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ISSUE FOCUS ///

FORGING / MAINTENANCE

OPTIMIZING FORGING MACHINE PRODUCTIVITY, LONGEVITY

COMPANY PROFILE ///

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FROM THE EDITOR ///



Forging and maintenance – important heat-treating areas

When it comes to forging, heat treatment of some kind is more than likely involved. That's why *Thermal Processing* takes at least one issue a year to focus on this important manufacturing process.

Forging has been used to shape and form metal for thousands of years, and it continues to be a useful tool in modern machine shops around the world.

Our August issue serves up a few articles that deal with forging from a couple of different aspects, as well as maintenance solutions.

In our main cover article, frequent contributor Del Williams looks at optimizing the productivity and longevity of forging machines. The article explains how a forging equipment OEM's "health check" and ongoing preventive maintenance program has helped forgers optimize production and keep their equipment online even when faced with high turnover.

Forging is also used quite heavily in the aerospace market. Our second forging article deconstructs the aerospace forging market and how it may hold numerous opportunities in the future.

This issue also includes a look at how augmented reality is helping to assist in the manufacturing process.

Many companies are concerned about the ecological impact their businesses may have on the environment. To address this concern, they are pursuing avenues to help protect the world we live in.

With that in mind, our heat-treating audience may also find some solutions to that challenge in my conversation with SECO/WARWICK CEO Sławomir Woźniak. In the Q&A, he talks about how his company is offering greener technology, as well as ensuring the company itself is making great strides in lowering its overall carbon footprint.

Our columnists have put together some fascinating reads on various heat-treating topics this week as well, so please make sure you give those an in-depth read.

All that and more awaits your attention, so I hope you enjoy reading it as much as I did putting it all together.

As always, thanks for reading!

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UPC-Marathon, a Nitrex company, replaced an outdated endo generator for an automotive manufacturer in Brazil. (Courtesy: Nitrex)

UPC-Marathon replaces endo generator in Brazil

UPC-Marathon, a Nitrex company and a leading provider of process control solutions for the heat-treatment industry, successfully commissioned an endothermic gas generator for a major automotive manufacturer in Brazil. This achievement marks UPC-Marathon's entry into the supply chain of a renowned automotive industry player.

UPC-Marathon replaced an outdated endo generator at the manufacturer's transmission plant, which supplies gears for well-known vehicle brands. Recognizing the need to optimize process efficiency and meet evolving industry requirements, the manufacturer invested in a UPC-Marathon EndoFlex generator with a 200 M3H flow capacity to enhance its carburizing process

and achieve unparalleled performance in operations.

The decision to choose UPC-Marathon as the preferred supplier was based on several key factors. The manufacturer sought improved energy and gas efficiencies, and by opting for the EndoFlex, they anticipate a 50 percent increase in energy efficiency. Additionally, the new generator streamlines maintenance procedures, complies with stringent quality standards, and reduces CO2 emissions, aligning with the manufacturer's vision for sustainable growth.

UPC-Marathon's strong presence in Brazil also played a crucial role in securing this order. With a proven track record and successful installations nationwide, UPC-Marathon emerged as the sole provider capable of delivering a technologically advanced next-generation generator that meets the manufacturer's current and future needs.

"This marks our first partnership with this Brazilian automotive manufacturer,

and the successful commissioning of the endo generator is a significant milestone," said Marcio Boragini, UPC-Marathon's local representative. "We are pleased to hear positive feedback from the ground crew who have firsthand experience with the generator. Their endorsement of its seamless operation, user-friendliness, and simplified maintenance further confirms the exceptional performance and functionality of EndoFlex."

The turnkey system was successfully commissioned in May 2023.

MORE INFO www.nitrex.com

Can-Eng adding roller hearth iso-thermal annealing line in NC

Can-Eng Furnaces International LTD, has secured a contract for a roller hearth iso-thermal annealing line for an American producer of steel automotive impression forgings in North Carolina.

The system will be capable of both iso-thermal annealing and normalizing consisting of a high-temperature furnace



Installation of a Can-Eng roller hearth iso-thermal annealing line for an American producer of steel automotive impression forgings will begin in Q2 2024. (Courtesy: Can-Eng Furnaces International LTD)



SEND US YOUR NEWS Companies wishing to submit materials for inclusion in Thermal Processing's Update section should contact the editor, Kenneth Carter, at editor@thermalprocessing.com. Releases accompanied by color images will be given first consideration.



Conrad Kacsik completed a multiple burner control system upgrade for a manufacturer in the rail and transit industry. (Courtesy: Conrad Kacsik)

operating under EXO atmosphere, a separate low-temperature roller hearth furnace, automatic bin dump and loading system, integrated tray/basket return system, and level II automation technology. Installation of the equipment will begin in Q2 2024. This is the fourth contract awarded to Can-Eng in recent years; the previous three were configured as a mesh belt normalizing furnace, cast link belt normalizing furnace, and a roller hearth iso-thermal annealing furnace.

MORE INFO www.can-eng.com

Conrad Kacsik revamps burner control system

Conrad Kacsik Instrument Systems Engineering Division recently completed

a multiple burner control system upgrade for a manufacturer in the rail and transit industry.

The system is comprised of a new control panel containing a touchscreen operator interface controlled by a Honeywell HC900 integrated with Specview HMI software. The project also included the addition of blocking valves before each burner and the installation of new flame safety relays that allow independent operation. In the event of a single burner failure, the addition of blocking valves coupled with a new control scheme allows continued operation of the remaining burners.

Furnace operation can be controlled via the touchscreen computer in the control panel or remotely from a networked computer located within the heat-treat office.

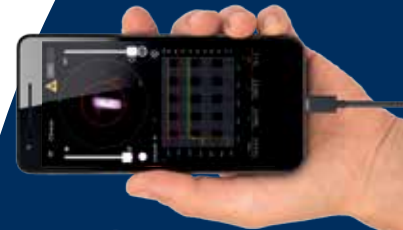
MORE INFO www.kacsik.com

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Solar Atmospheres hosted more than 40 high school students enrolled in the Summer Engineering Institute (SEI) at Lehigh University. (Courtesy: Solar Atmospheres)

Lehigh's engineering students tour Solar Atmospheres

Solar Atmospheres hosted more than 40 high school students enrolled in the Summer Engineering Institute (SEI) at Lehigh University.

The SEI program, under the guidance of director Dr. Laura Moyer, is a two-week residential program running two sessions back-to-back. Students are nominated by faculty of local high schools, and the program specifically targets under-represented groups including girls, first-generation students, and students who might otherwise have limited opportunities to study in the fields of science, technology, engineering, and math (STEM).

Solar Atmospheres provided a tour of the campus, exhibiting materials and processes for intriguing applications in a variety of markets. The students experienced a manufacturing setting encompassing related topics from their curriculum, gaining a better understanding of heat treating and manufacturing, and how cutting-edge technology reshapes centuries-old processes.

MORE INFO www.solaratm.com

Wind power plant maker picks Seco/Warwick for furnace

A recognized manufacturer of wind power plants has chosen a vertical vacuum furnace from Seco/Warwick designed to perform low-pressure carburizing for the large structural elements (gearboxes) used in wind power plants.

The solution on order combines the advantages of two technologies: atmospheric and vacuum processing. The furnace is designed for low-pressure carburizing oversized parts, made possible due to a very large, vertical heating chamber, while the furnace pit structure saves space in the production facility.

“The Pit-LPC technology is a modern alternative to atmosphere carburizing. Its main advantage is the ability to carry out efficient and effective carburizing in a much shorter time than in atmospheric furnaces,” said Maciej Korecki, vice president of the Seco/Warwick Group's Vacuum Segment. “The vacuum processing solution provides more than twice the productivity, and consequently lower process costs and a quick investment return. This technology increases the safety for users, because it does not involve explosive and flammable

gases. LPC eliminates direct CO emissions from the carburizing atmosphere, and makes the solution ‘green.’

“There is no doubt that the world is experiencing a climate crisis that requires decisive action. Renewable energy plays an important role in mitigating climate change. That is why it is important for us that we can support a partner who focuses on sustainable, renewable, and unlimited green energy.”

This is the first cooperation with this partner in the field of vacuum technology.

The main advantage of this furnace is the ability to open the furnace at process temperature at the end of the cycle. This is the advantage of atmospheric furnace technology implemented within a vacuum furnace. This type of solution combines the advantages of an atmospheric furnace with the advantages of a vacuum furnace, which include: elimination of the oxidation effect at the grain boundary, process purity, and heating uniformity. The product solves the problem of high energy and process gas consumption by the partner's old furnaces, and shortens the carburizing process, which significantly improves efficiency and production costs.

In 2021, 17 GW of wind capacity was installed in Europe, of which 11 GW were produced in European Union countries. According to a report published by WindEurope, maintaining the current pace of wind energy development will not be enough to meet the EU climate goals by 2030. Despite this, wind energy is one of the fastest growing branches of renewable energy.

The wind energy sector is under great pressure to reduce the cost of generating energy per megawatt hour. These expectations can be met by improving the turbine design to increase their operating parameters and reliability, while reducing maintenance costs.

“Wind turbine operators face the challenge of ensuring the reliability and full readiness of their equipment,” said Korecki. “Turbines experience difficult working conditions — at sea, in cold climates or in isolated places — that can adversely affect their efficiency and reliability. Therefore, it is extremely important that the parts used in their production are of the highest quality. Such quality is guaranteed by our vertical vacuum furnace. At the same time, we can reduce production costs while increasing quality. An additional advantage is the

furnace's energy savings, with this unique design provided by Seco/Warwick."

MORE INFO www.secowarwick.com

AHT increases gas nitriding size capabilities in Iowa

Advanced Heat Treat Corp. (AHT), a recognized leader in heat-treat services and metallurgical solutions, announced the addition of a new gas nitriding system at its corporate headquarters located in Waterloo, Iowa.

The investment increases AHT's Iowa location's size capabilities for gas nitriding, gas nitrocarburizing, and its trademarked heat-treat process for wear and corrosion, UltraOx®. The equipment can also be used for stress relieving.

The new gas nitride system, which is up and running, can accommodate parts up to

26 feet in height. The equipment will serve applications within the industries of plastics, oil and gas, hydraulics, and more.

AHT has expanded its gas nitriding services over the past couple decades, and even more so in the past couple years. AHT has invested in four new gas nitriding units since 2019 and has added more gas nitriding-related accreditations and specifications such as Nadcap, AMS 2759/6, AMS 2759/10, and AMS 2759/12.

"I am proud of what our team is accomplishing and look forward to growing our gas nitriding business even more," said AHT president, Mikel Woods. "Now we are able to better accommodate large and long parts at all of our nitriding locations."

The company has nitriding facilities in Waterloo, Iowa; Monroe, Michigan; and Cullman, Alabama. Their second location in Waterloo, Iowa, focuses on traditional heat treatment such as carburizing, induction hardening, through hardening, and more.

MORE INFO www.ahtcorp.com

Tenova revamps its electric arc furnace for ORI Martin

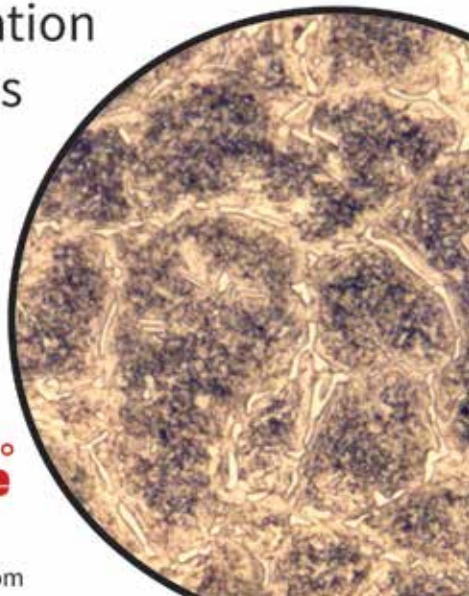
ORI Martin has awarded Tenova, a leading company in sustainable solutions for the green transition of the metals industry, a new contract to replace its electric arc furnace (EAF) at its mill in Brescia, Italy.

ORI Martin is one of the main European integrated steel groups which produces high-quality steel for the automotive, fastener, mechanical and building sectors.

This latest contract continues the decades' long partnership between the two companies which began in 1998, when ORI Martin commissioned Tenova's Consteel® EAF, making it the first Consteel in Europe at the time. It remains the most sustainable technology for melting steel to date. The revamping of ORI Martin's EAF highlights the group's ongoing commitment to evolve and innovate in its pur-

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suit of a sustainable steel sector.

In 2015, after more than 15 years of production, Tenova was contracted to modernize the Consteel unit, as well as install a heat-recovery system on the primary off-gas line exiting the new Consteel to recover the available thermal energy in the off-gas for the production of steam. The iRecovery® system continues to deliver thermal energy to Brescia's district heating grid during winter, as well as feeding an ORC turbo-generator to produce electric energy for ORI Martin's internal use. In 2019, Tenova partnered again with ORI Martin on the Lighthouse Plant "Acciaio_4.0", a pioneering project supported by the Italian Smart Factory Cluster which created a Cyber Physical Factory by integrating the Industry 4.0 technologies in the steelmaking process.

Tenova has now been contracted to revamp the 25-year-old EAF — a demonstration of the reliability of its technologies. With this new contract, ORI Martin will finalize the revamping of its plant, optimizing consumption and process for the safe production



ORI Martin and Tenova began their partnership in 1998 with the supply by Tenova of the first Consteel® in Europe. (Courtesy: Tenova)

of steel with minimal environmental impact.

The Brescia plant will also be ready for the installation of an electro-magnetic stirrer with Tenova's Consteerr® process, which will increase process efficiency. The Consteerr technology is an innovative electro-magnetic stirring system, developed through an exclusive worldwide partnership

with ABB. It offers significantly low operating costs, extremely reliable and safe operations, as well as superior quality steel. The Consteerr enhances the Consteel Evolution process with ABB's ArcSave® non-contact electromagnetic stirring of the furnace's liquid bath and can be customized to match the needs of different EAF process steps.

"We are delighted to continue this decades' long partnership with ORI Martin, which is a true testament to the reliability of Tenova's technologies and a great manifestation of ORI Martin's trust in our company," said Mario Marcozzi, Tenova Upstream Sales & Marketing Director.

"Sustainability has always been a core value at ORI Martin, as we have pursued strategies to protect the environment and facilitate a circular economy. As early as 1998, we were investing in technologies to mitigate our impact on the environment, which is how we came to Tenova, who has been a trusted and reliable partner throughout. With this latest generation Consteel EAF, we

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are confident ORI Martin will continue to be one of the most flexible, efficient, and environmentally friendly steel meltshops,” said Natale Gaudenzi, ORI Martin plant manager.

Start-up of the new furnace is scheduled for June 2024.

MORE INFO www.tenova.com

Solar Atmospheres Eastern PA adds new brazing facility

Solar Atmospheres recently commissioned a new 25,000-square-foot state-of-the-art brazing facility aimed at high-volume, high-quality braze production.

The facility boasts six vacuum furnaces dedicated to brazing, including a unique all-metal hot-zone furnace designed for brazing stainless steel to copper with silver and gold-based braze filler metal (BFM).



