INDUSTRIAL HEATING

The International Journal of Thermal Processing
AUGUST 2018

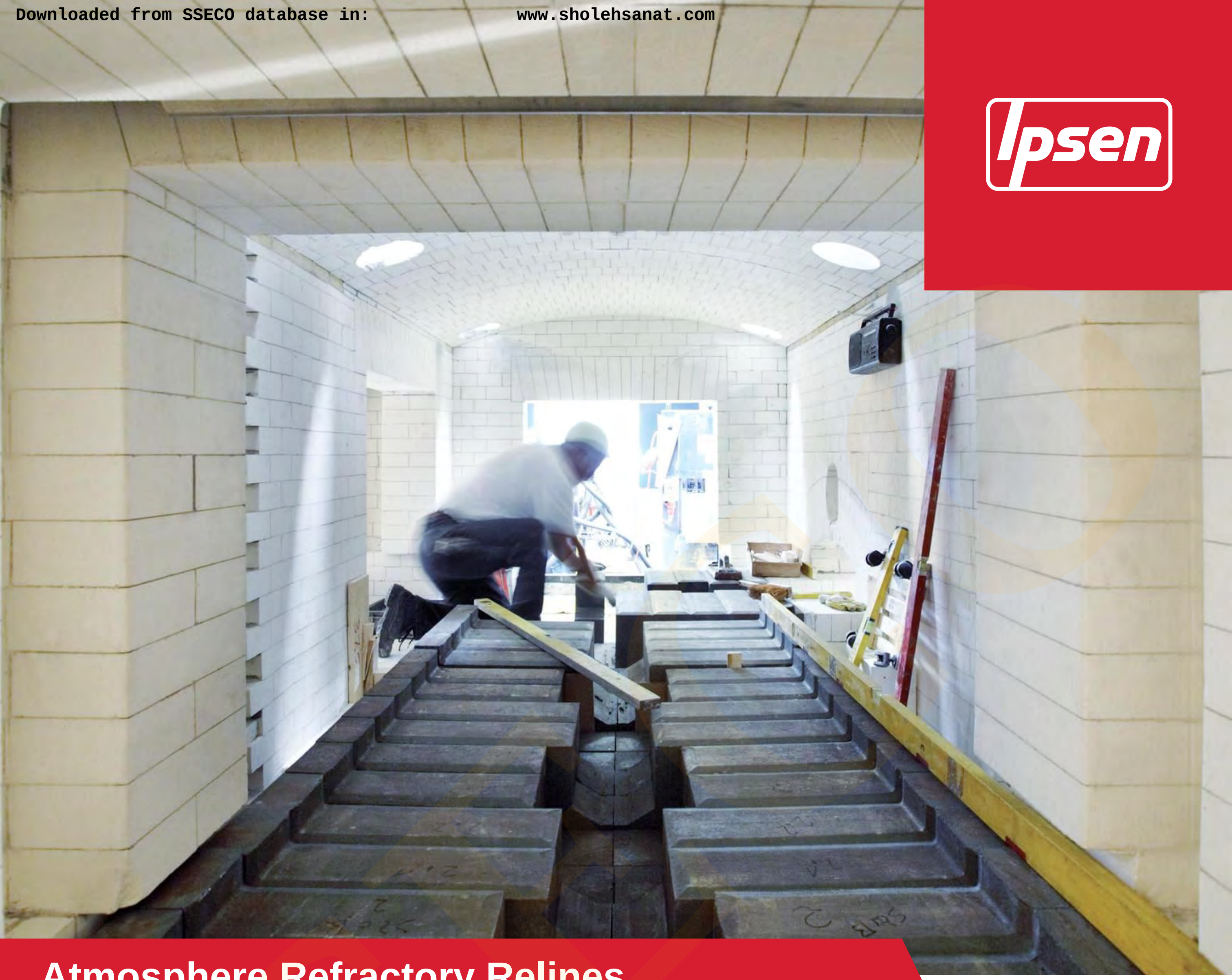
Connected Plant, AR, IIoT 8

INSIDE

FNA 2018 IS TECHNOLOGY EQUIPMENT & TRENDS PAGES 21-24

FNA 2018

www.industrialheating.com • A bnp Publication • Vol. LXXXVI • No. 8



Atmosphere Refractory Relines

Are you having difficulty maintaining temperature uniformity in your atmosphere furnace? Have you noticed the paint peeling on the outer walls of your furnace? Is your refractory cracking, sagging, or falling apart? If so, it may be time for a refractory reline. Let Ipsen's experienced atmosphere team help you evaluate your current refractory conditions and plan your next refractory reline.

With decades of experience, our professional technicians have the knowledge and resources to ensure the use of proper refractory materials to restore your furnace back to its original condition. Once the reline is complete, Ipsen can help you reintroduce your furnace to production.

Contact us for your free refractory evaluation:
go.IpsenUSA.com/Retrofits

IpsenUSA.com

Are you going to FNA? Visit us at booth 301.

CONTENTS

AUGUST 2018

FEATURES

8

10

12

15

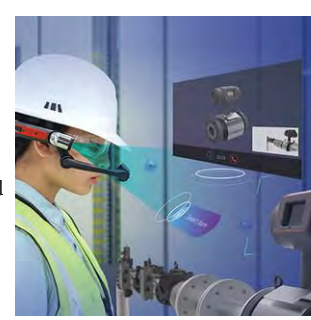
CONTENTS

AUGUST 2018

DEPARTMENTS

SPECIAL SECTION

On the Cover: In line with our instrumentation and controls focus, our cover photo illustrates the ways IIoT and connected devices are helping technicians (*p. 8*).

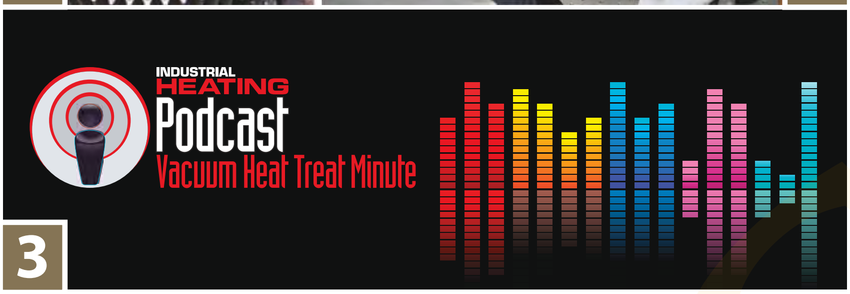


INDUSTRIAL HEATING (ISSN: Print 0019-8374 and Digital 2328-7403) is published 12 times annually, monthly, by BNP Media, Inc., 2401 W. Big Beaver Rd., Suite 700, Troy, MI 48084-3333. Telephone: (248) 362-3700, Fax: (248) 362-0317. No charge for subscriptions to qualified individuals. Annual rate for subscriptions to nonqualified individuals in the U.S.A.: $142.00 USD. Annual rate for subscriptions to nonqualified individuals in Canada: $177.00 USD (includes GST & postage); all other countries: $202.00 (int'l mail) payable in U.S. funds. Printed in the U.S.A. Periodicals Postage Paid at Troy, MI and at additional mailing offices. For SINGLE COPY SALES OR BACK ISSUES ONLY: contact Ann Kalb at (248) 244-6499 or KalbR@bnpmedia.com. POSTMASTER: Send address changes to: **INDUSTRIAL HEATING**, P.O. Box 2146, Skokie, IL 60076. Canada Post: Publications Mail Agreement #40612608. GST account: 131263923. Send returns (Canada) to IMEX Global Solutions, P.O. Box 25542, London, ON, N6C 6B2. Change of address: Send old address label along with new address to **INDUSTRIAL HEATING**, P.O. Box 2146, Skokie, IL 60076. For subscription information or service, please contact Customer Service at: Phone: (800) 952-6643 Fax: (847)763-9538.

MTI & IHEA Associate Member


1


2



3

ONLINE

1 Web Exclusive

Quick ROI with New Carburizing System

Heavy Carbon Company LLC (Pittsford, Mich.) and its founder/inventor, George Barbour, have been granted a patent for a technology and device that allows the user to carburize faster without forming excessive carbides or sooting up the furnace.

www.industrialheating.com/quickROI

2 Video

Engineering Polymer Nanofibers

Sheng Shen, an assistant professor of mechanical engineering at Carnegie Mellon University, describes his work developing low-density, multi-functional materials that have a broad range of applications in aerospace, automotive and biomedical technologies.

www.industrialheating.com/videos

3 Podcast

Vacuum Technology (Part 1): Relationship Between Vacuum Pumpdown, Leak Rate Testing and Rate of Rise

This podcast is a general discussion about how vacuum pressure is measured and how vacuum leak rates and rate of rise testing are monitored in vacuum furnaces.

www.industrialheating.com/vhtmin

INDUSTRIAL HEATING

Manor Oak One, Suite 450, 1910 Cochran Rd., Pittsburgh, PA 15220
412-531-3370; Fax: 412-531-3375; Online: www.industrialheating.com

MANAGING DIRECTOR
John Schrei schreij@bnpmedia.com; 248-786-1637

GROUP PUBLISHER
Darrell Dal Pozzo dalpozzod@bnpmedia.com; 847-405-4044

EDITORIAL/PRODUCTION STAFF
Reed Miller Associate Publisher/Editor – M.S. Met. Eng., reed@industrialheating.com; 412-306-4360
Bill Mayer Managing Editor, bill@industrialheating.com; 412-306-4350
Linda Becker Contributing Editor, beckerl@bnpmedia.com; 262-564-0074
R. Barry Ashby Washington Editor, askbarry@industrialheating.com; 202-255-0197
Dan Herring Contributing Technical Editor, 630-834-3017; heattreatdoctor@industrialheating.com
Dean Peters Contributing Editor, dean@forgemag.com; 216-570-4537
Karen Talan Production Manager, talank@bnpmedia.com; 248-244-6246
Brent Miller Art Director, brent@industrialheating.com; 412-306-4356

AUDIENCE MARKETING
Hillary Leman – AUDIENCE MARKETING COORDINATOR
Alison Illes – SENIOR INTEGRATED MEDIA SPECIALIST
Carolan Bieniek – AUDIENCE AUDIT COORDINATOR
For subscription information or service, please contact Customer Service at:
Phone: 800-952-6643 or Fax: 847-763-9538; Email: industrialheating@omeda.com

LIST RENTAL
Postal & Email Contacts
Kevin Collopy Sr. Account Manager; Phone: 402-836-6265; Toll Free: 800-223-2194, ext. 684; Email: kevin.collopy@infogroup.com
Michael Costantino Senior Account Manager; Phone: 402-836-6266; Email: michael.costantino@infogroup.com

ADVERTISING SALES REPRESENTATIVES
Kathy Pisano Advertising Director and Online Advertising Manager, kathy@industrialheating.com; 412-306-4357, Fax: 412-531-3375
Becky McClelland Classified Advertising Mgr., becky@industrialheating.com; 412-306-4355
Rick Groves Eastern Sales Manager, grovesr@bnpmedia.com; 248-244-6444; Fax: 248-502-2109
Steve Roth European & Midwest Sales Manager, roths@bnpmedia.com; 520-742-0175, Fax: 847-620-2525
Mr. Arlen LUO Newsteel Media, China; nsmchina@126.com; Tel: +86-10-82160060, Fax: +86-10-62150588
Becky McClelland Reprint Quotes; becky@industrialheating.com; 412-306-4355

SINGLE COPY SALES
Ann Kalb kalbr@bnpmedia.com

CORPORATE DIRECTORS
John R. Schrei Publishing
Rita M. Foumia Corporate Strategy
Michelle Hucal Content Deployment
Michael T. Powell Creative
Scott Wolters Events
Lisa L. Paulus Finance
Scott Krywko Information Technology
Marlene J. Witthoft Human Resources
Vincent M. Miconi Production

BNP Media Helps People Succeed in Business with Superior Information

Making Connections

REED MILLER
Associate Publisher/Editor
412-306-4360
reed@industrialheating.com

With Furnaces North America on the horizon, our thoughts turn to making connections or renewing relationships. We encourage you to make your reservations now.

This summer has been one for *Industrial Heating* to both make and renew connections through attendance at two events. The first was a relatively short trip to Meadville, Pa., for an open house at Laser Hard Inc., a start-up company.

It was an easy decision for Doug Peters. When longtime friend Blair Learn called and asked Peters if he wanted to branch out and form a new company, it took the owner of Peters' Heat Treating less than five minutes to make the call.

"It's a perfect marriage," Peters said. "With his experience in laser welding (Learn owns Phoenix Laser Solutions) and my experience in heat treating, it was a no-brainer."

And so began Laser Hard, the Meadville, Pa.-based partnership between commercial heat treater Peters' Heat Treating and laser welder Phoenix Laser Solutions. The company invested in a mobile robot designed for targeted laser hardening and tempering of metal surfaces in March 2018. One month later it began commercial work.

Laser Hard says this is the first production system of its kind in the United States. The robot combines the latest innovations in laser technology and optical pyrometry. It utilizes a six-axis robotic arm that articulates with a two-axis tiltable rotary table. This movement control provides the capability to project the laser beam in free 3-D movements precisely following contours of parts with complex geometries. The laser heat-treating processes include hardening, tempering and annealing. They deliver the same properties as conventional heat treating but with the added benefits of accuracy and adaptability to workpiece geometry.

"The hardest part has been educating the customer on how it is used," Peters said. "You can't compare it to any other technology because it's the first of its kind in the U.S."

Things are just getting started for Laser Hard. The company has yet to take advantage of the robot's mobile capabilities – meaning it can take the machine to the customer – and it is still learning on the fly. According to Learn, the opportunities the technology provides are endless.

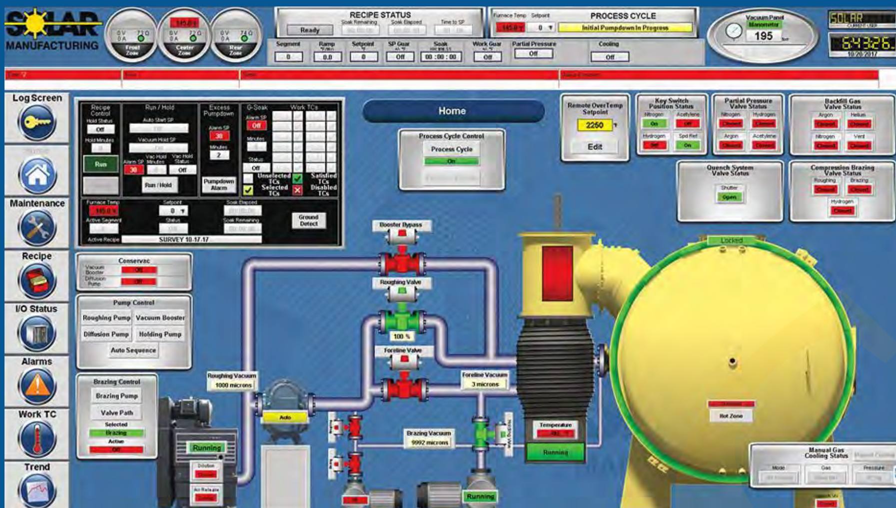
The second event required a longer trip to San Antonio, Texas, for the Honeywell Users Group. Technology was certainly on display at this venue. It's remarkable what current and near-future technology will do to help our businesses. The key concept is "connected plant" or, in a larger way, the Industrial Internet of Things (IIoT).

By connecting everything in your plant, you can gain insights to help you better understand and optimize your processes. Augmented reality (AR) is one of the tools, with intelligent wearables being a result. With so many of our people retiring or soon to retire, you can manage the competency of your employees using these tools. AR can show operators how to do certain tasks on a hands-on basis. Experts on call can be tied in to what operators are viewing to consult from afar. Visual procedures can also record what someone is doing on a given job for future recall.

Having our devices connected and knowing the data will also help us with the problem of losing qualified workers. That knowledge can be digitized, brought to life and given context. With connectivity, we can then instantaneously access that information and know the best path from A to B.

We don't have the space here to dig more deeply, but we encourage you to explore the opportunities afforded by technology. Learn more in a few short months at FNA 2018. Hope to see you there.

SolarVac® Polaris
CONTROLS & AUTOMATION



SolarVac® Polaris control systems are a new generation of controls and automation developed to simplify the operation of our vacuum furnaces and expand their capabilities.

The SolarVac® Controls are a PLC based control system with PC based operator interface, recipe storage, alarm management, and data acquisition functions. It includes an extensive memory capacity and provides the versatility of remote access for monitoring furnace functions (available option). Also, because of extensive memory capacity, there is essentially no limit as to the number of cycle recipes that can be incorporated and stored for future use. As an option, cycle programming can either be done at the furnace or from a remote computer and downloaded to the furnace PC. Essential protective security features are incorporated to ensure against improper or accidental entries or changes by operators.

For additional information on the SolarVac® Polaris controls, contact Sales at sales@solarmfg.com or 267-384-5040.

