Continuous Improvement Ideas for Induction Hardening

Induction Heat Treating Corp.

www.ihtcorp.com

Continuous Improvement Ideas for Induction Hardening

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In the highly competitive automotive heat-treating market, keeping current is a competitive advantage. Based on a plant tour and interviews with key personnel at Induction Heat Treating Corp. (www.ihtcorp.com), Crystal Lake, Ill., the following article discusses three ideas where upgrades and advances in technology, equipment, and processes have helped the company produce high-quality induction heat-treated parts.

Every heat treat department, whether captive or commercial, has a goal of zero defects, zero re-works, and the lowest possible processing cost. Attaining this goal is the focus of day-to-day life in each heat treat department. While every department has their own strategy to accomplish this goal, the essentials are relatively common—good information, good equipment, and efficient processes. As an induction-only heat treater, key personnel at Induction Heating Treating Corp. (IHTC) spend much of their time looking for ways to minimize non-conformities, re-works, and costs. The company has been induction heat-treating for 60 years, has over 20 induction heating stations, and does an annual volume of over 10 million hand-fed parts.

What is this company's formula for turning around high quality, low defect, low process cost induction-heat treated parts for the automotive industry? Here are three ideas presented by key personnel at the company that might be applicable for your induction heat treat department.

IDEA #1 Update System-Wide Information Technology

Ed Kopidlansky, Operations Manager, says that information is king. As a result, IHTC has been working to develop and optimize the use of a homegrown, system-wide production control and shop tracking control system. Similar in function to

systems provided by industry vendors like Cornerstone Systems Inc., IHTC's system has evolved to uniquely meet their particular manufacturing environment. The system integrates quotes, job tracking, job setup, equipment downtime, part non-conformities, personnel/training data, accounting, invoicing, and a host of other functions important to the successful operation of their business.

The system is built on a Borland Paradox™ platform and receives inputs

from numerous sources around the shop and office. Most recently, the company installed three shop-level computer stations to be used by setup supervisors. Previously, setup supervisors had to go to another location to enter all the critical data required. Now, they can do so from a nearby computer station, minimizing the amount of transit time and increasing efficiency (Fig 1).

When a job is being estimated, cycle time data such as the number of seconds to load, position, heat, scan, quench, return,

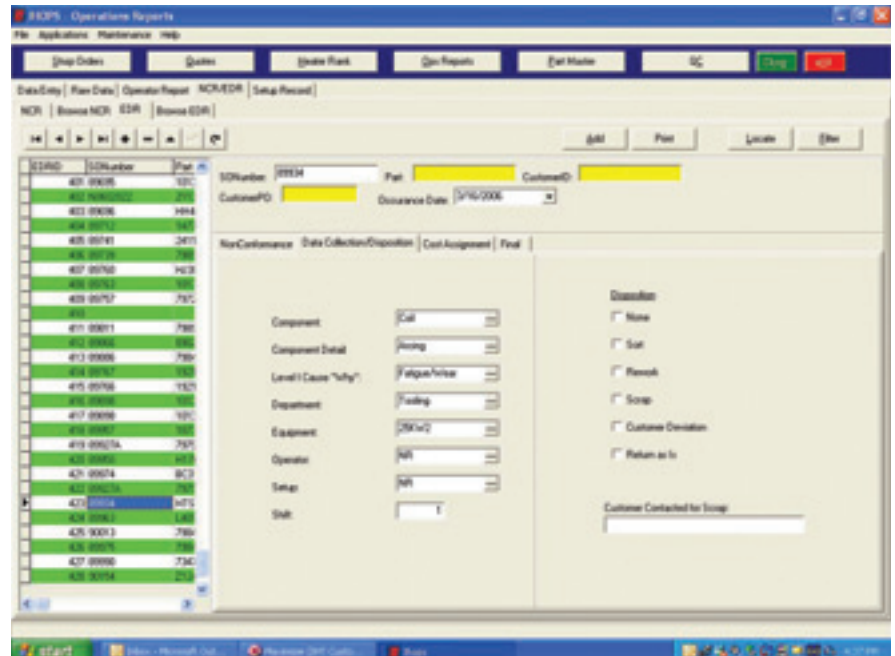


Fig. 1 Sample system-wide supervisory information screen. Equipment downtime for any interrupted production process is recorded on a screen like the one shown here.

and unload is estimated and entered into the system. Tooling costs including coils, adapters, fixtures, and machining costs are entered as well. Estimated utility, transportation and man-hour costs are also added. From this data, realistic costs can be quoted to the customer, but more importantly the data provides IHTC with a “job plan,” which the company then uses as a benchmark to determine if they have performed the job efficiently.