Solar Atmospheres Eastern PA specializes in the brazing of high-value components using filler metals based on nickel, silver, gold, and copper. (Courtesy: Solar Atmospheres)

Solar specializes in the brazing of high-value components using filler metals based on nickel, silver, gold, and copper.

“Solar provides high-quality brazing services for numerous markets, as well as braze-manufacturing services of turn-key components utilizing a large base of suppliers that are also customers,” said Mike Moyer, Solar’s vice president of Sales. “Over the last

40 years of brazing and heat treating, we have developed valuable relationships with some of the best and most capable manufacturers in the United States. This translates into unique resources that few others have in the marketplace.”

The new state-of-the-art production facility boasts 4,000 square feet of climate-controlled workspace where technicians assemble and inspect parts ranging from tiny capillary-tube manifolds to large land-based gas turbine blades. The operation incorporates increased capacity for helium-leak testing and pre-braze tack welding of braze assemblies.

“With Nadcap accreditation and AS9100 registration, our new facility operates as one expects from the Solar brand,” said Chip Lahneman, Solar’s general manager of brazing. “The investment in our new facility demonstrates Solar’s commitment to meeting our customers’ brazing needs, now, and in the future.”

MORE INFO www.solaratm.com

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Seco/Warwick Vector will aid jet engine repair in Serbia

Seco/Warwick will supply an industry leader providing maintenance and repair services for jet engines with a vertical vacuum furnace with bottom-loading and gas cooling.

The Vector® vacuum furnace will be used to process components for civil aircraft jet engines. Thanks to the internal cooling gas blower as well as internal heat exchanger, the furnace is characterized by compact construction and minimum space requirements. The furnace ordered is designed in accordance with the AMS2750G standard — in the second class (II) with B-type instrumentation, as required for the aviation industry.

“The aerospace/MRO industry is facing a major challenge. Interrupted supply chains and the difficult geopolitical situation in Europe means that many aerospace/MRO

companies have to revise their existing development and optimization strategies,” said Maciej Korecki, vice president of the Vacuum Segment at the Seco/Warwick Group. “Bringing the heat-treatment process in-house with the purchase of this vacuum furnace allows the company to fully control the production process, and may be the key to success. We also contracted a vacuum furnace for another company from the aerospace/MRO industry in Hungary. Seco/Warwick vacuum furnaces are used in the production of components for most civil aircraft around the world.”

Graphite insulation and wide heating elements ensure long-term and reliable equipment operation in industrial conditions. The following heat-treatment processes can be carried out in Vector furnaces: brazing, annealing, hardening, solution heat treatment, aging, tempering, and degassing. During cooling, the cooling gas circulation with the use of a unique nozzle array system optimizes and ensures uniform cooling of the treated parts.

The Vector on order gives the customer the opportunity to conduct very efficient and clean heat treatment processes such as brazing and annealing in high vacuum, ensuring the highest protection of the surface details when using high-alloy steels, thanks to the use of a graphite heating chamber and a diffusion pump. The capacity to carry out very efficient hardening processes is a great advantage. This is thanks to the use of cooling gas high pressures (6 bar).

Seco/Warwick has provided vacuum furnaces to companies in the aviation industry many times. The company has a large body of experience manufacturing vacuum furnaces with above-average quality. The furnaces operate well in even the most demanding sectors. Seco/Warwick furnaces for aviation are designed in accordance with the AMS2750G standard in the second (II) class.

With the new solution, the partner will increase production capacity at its repair facility in Serbia.

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Working Dim's	36" wide x 48" deep x 36" high
Flow Meters	Nitrogen, endo, natural gas, air
Controls	Allen Bradley PLC
General	System 1 rear handler



Williams Industrial Gas-Fired Temper Furnace u-3782

Max Temp	1450°F
Working Dim's	36" wide x 72" deep x 36" high
Power	480 V, 3-Phase, 60 Cycle, 40 Amp
Max Fuel Demand	1000 CFH, 800,000 BTU
Controls	SSI controls



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created by air evacuation) as the protective atmosphere for the heat-treated part surfaces. The vacuum furnace's main advantage is its versatility and the ability to carry out processes traditionally carried out in atmospheric furnaces. Differences in the vacuum furnace construction as well as the method of conducting the processes minimizes both media consumption and emissions to the environment, making the vacuum furnace itself a Seco/ECO solution when compared to traditional atmosphere furnaces.

Vacuum heat treatment's eco-friendly features include:

- » Perfect part surface quality (without additional operations).
- » No intercrystalline oxidation (no additional mechanical treatment).
- » No need to use protective gases (lower costs and emissions).
- » Minimal consumption of process gases (cost savings).
- » Minimum time for atmosphere preparation and conditioning (saving time and costs).
- » Zero startup and shutdown time, work on demand (saving time, costs).
- » No open flame, no risk of fire or explosion (safety).
- » Clean process, no part washing required (reduced environmental pollution).
- » Low heat and by-product emissions (limited global warming effect).
- » Environmentally friendly (zero pollution).
- » Zero CO2 emissions (carbon footprint reduction).

MORE INFO www.secowarwick.com

Solar Manufacturing ships furnace to firearms maker


Solar Manufacturing recently shipped a vacuum furnace to a firearms manufacturer based in the Midwest United States. The furnace will primarily be used to anneal firearm components.

The Model HFL-5748-2IQ furnace features a graphite insulated hot zone of 36" x 36" x 48" deep with a weight capacity of 5,000 pounds, and maximum operating temperature of 2,400°F. Solar Manufacturing also

assisted with the furnace installation.

"This was the first vacuum furnace our customer had purchased for their in-house heat treating," said Adam Jones, Midwest Regional sales manager for Solar Manufacturing. "We were awarded the project based on our ability to demonstrate our furnace technology would successfully process their parts with

the utmost in quality and reliability."

Solar Manufacturing designs and manufactures a wide variety of vacuum heat treating, sintering, and brazing furnaces and offers replacement hot zones, spare parts, and professional service. 

MORE INFO www.solarmfg.com

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- Touch Screen Capability

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INTERNATIONAL FEDERATION OF HEAT TREATMENT AND SURFACE ENGINEERING

Start making plans for Heat Treat 2023, one of many big conferences ahead

This event, co-located with IMAT 2023 and the Motion+Power Technology Expo in Detroit, is October 17-19 and is expected to cover many topics of interest. This is the 32nd ASM Heat Treating Society Conference and Exhibition.

At the present time, there are about 125 papers from international heat-treating professionals.

Since it is co-located with ASM's Annual Meeting, "International Materials, Applications and Technologies (IMAT)" Conference & Expo, Heat Treat will provide attendees with access to 100 materials-related exhibitors and more than 400 additional technical presentations and workshops. Also, attendees will have access to an additional 300 exhibitors with the co-located Motion+Power Technology Expo 2023.

There are numerous student/emerging professionals initiatives, including free college student registration, Fluxtrol Student Research Competition, and the new ASM Heat Treating Society Strong Bar Student Competition. This is an opportunity for young professionals and students to meet international heat-treating experts.

The technical program is available at www.asminternational.org/heat-treat/technical

28TH IFHTSE CONGRESS

November 13-16, 2023 | Yokohama, Japan

Sponsored by the Japanese Society for Heat Treatment, this wide-ranging conference offers participants the opportunity to network and hear presentations on a variety of topics, including thermal processing of steel, surface hardening additive manufacturing, and modeling and simulation of industrial processes.

» **Technical program info:** jsht.or.jp/ifhtse2023/IFHTSE2023Program.html

IMPORTANT DATES

» **Deadline of extended abstract:** August 25, 2023.

» **Deadline of full paper submission*:** September 29, 2023.

A special issue of JSHT is scheduled to be published in March 2024. Applicants can submit a full paper (refereed) to the special issue.



Heat Treat 2023 will be in Detroit along with the Motion+Power Technology Expo. (Courtesy: Shutterstock)

*Only the presenters of the 28th IFHTSE Congress can submit full papers for this special issue.

2ND BOSPHORUS INTERNATIONAL HEAT TREATMENT SYMPOSIUM

April 25-26, 2024 | Istanbul

BHTS'2024 — the 2nd Bosphorus International Heat Treatment Symposium will be at Istanbul's Halic Congress Center in cooperation with MISAD — Heat Treatment Industrialists Association and METEM — UCTEA Chamber of Metallurgical and Materials Engineers' Training Center.

With the scope of this symposium, a space will be created where the challenges in advanced heat-treatment technologies, current R&D studies, new developments, and different ideas will be discussed. Within this framework, local, foreign, and international companies are invited that want to exhibit their products, services, and exemplary applications to support them as participants. The symposium is in Turkish and English. Turkish-to-English simultaneous translation will be provided in all sessions.

IMPORTANT DATES

» **Abstract submission deadline:** October 13, 2023.

» **Deadline for papers:** January 19, 2024.

»More info: www.bhtsheat.com/en

29TH IFHTSE CONGRESS

September 30-October 3, 2024 | Cleveland, Ohio

The Congress takes place in concomitance with IMAT, ASM's annual meeting. Planning for this event is in progress. More information available soon.

IFHTSE FELLOWS TO BE PRESENTED IN YOKOHAMA

The following IFHTSE Fellows will be awarded at the 28th IFHTSE Congress in Yokohama, Japan:

»Professor Yoshinao Mishima, formerly Tokyo Institute of Technology, Japan: "In recognition of his study for improving the mechanical properties of heat-resistant metal materials by microstructure control, and contribution to the development of heat treatment technology and IFHTSE."

»Dr. U. Kamachi Mudali, Chairman and Chief Executive, Heavy Water Board, Department of Atomic Energy (DAE), Government of India: "In recognition of outstanding scientific contributions in corrosion and surface engineering of ferrous and non-ferrous alloys by innovative laser, ion beam, and chemical methods to achieve novel microstructures and improved corrosion resistance and development of high nitrogen stainless steels and high temperature ceramic coatings for aggressive corrosive environments."

MEMBER SPOTLIGHT

Technical University of Denmark

DTU is one of the highest ranked technical universities in Europe. At DTU, the goal is to educate, make innovative discoveries, generate entrepreneurial ideas for improving people's lives, and protecting the environment.

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IFHTSE is a federation of organizations not individuals. There are three groups of members: scientific or technical societies and associations, universities and registered research institutes, and companies.

IFHTSE 2023 EVENTS

OCTOBER 17-19, 2023

Heat Treat 2023

Detroit, Michigan | www.asminternational.org/web/heat-treat

NOVEMBER 13-16, 2023

28th IFHTSE Congress

Yokohama, Japan

SEPTEMBER 30-OCTOBER 3, 2024

29th IFHTSE Congress

Cleveland, Ohio | with IMAT and ASM's annual meeting

For details on IFHTSE events, go to www.ifhtse.org/events



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INDUSTRIAL HEATING EQUIPMENT ASSOCIATION

MEMBER SPOTLIGHT: TEECO

Knowledgeable support, timely service for industrial combustion systems



Thermal Energy Engineering Company (TEECO) aims to support its industry partners by bridging knowledge gaps and providing field support to ensure the most reliable equipment operations. (Courtesy: TEECO)

Thermal Energy Engineering Company (TEECO) is a service company focused on supporting industrial combustion systems across numerous disciplines. Whether it's baking cheesecakes, melting metals, milling minerals, or drying fertilizers and pet foods, TEECO's combustion professionals have experience in a wide range of process heating applications that uniquely equips them with not only the knowledge of the combustion systems themselves, but also an eye to understand the whole process to provide the best service possible, no matter the customer or the application.

While the industrial combustion industry is undergoing many changes with market volatility, personnel limitations, and manufacturer reliability, TEECO aims to support its industry partners by bridging knowledge gaps and providing field support to ensure

the most reliable equipment operation. The company's approach to success is to earn the trust and confidence of both OEMs and end users by providing dependable services that are knowledgeable, professional, and timely, to strengthen combustion and process reliability industry wide.

OEM SUPPORT

Industry trends over recent years have shown opportunities for OEMs to leverage the experience of vendors and contractors for specialized engineered systems and service to provide the most reliable equipment to their end user customers. TEECO's combustion background allows it to support OEMs from multiple approaches, including:



TEECO's combustion background allows it to support OEMs from multiple approaches. (Courtesy: TEECO)

BURNER APPLICATIONS ENGINEERING

TEECO's engineering team helps OEMs with:

- » Burner selection.
- » Gas train application and sizing.
- » Control system design.

EQUIPMENT PROCUREMENT AND ASSEMBLY

Design and assembly of

- » Gas trains.
- » Control panels.
- » Auxiliary components.

FIELD SERVICE

TEECO's service department travels nationwide to help OEMs perform:

- » Equipment startups.
- » Safety inspections.
- » Troubleshooting.
- » Burner tuning.
- » Instrument calibration.

END USER SUPPORT

» **Safety Audits and Service:** TEECO travels to end user sites nationwide to provide annual NFPA safety inspections and troubleshooting on various types of on-site equipment, as well as burner tuning to help customers achieve their gas efficiency and carbon emissions goals.

» **Process Engineering Consultations:** Leveraging years of experience with numerous applications to understand the entire production system upstream and downstream of the burner and lend expertise and advice to improve equipment efficiency, throughput, quality, and emissions.

» **Turnkey Retrofit Projects:** Providing engineered systems and installation services to replace outdated or failing equipment in the field, including gas trains, control panels, and more.

For more information on services offered or to begin your partnership with TEECO's team, contact them at info@thermeng.com or 864-832-2238.

IHEA CALENDAR OF EVENTS

AUGUST 21

Fundamentals of Industrial Process Heating

6 week online course | \$775 IHEA members / \$950 non-members

This course is designed to give the student a fundamental understanding of the mechanisms of heat transfer within an industrial furnace and the associated losses and the operation of a heating source either as fuel combustion or electricity.

AUGUST 24

Sustainability & Decarbonization Webinar Series – Ongoing Sustainability: Industry Best Practices

Carbon reduction is not a project, it is a process, and must be ongoing. Earlier sessions will help you determine your carbon footprint and understand ways to track and impact your carbon footprint. In this presentation, we will review methods and programs to ensure the continual improvement of your carbon reduction efforts.

OCTOBER 31

Safety Standards & Codes Seminar

Cincinnati, Ohio | \$800 IHEA members / \$975 non-members

This seminar is designed for individuals involved in the design, manufacture, service or operation of ovens, furnaces, kilns, dryers, thermal oxidizers and a wide range of industrial applications. It is intended to help the attendee become better acquainted with the newly updated NFPA 86 – Standard for Ovens & Furnaces.

OCTOBER 31

IHEA's Annual Combustion Seminar

Cincinnati, Ohio | \$800 IHEA members / \$975 non-members

Long the industry premier seminar for industrial process heating professionals, this two-day event offers attendees the chance to learn the latest in combustion technology and visit with industry suppliers during a tabletop exhibition the first day. The IHEA Combustion Seminar is designed for persons responsible for the operation, design, selection and/or maintenance of fuel-fired industrial process furnaces and ovens. Seminar speakers are industry leaders in the combustion industry. Presentations will be non-commercial and promote the technology overall, not a specific product or company.

For details on IHEA events, go to www.ihea.org/events

INDUSTRIAL HEATING EQUIPMENT ASSOCIATION

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Tools are available to simulate complex gear measurements after heat-treatment simulation.