Vacuum Furnace Control Systems

Programmable Logic Controller
Allen-Bradley CompactLogix PLC

HMI Operator Interface
Industrial PC with an advanced 21.5" color touch panel; utilizing Wonderware InTouch 2014 R2 supervisory-level HMI software

Graphic Video Recorder
Eurotherm Model 6180A Digital Display Recorder

Vacuum Gauge Controller
Televac MM200 or MC300

Over Temperature Controller
Honeywell Model UDC2500

Control Thermocouples
Type S for furnace control and over temperature protection

Work Thermocouples
Type K thermocouples and internally mounted plug and jack assembly

Remote Access
Proprietary mobile app allows supervisory level personnel to remotely monitor

TeamViewer
Allows Solar Manufacturing to provide remote support

SOLAR MANUFACTURING

PROUDLY MADE IN THE USA

www.solarmfg.com

Failing Public Education

BARRY ASHBY
Washington Editor
202-255-0197
askbarry@industrialheating.com

Non-partisan surveys in the U.S. and worldwide show that **American-educated students are and have been failing** compared to U.S. needs and competition.

When my grandson was not admitted to several colleges this spring, I started wondering why, after all the wonderful awards and accolades he had received from the public school he attended. Then I reread "The Conspiracy of Ignorance: The Failure of American Public Schools," which was written almost two decades ago by Martin Gross. I then concluded that it was the public school my grandson attended that was inadequate. Four of my six grandchildren who attended private/parochial schools did just fine with education.

For insights that will certainly trouble you on this topic, watch "Watters World" on Fox News and listen to the young people who are asked simple questions in interviews. For example, "When did World War II end?" "What is discussed in the 2nd Amendment of the Constitution?" "How many members are on the Supreme Court?" The responses are, in every sense, unbelievably pathetic.

All of this is very important to you, your company, the nation and our future. One son of mine says his company has a hard time finding competent employees – people who will show up for work at a given time each day (to install institutional fire-suppression systems) and exhibit a workman's competence (remember stuff like "righty-tighty, lefty-loosey").

Here is some perspective on how U.S. students compare to half a million peers worldwide. The Program for International Student Assessment is a study by the Organization for Economic Cooperation and Development that includes 15-year-old students worldwide in 72 countries. According to the 2015 report, which was published in December 2016, America ranked 24th in reading, 25th in science and 40th in math. The U.S. is mediocre at best and has not changed much since 2000, after three to four decades of continuous decline.

Essentially, all of this "lack of performance" in U.S. education comes while public school systems spend $115,000 annually per student, which is fifth in the world behind Austria, Luxembourg, Norway and Sweden. On standard tests, by the way, Chinese math students scored 55% as "top performers," while Americans showed 9% in that category. The National Assessment of Educational Progress, a project sponsored by the U.S. Department of Education, reports that 40% of 4th graders, 33% of 8th graders and 25% of 12th graders are "proficient" or "advanced" in mathematics. Concurrently, according to Pew Research Center reports, 29% of American parents rank the nation's K-12 STEM education as "above average." This disconnect between reality, parental fantasies and government bureaucracies is clearly evident and enough to make a common-sense person gag.

In a winter 2018 study by the CATO Institute, a teacher and study author cited "characteristics" of modern students in his classrooms. He said public high-school students display a: non-conceptual mentality, lack of independent thought and penchant for cutting corners even when it violates specified rules. He stated that students "do not have a chronological and hierarchical grasp of facts and are often asked to develop esoteric thoughts" without a clue of the subject. He also said that students "do not think independently and are defenseless against subtle but growing forms of propaganda within our schools." He further said that teachers in science courses claim that "federal agencies must work constantly to prevent industrialists from destroying our environment" or that "global warming is real and caused primarily by insufficiently regulated American industries."

Let me remind readers of several things.

- Your business future relies on the availability of competent employees, most of which come from our public education system.
- Non-partisan surveys in the U.S. and worldwide show that American-educated students are and have been failing compared to U.S. needs and competition.
- The unionized public education system in America has a vested interest to control all important "what and how" school issues and has not performed up to national requirements.

My clear message is this: "American industry, do what is required for the country's interest. This is not about politics but about national need." We must require public schools and teachers to perform.

郝 氏
H S C F
HSCF The carbon fiber company
carbon graphite thermal insulation material
carbon fiber, carbon felt , graphite felt
rigid graphite board, Hot Zone, CFC
MOODY
INTERNATIONAL
UKAS

Furnace Atmosphere Control Methods (Part 2)

DANIEL H. HERRING
The HERRING GROUP, Inc.
630-834-3017
dherring@heat-treat-doctor.com

How can one ever forget the smell of burning shoe leather? In the early 1970s, The Doctor, with the soles of his shoes literally melting away, was working atop a pusher carburizer to change one of those newfangled oxygen-probe sensors.

It was summer. It was hot. It was humid. It was Iowa. The job had to be done every few hours or so – such was the life expectancy of an oxygen probe in those days. The salesman working next to me had it tougher, though. He was wearing a three-piece suit!

Throughout his career, The Doctor has been in the right place at the right time in history more times than not. Such was the case here – to be present at the dawn of the introduction and commercialization of the oxygen probe into the heat-treatment industry. As the phrase goes, we've come a long way, baby. Let's learn more.

More about Oxygen Probes

We continue our discussion from the June issue about measuring and controlling furnace atmospheres by looking at devices other than oxygen probes.

Maintenance Tips for Sampling Systems

Certain other types of furnace-atmosphere measurement and control devices (see online content) require pulling a gas sample from the furnace. P

Fig. 1. Portable three-gas analyzer *(courtesy of Super Systems, Inc.)*

common to all heat-treatment operations, but nowhere is it more important than for gas-sampling systems.

By using existing inputs and outputs on controllers and PLCs, operators can set specific timers and counters, which are extremely useful when determining when certain maintenance tasks should be planned or considered. With an established baseline, quick evaluation of real-time versus historical information can identify problem situations. Taken a step further, notification software can be used to automate e-mails and text messages to key personnel.

Here are several items and a few tips to keep sampling systems running trouble-free.

- **Sampling lines**
  - Install, inspect and replace the line and analyzer filters as necessary.
  - Verify sample flow (many analyzers are flow-dependent).
  - Use flowmeters at the furnace sample port or at the analyzer (or both).
  - Provide a way to clean out the sample port (i.e., rod out if carbon buildup occurs).
  - Do not over-pressurize/backpressure the analyzer (many cells are flow- and pressure-dependent). Install metering valves if necessary.
  - Purge the sample lines and analyzer with nitrogen when not in use.
- **Analyzers**
  - Calibrate (i.e., zero or span) the infrared and thermal-conductivity analyzers with nitrogen and a span gas (typically from a cylinder filled with a gas of known composition).
  - Span with outside air or a moisture generator.
  - Span with lithium-chloride or potassium-chloride salt solutions.
  - Some units (Alnor® dew pointers) require factory calibration only.
- **Oxygen probes**
  - Check surface-carbon values against shim stock.
  - Measure temperature near the probe.
  - Measure and correct for CO content of the

Fig. 2. Typical sample-port configuration on a continuous mesh-belt furnace

furnace atmosphere.
- Confirm reference air and burnout air are being supplied unimpeded.
- Confirm proper probe location and insert depth.
- If hot insertion or removal is required, follow manufacturer's recommendations with respect to prescribed speed of movement of the probe. Slower is always better.

Special note: See the online version for a detailed discussion of how infrared analyzers, dew-point analyzers and other measurement devices are used to control processes such as carburizing, nitriding and ferritic nitrocarburizing.

Infrared (NDIR) Analyzers

Infrared analysis uses light in the infrared spectrum to analyze a gas sample and determine the percentage of each constituent in the furnace atmosphere. Single gas (carbon monoxide) or multiple (3-8) gas analyzers are used to detect these percentages.

The amount of carbon dioxide in the furnace is an indirect way of measuring the carbon potential of the atmosphere, and charts/tables can be used to correlate CO_2 readings with dew-point or millivolt signals from oxygen probes. For example, the CO_2 value – similar to water vapor and oxygen – varies based on furnace temperature and carbon potential but will typically lie between 0.25 and 0.50%. Multiplying the CO_2 value by 100 can roughly approximate the dew point (in Fahrenheit).

Today, three-gas infrared analyzers (Fig. 1a) are popular and used to monitor the atmosphere produced by generators (Table 1) and furnaces. The analyzers work on the principle that individual gases absorb infrared radiation of very specific wavelengths. The amount of absorption increases with gas concentration. The unit operates under the principle that a gas sample passes through a cell where a light emits infrared energy of known wavelength.

Table 1. Typical field data for an operating endothermic gas generator[1]

Constituent	1ST Quarter	2nd Quarter	3rd Quarter	4th Quarter
% CO	19.02	19.66	19.32	19.21
% CO_2	0.260	0.252	0.254	0.257
% CH_4	0.07	0.08	0.09	0.09
Generator dew point, ºC (°F)	4°C (+39°F)	4°C (+39°F)	4°C (+40°F)	4°C (+39°F)
Dew point at furnace inlet, ºC (°F)	3°C (+37°F)	3°C (+37°F)	3°C (+37°F)	3°C (+37°F)
Zonal dew point (Z1 - Z4),ºC (°F)[3]	4.5°C to 5.5°C (+40°F to +42°F)	4.5°C to 5.5°C (+40°F to +42°F)	4.5°C to 5.5°C (+40°F to +42°F)	4.5°C to 5.5°C (+40°F to +42°F)

Notes: [1]85 m³/hour (3,000 cfh) output; [2]Natural gas feedstock; [3]Neutral hardening

The sensor converts measured infrared energy into an electrical signal. These values are usually compared to the values obtained with a reference gas. Infrared analyzers are known for their fast response and are easily calibrated.

Summing Up

While manual control methods are highly effective when properly employed and continue to be used throughout the heat-treatment industry, the future lies in the precision and customizability of automated atmosphere-control methods. By utilizing specialized process controllers and software, these systems help enhance productivity through real-time monitoring and control, leading to reduced scrap and freeing up operators for other tasks.

Automated systems also form the basis for electronic data acquisition that improves process traceability and makes it much easier to analyze data in making decisions for improving processes. Preventive-maintenance programs often grow from automated methods, reducing unplanned downtime. Instrumentation upgrades associated with automation bring many additional benefits, including:
- Increased focus on operation-specific features, such as carburizing, vacuum heat treating and nitriding.
- Recipe control and management, leading to fewer entry points and operator requirements.
- Potential for greater operating ranges due to the ability to manage multiple parameters at the same time.

What will the future hold with respect to atmosphere control? Artificial intelligence and real-time load-monitoring devices seem to be only a step away. As technology improves, processes improve. While the initial cost of control upgrades may be seen as significant, quality demands and assurance of absolute process repeatability make them a necessity.

The balance of this article, including all remaining figures, can be found on our website at www.industrialheating.com/ATM2.

Advanced Energy

Perfecting Power

MTI
Metal Treating Institute
904-249-0448
www.HeatTreat.net

Advanced Energy (AE) has devoted more than three decades to perfecting power – enabling design breakthroughs and driving growth for its customers. The company's precision power and control technologies, combined with its application know-how, inspire close partnerships and innovation.

Founded in 1981, AE has built a diversified and global business delivering those advanced power and control technologies to customers across a broad range of industries (including aerospace and automotive). The AE team, deployed throughout North America, Europe and Asia, is dedicated to providing technical expertise and responsive and agile power solutions for industrial manufacturing.

AE products provide leading, field-proven power control and arc-management capabilities that enable complex semiconductor processes and other high-technology applications. Its high-voltage power systems serve high-tech and industrial applications from medical equipment and scientific analysis to intense pulsed light and mass spectrometry.

The Fort Collins, Colo.-based company's thermal products offer precision temperature measurement and control, while its power control modules provide exceptional quality for heating, melting, bending, forming or drying in a wide variety of industrial applications.

There are two products in particular that are vital to AE's success.

- Optical pyrometers: The Onyx noncontact optical pyrometer series meets the most demanding accuracy and repeatability requirements over a broad temperature range. The versatile series is ideally suited for a wide variety of industrial materials – such as steel, nonferrous metals, graphite, silicon carbon (SiC), carbon fiber and ceramics – during critical thermal processing.
- SCR power controllers: Thyro family SCR power controllers regulate temperature with exacting precision, controlling the flow of electricity from the grid to a heater. This product family's precision and reliability is proven for any industrial manufacturing process requiring exacting material melting, heating or forming.

AE also offers comprehensive repair, enhancement and used equipment programs for the complete life cycle of the products it supplies.

This MTI Associate Member made a significant transaction in July 2017 when it acquired Excelsys Technologies, a leading power-supply manufacturer and designer of high-efficiency, low-profile power supplies for specialist markets including industrial, medical, communications and military. The Cork, Ireland-based company's products include AC/DC modular power supplies, single output power supplies and custom power supplies.

Excelsys is also creating a new standard in customer service through the application of principles of excellence in channel partnership, product quality, manufacturing efficiency and the innovative use of new technology.

Visit www.advanced-energy.com for more information on Advanced Energy.

Honeywell Thermal Solutions

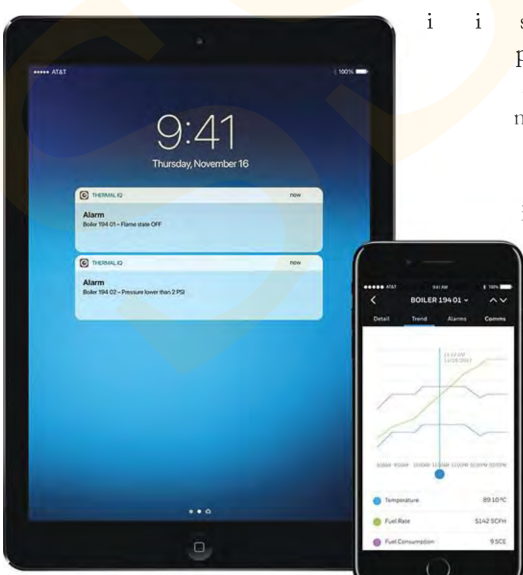
IHEA
Industrial Heating Equipment Assoc.
859-356-1575
www.ihea.org

Honeywell has an extensive history in combustion processes and controls, including solutions for industrial combustion industries.

Ten years ago, Honeywell expanded its presence in industrial combustion with the acquisition of Maxon and Iris Systems. Then, two years ago, the company acquired Elster. With these acquisitions, Honeywell Thermal Solutions united the combustion industry's leading brands to provide the most extensive range of thermal solutions globally: Honeywell Combustion Controls, Honeywell Combustion Safety, Honeywell Combustion Service, Eclipse, Exothermics, Hauck, Kromschröder and Maxon.

With more than 100 years of industry-leading experience, Honeywell Thermal Solutions today provides a combination of expertise and solutions for:

- Burners – low temperature and high temperature for industrial processes
- Burner management systems (BMS) – single and multi-burner controllers; UV, infrared, visible and combination flame detectors; fuel air ratio and O_2 trim systems; and application-specific programmable BMS controllers
- Fuel delivery systems – pressure regulation, shut-off valves, control valves and fuel i i stems for heavy industrial plications
- red-to-order solutions – ng the most compliant systems to code and s with the greatest depth ical know-how
- Connected solutions – Honeywell Thermal IQ is a remote monitoring solution developed by thermal-process experts that securely connects your combustion equipment to the cloud, making critical thermal-process data available anytime, anywhere, on any smart device.



Very few alternative providers can meet the breadth, depth and expertise offered by Honeywell Thermal Solutions. Whether it is high-temperature and low-temperature industrial burners or burner management systems for industrial process applications, the Houston, Texas-based company has a portfolio that covers every need. This portfolio of thermal transfer solutions covers everything from commercial to heavy industrial sectors and includes:

- End-to-end customer experience (from opportunity, to delivery, to start-up, to operation, to post-shipment)
- Turnkey solutions for new and existing applications
- Executing projects from start to finish, with multiple solutions from simple to complex

In a highly competitive global marketplace, industrial organizations increasingly seek digital intelligence to manage and operate hundreds or thousands of assets from a single site or across an enterprise and address critical operating demands. They need effective tools to transform process data into real-time information regarding process performance, equipment health, energy consumption and emissions monitoring. The Honeywell Connected Plant strategy maximizes the connectivity of real-time and cyber-secure operating data in thermal processes and automates predictive analytics to provide outcome-based, predictive maintenance to bring significant benefits to the operation. These benefits include increased visibility and accountability, minimized unplanned downtime and maximum uptime, increased efficiency and enhanced safety.

Honeywell Thermal Solutions will continue to address key industry trends as a global industrial thermal solutions provider with leading technology, software and cloud-based, connected strategies.

Visit www.thermalsolutions.honeywell.com for more information on Honeywell Thermal Solutions.