The “job plan” data is then compared to real-time data input from multiple sources. Incoming jobs are logged in the receiving area and matched to the appropriate “job plan.” Setup personnel input critical data such as heat times, power levels, quench concentrations, fixtures and coils to be used, and which induction station will process the job. From this real-time data, the company can compare actual costs to estimated costs.

What is the benefit of having this type of data tracking system? This question might best be answered by examining the “efficiency coefficient” used by Mr. Kopidlansky for each job. In the past, before accurate data was available, a relatively low efficiency coefficient was applied to job estimates due to lower equipment utilization times. But with the development of the system-wide job tracking system, more time is spent actually heat treating parts and less time is spent processing paperwork, locating and setting up jobs, or running to a centralized location to log job data. As a result, the efficiency coefficient is higher, meaning more throughput per hour.

Another benefit of this system-wide data logging is the potential benefit on equipment maintenance and troubleshooting. Given that each job is logged along with the station on which that job is performed, if the system reports higher than normal defects coming from a particular station, maintenance can address the issue before further nonconformities occur.

IDEA #2 Upgrading Power Supplies & Control Systems

Gary Tudor, Vice President and co-owner, says that the most efficient induction shop constantly updates its equipment. In recent years, this has meant the replacement of numerous power supplies at IHTC and the current task of upgrading control systems.

Power supply upgrades are typically done in-house, but the most recent power supply (Ajax/TOCCO Magnethermic, Warren, OH, www.ajaxtocco.com) was installed in 2005 and is a 250 kw, 4-10 kHz unit supplying either a 72 in. scanner or a dedicated fixture running inverted delta safety components (Fig 2). Power supplies have been upgraded for several reasons. First, the company wants to take advantage of the variable frequency power supplies and the flexibility of case depth offered with these variable frequency power supplies. The company also considers the serviceability of these older power supplies as the ability to get replacement parts and service diminishes over time.

In 2006, IHTC is updating many of the induction station control systems to meet the data logging requirements of HT2005–

the new automotive quality standard. One important change being made in order to meet HT2005 requirements is the move from energy monitors to coil signature. Energy monitors measure total kilowatt seconds input into a part. Energy monitors do not show the energy input profile, just a lump sum energy input. Coil signature, on the other hand, shows the energy profile over time and is therefore much more informative and can help more quickly recognize potential non-conformities that might be caused by peaks or valleys in the coil voltage not otherwise noticed by energy monitors.

IDEA #3 Update Scanner Capabilities

IHTC Maintenance Manager Michael Smith says that maintaining the best material handling equipment is also a critical element in a successful induction heat treat department. Historically, IHCT has built their own induction scanning systems. However, in 2006, the company purchased a scanner (Induction Systems, Inc., Waukesha, WI, www.inductionssystemsincc.com) that they felt closely met their requirements (Fig 3). According to Mr. Smith, there were several things they looked for in a scanner. The company likes Windows®-based programming due to its ease of integration with other systems on the shop floor, so the new system has Windows®-based programming. The equipment needed to be easily serviceable, and, if purchased from an outside vendor, the vendor needed to have a good reputation for after-sales service. IHTC was also looking for a scanner with a



Fig. 2 Most recently installed 250 kw, 4-10 kHz power supply



Fig. 3 Recently installed dual-spindle induction scanner

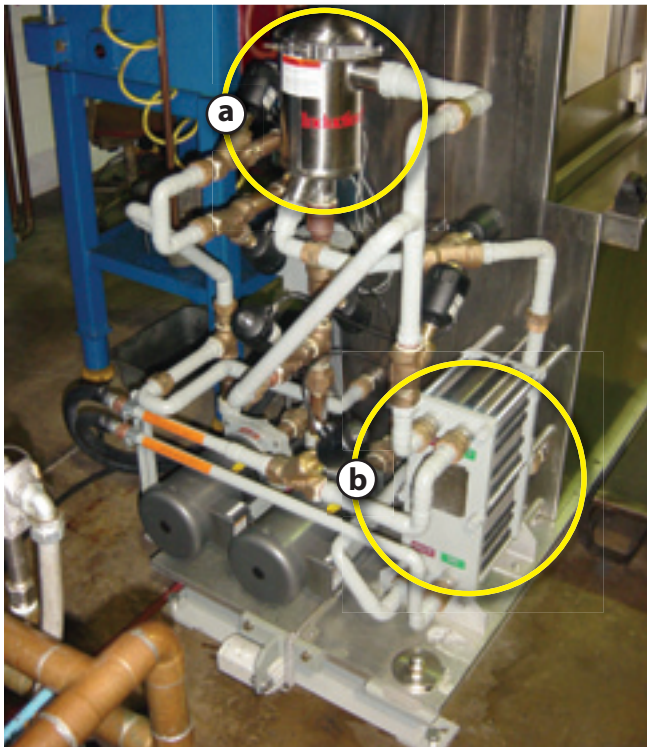


Fig 4. Both the filter canister (a) and the heat exchanger (b) are easily accessible for cleaning.