Evaluating effect of heat treat on flank slope profile deviation of steel gears using simulation

The finish machining of a gear is undoubtedly one of the most important manufacturing steps. It sets the geometry, surface condition, and residual stress profile that will see service conditions. Many heat treatments exist that induce favorable compressive residual stresses in the near surface of the gear, improving fatigue life. However, a chain is only as strong as its weakest link and the situation is no different for a gear's working surfaces; its fatigue life is only as good as the smallest near-surface compressive stress. Given that most quench-hardening processes result in a nonuniform size change, the material which must be removed to ensure the gear is within the dimensional requirements must also be removed nonuniformly. Although the dimensions are brought within the tolerances specified by the gear designer, the final residual stress and hardness profiles are at the mercy of the amount of material which must be removed.

If properly executed, a case-hardening process such as carburization or induction hardening should induce compressive residual stresses from the surface to approximately the case-core interface. The compressive stress then transitions to a tensile stress just below the case-core interface. The residual stress state is in static equilibrium and any modification to the stress profile, by removing a layer of material for example, will create a state of nonequilibrium. To correct the nonequilibrium state, the residual stress will change. Much work has been done to evaluate the effects of grinding, one of the most common finishing operations, on the rebalancing of the residual stress profile in gears. Depending on the amount of material removed and the amount of material removed during each pass, the stress change can be minimal or significant. [1 – 4] In conjunction with the rebalancing, grinding processes can induce a temperature increase at the near surface of the workpiece due to frictional effects. If the temperature is kept sufficiently low, there will be no detrimental effects to the material's properties. As the surface temperature begins to approach 200°C however, several microstructural changes may occur. The first, depending on the tempering temperature employed after quench hardening, is the possibility to reduce the hardness and residual stress by over-tempering the component. If

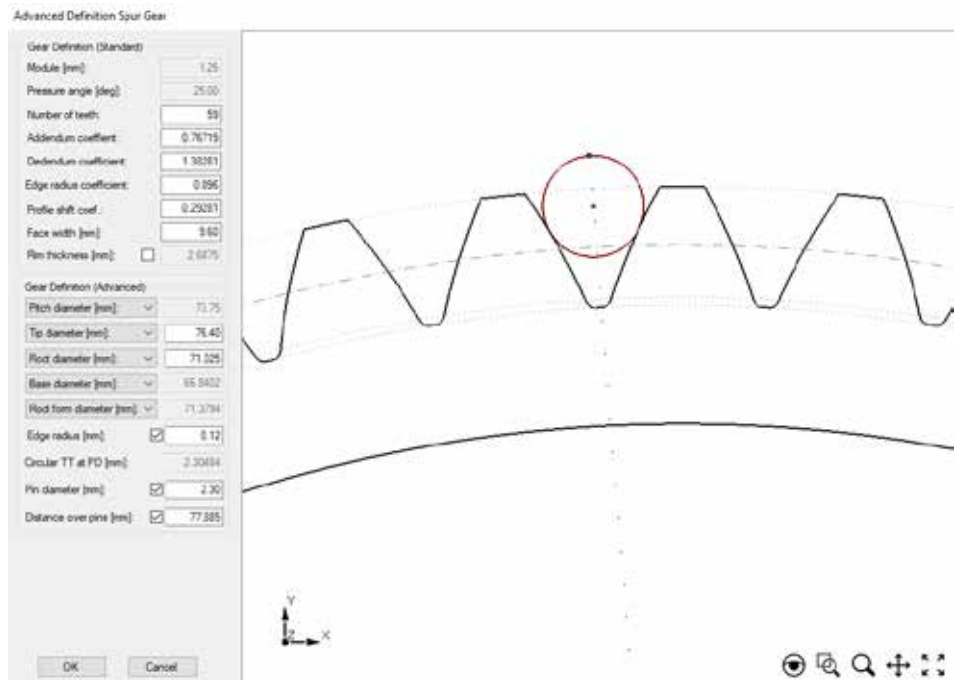


Figure 1: Gear parameters used to generate the 3D CAD gear model in IGD.



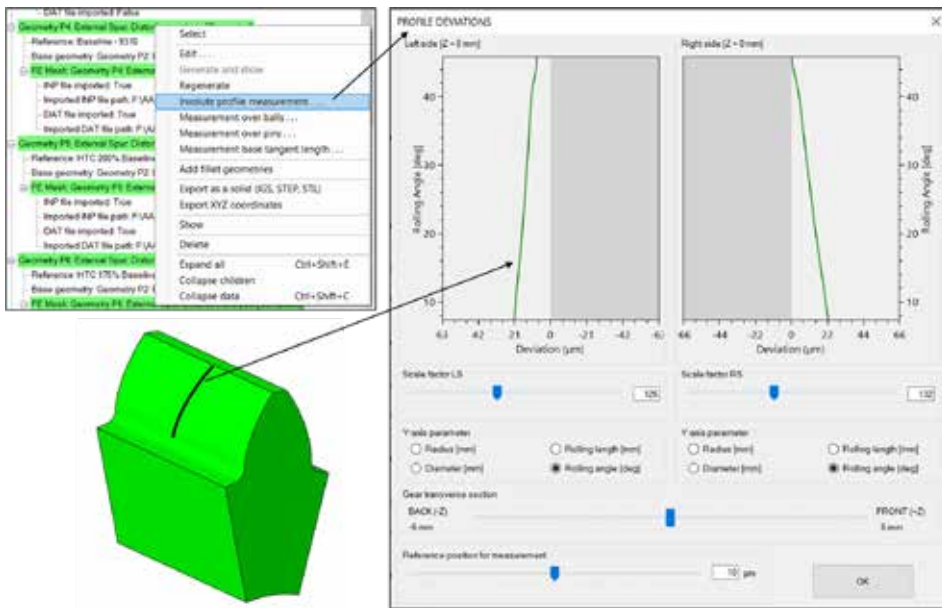


Figure 2: Slope profile deviation measurement tool in IGD.

the temperature continues to rise, significant stress relaxation may occur. If the temperature rise is not reasonably controlled, the temperature may get high enough to induce a phase change to austenite. An unintended phase change at this stage of the manufacturing process could result in catastrophic failure if the component is placed directly into service. [5 – 6]

The deviations to the tooth's flank slope profile are of the utmost importance to the gear's in-service performance; particularly with respect to contact stress, bending stress, wear behavior, and operational noise. Due to variations in a component's cross-sectional thickness and variations inherent to local-fluid behavior, most quenching processes will alter the slope profile of the tooth flank. This deviation must be corrected before the gear is able to enter service. [7 – 9] Heat-treatment simulation software, when combined with powerful post-processing algorithms designed to evaluate simulated gear distortion, can be an indispensable tool to design and process engineers. As discussed in the December 2022 Metal Urgency column

(<https://thermalprocessing.com/media/FlipBook/2022/1222/1222-TP.html#p=18>), the heat-treatment simulation software DANTE can predict the distortion and stress from the quench-hardening process of steel gears. Rochester Institute of Technology's software program, Integrated Gear Design (IGD), is a powerful pre- and post-processing software tool used for gear design and in-service performance evaluations. When the two softwares are used together, simulated gear distortion can be quickly and easily evaluated and compared to measurements of actual components. [10] This article will take advantage of the powerful capabilities afforded by the combination of the two software programs to evaluate the effects of different quenching conditions on the flank slope profile deviation of a spur gear made of carburized AISI 9310. The gear parameters used to generate the 3D CAD gear geometry in IGD are shown in Figure 1.

The heat-treatment process, simulated using DANTE and Abaqus, consisted of the following steps: austenitization, carburization, transfer from the carburizing furnace to the quench tank, oil quenching, and tempering. The focus of this study was to evaluate the effect of various quenching speeds on the flank slope profile deviation. A nominal oil quench was defined as the heat transfer coefficient (HTC) as a function of part surface temperature data set available as a generic HTC definition in DANTE. This curve was scaled by 25, 50, 75, 125, 150, 175, and 200 percent to account for different oil types or variations which may be present during a quenching process.

IGD was used to quickly evaluate the flank slope profile deviation of both flank surfaces, as shown in Figure 2. The data can be exported as an Excel file and further manipulated and compared. Figure 3 shows the slope profile deviation over the flank surface for five of the eight cases simulated; others removed for clarity. For the simulated geometry and processing conditions, the profile variation

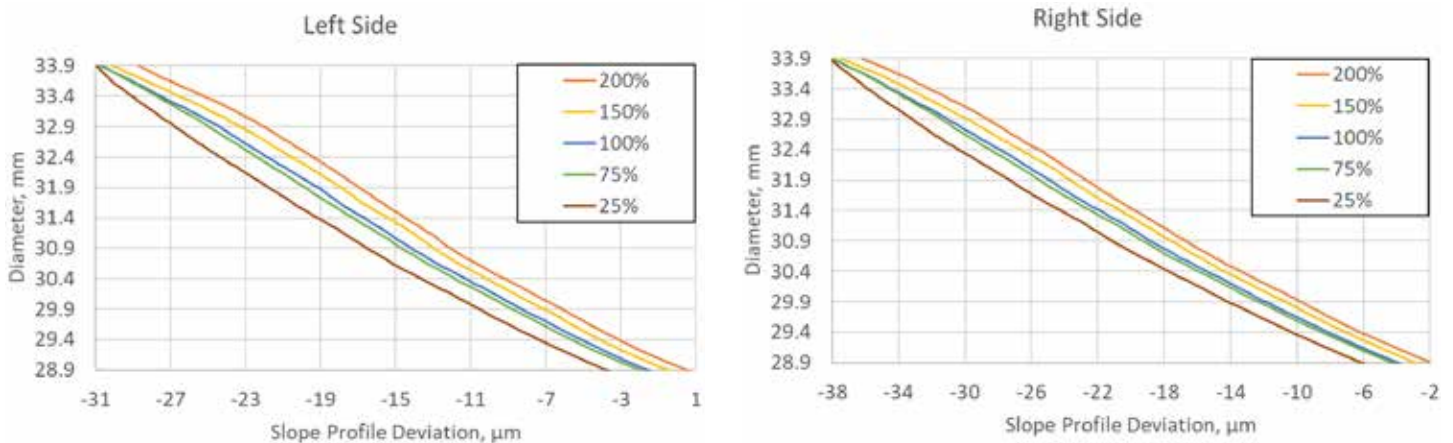


Figure 3: Slope profile deviation over the tooth flank for five simulated quenching conditions.

	25%	50%	75%	Nominal	125%	150%	175%	200%
RS	32.1	32.9	33.8	34.3	34.6	34.8	34.7	34.4
LS	27.2	28.1	28.8	29.3	29.6	29.7	29.6	29.4

Table 1. Total slope profile deviations for the eight simulated cases, in microns.

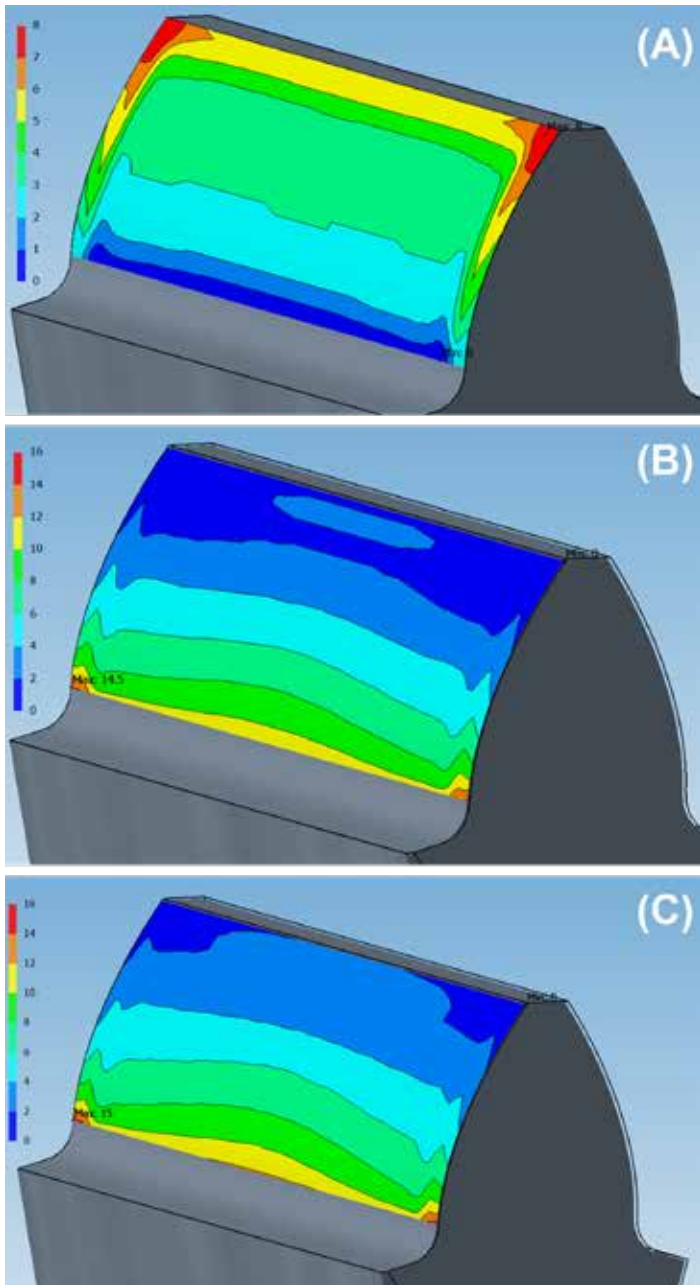



Figure 4: Contour maps of the slope profile deviation generated in IGD for the (A) minimum, (B) nominal, and (C) maximum quenching rates evaluated.

remained nearly consistent over the length of the flank between the cases, indicated by the near-parallel lines in Figure 3. However, at any given location on the flank there is an approximately 5 μm difference between the fastest and slowest cases evaluated. Depending on the case depth and the residual stress gradient, this may create inconsistent performance between supposedly similar gears. From Figure 3, much more material would need to be removed near the tooth tip, compared to the amount removed near the root to correct the slope profile.

The total slope profile deviation, a commonly reported value during quality assessments, can also be determined. Table 1 shows the total flank slope profile deviation for the eight cases evaluated. The slower quench rates significantly affect the total slope profile deviation, while the faster quench rates do not. However, from Figure 3 it is clear that the faster quench rates do have an effect on the size of the flank, which must be known to produce a dimensionally accurate final component. Figure 4 shows the contour maps of the left flank

slope profile deviation generated in IGD. Viewing the results over the entire flank helps illuminate differences between processing conditions and exactly how a flank profile is distorting.

Evaluating the slope profile deviation induced by various quenching conditions is just the first step in a full evaluation of the effects on hardness and residual stress. The next step would be to evaluate the effect of material removal on the residual stress and hardness, noting any conditions that result in an unfavorable condition. Finally, the new hardness, residual stress, and dimensions can be brought back into IGD to conduct tooth contact analysis and/or loading simulations to evaluate and compare various heat treatments on in-service performance.

In conclusion, IGD and DANTE can provide a powerful tool to evaluate the effects of heat treatment on gear properties and performance. DANTE lifts what was once considered a black box in heat treatment, revealing the causes and effects incurred during heat treatment of steel gears. Additionally, what was once considered a near impossible task by heat-treatment simulation software, IGD easily evaluates simulated gear distortion using the same measurements that are used in industry to assess gear quality. 