EQUIPMENT NEWS

Process Controls and Software

Super Systems Inc. completed a controls and software upgrade for JTEKT Corporation's Koyo Bearings brand in Dahlonega, Ga. The scope of the investment includes all engineering, installation, controls and software for the company's gas-fired hardening furnace line. The new automation included a turnkey retrofit of new control cabinets as well as software necessary for furnace control and historical process data review. The controls and software provide JTEKT with the confidence to heat treat parts to meet the highest standards with complete traceability for its Koyo Bearings brand. The instrumentation and software for the update included the hardening furnaces, quench, washer/rinse and temper equipment. www.supersystems.com

Car-Bottom Air Furnace

Solar Atmospheres of Western PA invested in a new car-bottom air furnace. The

20-foot-long furnace, which will be delivered in July 2018, will be surveyed in accordance with AMS 2750 and is uniform within ±10˚F (Class 2). It has a working zone that is 60 inches square x 240 inches long and will handle a workload up to 30,000 pounds. With a maximum operating temperature of 1400˚F, the furnace will accommodate not only the tempering of large tool-steel components but also age hardening of 15-5 PH, 17-4 PH and nickel-based alloys. www.solaratm.com

Heat-Treat System for U.S. Expansion

Can-Eng Furnaces International Ltd. was awarded a contract from an India-based conglomerate to design, manufacture, install and commission an aluminum automotive casting heat-treatment system for its new greenfield North American expansion in South Carolina. This solution-treatment, water-quench and artificial-aging system are arranged to provide T5, T6 and homogenizing processes. The system will service three distinct aluminum product groups with unique treatment cycles. www.can-eng.com

Vacuum Furnace

Zenith Cutter, a manufacturing company based in Loves Park, Ill., purchased an **Ipsen** TITAN H6 vacuum furnace with 2-bar gas quenching that will be used at its Metkraft facility in Ho Chi Minh City, Vietnam. The furnace has a graphite work zone measuring 36 x 48 x 36 inches with a 3,000-pound load capacity. It is capable of operating at temperatures of 1000-2400°F (538-1315°C) with ±10°F (±6°C) temperature uniformity. The furnace is also equipped with a closed-loop water system and Ipsen's PdMetrics predictive-maintenance software. www.ipsenusa.com

Box Furnace

L&L Special Furnace Co. Inc. commissioned a large resistance box furnace and quench tank in New Zealand for an aerospace manufacturer of landing gear and associated components. The furnace has an effective work zone of 22 inches high x 34 inches wide x 68 inches deep. The quench tank provided with the furnace is capable of quenching parts up to 24 x 36 inches in oil. The furnace includes a Eurotherm Nanodac temperature controller/paperless recorder, as well as a separate over-temperature-protection controller and paperless chart recorder with dedicated TUS software. www.llfurnace.com

Process Controls

Orchid Memphis, a medical implants manufacturer, modernized three vacuum furnaces in Memphis, Tenn., with process-control upgrades from **United Process Controls** (UPC). The company chose to retrofit two furnaces with replacement controls and a total control-system replacement for the third furnace. All systems feature Protherm 700 controllers, and soft-start panels were introduced to help lower energy costs during quenching. www.group-upc.com

BUSINESS NEWS

Powdered-Metal-Component Manufacturer Expanding

Atlas Pressed Metals started construction on a 45,000-square-foot addition to its powdered-metal-component manufacturing plant in DuBois, Pa. The expansion, which is scheduled to be completed in October, will bring the facility to 100,000 square feet and allow for installation of larger-tonnage presses. Atlas' on-site powdered-metal capabilities include sinter-hardening, machining, inspection and materials testing.

Solar Manufacturing Breaks Ground on New Facility

Solar Manufacturing Inc. held a groundbreaking ceremony for a new $8 million manufacturing facility at the Sellersville Business Campus in Sellersville, Pa. Due to substantial growth in recent years, the furnace manufacturer expanded into two separate manufacturing facilities located a few miles apart. The new property will allow Solar to combine its nearly 50 employees under one roof for more efficient production and triple its current space. Construction is expected to be complete in early 2019. The nearly 60,000-square-foot building will contain 40,000 square feet of crane-served manufacturing space and a two-story office space.

Atmosphere Annealing Adds Ferritic Nitrocarburizing

Atmosphere Annealing, a division of Premier Thermal Solutions, recently added ferritic nitrocarburizing (FNC) to its process offerings in Lansing, Mich. FNC is typically used on plain-carbon steel components and is known for providing a high level of wear resistance, low distortion, improved fatigue properties and greater corrosion resistance. Depending on requirements, FNC is often used as an alternative to carburizing and carbonitriding.

Gerdau Launches $70.3 Million Investment

Gerdau Special Steel North America is launching a $70.3 million project at its Monroe, Mich., special steel mill. This round of investment will include a new electric-arc furnace (EAF) transformer, controls and mechanical upgrades in the EAF, and a new twin ladle furnace and material-handling system. The project is expected to be complete in December 2020.

Big River Steel Investing $1.2 Billion in Arkansas Expansion

Big River Steel will invest $1.2 billion to expand its LEED-certified, Osceola, Ark.-based scrap recycling and steel production facility. The expansion will double Big River Steel's hot-rolled steel production capacity to 3.3 million tons annually. In addition, the expansion will facilitate the company's ability to produce even higher grades of electrical steel. Engineering efforts are already underway with SMS group. Major construction activity will begin later this year and continue for approximately 24 months.

INDUSTRY EVENTS

Sept. 11-12

Forging Industry Technical Conference; Long Beach, Calif.
www.forging.org

Sept. 25-28

Heat Treat Mexico 2018 – Advanced Thermal Processing Technology Conference and Expo; Queretaro, Mexico
www.asminternational.org

Oct. 8-10
Furnaces North America 2018
Indianapolis, Ind.
www.furnacesnorthamerica.com

FNA 2018

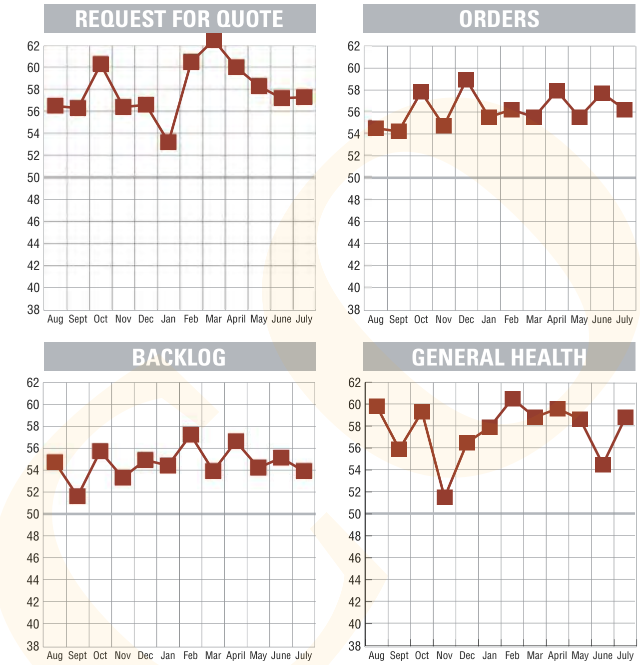
Oct. 14-18
Euro PM 2018 Congress & Exhibition; Bilbao, Spain
www.europm2018.com

Oct. 15-17
2018 Die Casting Congress & Exposition; Indianapolis, Ind.
www.diecasting.org

Oct. 28-Nov. 1
ISTFA 2018 – International Symposium for Testing and Failure Analysis; Phoenix, Ariz. www.asminternational.org

Nov. 13-15
EUROFORGE – 1st European Fair and Congress for the Forging Industry; Berlin, Germany www.euroforge-confair.com

Equipment & Business News



Values above 50 indicate growth or increase. Values below 50 indicate contraction or decrease.
To participate in this survey, please contact Bill Mayer at bill@industrialheating.com


FNA 2018
ONLY ONE WORD DESCRIBES FNA 2018...
...GO!
FNA 2018
The FUTURE Will Meet You There
The Big Event:
October 8-10 in Indianapolis, IN
REGISTER TODAY!
FNA 2018
TECHNOLOGY, EQUIPMENT & TRENDS
✓ Emerging Technologies
✓ Trends in Heat Treating Systems & Equipment
✓ 35 Technical Sessions
✓ 2 Networking Events
✓ Over 170 Top Suppliers to the Heat Treating Industry
✓ Network with Attendees from 40 States and 10 Countries
✓ Maximizing Productivity & Safety
www.FurnacesNorthAmerica.com
October 8-10 • Indiana Convention Center
Indianapolis, Indiana
FNA 2018

FNA 2018 EXHIBITOR LIST

Company/Organization (*MTI Member)

Across USA Inc.
Advanced Energy Industries*
Advanced Nitriding Solutions*
Aerospace Testing & Pyrometry, Inc.*
AFC-Holcroft LLC*
Ajax TOCCO Magnethermic Corporation
ALD Thermal Treatment, Inc.*
ALD Vacuum Systems, Inc.*
Allied Mineral Products, Inc.
Alloy Engineering Co.
AMETEK Land Instruments
ANDRITZ METALS Inc.
APPI*
Applied Ceramics, Inc.
Applied Test Systems
Ariane Group
ASM International
Avion Manufacturing Co.*
AVS Inc.
Bloom Engineering Co. Inc.
Bronkhorst USA
BTU International, Inc.
Busch Vacuum Pumps and Systems
C3 Data
Can-Eng Furnaces International Ltd*
Carbon Composites Inc.
CC Jensen, Inc.
Chemtool Incorporated*
Cleveland Electric Laboratories
CMI Industry Americas
Conax Technologies
Conrad-Kacsik Instrument Systems, Inc.*
Control Concepts Inc.
Cooley Wire Products
Cornerstone Systems, Inc.*
Custom Electric Manufacturing*
DeKalb Blower Inc.*
Diablo Furnaces, LLC
DixiTech CNC*
Dry Coolers, Inc.*
Du-Co Ceramics Co.
DuBois Chemicals / Heatbath*
Duraloy Technologies, Inc.
ECM USA, Inc.*
Edwards Vacuum Ltd
Epcon Industrial Systems, LP
Eurotherm by Schneider Electric*
Fives North American/NACS
Fluke Process Instruments
Furnacare, Inc.*
G-M Enterprises*
Gasbarre Furnace Group*
Gear Solutions & Thermal Processing
Gefran, Inc.
GeoCorp, Inc.
Graphite Machining, Inc.
H. C. Starck, Inc.*
Halifax Fan USA
Heat Treat Central
Heat Treat Equipment*
Heat Treat Today*
Heat Treating Services Unlimited, Inc.*
HeatTek
Honeywell Thermal Solutions*
Houghton International
I Squared R Element Co., Inc.
Idemitsu Lubricants America Corp.*
Induction Tooling, Inc.*
Industrial Heating Equipment Assoc.
Industrial Heating Magazine*
INEX Incorporated*
ION-HEAT
Ipsen USA*
ITC - International Technical Ceramics, LLC
Jackson Transformer Company*
Jensen Oven div. of JB Autotech LLC
Jumo Process Control Inc.
Kanthal, Part of Sandvik Group
Karl Dungs, Inc.
King Tester Corporation*
L&L Special Furnace Co., Inc.
Lectrodryer
Leybold USA Inc.
Lindberg/MPH*
Material Interface, Inc.
McDanel Advanced Ceramic Technologies
McLaughlin Services LLC*
MERSEN USA Greenville-MI Corp.
Metal Treating Institute*
Metallurgical High Vacuum Corp.*
Molybdenum & Tungsten International
- Moltun International
MTI Corporation
Mycon Corporation
Nabertherm
Nanmac Corp.*
Nel Hydrogen
Nitrex Metal, Inc.
Noble Industrial Furnace Co. Inc.
North American Cronite, Inc.*
Nutec Bickley
Olstrad Engineering - NOXMAT
Onex, Inc.
Park Thermal International (1996) Corp.*
Pfeiffer Vacuum Inc.
PhoenixTM LLC
Pietro Fiorentini
PLANSEE USA LLC
Praxair Inc.
Pro-Tech Company, Inc.*
Procedyne Corp.
Protection Controls, Inc.
PVT Inc.
Pyradia*
Qual-Fab, Inc.
Radyne Corporation*
Rock Valley Oil & Chemical Co.
Rohde GmbH
Rolled Alloys
RoMan Manufacturing*
Rubig US, Inc.
Russells Technical Products
San Yung Electric Heat Machine Co.
SBS Corporation*
SCC, Inc.
Schmidt + Clemens GmbH + Co. KG
Schunk Carbon Technology, LLC*
schwartz GmbH
SECO/VACUUM Technologies
SECO/WARWICK Corporation*
Selas Heat Technology
Sentry Insurance*
SGL Group - The Carbon Company
Siemens Industry, Inc.
Signature Vacuum Systems, Inc.
Sinterite*
Skyre, Inc.
Solar Manufacturing*
South Tek Systems
Stand Energy Corporation*
Struers Inc.
Super Systems, Inc.*
Surface Combustion, Inc.*
Taylor-Winfield Technologies, Inc.
TE Wire & Cable
Televac/Fredericks Company
Tenova Core
The David Round Company
The Mercer Group
Thermal Care, Inc.
Thermcraft, Inc.
Thermo Transfer, Inc.
Toyo Tanso USA
Trillium US, Inc.
Ultra Electronics - Furnace Parts*
United Process Controls*
United Process Controls, Inc.- Canada
Upton Industries Inc.
VAC AERO International, Inc.
Vacuum Pump Services Corp.*
Vacuum Research Corporation
W.H.Kay Co.
Williams Industrial Service, Inc.*
Wirco, Inc.*
Wisconsin Oven Corporation*
WS Thermal Process Technology Inc.*
Yangzhou Jinrun Mesh Belt
Manufacturing Co., Ltd
York Wire and Cable, Inc.
ZIRCAR Refractory Composites, Inc.
Updates @ FurnacesNorthAmerica.com

Visit www.FurnacesNorthAmerica.com for the most up-to-date listing of exhibitors

FNA 2018

TOP BENEFITS OF ATTENDING FNA 2018

LEARN the proper data to collect for **predictive production and maintenance.**

HEAR solutions to your **everyday equipment maintenance** problems.

STUDY the latest **quenching and cooling** on instrumentation & automation.

SEE the latest in **furnace equipment and processes**.

ACQUIRE new solutions in operations and heat treating systems to minimize labor and **increase output.**

MEET 170+ suppliers that can **solve your operation and production needs.**

DISCOVER the latest compliance issues with **AMS 2750 and Pyrometry.**

NETWORK with the **best minds in heat treating** from all over the world.

FNA 2018 EDUCATIONAL TRACKS:

- ✓ Standards/Pyrometry
- ✓ Controls/Materials
- ✓ Quenching/Cooling
- ✓ Equipment
- ✓ Processes
- ✓ Heat Treat Business
- ✓ FNC/Nitriding
- ✓ Productivity & Data
- ✓ Emerging Technologies
- ✓ Maintenance

BRING A CAR LOAD

of Key Team Members:

- ✓ CEO/President/GM
- ✓ Key Managers in:
  - Quality
  - Safety
  - Engineering
  - Production
  - Maintenance

To see the latest in Equipment, Technology & Trends

FNA 2018

FNA 2018 REGISTRATION

INDIANAPOLIS, IN • OCT. 8-10, 2018

Produced by: Metal Treating Institute

Media Partner: INDUSTRIAL HEATING

(Please Choose One)

- ❍ **FNA Expo Only (FREE)**
- ❍ **FNA Expo + Opening Night Reception ($50)**
- ❍ **FNA Full Conference Pass ($259)**
  (Early Bird $229 Registration Fee - $259 after Sept. 1 • 35 Technical Sessions, FNA Expo, Opening Night and Trade Show Floor Receptions)
- ❍ **ADD Oct. 10 MTI Member Awards Dinner ($160)** Members Only

Monday, Oct. 8 6:00-8:00 pm: FNA 2018 Kickoff Welcome Reception with Heavy Hors d'oeuvres (MAR)

Tuesday, Oct. 9 8:00-11:15 am Tech Sessions; 11:15 am-5:30 pm FNA Business Expo (ICC); 4:00-5:30 pm Trade Show Floor Reception w/Heavy Hors d'oeuvres (ICC)

Wednesday, Oct. 10 8:00-10:45 am Tech Sessions (ICC); 10:45 am-2:30 pm Business Expo (ICC); 6:30-11:00 pm: Dinner/YES Graduation (MAR) *(MTI Members Only)*

Marriott Hotel Downtown 350 West Maryland St., Indianapolis, IN • To reserve a room, call 877-640-7666 • Group Rates: $185. Group Code: Furnaces North America

REGISTRATION FORM

AVOID LONG LINES, PRE-REGISTER TODAY

FIRST NAME ____________________ LAST NAME ____________________

POSITION ____________________

COMPANY ____________________

ADDRESS ____________________

CITY ____________________ STATE ____________ COUNTRY/ZIP CODE ____________

PHONE ____________________ FAX ____________ E-MAIL ____________

A. PRIMARY FUNCTION

- ❍ CEO/President/General Manager
- ❍ Guest
- ❍ Maintenance
- ❍ Manager/Supervisor
- ❍ Marketing/Sales
- ❍ Metallurgist/Supervisor
- ❍ Purchasing
- ❍ Quality Control/Assurance
- ❍ Technician/Operator

B. PURCHASING AUTHORITY

- ❍ Approve
- ❍ Recommend
- ❍ Specify

C. TYPE OF ORGANIZATION

- ❍ Consulting
- ❍ Education
- ❍ Government
- ❍ Heat Treating Captive
- ❍ Heat Treating Commercial
- ❍ Supplier To Industry
- ❍ Testing Facility/R&D

D. TOTAL EMPLOYEES AT THIS LOCATION

- ❍ 1-19
- ❍ 50-99
- ❍ 250-499
- ❍ 1000+
- ❍ 20-49
- ❍ 100-249
- ❍ 500-999

E. HEAT TREATING ACTIVITY (CHECK ALL THAT APPLY)

- ❍ Alloys
- ❍ Aluminum Non-Ferrous
- ❍ Annealing
- ❍ Austempering
- ❍ Brazing
- ❍ Carbon Nitriding
- ❍ Carburizing
- ❍ Composites
- ❍ Cryogenic Treating
- ❍ Hardening (Q&T)
- ❍ High Speed Steel
- ❍ Laser Heat Treating
- ❍ Low Temp Carbonitriding
- ❍ Marquenching
- ❍ Nitriding
- ❍ Sintering
- ❍ Straightening
- ❍ Tool Steel

