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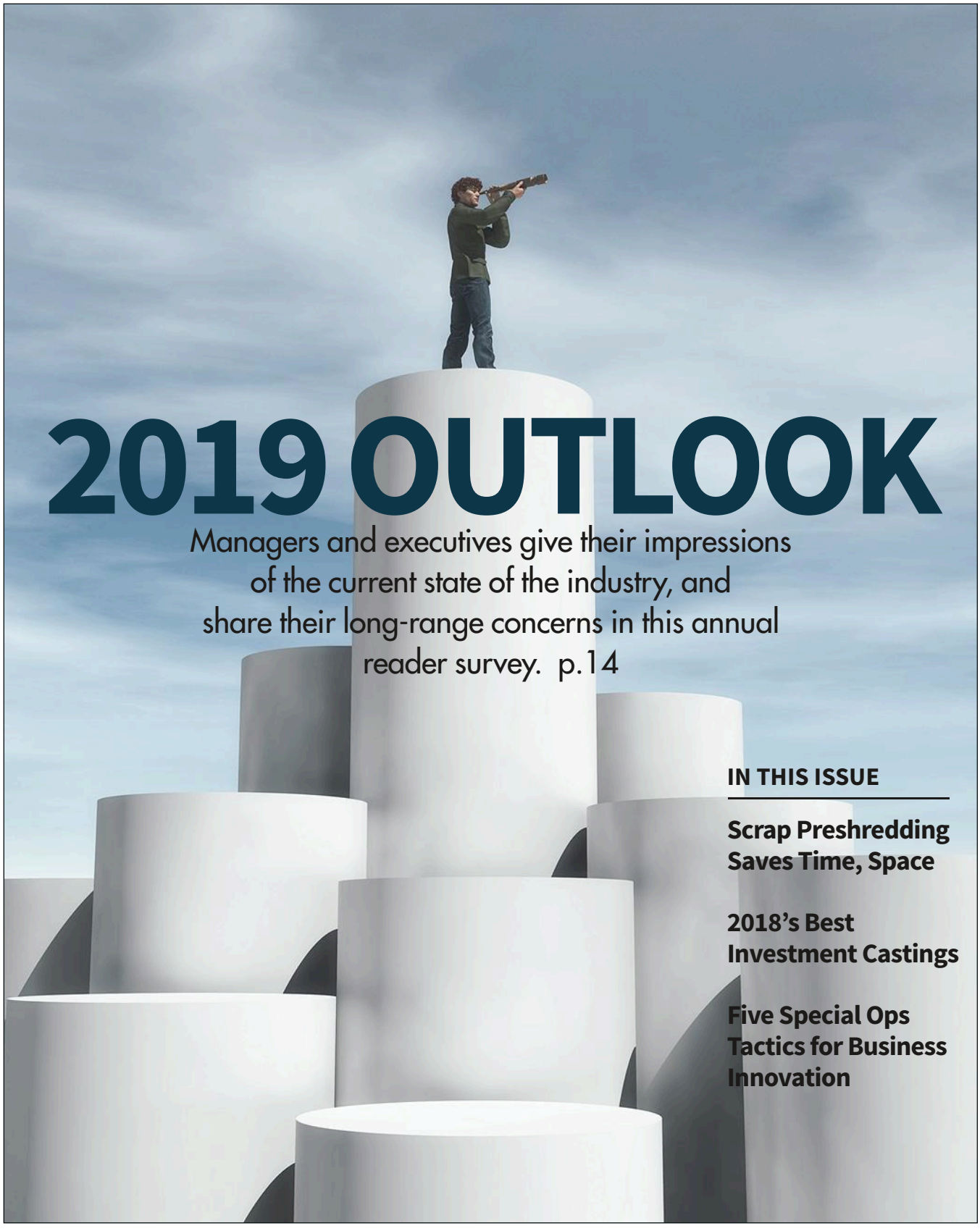

2019 OUTLOOK

Managers and executives give their impressions of the current state of the industry, and share their long-range concerns in this annual reader survey. p.14

IN THIS ISSUE

Evaluating Cored-Wire Practice to Automate Iron Treatment, Inoculation

Selecting the right alloy and inputting accurate values can make alloy addition more effective, reliable, and environmentally friendly

Q: We pour medium- to large-size gray, ductile, and CGI castings, and we are evaluating our current gray- and ductile-iron tapping, treating, inoculating and pouring processes. Is there a process/practice that would allow us to automate treating and inoculating processes effectively?

A: There are many different processes for treating and inoculating cast iron, processes that usually are conducted at the ladle. Tundish, pour-over, and sandwich methods are typical. More automated processes include plunging and the gazelle (porous plug) methods, while for inoculation the in-stream process is automated easily and provides many benefits.

However, one approach can apply both automated treatment and inoculation practice. Cored-wire practice introduces a hollow wire filled with powder alloys to the molten metal. The alloys in the wire may be MgFeSi for magnesium treatment (for DI or CGI), and/or inoculation material (for DI, GI or CGI.)