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ABOUT THE AUTHOR

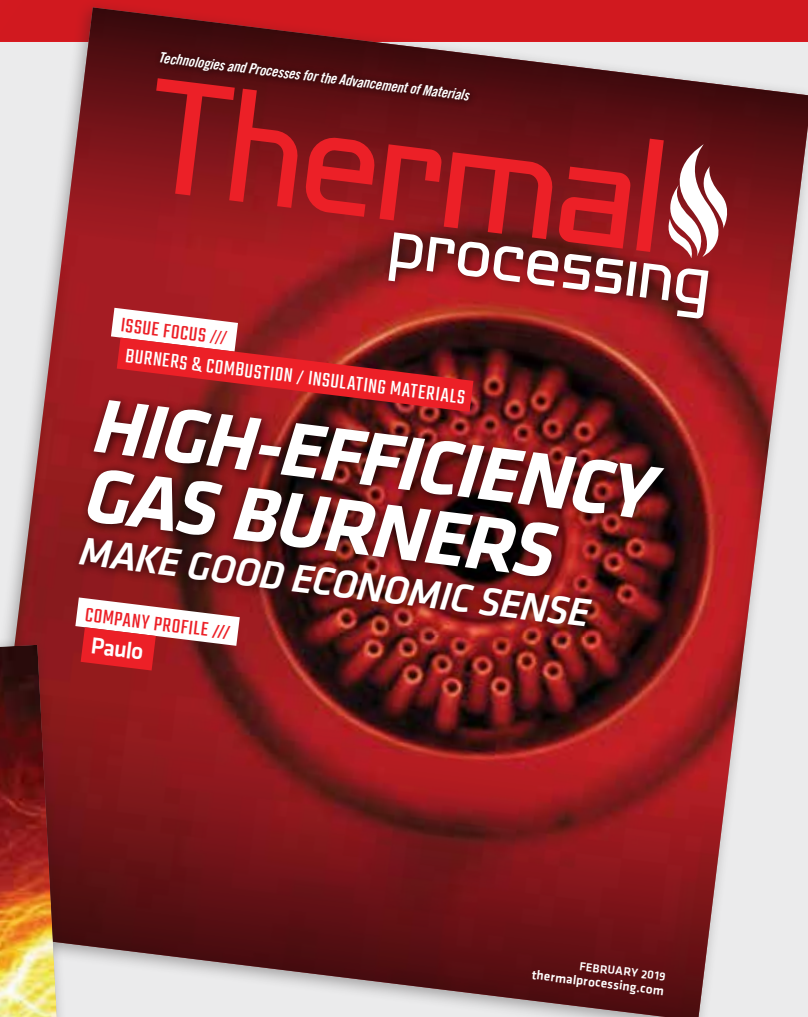
Justin Sims is a mechanical engineer with Dante Solutions, where he is an analyst of steel heat-treat processes and an expert modeler of quench hardening processes using Dante software. Project work includes development and execution of carburization and quench hardening simulations of steel components and analysis of heat-treat racks and fixtures. He has a mechanical engineering degree from Cleveland State University.

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The Segerberg Hardening Power for polymer quenchants is an empirical evaluation of the relative heat extraction rates of differing polymer quenchants.

Hardening power: A measure of quenching performance

In this column, we will discuss the Segerberg Hardening Power (HP) for polymer quenchants.

When comparing polymer quenchants, there are several things that we look at to make sure that it will quench our parts satisfactorily. First, we look at the cooling curve of the quenchant to make sure that it will properly quench our parts. A typical cooling curve of a polymer quenchant at different concentrations is shown in Figure 1. A table showing the specific values taken from the cooling curve is provided in Table 1.

After verifying that the quenchant will satisfy our required metallurgical properties, we look at other things, such as biostability, available corrosion inhibition, etc.

In this table, we see a value for the HP-IVF (polymer). In this article, the meaning of this value will be explained.

HARDENING POWER FOR POLYMER QUENCHANTS

Several decades ago, the late Sorin Segerberg of IVF in Sweden proposed the concept of hardening power for oils and polymer quenchants [1] [2]. During this time, cooling-curve testing was not truly established as an international or USA standard. It wasn't until about 1995 that the ASTM [3], and the ISO method [4] was established as the preferred method for cooling curve measurement.

In this analysis, immersion quenching of 16mm diameter x 48mm long cylinders of SAE 1045 were quenched in many different oil quenchants. Hardness was measured on the parts, and a regression analysis was performed on the results. For unalloyed steels, the formula for hardening power was determined to be:

$$HP = 91.5 + 1.34T_{VP} + 10.88CR_{550} - 3.85T_{CP}$$

Where TVP is the transition temperature between the vapor phase and the boiling phase (°C), CR550 is the cooling rate over the temperature range of 600 to 500°C (°C/s), and TCP is the transition temperature between the boiling phase and the convection phase (°C).

For polymer quenchants, a similar approach was taken. However, since in polymer quenchants the vapor phase is generally non-existent, and there is typically no sharp transition boiling and convection, a different type of equation was necessary. In this case, the equation was modified to examine the cooling rate at the ferrite/pearlite nose (CRP, °C/s), and the cooling rate at the martensite start temperature (Ms, °C):

$$HP = 3.54CR_P + 12.30CR_M - 168$$

For alloyed steels, the coefficients in each of the equations for oils and polymer will be different. As can be seen from the above equation, the cooling rate at 300°C will have a greater impact on the hardening power than will the cooling rate at 550°C, for the same range of values.

EFFECT OF COOLING RATES AT 550°C AND 300°C

To examine the relative effects of the cooling rates at 550°C and 300°C

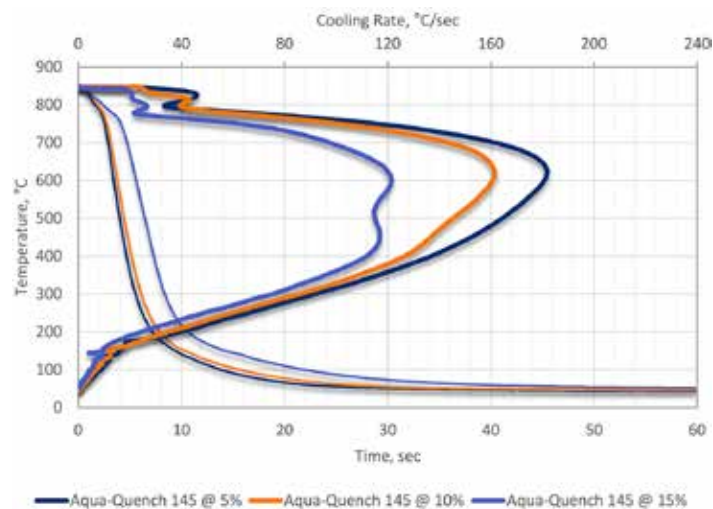


Figure 1: Cooling curves of Aqua-Quench® 145, a typical low-molecular weight PAG type polymer. Cooling curves measured using an ASTM D6200 probe, agitated in an ASTM D6259 agitation device (Tensi) at 40°C and 1,000 RPM.

Curve	Units	5%	10%	15%
Maximum Cooling Rate	°C/s	189.39	165.83	120.94
Temp. at Max. Cooling Rate	°C	599.1	613.95	618.56
Temp at Start of Boiling	°C	806.79	810.81	782.58
Temp at Start of Convection	°C	162.05	145.48	508.1
Cooling Rate at 300° C	°C/s	96.26	88.9	74.28
Time to 600° C	s	3.34	3.68	5.49
Time to 400° C	s	4.56	5.05	7.2
Time to 200° C	s	7.05	7.77	10.49
HP-IVF (polymer)		1798.98	1643.36	1319.83

Table 1: Specific values taken from the cooling curve.

in a polymer quench, on the hardness and microstructure, a simple design of experiments was created. In this DOE, the Cooling Rate at 550°C was varied from 100 to 200°C/s, and the Cooling Rate at 300°C was varied from 60 to 110°C/s. From these values, the hardening power was calculated, and cooling rate curves were created (Figure 2).

From the cooling rate curves, time-temperature curves were calculated (Figure 3). The time-temperature curves were then input into JMatPro [5] and the hardness and resulting phases were calculated. An SAE 1040 steel was used as the low hardenability would accentuate differences in cooling rate.

The results of the DOE are shown in Table 2.

Graphs showing the effect of the cooling rates at 550°C and 300°C

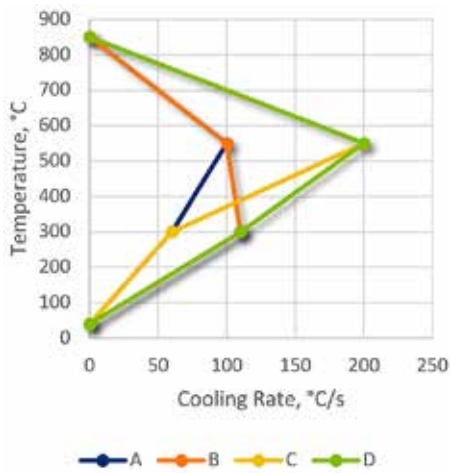


Figure 2: Cooling rate curves determined from DOE.

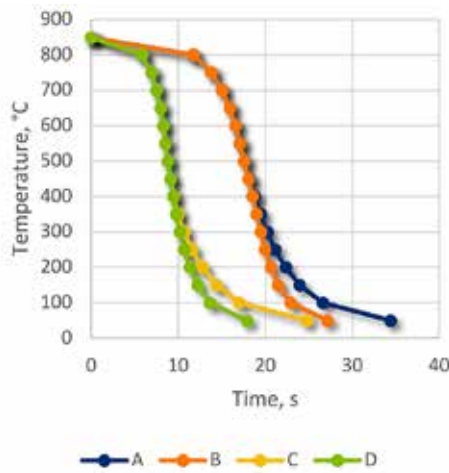


Figure 3: Time-temperature curves derived from the cooling rate curves.

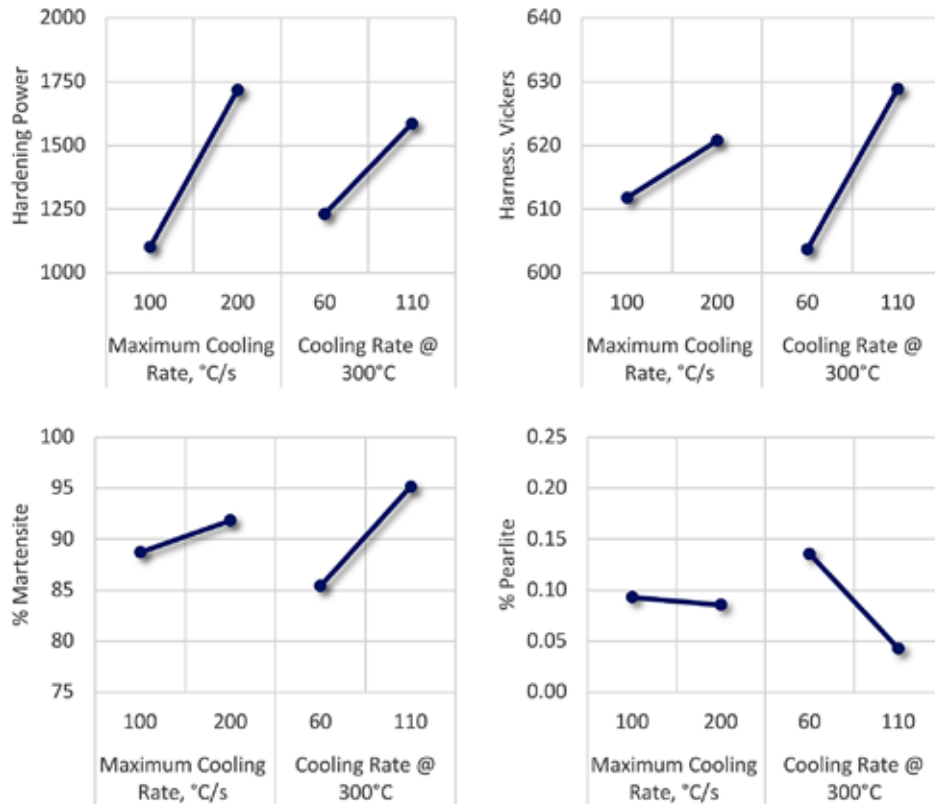


Figure 4: Results of DOE showing main effects of the cooling rates at 550°C and 300°C.


are shown in Figure 4.

The results of the DOE show that for the same value, the hardening power and hardness will increase more with the cooling rate at 300°C, than will the same amount at 550°C. As expected, the cooling rate at 300°C had a greater impact on the amount of martensite present, with increasing cooling rate at 300°C. Increasing the cooling

rate at 300°C also had the effect of reducing the amount of bainite present in the matrix after quenching.

CONCLUSION

In this article, the Segerberg Hardening Power for polymer quenchants was discussed. This is an empirical evaluation of the relative heat extraction rates of differing polymer quenchants, based on the cooling rates at the ferrite/pearlite nose (550°C) and the cooling rate at the martensite start temperature (about 300°C).

Increasing the cooling rate at 300°C increased the hardness and percent martensite formed, while decreasing the amount of bainite formed. Even though the maximum cooling rate was equivalent to a fast quench oil or faster, the cooling rate at 300°C was dominant for hardness and resulting microstructure in the matrix. 

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ABOUT THE AUTHOR

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Run	Max Cooling Rate (°C/s)	CR ₃₀₀ (°C/s)	HP	Hardness (Vickers)	% Austenite	% Ferrite	% Martensite	% Bainite	% Pearlite
A	100	60	924	596.277	0.131	5.299	82.859	11.569	0.141
B	100	110	1278	627.339	0.131	1.828	94.585	3.411	0.045
C	200	60	1539	611.218	0.138	5.078	87.967	6.687	0.130
D	200	110	1893	630.268	0.132	1.660	95.743	2.424	0.041

Table 2: Results of simple DOE examining the effects of the maximum cooling rate at 550°C and the cooling rate at 300°C. Hardness and other values as calculated by JMatPro for SAE 1040 steel.



Whether it's the wide range of uses and sensitivities or its path from discovery to wide industrial use, aluminum is an interesting metal.

A brief history of the non-ferrous alloy aluminum

Non-ferrous alloys have caught my interest throughout my career, particularly aluminum. From its resistance to corrosion to its sensitivity at elevated temperatures, it is an interesting material. Moreover, it changed the aerospace and other industries due to the material properties of aluminum.

Following are some of the more interesting aspects of aluminum.

A HISTORY

Aluminum is not a rare metal; it constitutes around eight percent of the Earth's crust. Its late appearance on the metals scene can be attributed to its strong attraction to oxygen. It binds itself tightly in chemical combinations that are extremely difficult to break down from composites such as clays, schists, and mica (types of minerals). The oldest known of these composites — for centuries referred to as “earths” — is alum, which was used in China 3,800 years ago in the preparation of medicines and tanning. In the centuries after that, “earths” took on the name “pure clay,” then “alumina,” from which the name “aluminum” comes.