F. PRIMARY INDUSTRY SERVED (CHECK ONE)

- ❍ Aerospace
- ❍ Agricultural
- ❍ Automotive
- ❍ Basic Steel (Mill)
- ❍ Forgings
- ❍ Foundries
- ❍ Home Appliances
- ❍ Material Handling Equipment
- ❍ Military
- ❍ Mining Equipment
- ❍ Petroleum/Utilities
- ❍ Production Machinery
- ❍ Railroad
- ❍ Stampings
- ❍ Steel Warehousing

3 EASY WAYS TO REGISTER

1. **FAX THIS FORM: 1-904-249-0459**
2. **ONLINE: www.furnacesnorthamerica.com**
3. **MAIL: FNA 2018**
   Metal Treating Institute
   8825 Perimeter Park Blvd. #501
   Jacksonville, FL 32216

METHOD OF PAYMENT

❍ AMEX ❍ VISA ❍ MASTERCARD ❍ DISCOVER ❍ CHECK

CARD # ____________________ EXPIRATION ________ SECURITY ________

NAME ON CARD ____________________

BILLING CITY ____________________ BILLING STATE ____________

SIGNATURE ____________________

FNA 2018

High-Volume Induction Heat Treatment

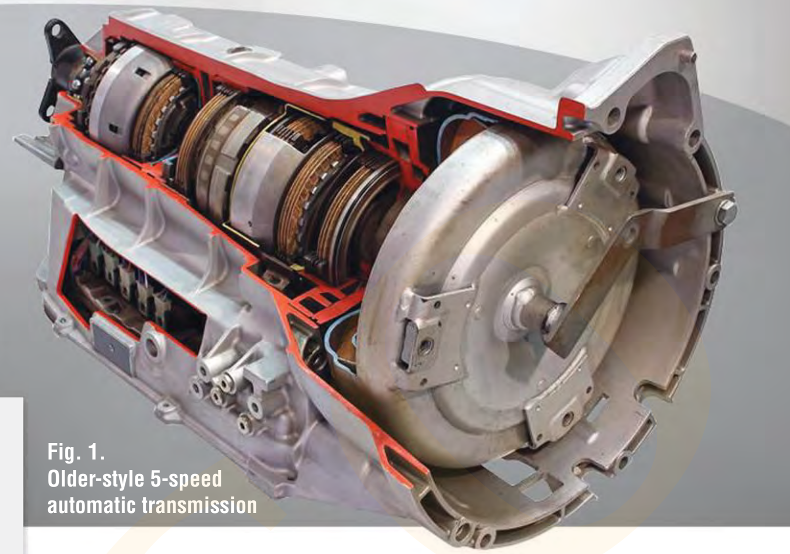


Fig. 1.
Older-style 5-speed automatic transmission

Ryan Neiss – Taylor-Winfield Technologies Inc.; Youngstown, Ohio

The automotive industry is constantly developing more-complex powertrain components.

Not long ago, a 5-speed automatic transmission was considered a major technological achievement. Today 8-, 10- and even 11-speed transmissions are being designed to increase fuel economy and performance. Additionally, the Corporate Average Fuel Economy (CAFE) standards are requiring automobile manufacturers to improve the fuel economy of cars and light trucks manufactured in the U.S. as far out as 2025. This is a challenge in itself without mentioning all the passenger-friendly amenities that are offered in today's automobiles.

The solution to improving fuel economy and performance is to use lighter materials that provide optimal strength-to-weight ratios. By adding more components while striving to reduce the vehicle weight means that not only are there more parts that have to be heat treated, but the size of the parts being heat treated are reduced. This trend has been coined "dematerialization" and is perfect for induction heating.

The precise positioning and control of induction heating processes provide the speed and control required for consistent, high-output heat treatment. Today, automobile parts manufacturers are using a variety of different alloys to create a single component. Components that were once simply cast out of one material are now manufactured with multiple alloys to deliver optimum performance with less size to weight. As the projected volume of powertrain components increases and the heat-treat requirements become more stringent, powertrain suppliers will be required to increase production rates and reduce the cost per part.

What does this mean for induction heating OEMs?

As automotive powertrain designs increase in complexity, the original equipment manufacturers (OEM) who design and provide heat-treatment processes must also evolve. More frequently than not, parts with varying alloys require selective heat treatment to provide the correct material properties for the designed task. To manage this change, the OEM must redesign existing equipment and engineer heat-treatment systems and scanners that include multiple-part treatment capabilities into a single- or multi-stage process. This is what I call a high-volume induction heating system (HVIHS). More information is in the sidebar.

Decisions for the Part OEM

The main question that the drivetrain manufacturers have to answer is: "Should we outsource this work or keep it in-house?" Let's take a look at some of the common factors that aid in making this decision.

- Examine existing heat-treating equipment
- Examine the part materials
- Examine the shape of the part

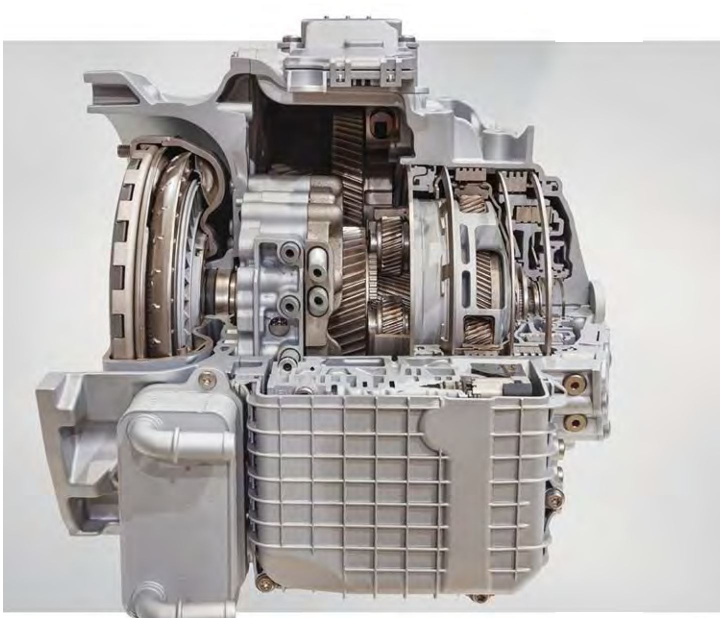


Fig. 2. Newer 9-speed automatic transmission

- Examine the part heat-treat specifications
- Estimated annual units (EAU) that require heat treatment
- Quality requirements
- Manufacturing space required for additional equipment

Examine, Examine, Examine ...

Many, if not all, powertrain part suppliers are doing some heat treating in-house and have a mix of furnaces and induction equipment used for heat treating components. It is important to examine existing equipment to determine the machine utilization rate for each piece of equipment. This will help to determine if additional capacity is available with the existing equipment or if new investment is required. This analysis will help determine the next steps to take.

- Additional capacity available? Consider upgrading an existing system to enable additional parts to be processed.
- No additional capacity? Consider investing in a new system.
- No additional capacity? Consider outsourcing the additional heat-treatment requirement.

If the powertrain part supplier finds they have additional capacity, the next step is to determine what equipment has the specified capacity and if the equipment can provide the correct heat treatment for the additional volume. Can it absorb 25%, 50%, 75% or 100% of the expected additional volume? Would additional shifts be necessary to cover this? Are there tooling changes or coil changes for this part?

If no additional capacity is available with the existing equipment, here are a few of the most common considerations.

- Outsource the heat treating. This is most commonly done with an existing heat-treating company that has experience in the automotive sector.
- Allocate capital for new heat-treating equipment, ancillary equipment, installation and possible building expansions.
- Determine available floor space for new equipment.
- Determine if this equipment will replace some old or unutilized equipment.

Fig. 3. Dematerialization over decades has resulted in the lighter, therefore more fuel-efficient, foreground part

The Induction OEMs Can Help

During this "determination" phase, an induction heating OEM supplier can help by offering standard or customized solutions based on the desired outcome. An experienced OEM will provide an unbiased assessment of the need and a solution that best fits the requirement. Any one-size-fits-all assessment where a standard product is offered when a custom-engineered solution is required should be met with skepticism.

Items to Keep in Mind when Selecting a High-Volume Induction Heating System

If your company is considering a high-volume induction heating system that is outlined in the sidebar, here are some key items you will want to consider.

- EAU of part/part families
- Part similarity

Fig. 4. High-volume induction heating system

Fig. 5. High-volume induction heating system

Fig. 6. Modular coil bank enables coil-to-part consistency

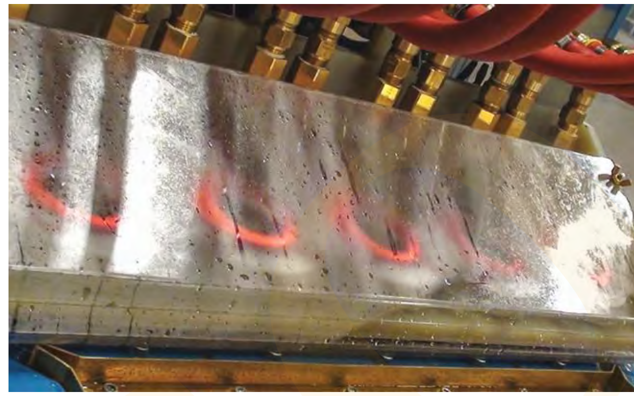


Fig. 7. Parts going through a hardening cycle

- The smallest and largest area required to heat
- The material that is required to heat
- Simple part changeover if system does multiple families of parts
- Flexibility in system design
- Pre- and post-heat-treating processes
- Automating parts-handling input and output from the system IH

A New Approach to Scanner Design for High-Volume Induction Heat Treating

In most manufacturing facilities, space comes at a premium. Updating or replacing existing heat-treatment equipment from a single spindle to a dual spindle is a viable approach to increase part production rates by hundreds per hour, but what if the requirement is to increase the rate by thousands of parts per hour?

High-volume production-rate heat-treatment demand requires a different approach to the design and layout of system. The system shown herein has a product cycle time of 2,500 parts/hour and allows a que time of 60 minutes. This turnkey system automatically loads a temper furnace after the hardening process.

Included is a PC with PLC machine programming, which allows for data storage and management for input to an upper-level quality and production-control information system. The PC allows Industrial Internet of Things (IIoT) capabilities for capturing and processing data into useable metrics for monitoring machine utilization, quality control, scheduling PM tasks and ordering items for preventive maintenance.

It is important when discussing the requirements for a high-volume system to know the material composition of the part. This allows the induction OEM to provide you with the proper system design for the parts output required. This also helps to control the level of investment required for the system.

For more information: Contact Ryan Neiss, product manager, Induction Heating Product Group; Taylor-Winfield Technologies Inc., 3200 Innovation Place, Youngstown, OH 44509; tel: 330-259-8547; fax: 330-259-8538; e-mail: rneiss@taylor-winfield.com; web: www.taylor-winfield.com.

INDUSTRIAL HEATING
Use this QR-Code to read our Best-of induction heat treating article on the *Industrial Heating* website.

Smarter Furnaces: Leveraging the Promise of Instrument IoT

Peter Sherwin – Eurotherm by Schneider Electric; Ashburn, Va.

The world is going crazy for connected devices (IoT) – nearly 25 million smart speakers were sold last year, with about 11 million moved in the holiday season alone.[1]

Fig. 1 Tablet app for test management and calibration

Why this hunger to add an Ethernet port/WiFi or 3G/4G functionality to any device? Well, a so-called dumb instrument can be now transformed into something much smarter. Who would have thought a few years ago that we would be asking our speakers about the weather forecast and letting them control our music choices from our past music selection. Integration is also now possible into our lighting systems, our home entertainment (including TV choices) and much more.

Not to be left behind, the automation industry has jumped on this bandwagon. IoT has morphed into the Industrial IoT with cybersecurity a core component (see sidebar 1). A plant-wide integrated view is termed Industrie 4.0, led initially by the German government but now adopted by most European automation suppliers.

Diving into the details, you may ask how Industrial IoT (IIoT) differs from IoT. For starters, industrial devices already have some smarts (PLCs, automation controllers). They are built to survive many years in harsh environments and are usually already connectable either directly or through connection to a LAN (local area network). There is typically a window into the devices' real-time operation through an HMI (human-machine interface), and those display units can have some form of the remote view that could be picked up by smartphones or tablets.

So why the fuss around IIoT? Quite simply, instead of a dumb device getting smarter (as with IoT) you now have the potential to make a smart device truly brilliant.

Fig. 2. SMS or e-mail signup

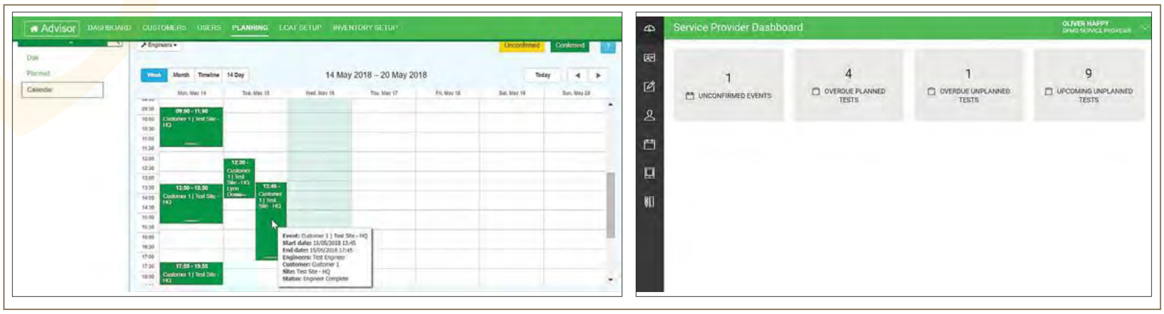


Fig. 3. Planning screen

Imagine your automation controller making decisions on optimizing a process in real-time. Some controllers can do this, but before IoT was a concept these changes needed to be "hardwired" into the device with required firmware changes and software updates. These developments typically take months to initially program and test before finally loading into an industrial device. Today's IIoT controllers have a cloud component, and this provides a layer to enhance a controller's ability by adding features not available directly in the base unit. When augmenting the base controller's ability, engineering enhancements can be done quickly in the cloud.

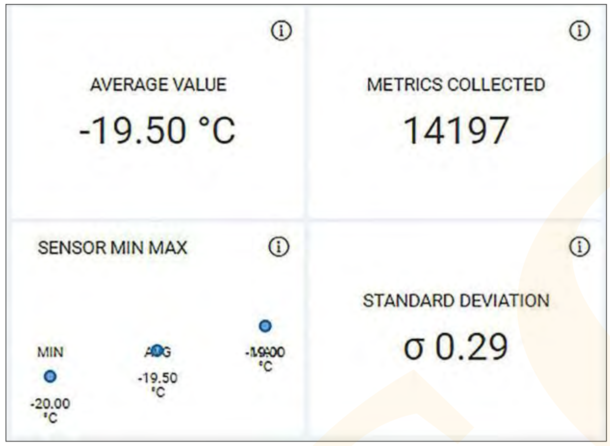


Fig. 4. Simple analytics

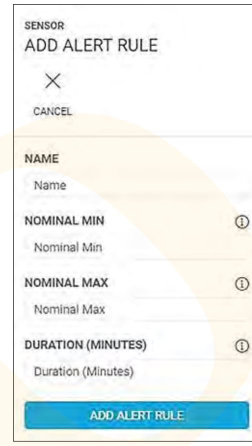


Fig. 5. Add alert rule

Example 1: Alerts When You Need Them

Adding SMS or e-mail capability to an instrument to alert (if deviating from the desired setpoint) is a complicated setup in most on-premise solutions to integrate into the local IT mail servers.

This situation is made more straightforward via the cloud due to native integration with cloud-based mail solutions. Time to add functionality: as fast as you can type your e-mail address (Fig. 2).

Example 2: Instrument Tests on Time

Many instruments require some form of maintenance plan (calibration, alarm tests, etc.), but few can automatically alert all interested parties when tests are due and can't remind third-party test providers on required test schedules (Fig. 3).

Cloud-based systems with some form of instrument integration (e.g., QR Code link) can leverage the ability to give controlled access to both internal and external parties and allow a global view of test compliance (see sidebar 2).

Example 3: Analytics That Make a Difference

Most modern instruments are designed for multi-applications to give the manufacturer a broader addressable market and higher volumes, which enable a more attractive price to the customer. However, specific end-customer requirements may not be predicted in design, and the opportunity to derive even higher value from the instrument after development is lost due to the cost of specialized engineering. Some advanced applications need more computing power than the onboard processor can cope with, so either a more-powerful device is required or the customer compromises on his ideal solution.

The cloud opportunity offers a different solution. Leveraging the cloud platform and the immense computing power of server-farms, it is possible to not only achieve after-event analytics but also to provide stream (or real-time) analytics (Fig. 4). A typical example is a predictive-maintenance program that leverages machine-learning algorithms. The system self-learns the behavior of the plant or component on the plant and is searching for anomalies to alert against. Information not captured by the instrument may also be linked to the cloud directly from the sensor (e.g., environmental conditions – temperature, vibration, etc.).

Example 4: Quick Reaction to Issues

A simple alarm system will alert on a problem. A complex alarm system will give more of an indication of where the problem is, its duration, etc. This complexity needs programming into the system (Fig. 5).

A cloud solution can alarm (triggering the SMS as detailed before) and also direct the user to the source of the alarm, its trigger point, duration, and trends before and after the event.