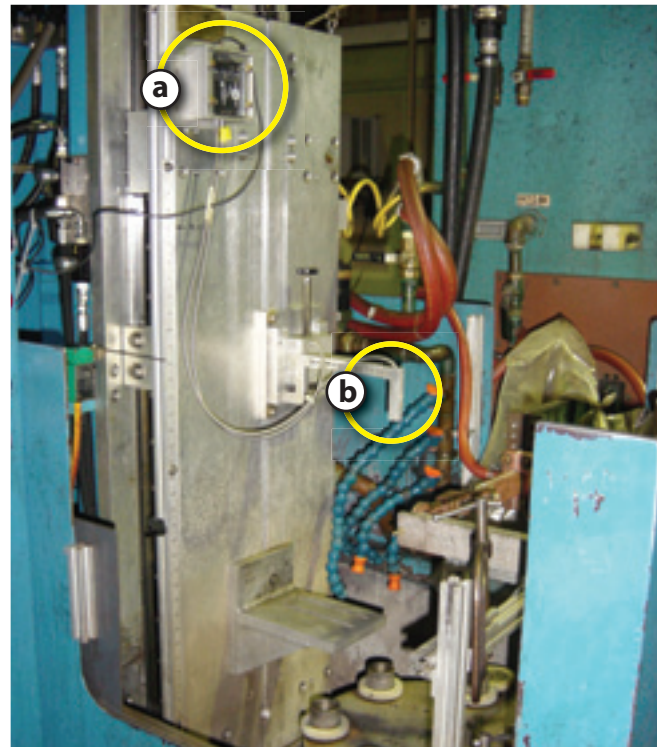


Fig 5. Optical eye (b) and associated controller (a) provide more rugged and reliable notification of improperly seated parts.

relatively small footprint and portability so that it could be easily moved either for the purpose of mating the scanner with a different power supply or for cleaning.

Quench cleaning was also important. Several key issues surfaced with regard to quench cleaning. First, the quench must be easily cleaned of scale. The recently purchased system came with a separate settling tank where scale and other foreign objects, once rinsed from the quench tank, settle to the bottom and are then flushed entirely from the system. Secondly, easily accessible in-line filters were preferred since filters were changed 3-4 times each day. Thirdly, it was important that the heat exchanger, used to cool the quench fluid, be easily accessible and capable of being disassembled for cleaning (Fig 4).

Another requirement was X-Y coordinate adjustments for the scanner. This was accomplished, with the most recently purchased scanner, by placing the entire scanner on an adjustable frame. Once the appropriate X-Y coordinates

are achieved, the entire scanner frame is locked in place with the use of two locking bolts.

The company also required the scanner spindles to be driven by both upper and lower spindle drives. This ensures that there is no part slippage, even if the part becomes slightly loosened in the lower drive fixture.

Finally, a part fixture checking system was developed that ensures parts placed on an indexing table are properly seated in their fixtures before heat treatment. IHTC has typically used a “whisker switch” to notify the operator if a part was not properly seated. The whisker switch had to be carefully adjusted to within fractions of an inch of the acceptable height of the part as it indexed from the load to the heat position. Movements of the index table or scanner could cause the whisker switch to move giving a false signal--either letting poorly seated parts go by undetected or not allowing properly seated parts to pass--reducing efficiency.

To eliminate this problem, the company installed an optical eye (SmartEye, Tri-Tronics Company, Inc., Tampa, FL, www.ttco.com) on one of its scanners. The optical eye is much less prone to movement and is more precise than the whisker switch (Fig 5).

According to Mr. Tudor, the bread and butter of a good induction heat treat department is keeping current with information, equipment, and process knowledge. The three ideas listed above have helped IHTC improve their efficiency and service their customers well.

IHTC is located in Crystal Lake, Ill., and is owned by Dave Haimbaugh and Gary Tudor. The company has been in existence since 1946. **IH**

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