The wire is drawn from a coil that is mounted to the machine and feeds it to the molten metal. After it is set up, the machine has a human-machine interface (HMI) for installing required values of the melt and to introduce process automation. With these input values the machine will calculate the length of wire necessary to feed into the metal. Because this process is automated, it brings more accuracy to the sequence of adding magnesium and inoculation materials.

Cored-wire practice introduces a hollow wire filled with powder alloys to the lade to treat or inoculate molten iron.

These values are necessary to calculate how much wire is required in the molten metal. The coil normally reports the alloys in grams per meter of wire, and the information required by the computer will allow it to accurately calculate the length of the wire necessary to add the right amount of alloy.

The input values include sulfur content before and after treatment (for DI and CGI), iron volume, melt temperature, and wire-feeding speed. Some additional inputs may be required, but this will vary according to the current practice.

Normally, recovery levels of cored wire are comparable to other practices, however it will depend on a number of things: sulfur content before and after magnesium treatment, the percent of magnesium content in the treated iron, the iron quantity, the meters of wire fed, and the quantity of magnesium per meter of wire. With these details, a preliminary percentage of magnesium recovery can be calculated.

The temperature of the metal and the ladle geometry also affect magnesium recovery, and results will depend upon each individual practice.

For cored-wire practice it is preferable for the ladle to be taller than it is wide. Usually, a ladle that has a height/diameter ratio of 2:1 is recommended for cored-wire practice. This will promote a high iron column, meaning the Mg vapor bubbles have to travel a long distance through the iron and therefore remain largely within the iron.

However, it is possible to use your current ladles: The cored-wire mechanism can be tailored to any ladle as long as this is considered when designing the equipment.

Cored-wire practice offers reproducible results between ladles, high-quality iron, and simple process automation. In addition to these benefits, cored-wire treatment also can be an environmentally friendly process. The mechanism normally includes a lid with hollow tubes through which to introduce the wire: one of these tubes is used to control and direct the emissions from the treatment and inoculation step into the fan. With this system, it is easy to control the effluent and prevent the smoke from the magnesium treatment to disturb other activities in the foundry.

The typical products for ductile iron treatment and inoculation are MgFeSi and foundry-grade FeSi. However, we also offer pure magnesium wires and other inoculation products, such as ferrosilicon with zirconium, strontium, aluminum, calcium, bismuth and even cerium. Your selection depends on what you seek to accomplish at your foundry.

There also are different wire diameters that may be chosen for cored-wire practice. Standard diameters for wire are 9 and 13 mm, available for the different cored wire coils. On special occasions, a 16-mm diameter wire may be offered.

The different diameters will ensure that more material can be inserted per meter of wire. The larger diameters provide the ability to use less coil length, and also may reduce the wire-feeding speed for the mechanism.

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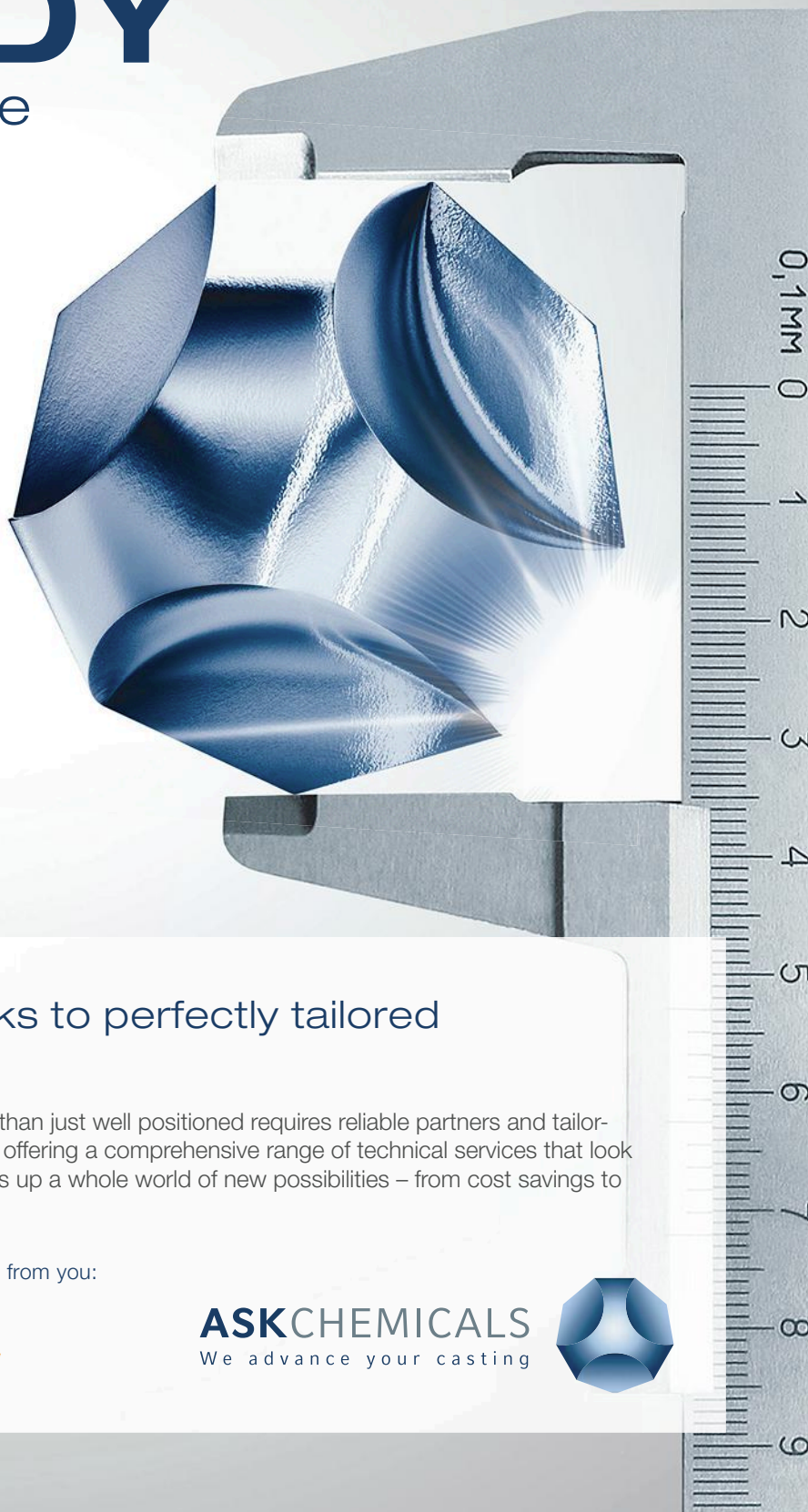