Example 5: Data Integrity Protection

How do you link the instrument to the cloud, and what happens in the event of a blip in WiFi signal or the 3G network having a small outage? Most professional offerings in this category incorporate a buffer unit into the architecture.

Connectivity and Cybersecurity

The EPC3000 Ethernet-enabled controller range is Eurotherm's first to be designed and certified to meet the stringent cybersecurity requirements of Achilles® Communications Robustness Testing Level 1. Ethernet communications are supported via a standard RJ45 connector, providing fast access to process and diagnostic information as well as connectivity to external PLC or plant SCADA.

EOS Advisor

EOS Advisor lets you manage equipment and staff more efficiently with one integrated system that helps you meet your compliance requirements. What's more, the EOS Advisor tablet app (eCAT™) helps improve your calibration process with rule-based workflows to enhance testing efficiency.

This unit becomes a central hub to receive data from the instrument and sensors and has onboard data storage in case of transmission failures.

Example 6: Third-Party Supplier Information

Commercial heat treaters, thermocouple providers and external maintenance provider: All these companies have systems that are remote to the end customer and typically require significant manual administration to provide the customer access to key documents or process information. This situation can slow down quality acceptance of externally treated components, put equipment uptime at risk due to a shortage of parts (certified thermocouples, etc.) or create delays caused by the uncertainty of conformance of maintenance checks. Modern-day cloud solutions can provide real-time access to this information and provide both service- and customer-defined views.

Instrument IoT

Many companies offer a form of IIoT, but few have taken this down to the instrument or sensor level with many still offering a top-down hierarchical architecture. This situation is where the term instrument IoT becomes relevant. As with instrument SCADA (on-premise), instrument IoT focuses on the instrument as the brain and the software (in this case cloud-based) to offer an overview as well as additional functionality. The engineering of specific applications is simplified when utilizing a prebuilt cloud platform and leveraging associated web technologies like APIs (application programmable interface).

Smart-hubs use data buffers, and a growing number of instruments have native cloud connection ability. Instrument IoT feeds into the grander Industry 4.0 offering by providing unique perspectives on the component level of equipment and its services.

Future Perspectives

Hybrid Solutions

Today's data routes are typically either on-premise or one-way to the cloud, and then information is dispersed to interested parties. New developments include hybrid solutions with hardware with special memory allocated to allow read/write into the instrument configuration based on intelligence created in the cloud.

Synthetic Sensors

One crucial development in home automation that could apply to industry (especially when looking to retrofit "smarts") is the use of general-purpose or synthetic sensors. Rather than instrument each piece of equipment with distinct special-purpose sensors, say for predictive maintenance, use a block of "supersensors" to blanket an area of the shop floor. This solution could give general information related to temperature, vibration, energy use and equipment use. It can also provide machine context via a learned fingerprint of a machine.

The views expressed in this article are entirely the author's, and may not be representative of their specific organization.

For more information: Contact Peter Sherwin, SaaS and heat treat business leader, Eurotherm by Schneider Electric, 44621 Guilford Drive, Suite 100, Ashburn VA, 20147; tel: 703-724-7300; fax: 703-724-7301; e-mail: Peter.Sherwin@schneider-electric.com; web: www.eurotherm.com.

References

1. https://www.billboard.com/articles/business/8085524/smart-speaker-sales-tripled-25-million-year-2017

Specialized C/C Fixtures for Today's Brazing Needs

Dan Kay – Kay & Associates; Simsbury, Conn.

Brazing furnaces today often contain a lot of very heavy fixturing materials in their brazing chambers. This "fixturing" includes all the heavy-metal structures in the furnace hot zone (e.g., grates, trays, racks, baskets, etc.).

Everything put into a hot zone must be heated up to brazing temperature and then brought safely back down to room temperature, hopefully distortion-free. All of this weight in the chamber results in long brazing cycles, and it also makes a significant percentage of the furnace load/mass to be nonproductive.

There is no free ride. It costs the brazing shop a lot of money to heat all that heavy fixturing weight up to brazing temperatures, perhaps several times each day, day after day and week after week. This cost detracts significantly from the brazing shop's bottom-line profitability. I have actually seen brazing shops where the total weight of the fixturing exceeded 90% of the total weight put into the furnace chamber. Less than 10% of the total load going into the furnace chamber was actually parts to be brazed and sold to a customer. This results in a number of brazing shops unknowingly being in the business of heat treating fixtures rather than being in the brazing business.

I have asked some shop managers, "OK, so let me see if I have this right. Even though you don't realize it, you're actually in the business of heat treating fixtures, but you do send some parts through the furnace to be brazed so that you can generate some income to pay for the heat treating. Did I get that right?" That usually makes them think more realistically about the poor productivity of their so-called "brazing furnaces."

To help alleviate this problem, carbon-fiber-reinforced carbon (C/C) is a material being used more and more for making brazing fixtures. C/C fixtures not only greatly reduce the weight going into the furnace but have the added benefit of excellent thermal stability over the long term.

Basics

The inner structure of a C/C fixture consists of carbon fibers such as those shown in Fig. 1. These are embedded in a special carbon-matrix material to form a very strong composite structure. The carbon fibers themselves have very high strength, and the carbon-matrix material offers specialized heat resistance, chemical resistance, low thermal expansion, and high thermal and electrical conductivity.

The length of carbon fibers used (often cut into very short pieces) and their orientation in the carbon matrix can be modified, as needed, to achieve desired properties. Compared to other fixture materials – such as compressed pure graphite, ceramics or metal – C/C material is very strong, lightweight and flexible. It will operate over a wide range of temperatures without any loss in performance while maintaining dimensional stability (no distortion).

C/C materials can safely withstand temperatures over 3500˚F (2000˚C) in any non-oxidizing environment (vacuum, argon, nitrogen, etc.). They should never be used at high temperatures in a hydrogen atmosphere or in any atmosphere with significant percentages of oxygen.

Fig. 1. Typical carbon fibers used in making C/C fixturing *(courtesy of Across USA)*

Fig. 2. This 66-pound (30-kg) grid showed significant distortion after nine months of furnace heating/cooling, with no intermediate straightening attempted during that time *(courtesy of Schunk Graphite).*

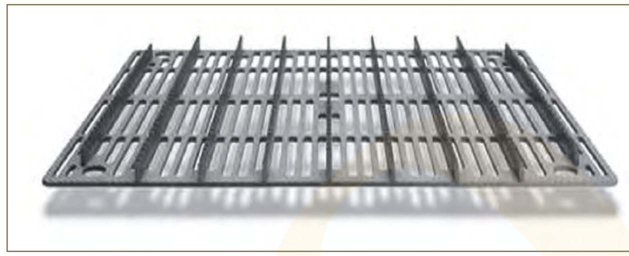


Fig. 3. This C/C grid weighs 5 pounds (2.5 kg) and was used in the same manner as the metal grid shown in Fig. 2 but with no distortion at all *(courtesy of Schunk Graphite)*.

Furnace Fixture Handling

Proper handling of C/C fixtures by shop personnel is very important, and it does require instruction and training. Carelessly throwing C/C fixtures across the ground or dropping them on the floor could cause damage to the C/C material and shorten the life of such fixtures. Remember that C/C material does not dent or distort as metal fixtures do, and even though it has a high resistance to fracturing due to its flexibility, people should still be trained in how to store, handle and use C/C fixturing.

As with all materials, C/C fixtures will expand and contract during heating, but it should be able to maintain its dimensional flatness better than metal fixtures (due to its ability to resist distortion better than metals). This is shown in Fig. 2 and Fig. 3, where a metal grid was cycled many times in a furnace for many months resulting in significant distortion, whereas a C/C grid used for the same purpose and length of time is still flat and distortion-free.

Because many of the metals that you are brazing can react with the carbon-based C/C fixtures on which they are sitting, it is very important that you provide some kind of a separating layer between the metal parts and the C/C fixture. This can be done by placing a thin sheet of ceramic material or a ceramic-fiber cloth between the C/C fixture surface and the bottom of the metal component being brazed.

An example of some ceramic pieces that were fitted to the rungs of a grate are shown in Fig. 4, where it can be seen that the ceramic pieces placed on top of the grid will prevent any metal that is sitting on top of those ceramic pieces from reacting with the fixture below it. Because C/C is more than 99% pure carbon, and pure carbon likes to react strongly with any metals that contain iron (such as stainless steel), any reaction between carbon and steel might easily form low-melting eutectics at temperatures under 2100°F (1150°C).[1]

Partial melting of the base metals sitting on that C/C fixture will result from direct contact. You need to know this and take precautions to ensure that metal does not come into direct contact with the C/C fixtures during heating in the furnace. A couple of other metals that can react strongly with carbon are titanium and chromium.

TIP 1: Do not let stainless components directly contact C/C fixtures during brazing cycles because the iron in the stainless can form low-melting eutectics with the carbon of the C/C fixturing. Keep them separated by a layer of solid ceramic, ceramic inserts, ceramic-fiber paper/cloth or by an adequate layer of an appropriate brazing stop-off painted or coated onto the surface of the graphite.

C/C Fixturing Designs

Figure 5 shows an example of a C/C brazing-fixture design. It is designed to hold the part being brazed between top and bottom plates made of C/C. The coil springs are also made of C/C and are used to apply equal pressure during the brazing process. C/C springs are made of unidirectional carbon-fiber composites and should be able to maintain correct pressure on the surface for hundreds of cycles, even at brazing temperatures up to about 2350°F (1300°C). An example of two kinds of C/C springs are shown in Fig. 6 (coil spring) and Fig. 7 (flat spring).

C/C Springs vs. Dead Weights for Compression

It is fairly common for braze shops to place a number of metal blocks (dead weights) on top of parts to compress the load

Fig. 4. Ceramic pieces placed on top surface of furnace grid *(courtesy of Schunk Graphite's CarboGard channels)*

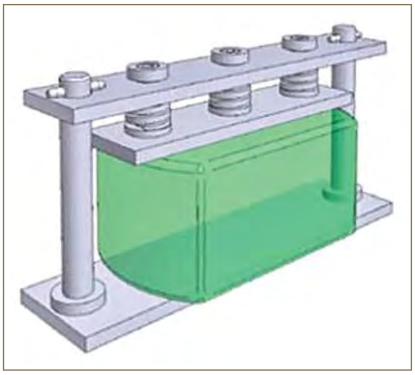


Fig. 5. Careful design of the fixturing is required so that very even force will be applied to the heat exchanger. As the temperature rises, the metal heat exchanger expands and the C/C springs compress

Fig. 6. C/C coil spring *(courtesy of Across USA)*

Fig. 7. Flat C/C spring *(courtesy of Across USA)*

> **TIP 2:** Remember, there is no free ride! Every pound put into the furnace absorbs heat, and every BTU/calorie absorbed by those dead weights costs you money.

beneath them, which keeps the metal parts in close contact with each other throughout the brazing cycle. This can often add hundreds of pounds to the furnace load being processed.

By using lightweight C/C spring loading of parts instead of dead-weight fixturing, a huge amount of nonproductive weight can be removed from the furnace. And, because the C/C fixturing itself heats up about three times faster than metals (due to the excellent thermal conductivity of C/C fixtures), the greater heating efficiency of the furnace load can significantly improve the throughput of each furnace.

Conclusions

C/C fixturing has many advantages when compared to metal fixturing being used for the same purpose. Among these are:

- Much lower gross weight of fixturing (grates, baskets, trays, racks, etc.)
- Significant improvement in furnace productivity (cycles run per day)
- Large reduction in cost of energy per part brazed
- Less need for fixture maintenance/replacement caused by fatigue or distortion

As C/C technology continues to develop, it is expected that more and more users will see C/C material as a fairly simple way to increase productivity and profitability in their brazing shops, swiftly offsetting the initial higher cost of C/C fixtures compared to typical metal fixtures. The costs of C/C fixturing are steadily coming down as more and more shops buy them and use them and find out the many advantages of switching to this "new" technology. IH

Acknowledgements: I wish to give special thanks to Lloyd Nagamine of Across USA Graphite Fixturing Company (Carson, Calif.) for his invaluable assistance in helping with the information used in the writing of this article.

For more information: Contact Dan Kay, Kay & Associates, 4 Lawton Drive, Simsbury, CT 06070; tel: 860-651-5595; e-mail: dan.kay@kaybrazing.com. Or contact Lloyd Nagamine at Across USA, Inc., 1480 Beachey Place, Carson, CA 90746; tel: 310-635-3555; e-mail: nagamine@acrosscc.com.

Optimizing Speed, Accuracy and Reproducibility in Metallographic Preparation of Heat-Treated Materials

Mike Keeble – Buehler, a division of Illinois Tool Works; Lake Bluff, Ill.

The microstructure of a material represents its fundamental properties, and most heat treatments are performed to tailor these properties to a specific need. Good metallographic preparation allows faster and more-accurate quality control – whether a microstructural inspection or performing specific tests such as case-depth analysis.

The process of metallographic preparation is basically straightforward. A series of sequential stages, such as those shown in Figure 1, are used to produce a sample that has been ground and polished sufficiently to:

- See the microstructure of the material through etching and imaging
- Make measurements
- Perform hardness testing

It is not uncommon to find that the people performing these steps are not specifically trained in the process, however, or the process has been inherited from decades ago and is applied with limited review. The net result is that we often find that it would be possible to perform a higher-quality preparation more quickly and often at a lower cost.

Both direct and indirect consequences of poor preparation approaches (Table 1) need to be recognized, and the value of reviewing this process becomes much more apparent. The extent of potential improvement may seem surprising, but technologies change. Even incremental improvements over a significant time period can make a big difference.

The purpose of this article is to review some key considerations in the metallographic process that may allow the reader to identify these opportunities in their own process.

Preparation Needs

When hardened materials are sectioned or ground heavily, residual heat may alter the microstructure or affect hardness results. These can be important factors in quality control, so it is important that any induced damage of this kind is removed in the subsequent stages. Each stage needs to remove the damage from the previous stage until the remaining damage is small enough not to interfere with analysis.

Table 1. Some of the reasons why optimizing preparation is well worth considering.

Poorly prepared specimens can lead to improper interpretation • Confusion, mistakes and repeating work
Bad specimens that are passed can lead to • In-the-field failures • Loss of customer confidence and ongoing business • Replacement and reparation costs
Good specimens failed can lead to • Excessive wastage • Delayed shipments
Un-optimized preparation methods • Waste resources – consumables, personnel and time

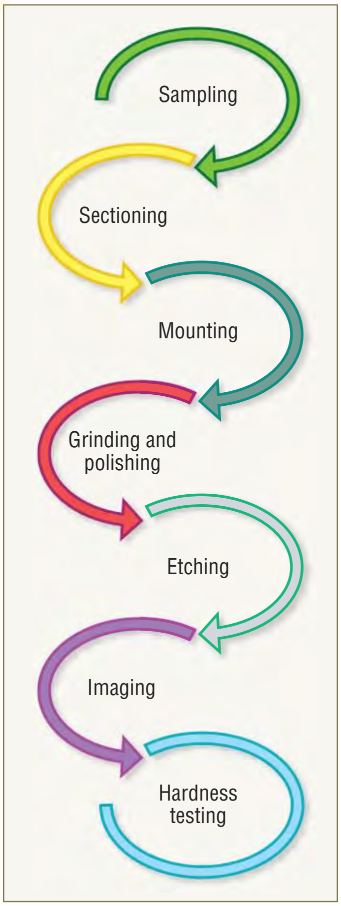


Fig. 1. Typical series of steps required in the preparation and analysis of metallographic samples

Fig. 2. AB250 metallographic saw

Fig. 3. Hot-compression mounting machines – the SimpliMet 4000 model shown can make two samples per cycle, doubling throughput.

Sectioning

A high proportion of the problems we find in specimen preparation originate with the sectioning method. Most applications will use a metallographic saw with an abrasive blade (Fig. 2). These are preferred because more-aggressive processes such as band saws can leave very deep damage on the sample, extending preparation times considerably.

Blade choice is simplified by the manufacturers, who will typically provide lookup tables that allow you to select abrasive blades by material type and hardness. For harder materials, a blade that wears down more quickly is needed (soft-bonded). The faster wear keeps the blade "sharp" by exposing fresh abrasive more quickly.

It is tempting to use a blade with slower wear (harder-bonded) to save cost, but this will often result in either slower cutting or the use of higher cutting loads and, therefore, more damage to the cut surface. It is far better, in most cases, to select the correct blade for your needs and simply cut at a slower rate if extended blade life is needed. This ensures the best compromise between quality, speed and cost.

Any movement in the specimen during the process will cause problems, from an uneven sample face to broken blades. It is recommended to secure the sample firmly during cutting, and supporting the sample on both sides of the cut will dramatically reduce burrs. In addition, cooling should be even and applied close to the cut to make sure that heat and debris are carried away effectively. Regular maintenance of both the machine and the coolant itself greatly improve consistency and quality.

Sample Mounting

The purpose of mounting samples prior to metallographic preparation is twofold: to protect the specimen and to make the samples easier to handle. Not all applications require the specimen to be mounted, and fixtures can often be used in semiautomatic machines to allow the preparation of unmounted samples. In most cases, mounting is preferred, however, especially where there is a need to examine the edges of specimens.

There are two main methods of encapsulating (mounting) samples prior to metallographic preparation.

1. Castable mounting: Place the sample in a mounting cup, mix two or more liquid and powder components, and pour over the sample. Cures in 5 minutes to 8 hours, depending on the resin used.
2. Hot-compression mounting: Place the sample in the machine, add powder, close and start the machine. Cures in 7-12 minutes, depending on sample size.