SLOW DEVELOPMENT

In 1807, five new metals were discovered by British chemist Humphrey Davy (1778-1829). One of these five was aluminum. Due to aluminum's strong attraction to oxygen, he was unable to isolate the aluminum using an electric arc. In Paris, 1854, Henri Sainte-Clair Deville (1818-1881) (Figure 1) continued experiments to isolate aluminum. He was convinced electrolysis was the most efficient way to produce high-volume pure aluminum. He began experiments using electrolysis, but soon found the cost of battery power was too expensive and had to end his experiments.

BEGINNING OF THE ALUMINUM INDUSTRY

In 1860, Sainte-Clair Deville partnered with Henry Merle, the founder of the PCAC, which produced soda. This plant had the necessary raw materials (bauxite) in place to launch aluminum production. Sainte-Clair Deville was the first to introduce bauxite (15-30 percent aluminum) into the process. Bauxite gets its name from the village Baux-de-Provence, where it was discovered in 1821.

Due to the red color of bauxite, it was originally thought that it would be good for the steel industry. Analysis showed that it was low in iron content but had high alumina content. Forty years later it would be the raw material of the aluminum industry. In 1887, Karl Bayer (1847-1904) patented a process that would be adopted in 1893. The first refinery to purchase the license was Gardanne in the Bouches-du-Rhone region of France. The

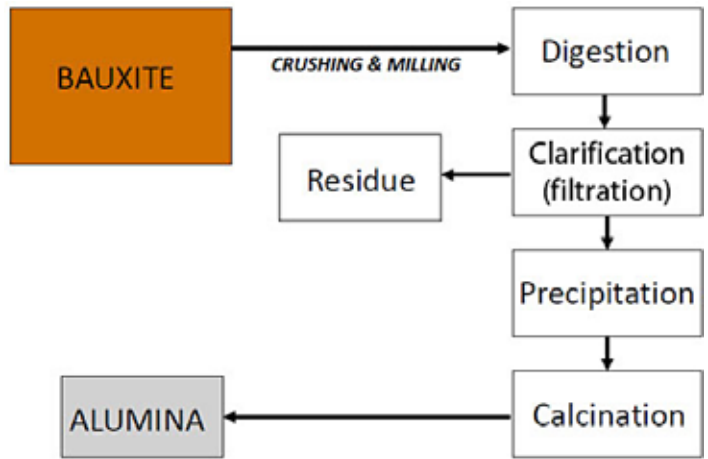


Figure 2: Karl Bayer's process was adopted in the 1950s following technological advances, particularly the development of an automated chain of operations.

process uses bauxite mixed with caustic soda, dissolved by heating at high pressure to 250°C (482°F) in autoclaves, then decanted and filtered. The hydrated aluminum oxide is separated from the cooled filtrate and calcined (dried) to obtain an alumina suitable for electrolytic process (Figure 2). This process was adopted in the 1950s following technological advances, particularly the development of an automated chain of operations.

MINING RESOURCES AND CONTROL

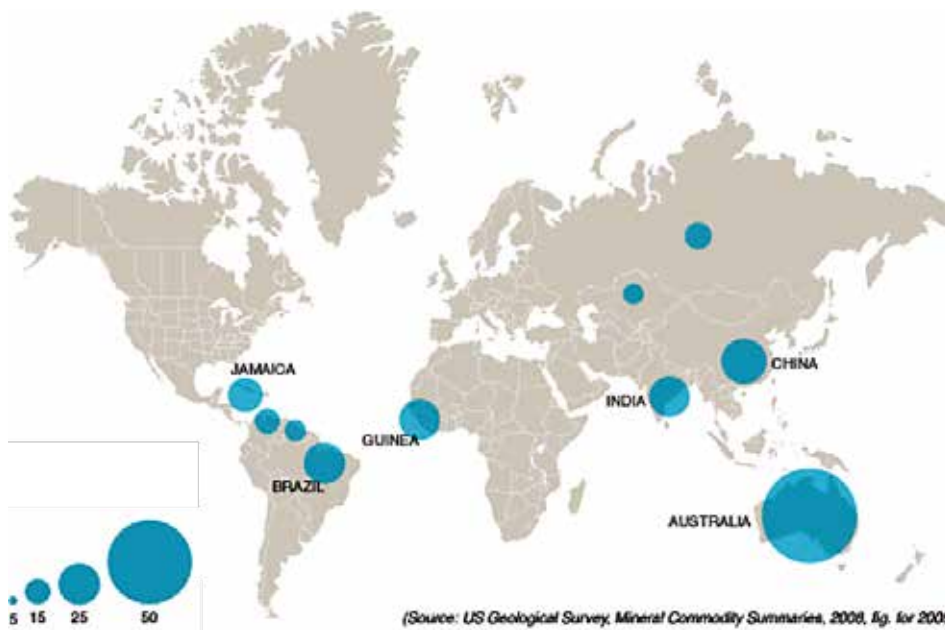
It takes four tons of bauxite to produce two tons of alumina, which is needed to produce one ton of aluminum. Controlling mining resources was of primary concern in the aluminum industry. Small-scale production sites were opened in various areas that were subsequently bought by larger entities in the highly competitive industry. France held the top position in bauxite mining until the end of WWI. Today, known reserves are estimated at more than 20 billion tons, representing three centuries of production at the current rate. The principal production zones are Australia, Africa, China, India and sub-tropical America (Figure 3). The last French mine closed in 1991.

ALUMINA TO ALUMINUM – ELECTROLYSIS

The aluminum oxide is melted and electrolyzed. The anode is made of graphite, a form of carbon. Oxygen ions move to the anode where they're converted to oxygen. The anodes are gradually worn away by oxidation. The cathode is also made of graphite. Molten



Figure 1: French postage stamp from 1955 commemorating Henri-Étienne Sainte-Clair Deville's work with aluminum.



(Source: US Geological Survey, Mineral Commodity Summaries, 2008, fig. for 2009)

Figure 3: The principal production zones are Australia, Africa, China, India and subtropical America.

aluminum is produced there. The process requires a lot of electrical energy, which is one reason why aluminum is more expensive than steel (Figure 4).

HEAT TREATMENT OF ALUMINUM

Aluminum is typically classified as two types: heat treatable and non-heat treatable. Following this, alloys are then classified in temper codes designated by the Aluminum Association. By definition, heat treatable aluminum alloys are those that can be strengthened by a suitable thermal process for that particular material. Let's use A356 as an example. Solubility of the alloy elements within A356.0 are directly related to temperature, although alloy element wt% is a critical factor.

In general, solution heat treating takes advantage of the precipitation hardening reaction. Its objective is to take into solid solution the maximum practical amount of the soluble hardening elements in the alloy. This process also consists of soaking the alloy at a temperature sufficiently high and for a long enough time to achieve a nearly homogeneous solid solution. Keeping with our example, solution heat treating of A356 castings produces the following effects: it dissolves Mg_2Si , homogenizes the casting, and changes the morphology of eutectic silicon. One of the most important aspects of this is the dissolution of Mg_2Si . Under equilibrium conditions, the solubility of the precipitating Mg_2Si phase decreases with temperature. A casting removed from the mold at 800°F will have approximately 0.3 percent Mg in solution. At 700°F, approximately 0.2 percent Mg will be in solution. This means that a drop of 100°F will result in a loss of approximately one third of the strength available from dissolved magnesium.

To obtain the maximum concentration of magnesium and silicon, the solution temperature must be as close as possible to the eutectic temperature, ideally 10°–15°F below the eutectic temperature.

Control of temperature is critical. If the melting point is exceeded, incipient melting (localized melting at the grain boundary) may occur

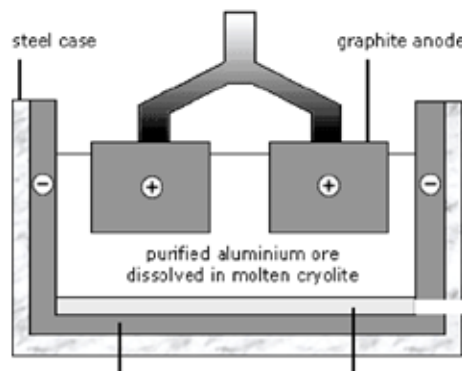


Figure 4: The electrolysis process requires a lot of electrical energy, which is one reason why aluminum is more expensive than steel.



Figure 5: Silicon particles are broken down into smaller fragments and gradually spheroidized.

and mechanical properties may suffer. This condition is only detectable by metallographic examination and is irreversible. Hence, most aluminum solution heat-treating furnaces must have a temperature uniformity of $\pm 10^\circ F$.

Solution heat-treating time is critical to ensuring the mechanical properties are conforming.

As discussed earlier, this is due to the vital role that the eutectic silicon morphology plays in obtaining satisfactory mechanical properties (Figure 5). In short, silicon particles are broken down into smaller fragments and gradually spheroidized (in physical metallurgy, a process consisting of the transition of excess-phase crystals into a globular — spheroidal — form). Prolonged solution time may, in turn, lead to coarsening silicon particles.

QUENCHING

The purpose of quenching is to keep the Mg_2Si from forming precipitates. If done correctly, this yields maximum strength and good elongation in castings. Two variables affect the rate of cooling: quench delay and quench medium and its respective temperature.

VERIFICATION OF PROPERTIES

Verification of properties is typically done in two ways — hardness testing and conductivity testing. This can be dependent on the material and thickness as well as state (i.e. casting, machined bar, etc.). Tensile testing may also be used depending on material process specifications.

SUMMARY

Several materials stand out, depending on an engineer's interest. Nonferrous alloys are particularly interesting due to their wide range of uses and sensitivities. I hope this article allowed readers to appreciate the different aspects of aluminum. 🌟

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Jason Schulze is the director of technical services at Conrad Kacsik Instrument Systems, Inc. As a metallurgical engineer with 20-plus years in aerospace, he assists potential and existing Nadcap suppliers in conformance as well as metallurgical consulting. He is contracted by eQualearn to teach multiple PRI courses, including pyrometry, RCCA, and Checklists Review for heat treat. Contact him at jschulze@kacsik.com.

A large, blue industrial forging machine is the central focus of the image. The machine is a vertical hydraulic press with a large, rectangular die set in the center. The background shows a factory environment with various pipes, cables, and structural elements. The lighting is bright, highlighting the metallic surfaces of the machine.

ISSUE FOCUS ///

FORGING / MAINTENANCE

OPTIMIZING FORGING MACHINE PRODUCTIVITY, LONGEVITY

Based on the results of a "health check," the OEM can suggest corrective actions to restore the equipment back to OEM specifications, along with a customized, ongoing, preventive maintenance program for hydraulic presses. (Courtesy: ACE)

Forging equipment OEM delivered 'health check' and ongoing preventive maintenance program helps forgers optimize production and keep equipment online even when faced with high turnover.

By DEL WILLIAMS

As the forging industry's most experienced maintenance staff and equipment operators retire, keeping legacy machines producing at full capacity is increasingly difficult. When new employees lack sufficient expertise and decades-old forging equipment breaks down, the result can be very costly, extended downtime.

"A seasoned team may know all the 'ins and outs' of every forging machine in a facility, but when workers leave, or retire, the preventive maintenance can suffer and equipment like hydraulic presses eventually will begin to break down," said Jay Raygor, service supervisor at Ajax-CECO-Erie Press. "When that happens, the cost of hourly downtime can be several thousand dollars per hour."

Raygor said, although some customers follow routine maintenance guidelines, most keep producing products until the equipment breaks down.

"The danger with this approach is that the lead time for some major component parts can be 20 to 26 weeks," he said.

Even if customers take oil samples, change filters, lubricate the machine, and check running clearances, major components can fail without at least an inspection on a regular basis.

As a solution, industry-leading OEMs such as Ajax-CECO-Erie Press (ACE) are now providing forgers with a proactive "health check," followed by an ongoing preventive maintenance (PM) program designed to sustain peak performance of equipment that may be many decades old.

ACE is the largest forging equipment supplier in North America. With its core brands founded in the 1800s, the company offers a full line of products, including standard mechanical forging presses, upset forging machines, forging rolls, hydraulic forging, forming, compression molding, cold extrusion, compaction, roll ring preform presses along with stretch forming and straightening machines, solid die forgers, trim presses, programmable die forgers, and custom-engineered hydraulic presses.

TIME FOR A HEALTH CHECK

As human beings age, the need for more frequent health checks is required to catch minor issues before they become serious. The same is true with forging equipment such as hydraulic presses, particularly if used for many decades.

"Some older forging machines have been in service since the 1950s

and '60s, so there are legacy parts that may be obsolete," Raygor said. "On these older machines, operators may not know how to troubleshoot an issue or even identify a worn or failing part. This increases the risk of a major breakdown."

The challenge only intensifies when there is a variety of forging equipment types and brands on the same production floor. For this reason, ACE offers forgers a comprehensive program of routine health checks on many major brands including Ajax, Chambersburg, ERIE Press, and L&F (formerly Sheridan-Gray).

To perform a health check, ACE uses the full documentation of the equipment in its broad portfolio of brands, along with extensive

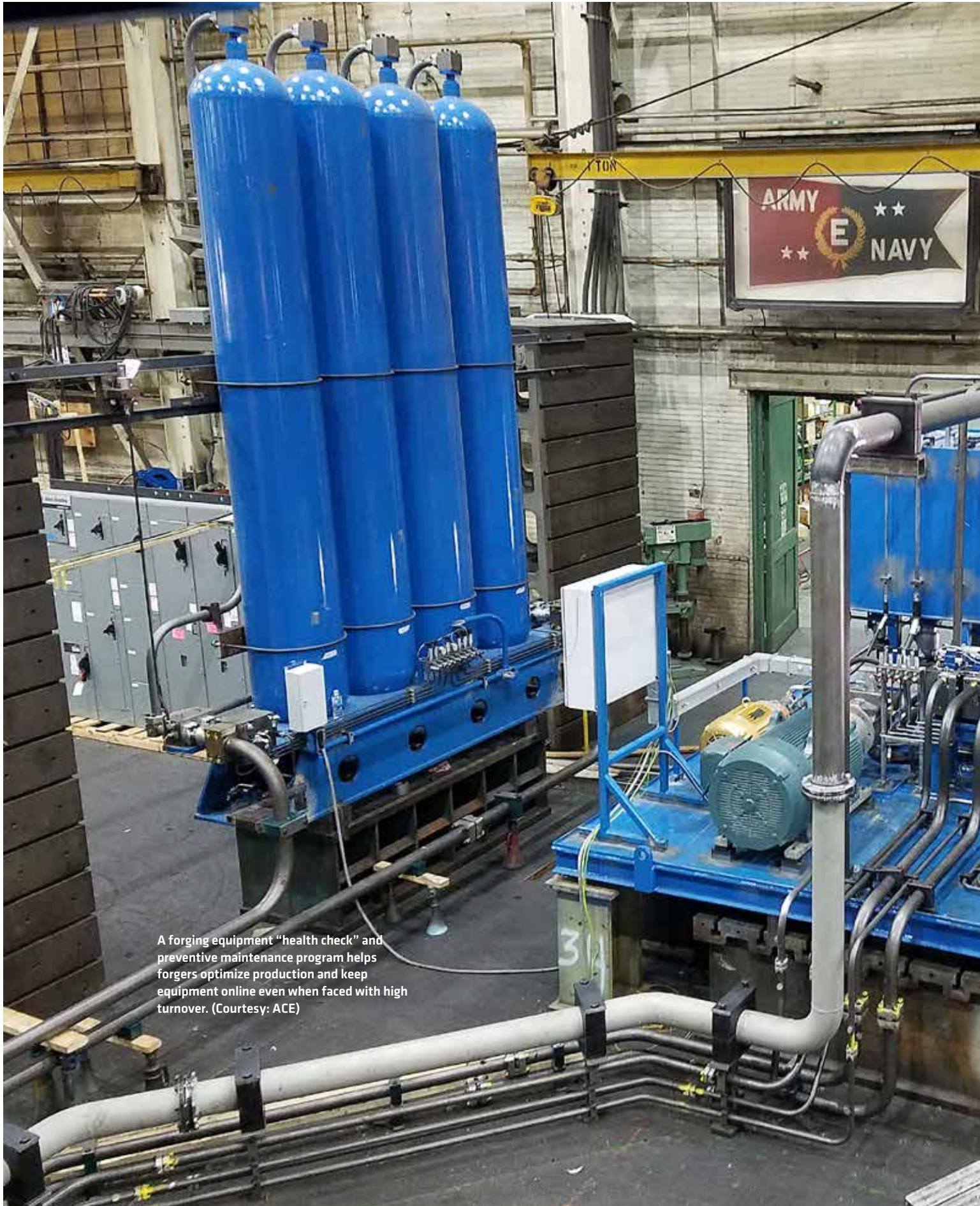


Industry-leading OEMs such as Ajax-CECO-Erie Press can provide forgers with a proactive "health check," followed by an ongoing preventive maintenance program designed to sustain peak performance of equipment of any age. (Courtesy: ACE)

maintenance and repair experience accumulated over many decades. The company's technicians examine the equipment condition, running clearance, electrical system, pump performance, etc.