The highest-quality mounts are made using a hot-compression mounting machine (Fig. 3). These machines use high pressures and temperatures to encapsulate samples.

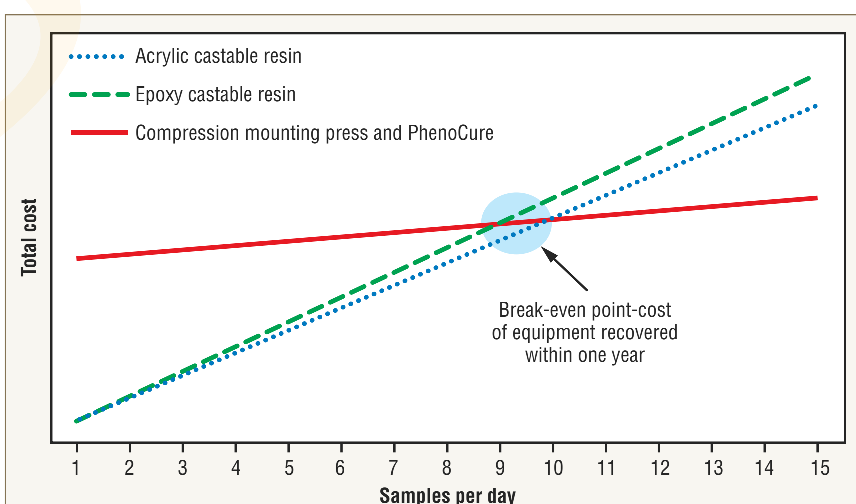


Fig. 4. Return on investment for a hot-compression mounting machine, compared with castable mounting. For 10 or more samples a day, the machine pays for itself in less than one year.

Table 2. Preparation method for higher-hardness (>35 HRC) ferrous materials using planar grinding

Surface	Abrasive/size	Load lb. [N]/specimen	Base speed (RPM)	Head speed (RPM)	Relative rotation*	Time (min.)
Alumina grinding stone	120 [P120] grit	7 [30]	Fixed	120	>>	1:00
UltraPad	9µm MetaDi Supreme Diamond*	7 [30]	150	60	><	4:00
VerduTex	3µm MetaDi Supreme Diamond*	7 [30]	150	60	>>	3:00
ChemoMet	0.05µm MasterPrep Alumina	7 [30]	150	60	><	1:30

*Plus MetaDi Fluid as desired.
>>= Complimentary (platen and specimen holder rotate in the same direction) >< = Contra (platen and specimen holder rotate in opposite directions)
Note: This method assumes 40-mm-diameter samples. Scale load by sample area as needed.

The largest barrier to their use is typically the purchase price. The mounting compounds for hot-compression mounting are inexpensive compared with castable mounting, however, so the longer-term economics can often make these a cost-effective purchase (Fig. 4).

The use of edge-retention mounting material is particularly important when examining coatings and surface layers (e.g., nitride layers and case layers) and checking for potential problems such as decarburization. Typically, a mineral-filled epoxy such as EpoMet is chosen for these applications.

Sample Preparation

The use of a semiautomatic grinder/polisher allows more-reproducible and consistent preparation. To get the specimens as flat as possible, the use of planar grinding, diamond grinding discs (DGD) and no-nap cloths are recommended. Central-force grinding (where specimens are locked into a holder for the entire process) helps to ensure uniform grinding and maximize planarity. It is also important to minimize the amount of time polishing on soft cloths because this can cause edge rounding. So, final polishing steps should be optimized and not excessively long. If the finish is not good enough after the last stage, go back and repeat earlier stages rather than polish longer.

A recommended preparation route for typical heat-treated materials is given in Table 2. Further information can be found in the "Solutions" section at www.buehler.com. In typical semiautomatic grinding machines, six or more specimens can be prepared at once using these methods. Compare the times with your current methods. Is there opportunity to improve your efficiency?

Many older preparation routes rely on multiple stages of silicon-carbide (SiC) paper. Manual preparation can be a quick approach for one sample at a time, but it's likely that costs are comparatively high, and the variability between users can cause significant problems with quality and high repreparation rates. In some cases, the cost of consumables for sample preparation can be as much as halved by changing from a manual SiC-based approach to semiautomatic preparation methods such as those in Tables 2 and 3.

The advantages of refining the metallographic process don't stop at the polishing stage. An improvement in preparation provides many advantages in etching and analysis, including:

- More-accurate hardness-test measurement
- Increased success rate of automated hardness-testing systems
- Better definition of microstructures during etching
- Faster and more-effective with a lower-strength etchant. This has the benefit of shortening etching time, improving confidence in the analysis of structures, and reducing health and safety risks for operators.

Conclusion

Sometimes the simplest observations are also the most powerful. Metallographic preparation is a critical step in many quality-control activities. Just like any other part of the manufacturing route, it is best applied with understanding and control. Proper use of equipment and methods can improve efficiencies and reduce costs. At the same time, it can ensure improved reproducibility and reliability of results. In the highly focused world of heat treatment, and in rapid-paced environments such as automotive manufacturing, this can be enough to provide a competitive edge to help ensure your success.

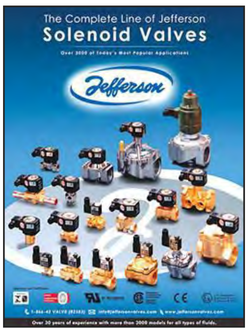
For more information: Contact Mike Keeble, U.S. Laboratories and Technology Manager at Buehler, a Division of ITW, 41 Waukegan Rd., Lake Bluff, IL; tel: 224-513-6281; e-mail: mike.keeble@buehler.com; web: www.buehler.com.

LITERATURE & WEBSITE SHOWCASE

Induction Heaters

Across International

Founded and based in New Jersey, Across International supplies laboratory equipment in the areas of heat treatment and material processing for universities, research facilities and labs. We have more than 20 years of industrial manufacturing experience with induction heaters, drying ovens, ball mills, lab furnaces and pellet presses.
www.acrossinternational.com



Solenoid Valves

Jefferson Solenoid Valves

Jefferson Solenoid Valves offers over 3,000 different valves for applications such as boilers, burners, cooling towers and many others. We also offer a diverse range of liquids and gases such as water, air, steam, oils, oxygen, liquid nitrogen, corrosive fluids and many others. Our products have approvals in accordance with UL 429, UL Hazardous Locations, CSA and is ISO 9001 certified.
www.jeffersonvalves.com

Carbon Atmosphere Analyzer

Super Systems Inc.

The CAT-100 atmospheric carbon potential analyzer provides a measurement of carbon potential in a furnace with a carbon-bearing atmosphere. The easy-to-use product provides a fast reading based on analysis of a metal coil soaked in the furnace for about 30 minutes. The CAT-100 has a color touch screen with features that include logging stored readings and furnace settings.
www.supersystems.com/CAT

Temperature Measurement

Thermocouple Technology

Thermocouple Technology (TTEC) manufactures a full line of industrial temperature measurement products, including thermocouples, RTDs, thermowells, transmitters, thermocouple wire, indicators, controllers and accessories. TTEC's experienced engineers specialize in custom-built temperature sensors for applications exceeding 4000°F.
www.tteconline.com

Induction Heating Systems

Ultraflex Power Technologies

Ultraflex Power Technologies has been manufacturing induction heating equipment since 2008. We offer the most advanced and innovative digitally controlled technology in the industry. Our high-quality products, global technical support and cutting-edge simulation tools ensure Ultraflex customers get the most out of their induction systems.
www.ultraflexpower.com

IH CONNECT

Welcome to IH Connect. Here's a quick and convenient way to connect with leading industry suppliers through e-mail, website or social media. Below is a list of advertisers in this month's issue. Connect with them to stay abreast of the latest technologies in the industry.

ACROSS INTERNATIONAL
Material processing equipment

Across International
www.facebook.com/AcrossIntl
twitter.com/acrossintl
info@acrossinternational.com
www.acrossinternational.com

BUSCH

Busch LLC
info@buschusa.com
www.buschusa.com

CENTORR Vacuum Industries

Centorr Vacuum Industries
sales@centorr.com
www.centorr.com

DMP CryoSystems

DMP CryoSystems
info@cryosystems.com
www.cryosystems.com

G-M ENTERPRISES

G-M Enterprises
sales@gmenterprises.com
www.gmenterprises.com

Ipsen

Ipsen
www.facebook.com/IpsenUSA
www.linkedin.com/company/ipsenusa
twitter.com/ipsenupdate
www.youtube.com/ipsenvideos
sales@ipsenusa.com
www.ipsenusa.com

Jefferson

Jefferson Solenoid Valves
info@jeffersonvalves.com
www.jeffersonvalves.com

nyb THE NEW YORK BLOWER COMPANY

New York Blower Company
www.facebook.com/newyork-blowercompany
www.linkedin.com/company/new-york-blower-company/
twitter.com/NewYorkBlower
www.nyb.com

SOLAR MANUFACTURING

Solar Manufacturing
www.facebook.com/SolarManufacturing
www.linkedin.com/company/solar-manufacturing
twitter.com/SolarMfg
www.youtube.com/user/SolarManufacturing
info@solarmfg.com
www.solarmfg.com

SuperSystems

Super Systems Inc.
www.linkedin.com/company/super-systems-inc
www.youtube.com/user/SuperSystemsInc
info@supersystems.com
www.supersystems.com

TTEC THERMOCOUPLE TECHNOLOGY

Thermocouple Technology
sales@tteconline.com
www.tteconline.com

UltraFlex POWER TECHNOLOGIES

UltraFlex Power Technologies
www.facebook.com/ultraflex-power
www.linkedin.com/company/ultraflex-power-technologies-inc/
twitter.com/ultraflexpower
www.youtube.com/channel/UCmpJ2KOeZ1VXKrspykAaapQ
sales@ultraflexpower.com; www.ultraflexpower.com

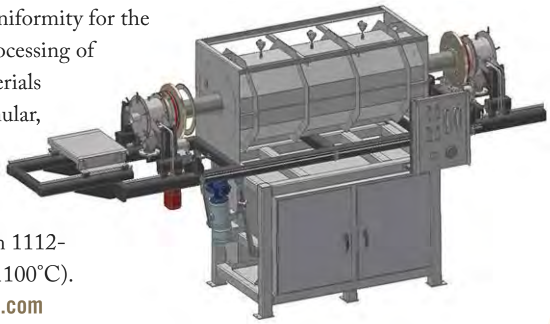
Thermal Processing Products

Rotary Furnace

Harper International

The HC Series is a standard set of rotary furnaces that are configured to order and available in a number of variations, dependent on specifications for temperature, tube length, heated length, diameter and number of zones. The pre-engineered furnace delivers superior temperature uniformity for the continuous processing of advanced materials including granular, powder or particulate aggregates operating from 1112-2012°F (600-1100°C).

www.harperintl.com



Dry Vacuum Pump

Leybold

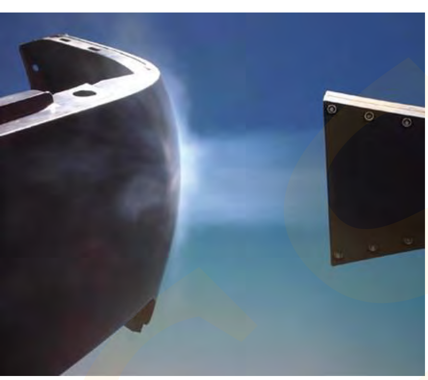
The VARODRY vacuum pump series is designed for industrial vacuum processes. The oil-free, air-cooled vacuum pump is easy to install and connect, and – due to its compact design – can be easily integrated into new or existing systems. Equipped with complete air cooling, the pump makes water cooling completely superfluous. It offers low maintenance requirements, emission-free ventilation and minimal operating noise in average daily operation. In addition, the pump is absolutely dry and clean, thus preventing oil and particle emissions or oil leaks as well as oil migrations in the vacuum chamber or into the products and processes. **www.leybold.com**

Cryogenic Cleaning System

Linde

The ADDvance Cryoclean system is designed for blast cleaning parts produced by additive manufacturing (AM) or other powder-metal processes. It uses a combination of CO_2 snow particles and a blasting abrasive to remove particles and difficult residues from 3D-printed parts. This includes surface oxides and unfused powders that need to be removed prior to further processing or surface finishing. The Cryoclean system produces CO_2 snow on-demand by feeding liquid CO_2 into a specially designed cleaning chamber, making it an environmentally friendly and cost-effective alternative to existing cleaning processes.

www.lindeus.com



Horizontal-Airflow Cabinet Oven

Grieve

No. 1045 is a 1250°F (677°C) horizontal-airflow cabinet oven that can be used for heat treating. Workspace dimensions measure 38 inches wide x 38 inches deep x 38 inches high. A 2,000-CFM, 2-HP recirculating blower provides horizontal airflow. The oven features 12-inch-thick insulated walls comprised of 2 inches of 2300°F ceramic blanket and 10 inches of rockwool. It includes all safety equipment required by National Fire Protection Association Standard 86 for gas-heated equipment as well as a digital indicating temperature controller. **www.grievecorp.com**

Infrared Pyrometer

Fluke Process Instruments

Thermalert 4.0 is a versatile infrared spot pyrometer for automatic, noncontact temperature measurement in harsh industrial environments. Intended for use with temperatures of -40°F to 4082°F (-40°C to 2250°C), the pyrometer series comprises 13 models with varied spectral responses, including dedicated sensors for metal products. The advanced IP65/NEMA4 instrument employs real-time background temperature compensation and laser aiming, and its DataTemp Multidrop system software supports remote configuration, monitoring, field calibration and firmware updates.

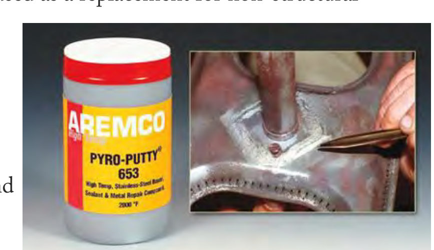
www.flukeprocessinstruments.com

High-Temperature Repair Compound

Aremco Products

Pyro-Putty 653 is an inorganic, single-part, ceramic and metal-filled paste that bonds tenaciously to cast iron, steel and stainless steel. It withstands continuous operating temperatures and rigorous thermal cycling to 2000°F (1093°C). The high-temperature repair compound is ideal for sealing defects in cast steel casings, housings, pipes and flanges. It can also be used as a replacement for non-structural weldments and flame spray repairs. Typical applications include repairing furnaces, ovens, gas manifolds, afterburners, boilers and incinerators.

www.aremco.com



Parts, Service & Consulting Aftermarket

PARTS • SERVICE • CONSULTING

Contact: Becky McClelland • Phone: 412-306-4355 • Fax: 248-502-1076 • becky@industrialheating.com

2018 Rates: Just $150 per month for a single card, $295 for a double card. We'll post your ad online for an additional $30.

INDUSTRIAL HEATING

offers high-impact packages so you can find the most qualified job candidates!

Contact Becky McClelland at: 412-306-4355 or becky@industrialheating.com

2018 Print Rates: $150 per column inch for 1x frequency; $140 for 3x; $125 for 6x; $120 for 12x

- **Print ad PLUS online posting:** Add $49.00
- **Print ad, Online Ad PLUS IH Daily News Brief Eblast:** Add $75.00

Web ONLY! Need Maximum Exposure Right Away? Online Ad Posting, IH Daily Newsbrief and Listing: $250.00

EMPLOYMENT OPPORTUNITY

PURCHASING AGENT/QUALITY ASSURANCE

Small industrial company seeking purchasing agent/quality assurance individual. Heat treating and metallurgy background a plus. Must have excellent computer proficiency, especially in Microsoft Office and Excel. Quality assurance background and knowledge of ISO Standards necessary. Communication, strong people skills and the ability to work well with others required. Especially when interacting with clients and vendors. Salary commensurate with experience. Benefits include complete compensation package including vacation, matching 401k and insurance. Apply at Chicago Flame Hardening, 5200 Railroad Avenue, East Chicago, Monday-Friday 9:00 a.m. to 3:30 p.m., **or Reply In Confidence to: ron@cflame.com**

CHICAGO FLAME HARDENING

EMPLOYMENT OPPORTUNITY

SALES AGENTS WANTED

Hi-Temp Products Corporation; an enduring 25+ year supplier of high temperature heating elements, furnace hardware, controls and an aftermarket furnace rebuilder within the thermal processing industries is looking to recruit commission based sales agents throughout North America. Please submit queries or line cards to info@hi-tempproducts.com.

HI-TEMP PRODUCTS CORP.

Phone: 1.800.822.4335 or
Hi-Temp Products Corporation
Address: 88 Taylor Street
Danbury, CT 06810

www.hitempproducts.com
info@hi-tempproducts.com

FOR SALE

LIQUIDATION

VACUUM PUMP REBUILDER

Stokes, Dresser, Leybold, Kinney, Welch, CVC, Varian Pumps, Parts, etc.

Call for list:

860-875-3712

FURNACE BROKERS INTERNATIONAL

FOR SALE

CARBURIZE FASTER?

IT ONLY SEEMS IMPOSSIBLE

[illegible]

• CH_4 [illegible]

[illegible]

HEAVY CARBON CO. ENDOCARB

700 lb. gear carburized 18% faster

HEAVY CARBON CO., LLC

Please send questions & specks to:
George Barbour
heavycarbon@frontiernet.net
Online at www.heavycarbon.com

FOR SALE

ENDOTHERMIC CATALYST

★★★ *Next Day Delivery* ★★★

11/16" and 1" Cubes in Stock

THE FINEST QUALITY THE LOWEST PRICE

Call 847-202-0000 or Fax 847-202-0004

THE DUFFY COMPANY
283 E. Hellen Rd., Palatine, IL 60067
www.duffycompany.com

FOR SALE

R & G Services, Inc.

101 Bissell Street, Joliet, IL 60432

Heat Treating Equipment
New & Used
Service • Installation • Rebuilds
Nickel Catalyst Cubes
IN STOCK

Phone: (815) 727-3300
Fax: (815) 727-3335
Please visit our website for a complete list of available furnaces, ovens & generators
www.randgservices.com
Email: weston@randgservices.com

INDUSTRIAL HEATING REPRINT PLAQUES ARE NOW AVAILABLE

Call Becky McClelland 412-306-4355 or becky@industrialheating.com

INDUSTRIAL HEATING

Online Ads Updated Daily!

Post Your Employment Ad, Used Equipment For Sale Ad or Aftermarket Services ad Today!
Contact Becky at 412-306-4355 or becky@industrialheating.com

EQUIPMENT FOR SALE

HEAT TREAT EQUIPMENT

42056 Michigan Avenue. Canton, MI 48188
Phone: 734-331-3939 • Fax: 734-331-3915
E-mail: john@heattreatequip.com

Batch Temper Furnaces

C0052 Surface Combustion Batch Temper Furnace (30"W x 48"L x 30"H, 1200°F, gas-fired)
C0068 Despatch Box Furnace (60'W x 72'D x 66'H, 395°F, electric)
U3644 BeaverMatic Batch Temper Furnace (36"W x 48"D x 36"H, 1500°F, gas-fired)
V1010 Dow Batch Temper Furnace (30"W x 48"L x 20"H, 1250°F, gas-fired)
V1024 PIFCO Batch Temper Furnace, Skid Hearth (36"W x 48"L x 30"H, 1200°F, electric)
V1068 Surface Combustion Oil Quench Furnace (30'W x 30'D x 48"H, 1950°F, gas-fired)
V1081 Lindberg Batch Temper Furnace (20'W x 24'D x 18"H, 1250°F, electric)
V1095 Surface Combustion Temper Furnace (30"W x 48"D x 30"H, 1250°F, gas-fired)
V1096 Surface Combustion Temper Furnace (30'W x 48'D x 30'H, 1400°F, gas-fired)
V1106 Dow Batch Normalizer Furnace (45'W x 84'D x 32'H, 1800°F, gas-fired)
U3624 Lindberg Nitrogen Temper Furnace (24"W x 36"D x 18"H, 1350°F, gas-fired)
U3651 JL Becker Batch Temper Furnace (36"W x 48"D x 36"H, 1350°F, gas-fired)

Batch High-Temp Furnaces

U3556 Pacific Industrial Batch High-Temp Furnace (24"W x 36"L x 18"H, 2800°F, electric)
U3637 Pacific Scientific Batch Temper (30'W x 48'D x 24'H, 1600°F, gas-fired)
U3643 Surface Combustion Temper Furnace (30'W x 48'D x 42'H, 1400°F, electric, 81kw)
V1013 Thermolyne High-Temp Batch Furnace (10'W x 14'L x 9'H, 2000°F, electric)
V1067 Seco Warwick Batch High-Temp Furnace (24"W x 24"H x 36"D, 1800°F, electric)
V1130 Onspec Slot Forge Furnace (72'W x 96'D x 48'H, 2000°F, gas-fired)

Batch Oil Quench Furnaces

C0086 Huber Car Bottom Furnace (10'4'W x 12'9'D x 8'H, 1800°F, gas-fired)

Car Bottom Furnaces

V1140 Beavermatic Car Bottom Furnace (48"W x 72"D x 48"H, 1600°F, gas-fired)
V1141 Beavermatic Car Bottom Furnace (60"W x 144"D x 60"H, 1400°F, gas-fired)

Drop Bottom Furnaces

C0069 Enviro-Pak Drop Bottom Furnace (48'W x 48'D x 48'H, 1200°F, electric)
U3543 Despatch Drop Bottom Furnace (4'W x 6'L x 4'H, 1200°F, electric)

Internal Quench Furnaces

C0064 Lucifer IQ Furnace (18"W x 24"D x 18"H, 1900°F, electric)
U3569 Surface Combustion IQ Furnace (24"W x 18"H x 36"D, 1750°F, gas-fired)
U3570 Surface Combustion IQ Furnace (24"W x 36"D x 18"H, 1750°F, gas-fired)
U3606 Dow/AFC IQ Furnace (30"W x 48"L x 24"H, 1850°F, gas-fired)
V1046 Surface Combustion IQ Furnace (87'W x 87'L x 36'H, 1850°F, gas-fired)
V1062 Surface Combustion Super IQ Furnace (36"W x 72"D x 36"H, 1950°F, gas-fired)
V1082 Holcroft IQ Furnace with Top Cool (36"W x 48"D x 30"H, 1850°F, gas-fired)
V1083 Holcroft IQ Furnace with Top Cool (36"W x 48"D x 30"H, 1850°F, gas-fired)
V1092 Surface Combustion Allcase IQ Furnace (30'W x 48'L x 30'H, 1850°F, gas-fired)
V1093 Surface Combustion Allcase IQ Furnace (30"W x 48"L x 30"H, 1850°F, gas-fired)
V1111 Surface Combustion IQ Furnace (30"W x 48"D x 30"H, 1850°F, gas-fired)

Mesh Belt Brazing Furnaces

C0102 JL Becker Mesh Belt Brazing Furnace (30'W x 24'5' heated L x 10'H, 2050°F, electric)
C0103 JL Becker MB Brazing Furnace w/Exo & Dryer (30'W x 24'5' heated L x 10'H, 2050°F, electric)
U3529 CI Hayes Mesh Belt Brazing Furnace (18'W x 6'H x 8' heating, 2100°F, electric)
U3592 JL Becker Mesh Belt Brazing Furnace (12"W x 6"H, 2100°F, electric)
V1035 Seco Warwick Mesh Belt Brazing Furnace (18"W x 12"H, 2100°F, electric)

Mesh Belt Tempering Furnaces

C0044 CGS Moore Mesh Belt Curing Oven (22'W x 20'L x 10'H, 500°F, gas-fired)
C0073 Heat Machine Mesh Belt Tempering Furnace (24'W x 10'L x 12'H, 1250°F, gas-fired, PT2501)
C0075 Industrial Heating Mesh Belt Tempering Furnace (24'W x 22'L x 12'H, 950°F, gas-fired, PT3630)
C0080 Surface Combustion Mesh Belt Temper Furnace (18'W x 11'H, 13' long, 1000°F, gas-fired)
C0081 Park Thermal Mesh Belt Temper Furnace (17.5'W x 7'H, 15'8' long, 900°F, gas-fired)
C0083 Eltropuls Plasma Furnace System (56"Dia x 80"D, 1022°F, electric)
C0090 Hengli Mesh Belt Sealing Furnace - Atmosphere (5.9'W x 3.5'H, 2100°F, electric)
U3638 American Gas Furnace MB Temper Furnace (31'W x 5'H, 17' heated length, 1100°F, gas-fired)
V1022 Surface Combustion Mesh Belt Tempering Furnace (42"W x 36'D x 12"H, 1350°F, gas-fired)

Pit Furnaces

V1088 Leeds & Northrup Pit Furnace (24" ID x 30" deep, 750°F, electric)

Pusher Furnaces

U3648 Ipsen P-12 Pusher Furnace (30"W x 30"L x 30"H, 1650°F,gas-fired)

Roller Hearth & Rotary Furnaces

U3550 PIFCO Powered Roller Hearth Temper Furnace (21'W x 12'L x 18"H, 1000°F, electric)
V1009 Ipsen Continuous Temper Roller Hearth Furnace (24"W x 10'L x 18"H, 1350°F, electric)
V1091 Finn & Dreffein Rotary Hearth Furnace (13'3"ID x 5'3"ID x 4'W x 2'8"H, 2275°F, electric)

Steam Tempering Furnace

U3616 Degussa Durferrit Steam Tempering Furnace (24'Dia x 48'D, 1200°F, electric)

Tip Up Furnaces

C0043 Industrial Furnace Tip-Up Furnace (8'W x 22'4'D x 6'H, 1800°F, gas-fired)

Vacuum Furnaces

C0013 CI Hayes Oil Quench Vacuum Furnace (24'W x 36'D x 18'H, electric)
C0027 Pacific Scientific Vacuum Temper Furnace (24"W x 36"D x 24"H, 1450°F, electric)
C0111 Lindberg Vacuum Furnace (15'W x 24'L x 12'H, 2400°F, electric)
U3612 AVS Vacuum Annealing Furnace 2-Bar (18'W x 24'D x 12'H, 2400°F, electric)
U3635 Lindberg Hydryzing Gas Generator (6000 CFH Endo, gas)
V1004 CI Hayes Vacuum Furnace, Oil Quench (18"W x 30"L x 12"H, 2400°F, electric)
V1128 Ipsen Vacuum Furnace (18"W x 32"D x 12"H, 2400°F, electric)
V1131 Abar Vacuum Furnace (34'W x 60'D, 2250°F, electric)
V1135 Abar Vacuum Furnace 2 Bar (72'Dia x72'Deep, 2400°F, electric)
V1136 Surface Combustion Vacuum Furnace, 2-Bar (26'W x 36'L x 22'H, 2400°F, electric)
V1138 Ipsen Vacuum Furnace, 5-Bar (24'W x 36'L x 14'H, 2400°F, electric)

Endothermic Gas Generators

U3594 AFC-Holcroft Gas Generator (3,000 CFH Endo, gas)
V1075 Lindberg Gas Generator (3000 CFH Endo)
U3647 Lindberg Gas Generator (3000 CFH Endo, 2050°F, gas)
V3512 Surface Combustion Gas Generator - 5,600 CFH Endo
V1036 Seco Warwick Gas Generator (3,000 CFH Exo, gas)

Material Handling - Conveyors

U3565 Conveyor - Roller (48"W x 20'L)

Ovens - Cabinet

U020 Blue-M Oven/Ref (20"W x 20"H x 18"D), (-4°F/400°F)
U3625 Lindberg Atmosphere Oven (38'W x 38'D x 38'H, 850°F, electric)
U3629 Cabinet Oven (30'W x 30'D x 36'H, 750°F, electric)
U3642 Blue-M Cabinet Oven (36"W x 36"D x 36"H, 650°F, electric)

Ovens - Walk-In

C0039 Gehnrich Walk-In Oven (72"W x 96"L x 72"H, 400°F, electric)
C0108 Park Thermal Walk-In Oven (90'W x 144'D x 72'H, 850°F, gas-fired)

Freezers

V1129 Webber Freezer (-120°F, electric)

Blowers

U018 Twin City Blower (20 HP, RBA-SW, Class 22)

Charge Cars

U3621 Dow Charge Car, DEDP (66'W x 60'D x 54'H)
V1085 Holcroft Charge Car (DE/DP, 36"W x 48"D)
V1112 Surface Combustion Charge Car, SE, 30'W x48'D

Scissors Lifts & Holding Stations

V1086 Holcroft Scissors Lift & (2) Holding Tables

Heat Exchanger Systems

U030 Graham Systems Heat Exchanger - Plate
V1104 SBS Heat Exchanger

Holding & Cooling Stations

V1113 Forced Cool Station (30'W x 48'D x 30'H)
Many other holding stations - ask for details

Water Cooling Systems

U3404 JL Becker Cooling Tower with Tank (Tower: 51"W x 36"L x 64"H, Tank: 72"W x 84"L x 66"H)
U3595 JL Becker 2-Tank Water Cooling System (tank: 72"L x 36"W x 37"H, 2 Dayton 1HP Motors)
U3646 HydroThrift, Duplex Pump Base, Water Cooling System
V1038 Bell & Gossett Shell & Tube Heat Exchanger with Tank

Washers

V1084 Holcroft Spray/Dunk Washer (36"W x 48"D x 30"H, 190°F, gas-fired)
V1101 Surface Combustion Spray Washer (36"W x 48"D x 30"H, 180°F, electric, 58kw)

Transformers

Extensive inventory of all types of transformers for any and all applications

Baskets & Boxes

Extensive inventory of heat treat baskets and boxes

Heat Treat Lines

V1137 T-6 Annealing & Aging Furnace Line

★ For Miscellaneous Parts Inventory and Complete Equipment Listings visit www.heattreatequip.com ★

FOR SALE

FOR SALE

Ipsen Vacuum Brazing Furnace

- ID: 48" x 48" x 36" High
- Horizontal Loading
- Moly Lined – 2400 ˚F
- Mech. Pumps + Diffusion Pump
- PLC Digital Controls
- Rebuilt in 2015
- Operational (Aerospace)

Cleveland, OH
Ph: 440-519-3800
Email: sales@whkay.com

THE W. H. kay COMPANY

FOR SALE

PHOENIX INDUCTION CORPORATION

Qualified Induction Specialists with over 90 years of combined experience, providing on site:

- Troubleshooting "down" equipment
- Quality preventative maintenance
- Acid flushing, thermal imaging & analysis
- Large inventory of OEM parts, as well as other manufacturers, AJAX*, AIH*, Bone Frontier*, IEH*, and Robotron*
- 24/7/365 days a year emergency phone support

Call: 248-486-8760
sales@phoenixinduction.com
www.phoenixinduction.com

*Registered trademarks of their respective companies

FOR SALE

High Temperature Adhesive & Sealant

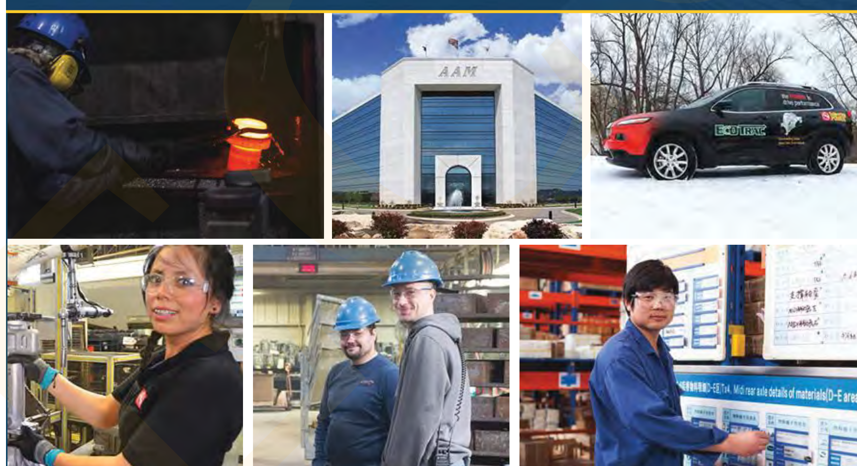
COTRONICS CORP.
www.cotronics.com
sales@cotronics.com • 718-788-5533

JOIN OUR TEAM!

AAM®

AAM is a premier, global leader in design, engineering, validation and manufacturing with over 25,000 associates operating at more than 90 facilities in 17 countries.

AAM is changing the way the world moves. We are dreamers, doers, game changers, innovators. Join us and move the world!



We're hiring a Heat Treat Engineer. The ideal candidate has:

- A degree in Mechanical, Electrical or Metallurgy Engineering
- Extensive knowledge of heat treating, with detailed knowledge of carburizing & induction equipment operation & process controls
- Basic knowledge of facilities operations
- The ability to use AutoCAD
- Familiarity with PLC controlled equipment

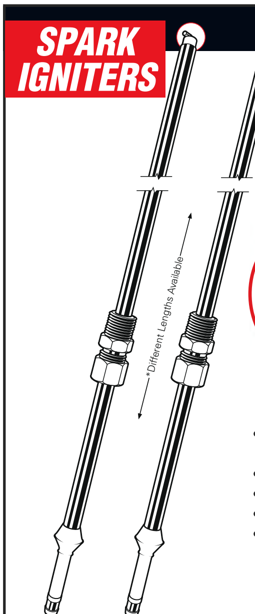
We offer competitive wages and employer-paid benefits, including medical, dental, 401(k), annual profit sharing, annual pay rate increases, and much more.

www.aam.com

For more information or to apply, visit aam.com/join-us/careers

AAM is an equal opportunity employer.