Based on the results of the health check, the OEM then suggests corrective actions to restore the equipment back to OEM specifications, along with a customized, ongoing, preventive maintenance program for hydraulic presses, including consumables such as filters and oil-sample analysis.

The extent of the PM program is based on factors such as the type of equipment, production, onsite support, and desired PM intervals. It can be scaled up or down to take into account the maintenance team's experience, availability, and turnover.



A forging equipment “health check” and preventive maintenance program helps forgers optimize production and keep equipment online even when faced with high turnover. (Courtesy: ACE)



“We want to be able to fill in where the customer’s needs are,” Raygor said. The health check helps us to not only evaluate the current state of the equipment, but also their inspection and maintenance schedule as well as technical capabilities. Their team may already be doing a certain amount of proactive maintenance. However, they may actually need to do considerably more to eliminate potential unscheduled downtime.”

TEACHING AID

The program can serve as a teaching aid to help the forger build its maintenance team. This not only increases the team’s self-reliance, but it also minimizes any downtime.

“The maintenance team can shadow and assist us, and we explain what we are doing, why we are doing it, and how to proceed,” Raygor said. “Over time, they will increasingly be able to maintain the equipment themselves.”

He pointed to an example of one forger that dramatically improved its own in-house PM capability with such a learning process.

“A customer that had one of our presses did not have much of a maintenance program due to significant turnover,” Raygor said. “So, we visited annually for years, and each time walked employees through the process. Recently, when we visited, we couldn’t believe how good their PM had become.”

REMOTE PREVENTIVE MAINTENANCE

Although PM is typically performed onsite, some actions can be performed remotely. ACE can use advanced collaboration tools and real-time video communications to connect with technicians where both can see, discuss, annotate, and resolve many situations at hand.

“If a forging machine is down, with a live (Expert Connect) session, the technical expert can see what the operator is seeing and guide them using annotations on their screen that remain fixed in a three-dimensional space exactly where drawn,” Raygor said. “This expedites problem resolution by up to 90 percent while helping to overcome any language barriers or issues with hearing clearly in an industrial production setting.”

To ensure the highest production uptime of forging equipment and prevent lengthy unexpected downtime, ACE offers a separate stocking program as an option.

“Consumable items common to every forging machine, like friction plates and driving plates for presses and upsetters, or piston heads, rods, rings, and packings for hammers, are often stocked,” Raygor said. “However, it is even more important to stock key items such as main gears, eccentric shafts, and rams to avoid long lead times for replacement.”

He noted that, in the stocking program, the customer pays a percentage of the cost and then the balance when they take possession of the part — even if two to three years later. A custom stocking program with minimal up-front investment can eliminate months of downtime due to long lead time parts.

To ensure the performance, consistency, and reliability of forging equipment, routine inspection and preventive maintenance have always been essential. When forgers find this increasingly taxing as their most experienced technicians retire, opting for periodic health checks and preventive maintenance with industry experts can be crucial to long-term productivity and quality. ♣

ABOUT THE AUTHOR

Del Williams is a technical writer based in Torrance, California. For more information, go to www.AjaxErie.com.

A detailed, close-up view of a jet engine's compressor section, showing multiple stages of highly polished, curved compressor blades. The lighting is dramatic, highlighting the metallic surfaces and the complex geometry of the blades. The text is overlaid on the central part of the image.

***AEROSPACE
FORGING
MARKET: AN
AVENUE OF
OPPORTUNITIES***

The aerospace forging market holds numerous opportunities in the future; the market is profit bearing for the investors, and there are several avenues for growth.

By AASHI MISHRA

Forging is a manufacturing process that has come a long way in the last century. In simple terms, forging is a process of shaping metal with the use of heat and pressure. When alloys are forged, parameters such as temperatures, processes, thermal cycles, and machines are changed to meet the demands.

These forged parts are extremely durable and resilient to use as components in various industries such as aerospace. With the advancements in the aerospace industry, the requirements have become complex. The developed components are trusted to be more efficient with the process of forging.

The enhanced material technology amalgamated with computer modeling techniques is extensively used in making forged aerospace equipment. These are the superior engineered products that ensure the safety of the flight.

BENEFITS OF AEROSPACE FORGING

The prominent benefit of using forging applications in the aerospace industry is that components can be far more durable and stronger than the components manufactured using bar stock and casting.

Moreover, the aerospace forging market has expanded because of impeccable technical expertise in providing reliable components. Some of the components in high demand in the aerospace forging market can be seen in Table 1 and Figure 1.

Various companies are harnessing benefits from the huge demand from the users and rendering a good user experience. The imperative features of these companies include:

- » Reliable technical expertise.
- » First article development capabilities.
- » Risk management and prior scheduling.
- » Customized service and flexibility in shapes, sizes, and quantities.
- » Reliable certifications and accreditations.
- » On-site capabilities for saw cutting and die sinking.
- » Facilities for closed die forging to meet high-performance specifications.

AEROSPACE FORGING MATERIALS

There are approximately 300 alloys and grades used by the companies to make prompt deliveries of high-quality products. The examples of forging alloys are titanium, Inconel, stainless steel, and brass alloys/copper.

AEROSPACE FORGING MARKET ANALYSIS

The aerospace forging market size is anticipated to reach approximately \$50 billion by 2035 by thriving at a CAGR of 8.1 percent over the forecast period. Additionally, in 2022, the market size of aerospace forging was evaluated to be \$30 billion.

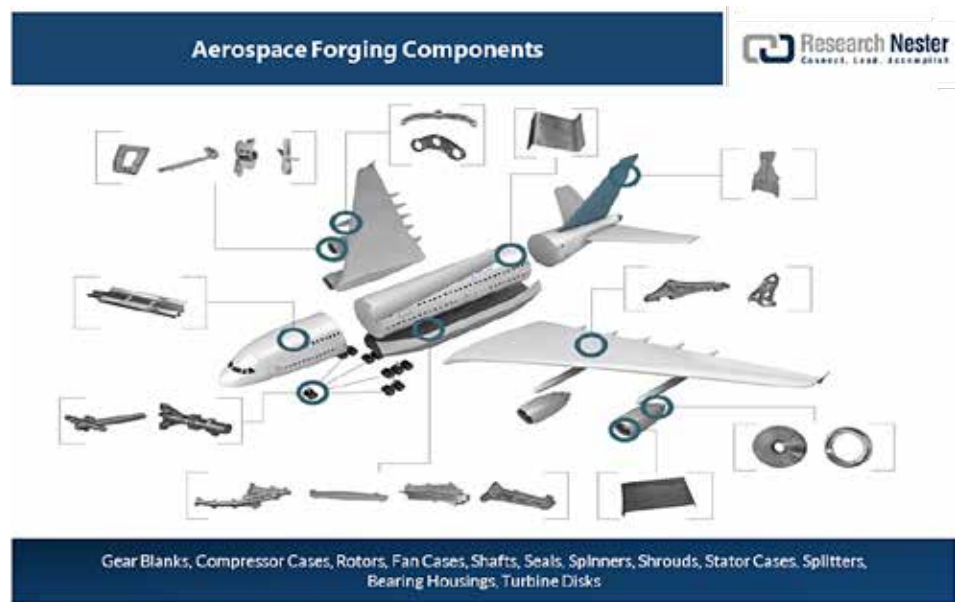


Figure 1

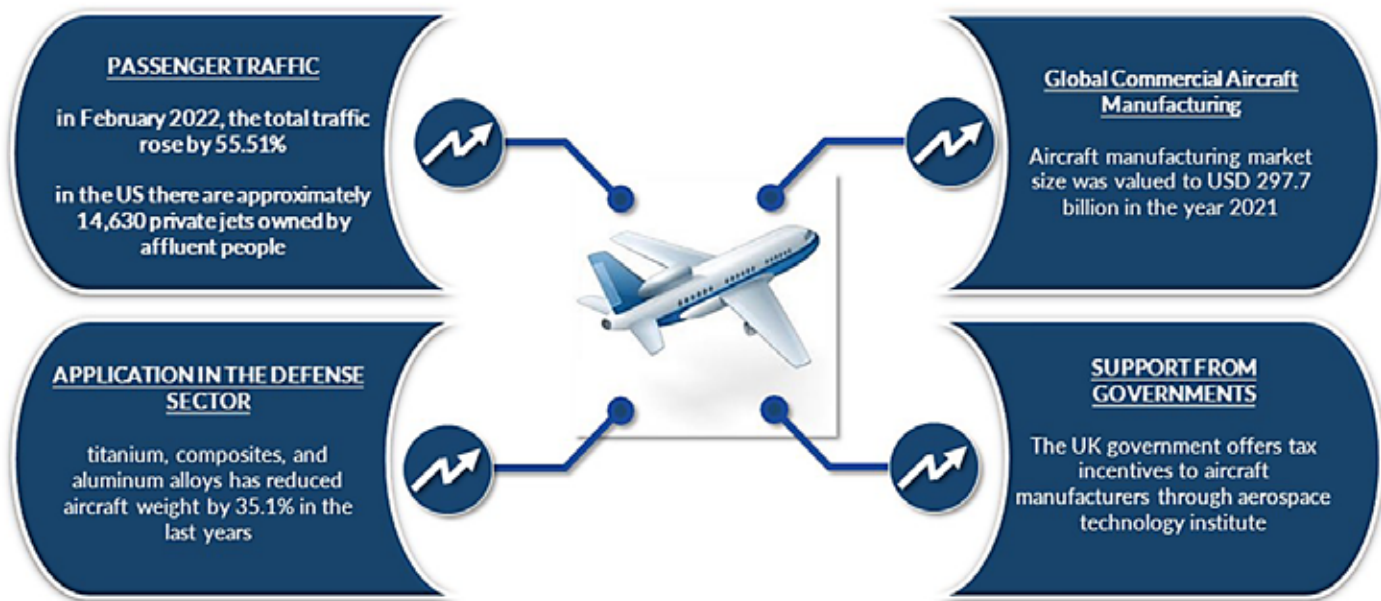
Rocket structure	Bulkheads, adapter structures, separation rings, barrels
Rocket propulsion	Closures, liners, chamber forgings, nozzles, fuel sumps
Commercial spacecraft	Flanges, injector plates, interfaces, thrust cones
Capsules	Bulk heads, LIDS adapters, deck forgings
Missiles	Cylinders, frustums, nozzles, shrouds, shells, tubes
Fixed-wing aircraft	Inlet attach rings, adapters, bell mouth, landing gear cylinders
Rotor aircraft	Swashplates, ring gears, planetary gear forging

Table 1

The growth of the market can be attributed to various factors (Figure 2) such as:

» **Rising passenger traffic:** According to a study done by Research Nester, in February 2022, the total traffic rose by 55.51 percent. The

Aerospace Forging Market Factors Responsible for the Rising Demand



Source: Research Nester Analysis

Figure 2

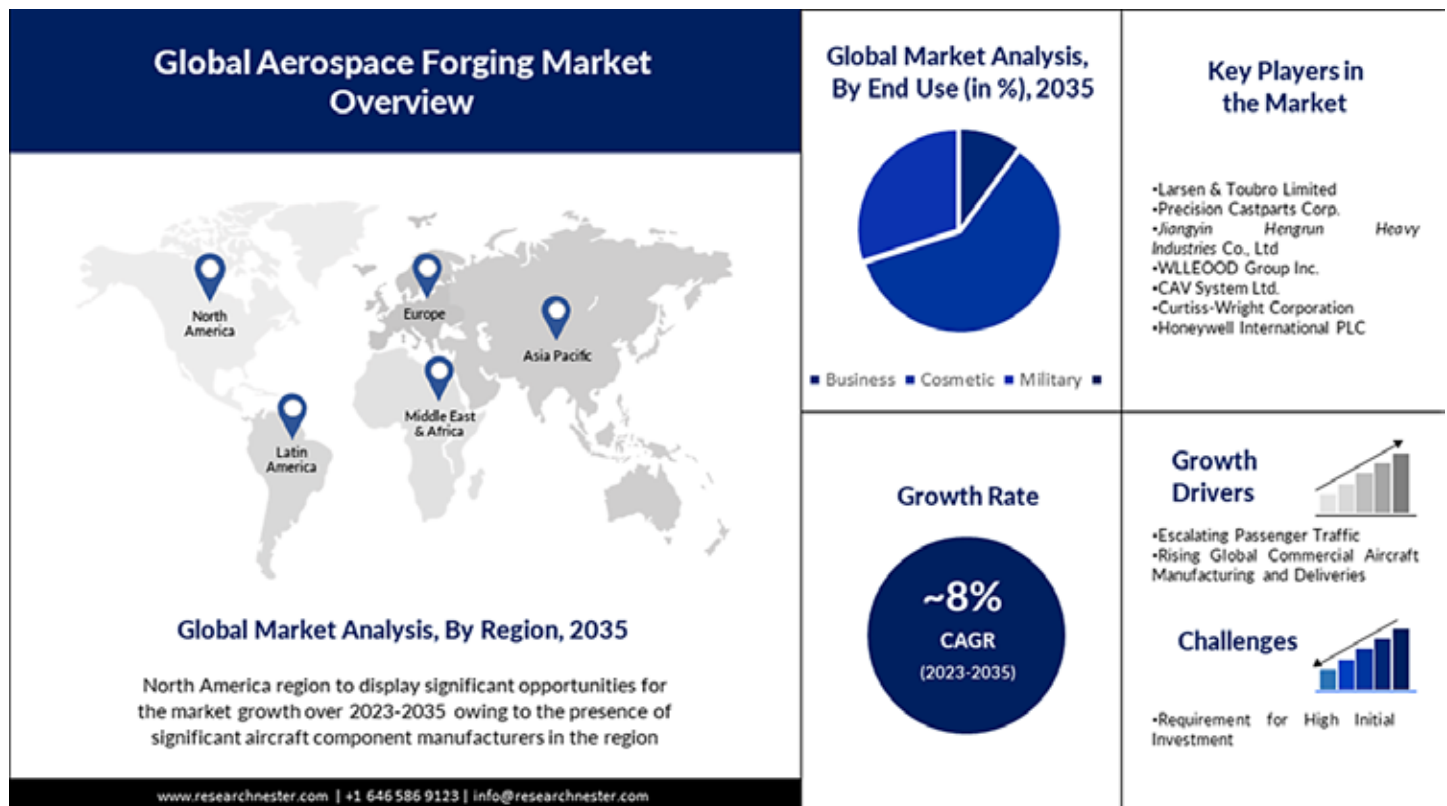


Figure 3

disposable income of people is rising since their travel expenses are also rising. Additionally, people are willing to invest more in travel, particularly air travel. Moreover, forged aerospace equipment is also applied in making chartered planes. A study conducted by Research

Nester reveals that in the U.S. there are approximately 14,630 private jets. The number is expected to grow further in the future, which will lead to a flourishing aerospace forging market.