FOR SALE



NEW DESIGN

- Improved Performance
- Longer Life
- Larger Gap
- Floating Spark
- Direct Replacement

Call for model/ pricing information

*We offer both designs

THE DUFFY COMPANY
283 East Hellen Road • Palatine, IL 60067
Tel: 847.202.0000 • Fax: 847.202.0004
www.duffycompany.com

FOR SALE

FOR SALE

Lindberg Pit Nitrider Model: 3896-EC12, Retort Size: 31" x 84" • 1200˚F • Electric

Furnaces, Ovens & Baths, Inc.
P.O. Box 900 • Clarkston, MI. 48347
Cell: 248-343-1421 • Web: www.fobinc.com

FOR SALE

TORQUE DIGITAL TOOLS

- Digital torque drivers up to 44 lbf-in
- Ratchet & adjustable digital torque wrenches up to 147 lbf-in
- High accuracy
- Programmable torque presets
- Selectable: ozf-in, lbf-in, kgf-cm, N-cm
- NIST-Traceable Calibration Cert included

800-373-9989
www.imada.com

IMADA, Inc.® ISO9001 & ISO/IEC 17025 Accredited

Contact Becky McClelland at 412-306-4355 to place an Industrial Heating ad in print or online

Since 1936

THE W.H. Kay COMPANY

Used Heat Treating Furnaces and Ovens

ATMOSPHERE GENERATORS

750CFH	Endothermic Ipsen	Gas
800CFH	Endothermic Surface	Gas
1,000CFH	Exothermic Gas Atmos.	Gas
1,500CFH	Endothermic Lindberg (Air)	Gas
2,000CFH	Ammonia Dissoc. Drever (3)	Elec
3,000CFH	Endothermic Lindberg (3) - Air	Gas
3,600CFH	Endothermic Surface (2)	Gas
5,600CFH	Endothermic Surface (2)	Gas
6,000CFH	Gas Atmos. Nitrogen Generator	Gas

BOX FURNACES

12" × 24" × 10"	Lindberg (Atmos.)	Elec 2000°F
12" × 24" × 10"	Lindberg (Atmos.)	Elec 2500°F
12" × 24" × 12"	Hevi Duty (2)	Elec 1950°F
12" × 32" × 12"	L&L (Retort)	Elec 2000°F
13" × 24" × 12"	Electra Up/Down	Elec 2000°F
17"×14.5"×12"	L&L (New)	Elec 2350°F
18" x 30" x 13"	Hevi-Duty	Elec 1850°F
18" x 36" x 18"	Hevi Duty	Elec 2000°F
18" x 36" x 18"	Lindberg (Fan)	Elec 1850°F
20" x 48" x 12"	Hoskins	Elec 2000°F
24" × 36"× 20"	L&L Up/Down	Elec 2000°F
24" × 48"× 20"	Lindberg	Elec 2200°F
36" × 36"× 48"	Grieve "Top Load"	Elec 2000°F
36" × 72"× 42"	Eisenmann (Car Bottom)	Gas 3100°F
60"×216"×48"	IFSI (Car Bottom)	Gas 2400°F
60"×156"×60"	Lindberg Car Bottom	Gas 1850°F
126"×420"×72"	Drever "Lift-Off" (2) (Atmos.)	Gas 1450°F

PIT FURNACES

14" Dia × 60"D	Procedyne Fluid Bed	Elec 1850°F
28" Dia x 48"D	Lindberg	Elec 1250°F
28" Dia x 48"D	L&N Nitrider	Elec 1200°F
28" Dia x 48"D	Lindberg	Elec 1250°F
72" Dia x 72"D	Flynn + Dreffein (2) (Atmos.)	Elec 1400°F
48" Dia x 60"H	"Bell" Nitrider (Retort)	Elec 1200°F

VACUUM FURNACES

24" × 36" x 18"	Hayes (Oil Quench)	Elec 2400°F
24" x 36" x 24"	TM - Temper	Elec 1400°F
48" x 48" x 24"	Surface (2-Bar)	Elec 2400°F
48" x 48" x 36"	Ipsen "Like New"	Elec 2400˚F
60" Dia x 96"H	Ipsen "Bottom Load"	Elec 2400˚F
72" Dia x 96"H	Abar "Bottom Load"	Elec 2400˚F

INTEGRAL QUENCH FURNACES

24" × 36" × 24"	AFC (Top-Cool-Line)	Elec 1850°F
30" × 48" × 20"	Surface (2)	Gas 1750°F
30" × 48" × 24"	Surface	Gas 1750°F
36" × 48" × 36"	Surface	Gas 1750°F

BELT FURNACES/OVENS

24" × 18'L	Thermal Basic Belt Line	Gas 1750°F
32" × 24' × 12"	OSI Slat Belt	Gas 450°F
36" × 24' × 8"	Surface Cast Belt (Line)	Gas 1750°F
60" × 40' × 14"	GE Roller Hearth (Atmos)	Elec 1650°F
60" × 40' × 14"	Wellman Roller Hearth (Atmos)	Elec 1650°F

MISCELLANEOUS

Combustion Air Blowers (All sizes)		
24" × 36"	Lindberg Charge Car (Manual)	
30" × 48"	Surface Charge Car (SE-ER)	
SBS Air/Oil Coolers (4)		
24" × 36" × 24"	Salt Quench Tanks (2)	Elec 1000°F
30" × 48" × 30"	Surface Washer	Gas
36" × 48" × 36"	Surface Washer	Gas
(2) Bell & Gossett "Shell & Tube" Heat Exchangers		
26" x 15' x 15"	Belt Washer/Dryoff	Gas
36" x 48"	AFC Charge Car (DE)	Elec
24" Wide Table	Surface rotary Hearth	Gas 1750°F

MISCELLANEOUS *(continued)*

30" x 30" x 30"	Subzero	-105 to 375˚F Elec.
SBS Air/Oil Coolers (4)		
AFC Pusher Line (Atmos.)		Gas 1750˚F
36" Wide Table – Rotary Hearth (Atmos.)		Elec 1850˚F
30" x 48"	Surface Roller Table	
36" x 48"	Holcroft Charge Car (DE)	
48" x 60" x 60"	Steel "Roll-in" Carts (3)	
54" Dia x 108" H	Ebner Bell (Atmos.)	Gas 1650˚F

OVENS/BOX TEMPERING

8" × 18" × 8"	Lucifer	Elec 1250°F
12" × 16" × 18"	Lindberg (3)	Elec 1250°F
14" × 14" × 14"	Blue-M	Elec 1050°F
14" × 14" × 14"	Gruenberg	Elec 1200°F
14" × 14" × 14"	Blue-M	Elec 650°F
14" × 14" × 14"	Gruenberg (solvent)	Elec 450°F
15" × 24" × 12"	Sunbeam (N_2)	Elec 1200°F
20" × 18" × 20"	Blue-M	Elec 400°F
20" × 18" × 20"	Despatch	Elec 650°F
20" × 18" × 20"	Blue-M	Elec 650°F
20" × 18" × 20"	Blue-M (2)	Elec 800°F
22" × 18" × 15"	Precision Quincy	Elec 1000°F
24" × 20" × 20"	Blue-M	Elec 1000°F
24" × 24" × 24"	Grieve	Elec 650°F
24" × 24" × 36"	New England	Elec 800°F
24" × 24" × 48"	Blue-M	Elec 600°F
24" × 36" × 24"	Grieve	Elec 500°F
24" × 36" × 24"	Demtec (N_2)	Elec 500°F
24" × 36" × 24"	AFC (N_2)	Elec 1250°F
24" × 36" × 24"	Trent	Elec 1400°F
25" × 20" × 20"	Blue-M	Elec 650°F
24" × 36" × 48"	Gruenberg	Elec 500°F
25" × 20" × 20"	Blue-M (Inert)	Elec 1100°F
26" × 26" × 38"	Grieve (2)	Elec 850°F
30" × 30" × 60"	Gruenberg	Elec 450°F
30" × 30" × 48"	Process Heat	Elec 650°F
30" × 38" × 48"	Gruenberg (Inert) (2)	Elec 450°F
30" × 48" × 30"	Surface (3)	Elec 1400°F
30" × 48" × 30"	Surface	Gas 1250°F
30" × 48" × 36"	Surface (Atmos)	Elec 1400°F
30" × 48" × 30"	Surface	Elec 1250°F
36" × 36" × 36"	Grieve (Solvent)	Elec 500°F
36" × 36" × 36"	Blue M Enviroment Chamber (-18˚C to +93˚C)	
36" × 42" × 72"	Gruenberg	Elec 450°F
36" × 48" × 36"	Pollution Control Burn Off	Gas 850°F
36" × 48" × 36"	Grieve	Elec 350°F
36" × 48" × 36"	Despatch (Horizontal Quench)	Elec 1200°F
36" × 48" × 36"	AFC	Gas 1250°F
36" × 36" × 60"	Despatch	Elec 500°F
36" × 48" × 36"	TPS (Environmental) Elec -40˚C to +200˚C	
36" × 60" × 36"	CEC (2)	Elec 650°F
36" × 84" × 36"	Lindberg (1996)	Gas 800°F
37" × 25" × 37"	Despatch	Elec 500°F
37" × 32" × 48"	Hotpack	Elec 750°F
38" × 20" × 26"	Grieve	Elec 500°F
42" × 72" × 36"	Despatch	Elec 1350°F
48" × 48" × 20"	Lindberg (Hyd. Press)	Elec 1250°F
48" × 34" × 52"	Heat Mach. (2)	Elec 500°F
48" x 48" x 48"	TPS - Environmental	Elec 392°F
48" x 48" x 48"	Trent	Elec 1250°F
48" x 52" x 60"	Despatch	Elec 500°F
48" x 48" x 60"	Grieve	Elec 350°F
48" x 48" x 72"	Despatch	Elec 650°F
48" × 72" × 36"	Lindberg - Car Bottom	Elec 1600°F
50" × 50" × 50"	Grieve	Elec 1250°F
55" × 30" × 60"	Precision Quincy	Elec 350°F
60" × 96" × 72"	OSI	Gas 500°F
68" × 72" × 72"	Gruenberg (3)	Elec 450°F
72" × 120" × 78"	Grieve	Gas 500°F
72" × 252" × 60"	Precision Quincy "Car Oven"	Gas 500°F
84" × 96" × 84"	Precision Quincy	Gas 500°F
108" × 96" × 65"	Eisenmann (4)	Gas 1200°F

30925 Aurora Road • Cleveland, Ohio 44139 • (440) 519-3800 Fax (440) 519-1455

web: www.whkay.com e-mail: sales@whkay.com

EQUIPMENT FOR SALE

2 Locations to Better Serve You

We Have Over 500 Pieces of Equipment in Stock
If your needs are not listed below, please let us know and we will locate a furnace/oven to suit your needs. We have all the ancillary equipment available for the above such as Tempering Furnaces, Washers, Charge Cars and Endo Generators.

Price is what you pay. Value is what you get. –*Warren Buffett*

CAR BOTTOM FURNACE
Gas Fired Car Bottom Furnace, 10' wide x 25' long x 8' high, 1,650°F, 18,000,000 BTUH, 16 North American Burners, 3 zones of control, 440V, 3 Phase, 60 Cycle complete with controls.

BEAVERMATIC
Beavermatic Gas Fired Car Bottom Furnace, 4' wide x 6' long x 4' high, 1,400°F max., 15,000 LB capacity, finer lined, powered car complete with ceramic piers, exhaust, blower and Honeywell controls.

BEAVERMATIC
Beavermatic Gas Fired Car Bottom Furnace, 5' wide x 12' long x 5' high, 1,400°F max., 30,000 LB capacity, fiber lined, powered car complete with ceramic piers, exhaust, blower and Honeywell controls.

ABAR
ABAR HORIZONTAL VACUUM FURNACE, 2 BAR, 24"W X 18"H X 36"L, 2,400°F, 1,000 LBS, 150 KW complete with Nitrogen or Argon Atmosphere, Spencer Blower, Varian Diffusion Pump, Stokes Mechanical Pump, Roots Blower Moly Elements, controls, circular hot zone and loader.

ABAR
ABAR HORIZONTAL VACUUM FURNACE, 2 BAR, 24"W X 24"H X 36"L, 2,400°F, 1,000 LBS, 150 KW complete with Nitrogen or Argon Atmosphere, Spencer Blower, Varian Diffusion Pump, Stokes Mechanical Pump, Roots Blower Moly Elements, controls, circular hot zone and loader.

INDUSTRIAL HEATING EQUIPMENT
Industrial Heating Equipment Gas Fired Mesh Belt Furnace, 24"W x 10"H x 22'L, 500,000 BTUH, 950°F c/w controls.

PARK THERMAL
Park Thermal Gas Fired Box Furnace, 3' W x 3' H x 4' L, 1,200°F, 500,000 BTUH, pneumatic vertical rising door, powered rollers and controls.

PARK THERMAL
Park Thermal Electric Salt Bath Nitriding System complete with 30" Dia. X 36" deep Pre-Heat Furnace, Nitriding Salt Bath, 38" x 38" x 30" deep Oxidation Quench Tank, 30" x 40" x 36" deep Oxidation Quench Tank, 2 Wash Tanks, 3 Rinse Tanks, 4 Air Cool Stations and Controls.

PARK THERMAL
Park Thermal Gas Fired Mesh Belt Furnace, 17-1/2"W x 7"H x 15' 8"L, 375,000 BTUH, 900°F c/w controls.

PROCESS HEAT
Gas Fired Furnace, 7'W x 5'H x 7'L, [illegible] p. 1,250°F, 10,000 Lb[illegible] ity Profiles and contr[illegible] **SOLD**

SALT BATH TRANSFORMERS
WPI Main Aluminum Scott T Dry Type Transformer, 250 KVA, 460 VAC 3 PH Primary, 60 HZ, 25/28/31/34/37/40 VAC 2 PH Secondary
WPI Teaser Aluminum Scott T Dry Type Transformer, 250 KVA, 460 VAC 3 PH Primary, 60 HZ, 25/28/31/34/37/40 VAC 2 PH Secondary

SURFACE COMBUSTION
Surface Combustion Gas Fired Mesh Belt Furnace, 42"W x 12"H x 36[illegible] BTUH, 2 zones, 3 fans [illegible] **SOLD**

SURFACE COMBUSTION
Electric Batch/Oil Quench Furnace, 30" W x 30" H x 48"L, Max. Temp. 1,950°F, System 1 Rear Handler, 3500 Gal. Quench Tank, 2 Agitators & Controls.

AFC - HOLCROFT
(2) INTEGRAL QUENCH FURNACES, 36"W x 30"H x 48"L, 1,800°F Max, Recuperated with Top Cool, Rear Handler, Oil Heaters (54kW), Re-Circ. Fan, Control System.

SURFACE COMBUSTION
(2) INTEGRAL QUENCH FURNACES, 30"W x 30"H x 48"L, 1,750°F, 1,000,000 BTUH, Trident Tubes, Endo/Natural Gas/Ammonia, SSI Atmosphere Controllers, SSI Gold Probes, Oil Filters And SBS Coolers. System Comes Complete with a Gas Fired Temper, Washer and Charge Car.

SURFACE COMBUSTION
INTEGRAL QUENCH FURNACE, 5000 lb. Payload Each, 36"W x 36"H x 72"L, Recuperated Rear Handler And Controls.

SURFACE COMBUSTION
INTEGRAL QUENCH FURNACE, 10,000 lb. payload, 87" W x 87" L x 36" H, 1,850°F, 4,600,000 BTUH, 12,500 Gallons, 6 Agitators, Eclipse Burners, 3 Rear Handlers & Controls with PLC.

HUBER
Huber Gas Fired Car Bottom Furnace, 10'-4"W x 8'H x 12'-8"L, 1,800°F, 5,200,000 BTUH and controls.

HOLCROFT
Holcroft Gas Fired Mesh Belt Furnace, 24"W x 9"H x 14' 8"L, 400,000 BTUH, 750°F c/w controls.

★ Visit us online at: www.parkthermal.com ★

Park Thermal International (1996) Corp.
62 Todd Road, Georgetown, ON L7G 4R7 | 257 Elmwood Ave., Suite 300, Buffalo NY 14222-2249
Tel: (905) 877-5254 • Fax: (905) 877-6205 • Toll Free: (877) 834-HEAT (4328)
Email: jmistry@parkthermal.com • Website: www.parkthermal.com
Since 1938

FOR SALE

FOR SALE
Surface Combustion Super Allcase
36" x 48" x 30" • Gas Fired
1750˚F System 1 • 3 Available
Furnaces, Ovens & Baths, Inc.
P.O. Box 900 • Clarkston, MI. 48347
Cell: 248-343-1421 • Web: www.fobinc.com

EQUIPMENT FOR SALE

Mowry Enterprises, Inc.
New ★ Used ★ Rebuilt ★ Solutions

★ FOR SALE ★

Ipsen H4848 6 Bar: 30 x 36 x 48, new graphite hot zone, Internal quench

Abar HR 34-60 : 24 h x 24 w x 60 d, 2 Bar Graphite hot zone, high vac port

Surface 20 22 36 2 bar, High vacuum, Graphite hot zone,

Heat Source 2 Bar, 1800˚C, 20 w x 10 h x 30 dep, Graphite, with debind, new PLC touch screen controls

Abar HR 26 2 Bar: 2400˚F, 18" x 24" x 36" graphite hot zone, High vacuum, 2 bar Pressure Quench

C.I. Hayes 24 x 24 x 36 Vacuum Temper: 1450˚F

Borel 18 x 24 x 36 Hydrogen Retort Furnace: 1832˚F

TM 12 x 12 x 20: graphite hot zone, high vacuum, internal quench, 5 psig positive quench

www.mowryenterprises.com
email: grm@mowryenterprises.com
Phone: 978-808-8634 Fax: 508-845-4769

INDUSTRIAL HEATING

The International Journal of Thermal Processing

AUGUST 2018

Connected Plant

Coming in October | Ad Closing: August 30

FREE SHOW/TECHNOLOGY PROFILE IN SHOW TABLOID

PLUS

- China Edition
- FNA Bonus Distribution

... And MORE!

See reverse for details...

OCTOBER IS FNA 2018 SHOW ISSUE #2

INSIDE

Select Item

FNA 2018 IS TECHNOLOGY EQUIPMENT & TRENDS PAGES 21-24

FNA 2018

Periodical Class

www.industrialheating.com · A bnp media Publication · Vol. LXXXVI · No. 8