» **Growing application in the defense sector:** The defense and

aerospace industries are interrelated and work closely together. The Aerospace Industry Association reports the use of advanced materials such as titanium, composites, and aluminum alloys has reduced aircraft weight by 35.1 percent in the recent years.

» **Increasing global commercial aircraft manufacturing:** The aircraft manufacturing market size was valued to \$297.7 billion in 2021. There is a rise in demand for cargo services coupled with increasing trade among the nations. On the backend, the demand for forged aerospace equipment is continuously rising.

» **Rising support from governments:** Various governments from all over the world are rendering incentives to aircraft manufacturers to give support to their research-and-development efforts. These incentives are helpful in bringing down the costs of R&D for aircraft manufacturers. For example, the U.K. government offers tax incentives to aircraft manufacturers through the Aerospace Technology Institute. This institute supports the company through funding and renders tax credits to companies that help companies develop advanced technologies.

REGIONAL SYNOPSIS

The market in North American region is anticipated to witness the highest growth over the forecast period. The reason for the growth can be attributed to the presence of major manufacturers of aerospace and aircraft components in the region. Other than this, the aerospace forging market in North America is directly linked to the growth of the aerospace industry. The U.S. aerospace and defense industry reported revenue of \$741 billion in 2022.

The Asia Pacific region is also expected to offer lucrative opportunities because of expansion in the aerospace industry. According to

a study by Research Nester, it has been estimated that in the next 20 years, China is anticipated to deliver more than 8,000 new aircraft.

Europe is also leading in the production of civilian aircraft. The European industry is popular for its aircraft engines, components, parts, and helicopters. This has caused a rising demand for forged aerospace components. (Figure 3)

IN A NUTSHELL

The aerospace forging market holds numerous future opportunities. The market is profit-bearing for investors, and several avenues for growth are possible. But before taking that plunge, it is necessary to understand the nitty gritty of the market.

There are various companies that are giving support to budding market players as well as leading market players. They have expertise with various prominent parameters of the market arena such as regional analysis, challenges, etc. Knowing these factors helps in creating profitable avenues. Getting a brief prior knowledge about these challenges can help in fabricating strategies for the business. Moreover, getting a brief regional analysis helps in knowing which region is offering lucrative opportunities for growth. ♣

» **Source:** www.researchnester.com/reports/aerospace-forging-market/4104

ABOUT THE AUTHOR

Aashi Mishra is a senior content writer for Research Nester. She is an experienced research writer, strategist, and marketer with a demonstrated history of research in a myriad of industries.

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A man in a blue shirt is wearing a VR headset and gesturing with his hands. In the background, a car is visible with glowing AR overlays, including a steering wheel and various circular patterns. The scene is set in a modern, brightly lit environment, likely a factory or showroom.

***6 BENEFITS
OF AR IN
MANUFACTURING***

Augmented reality is becoming a growing and useful tool to maintain a more efficient shop floor during the manufacturing process.

By WENDY MLYNAREK

Manufacturers are increasingly incorporating augmented reality in their digital transformation strategy. Augmented reality provides a multiplier effect for improving the efficiency and quality of production and inspection processes.

Defect detection assistance, improved production rate, increased safety for the factory and teams, increased productivity, reduced cycle times, and, above all, reduced costs: The benefits are numerous.

AR allows the industrial sector to gain effectiveness and efficiency while reducing errors and the additional costs generated, but it does not stop there.

Here is a closer look at some of the main benefits of augmented reality in manufacturing:

1 INCREASING PRODUCTIVITY THROUGH AUGMENTED REALITY

AR is a solution whose effectiveness and value to the industry are more proven than ever to increase industrial productivity. When used in factory and production processes, there are many gains to be made in a quest for operational excellence.

In addition to allowing workers to be more effective and faster in each of their tasks (assembly, inspection, maintenance), such a solution will enable them to be more efficient by optimizing processes and providing digital instructions for operators.

A company's teams can identify non-conformities faster and drastically reduce errors and related costs. Operations are performed correctly by having the right information in the right place at the right time and assigned to the right person.

To summarize, whatever the industrial performance, it will be optimized thanks to:

- » Faster learning curve for new operators.
- » Reduction of inspection time (DELMIA Augmented Experience provides up to 84 percent reduction of inspection time measured at our customers).
- » Reduction of cycle times and reporting.
- » Automatically updated reports and documentation.
- » Better traceability.

2 IMPROVING QUALITY THROUGH AR

The detection and reduction of non-conformities are some of the main objectives of the teams in charge of inspection and quality. The slightest error can be extremely costly and can lead to a series of time-consuming corrective actions, such as:

- » Correctly identified defects.
- » New production runs.

- » Several additional quality controls.
- » Possible additional logistical costs.
- » Generate dissatisfaction for end customers.

A detected non-conformity or error often implies more time to devote to the handled part, which can even go as far as stopping the production to identify and resolve the problem. The challenge is to detect errors as early as possible in the process to avoid late detection and the need to stop production. This can be a major challenge, especially when an operational excellence strategy is needed.

An augmented reality solution allows workers to anticipate these errors. With an AR tool, quality control information is contextualized and localized to simplify the inspection process. Operators



Augmented reality technologies can improve a factory's safety and comfort. (Courtesy: DELMIA)

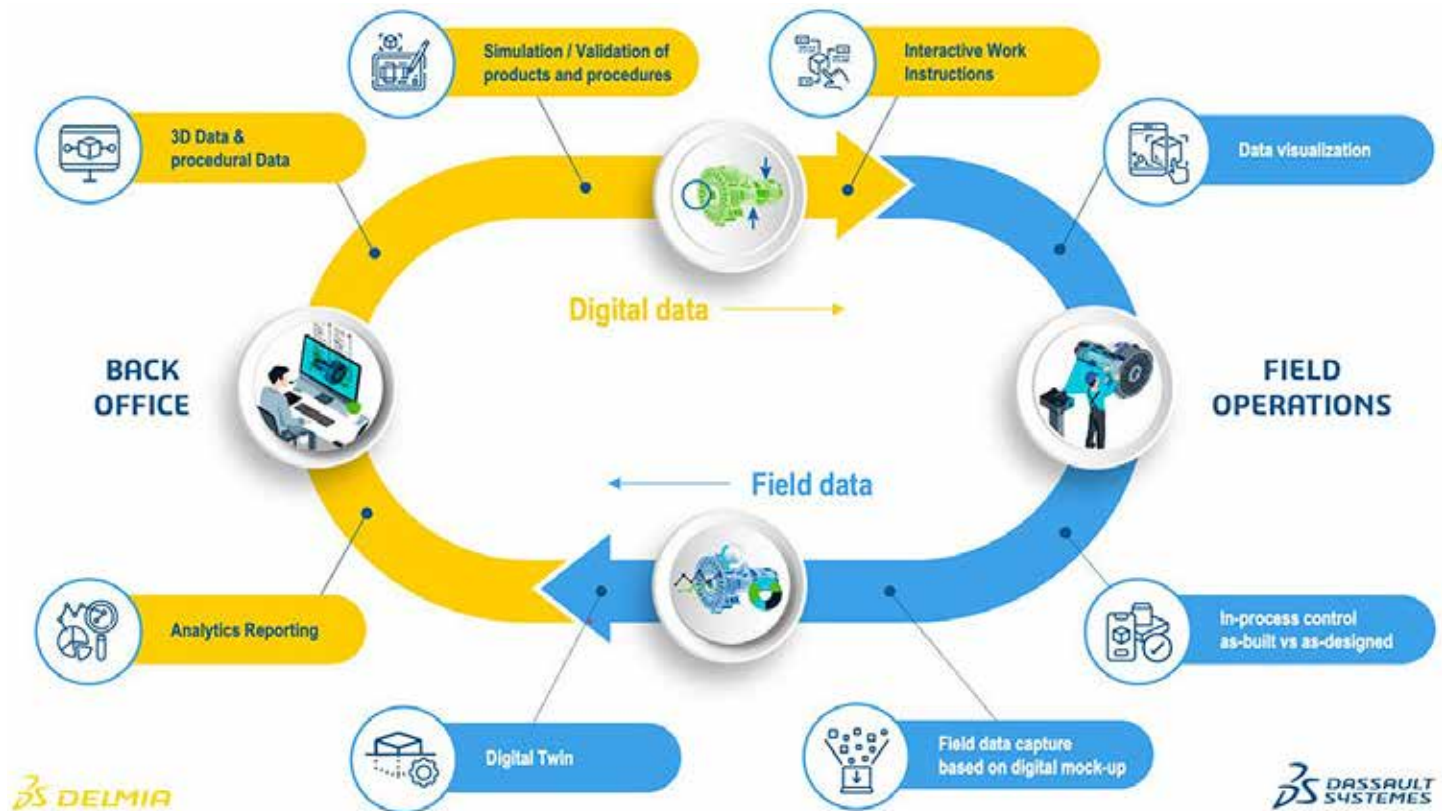
are guided through each inspection point using 3D data imported directly into the field and superimposed on the part to be inspected throughout the manufacturing process. This capability supports efficient validation of product conformity. In addition, errors are precisely localized, allowing the proper corrective and repair actions to be applied. DELMIA Augmented Experience solutions are already helping many industrial customers identify and efficiently report production defects.

But the best way to reduce quality problems is to avoid assembly errors in advance. AR effectively guides the operator to achieve "first-time right" via the contextualization of work instructions and their display in the field, making them intelligible.

3 CONNECTING THE FIELD WITH NEW DIGITAL CAPABILITY

What if the augmented operator was the connection point that could reconcile the real and virtual worlds? Displaying digital data from the design teams on the shop floor allows the operator to interact with the

Integrating AR solutions in the factory can positively affect team training. The simple fact of using augmented reality contributes to an operator's training and increases their skills.



Digital continuity can be possible with augmented reality. (Courtesy: DELMIA)

data. AR becomes the link to creating a tangible connection between the virtual (and all the digital information from the engineering office), with the real, meaning the operations happening on the field.

Implementing an augmented reality solution, especially if the chosen technology offers integration capabilities with the existing systems (MES, for example), may be the answer to the digital gap between V + R.

4 SUPPORTING THE FUTURE OPERATOR BY BOOSTING SKILLS DEVELOPMENT

Integrating AR solutions in the factory can positively affect team training. The simple fact of using augmented reality contributes to an operators' training and increases their skills. Using digital work instructions projected in the field or visualized through a tablet or augmented reality glasses, field teams receive the right information at the right time and become operational more quickly.

It is proven that using a virtual world facilitates the assimilation of information communicated and its application in the field. This way, operators develop much more intuitive gestures allowing them to become more autonomous and to respond well to possible issues. In addition, it also facilitates the memorization of the information transmitted to a company's teams.

Integrating an augmented reality solution fits perfectly into a training strategy. It facilitates the transmission of knowledge within the company and develops operator's autonomy more quickly, thanks to its more intuitive content.

5 PROVIDING A SAFER AND MORE COMFORTABLE WORK ENVIRONMENT

Augmented reality technologies can also improve a factory's safety and comfort. Complex assembly operations or maintenance actions provide significant support, consider many risk factors, and detail faults with better accuracy than any other resource (documentation or technicians).

» **Comfort:** The various hardware configurations compatible with augmented reality solutions allow workers to adapt to the workstation. The variety of hardware enables them to work hands-free and avoid numerous return trips to the office, a savings of time and energy that also provides comfort for a company's teams.

» **Technician safety:** Operators are better guided and accompanied step-by-step with alerts displayed in AR at the proper process moment.

As a result, the risk of human or technical errors is reduced, and field teams can better understand the company's processes.

6 OPTIMIZE DOCUMENTATION, TRACEABILITY, AND REPORTING

Augmented reality supports a solution for better industrial traceability. Getting the right information at the right place at the right time can be complex. Manufacturers need to be aware of a lack or break in collecting field data and documentation that is not up-to-date and too difficult to use.

Using augmented reality in the plant can positively affect trace-

ability. A good AR solution offers “as-built” data collection capabilities in the field with automated reporting, which provides full visibility into the assembly and inspection processes throughout the production and distribution chain.

We help industries optimize their traceability with innovative digital solutions that provide automatic data collection directly from the field following quality control. With such a solution’s capabilities, you can conduct documented inspections for internal traceability purposes and better communication with your customers.

AR HAS MANY ADVANTAGES IN INDUSTRY

» Augmented reality helps achieve operational excellence (getting it right the first time).

» AR solutions bring rapid ROI by improving quality, deadlines, productivity, etc.

» AR improves traceability and contributes to the collection of data that will feed the digital twin.

» It encourages operator-skill development.

» It contributes to the reduction of cycle times by reducing assembly and inspection times.

With augmented reality, performance can be optimized considerably while reinforcing manufacturing processes. 📡

ABOUT THE AUTHOR

Wendy Mlynarek is strategic business development director at Dassault Systèmes for the DELMIA brand, supporting aerospace and defense and the virtual twin experience marketing for manufacturing operations program. She has more than 25 years of experience in marketing manufacturing solutions globally.

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COMPANY PROFILE ///

ALL METALS & FORGE GROUP

MANUFACTURER OF OPEN DIE FORGINGS AND SEAMLESS ROLLED RINGS

All Metals & Forge Group is an ISO 9001:2015 and AS9100D manufacturer of custom and standard open die forgings and seamless rolled rings.
(Courtesy: All Metals & Forge Group)

For more than 50 years, All Metals & Forge Group has produced custom and standard open die forgings and seamless rolled rings in a host of different alloys for a wide range of industries.

By **KENNETH CARTER**, Thermal Processing editor

It's no small testament to be able to say a business has been going strong for more than half a century, but All Metals & Forge Group has been manufacturing and selling open die forgings and seamless rolled rings to a variety of industries for 51 years.

And if Lewis Weiss, the company president and CEO, has anything to say about it, that success will continue for another 50 years.

All Metals & Forge Group is an ISO 9001:2015 and AS9100D manufacturer of custom and standard open die forgings and seamless rolled rings in carbon steel, alloy steel, stainless steel, tool steel, nickel alloys, cobalt, aluminum, copper, and titanium. Forged shapes include large flat and hex bars, blocks, gear blanks, all flange shapes, flanged shafts, step shafts, discs, hubs, rings, cylinders, and sleeves. Industries that use the company's services include aircraft, aerospace, automotive, chemical, construction, defense, energy, engine and turbine, food processing, hydro, metalworking, mining, oil and gas, petroleum and power generation, pulp and paper, and shipbuilding.

SERVING GEAR-RELATED BUSINESSES

To that end, about 60 percent of All Metals & Forge Group's business is gear related, according to Weiss.

"Seamless rolled rings is a primary product and is used in the gear industry for manufacturers to produce gears," he said. "We can make rings up to a 200-inch diameter and down to about a 4-inch diameter. We do some things that other forge shops don't do. We always supply rough machines parts with an RMS finish — sometimes designated by the customer. But typically, we do a 250 RMS or 125 RMS. Sometimes, if a customer wants 64 RMS, we'll do that. We drill holes; we can do contour forgings."

When it comes to the gear industry, those businesses typically want a clean finish, according to Weiss.

"Some of the forge shops don't do this; they'll give them a raw unmachined part," he said. "We give them a rough machine part. It saves them time, and it saves them wear and tear on their equipment because we've already taken off the first rough cut of the ring. All-inclusive in our pricing is that we will do ultrasonic testing, which obviously is checking the parts internally for cracks, pits, voids, and so on. We do that as a matter of course. If somebody buys 1,000 rings from us, every part gets ultrasonically tested, and we don't charge extra for it. It's in the price, but our price is so competitive that we can give them a machine-ultrasonically-tested part for less money than a raw forged ring."

UNIQUE CUSTOMER APPROACH

That extra mile of service has made All Metals & Forge Group quite competitive in the industry, according to Weiss.

But the company offers an even more unique approach with its customers. With every new customer, Weiss and his team sends them a sample, but it's not just any sample. It is a physical, hands-on example that is able to demonstrate a variety of All Metals & Forge Group's skills.



All Metals & Forge Group's open die forgings and seamless rolled rings can be manufactured with carbon steel, alloy steel, stainless steel, tool steel, nickel alloys, cobalt, aluminum, copper, or titanium. (Courtesy: All Metals & Forge Group)

"We send this out to a new customer who knows nothing about us and maybe doesn't understand or can't appreciate what we supply," he said. "This is clearly rough machined with drill holes and with every one of the corners, the chamfer is all different."

The chamfered edge examples serve to show how fine that can be. The sample is also engraved with heat numbers (and the company's name and phone number, obviously). It also includes several RMS finish examples — 250 RMS on one side and 125 RMS on another, according to Weiss.

"The customer gets a real good idea of what they're going to get," he said. "This has been a very successful tool for us to send out to our clients. I like doing things that are different."

MORE THAN JUST CUSTOMERS

All Metals & Forge Group takes a vested interest in its customers, so much so that Weiss said he sees them as more than just customers.

"We like to partner with our customers; I don't just want a client; I want a partner," he said. "I want to help them get an order so that we can get an order; 80 percent of our business is legacy business."

And as the company's business continues to grow, that means that the 20 percent of those new customers end up being legacy accounts as well, according to Weiss.

"That's been our philosophy, and it's worked extremely well for

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“We’re a supplier of parts forgings involved in these various industries as well as supplying to other companies and manufacturers about how to improve, how to run your business, how to deal with the skills gap, how to deal with new technology, and software.”



Forgings are a custom-made product with specific ultrasonic and machining requirements and made of different alloys. (Courtesy: All Metals & Forge Group)



All Metals & Forge Group has been registered as an ISO company since 1994. (Courtesy: All Metals & Forge Group)

us,” he said.

All Metals & Forge Group has been registered as an ISO company since 1994, which includes an ISO 9000 rating. Since 1998, the company has achieved its AS 9100 rating, which is the aerospace version of ISO.

RENEWABLES SECTOR

Another growing industry that All Metals & Forge Group supplies products to is the wind-energy industry, according to Weiss.

“We are also involved with wind, and with wind, there are turbines, and inside the turbines are gears that are forged,” he said. “We supply those parts for wind energy as well.”

Weiss is quick to point out that his company has always been an early adopter in a variety of ventures, which makes renewable energy customers a foregone conclusion.

“For example, All Metals and Forge Group was the first metals company in the United States that had its ISO registration in 1994,” he said. “I got a lot of pushback from employees, but the day that we got our certificate in the mail, one of the salesmen got a phone call from a company in Wisconsin, and they said, ‘I have an inquiry. I need to buy this product; however, my customer has required that I only buy it from an ISO-registered company, and I can’t find anybody.’ And that was the first order — the first day that we got the registration. Once that one salesman got it, we got a \$60,000 order. And I never got pushback after that. Everybody got it.”

So what started out as a marketing tool became an integral part of the company’s essential offerings as industries eventually made ISO certifications standard operating procedures, according to Weiss.

That’s just one example of how Weiss and his team have tried to stay ahead and competitive throughout its long history.

‘MANUFACTURING TALK RADIO’

All Metals & Forge Group’s recent history has pushed the company into the popular podcast space.

“I come from, as my age indicates, the radio era, and I constantly listen to radio; I love radio,” Weiss said, who recently turned 80. “In 2013, I came up with an idea about getting more of a message out to the manufacturing sector about manufacturing. So, we created a podcast called ‘Manufacturing Talk Radio.’”

Since its inception, “Manufacturing Talk Radio” has done more than 750 shows, and at the beginning of the year, Weiss said they started syndicating AM and FM radio stations throughout the country.

“We are on one radio station in upstate New York, and the numbers are amazing of the people that we are reaching, as well as the messages that we are getting out to the audience — the audience mainly being manufacturing, including a lot of students, universities, research labs, and publications,” he said.

All Metal & Forge Group’s podcast is just one way Weiss said the company is embracing technology and staying at the forefront of the latest innovations.

“AI is the big thing now — machine learning,” he said. “We’re involved in all of these things, and from two aspects: We’re a supplier of parts forgings involved in these various industries as well as supplying to other companies and manufacturers about how to improve, how to run your business, how to deal with the skills gap, how to deal with new technology, and software.”

MANUFACTURING OUTLOOK E-ZINE

In addition to the Manufacturing Talk Radio, All Metal & Forge Group has been publishing a monthly e-zine for the past several years to replace its email newsletter established in 1988.

Manufacturing Outlook is a publication educating, informing, and alerting its subscriber base about the “outlook” for all things manufacturing in a looking forward approach, according to Weiss.

CHALLENGING WORK

Even with all the company offers, Weiss said every job is still a challenge — one that he welcomes.

“Forgings are a custom-made product: They have specifications; they have ultrasonic requirements; they have machining requirements; they’re different alloys,” he said. “The past three years have been particularly a challenge with regards to COVID disruption in the supply chain. Now we have issues with inflation, which has really gotten out of hand but seems to be improving a bit. And there are other issues that don’t necessarily directly involve the customer, but we do have geopolitical issues, China issues, Russia issues, and all of these things in one way or another do affect us. And not only us at All Metals & Forge Group, but us as in our manufacturing sector in this country. So, to that extent, we do work with, talk to, and engage with our customers.”

With all its offerings, both physical and virtual, All Metal & Forge



Every new customer receives a physical, hands-on example that is able to demonstrate a variety of All Metals & Forge Group’s skills. (Courtesy: All Metals & Forge Group)

Group has been able to carve out quite a significant niche within the forging industry and the manufacturing sectors that need its products, according to Weiss. And that success always comes back to keeping an eye on the future.

“We sometimes have our customers on our show,” he said. “It’s a video podcast, and it can be seen on YouTube, Spotify, and all the rest of the platforms, and the numbers that we’re seeing are of people who are interested in manufacturing, including kids. The college thing is getting to be old school almost; 40 percent of college kids don’t graduate, but they still wind up with a \$200,000 debt. But with manufacturing, three years ago, four years ago, you never heard about manufacturing in the news media — never heard of it. Now you hear about it pretty regular.”

To be sure, Weiss’ tenacity also plays a large part in his company’s success, as well as what comes next.

“As an early adopter, I’ll be there, I’ll be 90, but I’ll be there,” he said. “I love dealing with people in the manufacturing sector, and I’ve been doing it for over 50 years. It’s extremely educational. The people are really terrific. They’re hard workers, particularly the people who own businesses. They appreciate things like (our podcast), which is educational to them.”



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Q&A /// INTERVIEW WITH AN INDUSTRY INSIDER



SŁAWOMIR WOŹNIAK /// CEO /// SECO/WARWICK GROUP

“One of the reasons why we, as a company, are involved with a green transformation is because it is our mission, but it’s also because we see more customers following in the same direction.”

You recently attended ThermProcess in Dusseldorf. What kind of reactions to your products did you get from the attendees?

It was quite a good event for us. We had many visitors coming, both existing customers as well as new ones. They liked what we presented at our booth very much, especially all the green technologies that can support our customers while lowering their carbon footprint. What we see in the market is absolutely related to cost and process improvement, while meeting the new initiatives of green transformation.

We also see this in the heat-treatment industry, which is quite conservative in many aspects, especially with customers linked with the automotive industry and commercial treaters. We see more of that trend going in Europe than in the U.S. so far. But when you consider the current supply chain and the global link of all the suppliers, sooner or later, they will have to come into this global trend.

What are the ecological advantages of vacuum heat treating?

Vacuum heat treatment equipment and vacuum technologies are our main business lines. The process uses a lower consumption of process gases, but also a lower consumption of energy since very often the process takes a shorter time. Thanks to that, we can increase the overall productivity. Vacuum furnace compared to, let’s say, gas carburizing equipment is very flexible, because you can shut it down anytime you don’t need to use it, and you can switch it on again anytime you like. With gas carburizing, the equipment needs to be saturated with carburizing gas, and you have to maintain the carbon potential. Switching to vacuum is a greener technology, which means close-to-zero emissions, a lower energy consumption, and lower process gas consumption. And if you add the possibility to replace the oil quenching with the high-pressure gas quenching, then you can also eliminate the need to make a post-processing washing of the oiled parts.

What other technologies can SECO/WARWICK offer that help reduce the customer’s carbon footprint?

Last year we promoted a new model of furnace. We call it a Pit-LPC — pit low pressure carburizing furnace — dedicated for heat treatment and carburizing in the low pressure of large sized gears — especially for large gears where a thicker effective case depth of the carburizing layer is needed. The process takes a very long time — practically counted in hours. We can reduce the process by 50 percent or even more if we switch to low pressure carburizing. This is a big advantage to our customers. We have also developed the next stage of our ZeroFlow® nitriding process. We call it ZeroFlow Feedback Control, where we can have a better control of the nitriding process and optimized process time.

Going further, we have implemented 4D Quench® technology. We just provided this solution to an aviation customer, who is very happy

to use our technology; 4D Quench can replace the press quenching process, where you can do the hardening of gears by using the high-pressure gas quench. We can control the distortion level of the quenched gears, so the post-processing of machining is not required nor is washing of the parts, because you’re not using oil.

The 4D Quench is a fairly new development, correct?

This technology was developed some years ago and was originally dedicated for automotive industry. As a next stage, we started developing it as a solution for larger and precision gears dedicated to aviation transmissions like we can find in helicopters and planes. We know it is far more difficult to control the distortion of the larger diameter of gears, and we are able to achieve very good results with our advanced 4D Quench technology.

How can going greener help with your customer’s bottom line?

One of the reasons why we, as a company, are involved with a green transformation is because it is our mission, but it’s also because we see more customers following in the same direction. They want to do it because, being a green company, you can serve more customers. And it is not just that you are getting greener, but you can also save costs. This is why our customers want to implement green technologies that can positively affect their bottom line.

What you’re saying is, there was a necessity to become greener, but in doing so, they discovered they could actually save money?

Yes. If someone is a part of the global supply chain and is following all the directions given by the European Union (e.g. “Fit for 55 strategy”) along with more international organizations and institutions, sooner or later they will need to report the direction they’re going to lower their carbon footprint. This is what our customers are seeing: From one side, financial benefits, but from the other side, they see a new perspective to enter new markets or to simply maintain existing customers.

What other ecological activities are you involved with?

Besides helping our customers through the solutions we provide them, we are also, as a company, following the same direction. We have installed the photovoltaic system, we are switching our fleet of cars to electrical cars or we use the rainwater to water our grass in the company, just to mention a few of our pro-ecological measures. These kinds of activities are also showing our associates that we are not only providing and helping our customers be green, but SECO/WARWICK as a group is also a green company. ♻️

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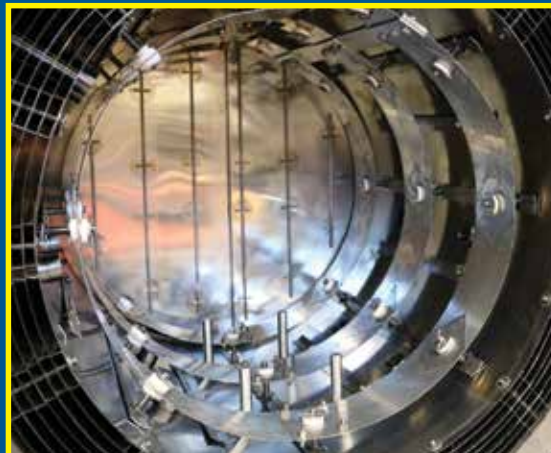
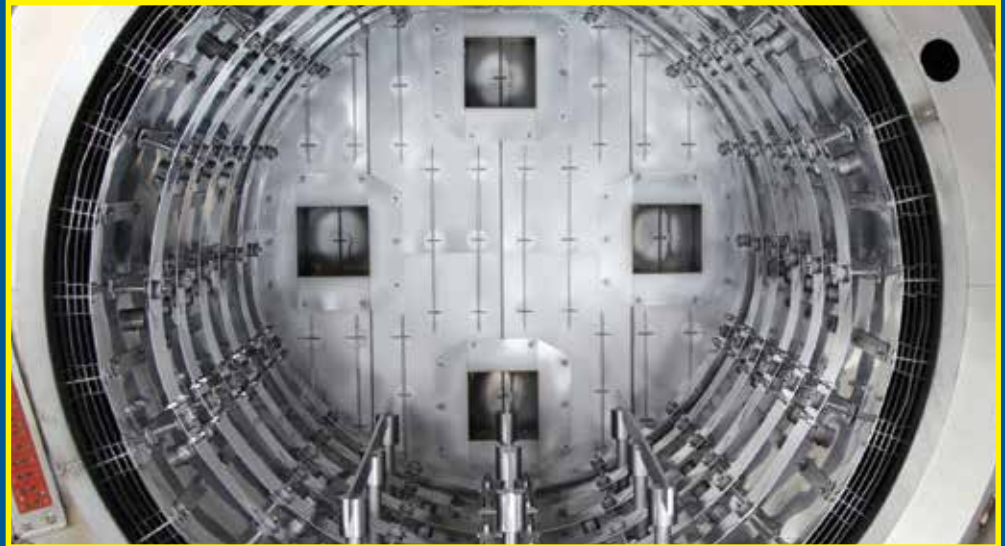
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