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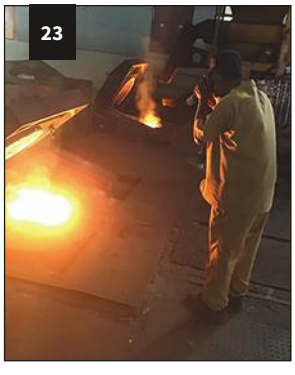

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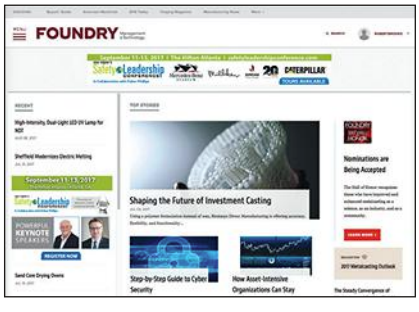

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Robert Brooks
Editor

Let's Try This Again

We arrive at this point so regularly that we ought to expect the rush, the anxiety, the curiosity that take turns in our priorities every December. The year is ending; time's up. There must be a meaning in a development that affects everyone, and still we search for meaning.

Over my writing career I've drafted the closing-out message, the looking-ahead message, and the stay-the-course message, taking the approach that suits my mood or seems to match the moment, whether that moment has been framed by anxiety or curiosity, or enthusiasm or dread. It fits the moment but never manages to resolve the dilemma. Why do we give so much of ourselves over to 'time,' its demands on us and its indifference to our expectations? Why do we feel so defeated by our failure to master 'time'?

Now, anyone with a memory of my past writing will know I return to this subject frequently, regardless of the calendar. Time may be a taskmaster but history is a reliable teacher. We (and I) learn from the vast record of human experience, as well as our own experiences and mistakes, if we are disposed to receive that information with some patience and openness.

I doubt I am the only one who feels the pressure of time, and the frustration it induces when we sense we're running out of it. And the sense of being beaten by time is only part of trap. The past year has given many metalcasters a sense of triumph or satisfaction – the assurance that government policies are now turned to favor them and their interests. "'Make American Great Again' has been more beneficial than anything in the past decade for American manufacturing," one reader effused. Another one countered: "Not sure what tariffs will do to us." "Tariffs are inflating costs that were not part of our budget forecast," added another.

The past year has been a good time for foundries and diecasters, and for manufacturers in general, as FM&T's annual survey of the industry's decisionmakers has documented for us. Casting shipment totals have increased in line with industrial and consumer demand. But what has brought success or progress has also introduced new factors that must be understood, and managed. Some people see only the good, others see only new problems.

The trap of moments like this is the impulse to interpret success as an individual triumph – comparable to the more common mistake of reading failure into missed schedules or lost opportunities. Of course, we volunteer for these problems: we engage in professions and activities in which time is budgeted, allocated, incentivized, and monetized. We reward services delivered on-time. We reward ourselves with "time off" because we have made it such a rare and valuable commodity.

We have made ourselves into commercial beings — overly eager for any sort of reward we may gain by our skill or availability. We view the reward as affirmation. Having been rewarded, we want more. We're willing to sacrifice more, often too much, to get it.

We've also disoriented ourselves by expanding the scope of knowledge that is accessible to individuals, and impulsively we confuse the facts we collect and the feelings or opinions that seem to spring from the same place. And we lose our selves in the technology that links all these variables, extraordinarily powerful tools that are not extensions of our minds or our wills, no matter how persuasive that illusion seems.

Of course we live in an extraordinary time, but all times are extraordinary according to the experience of those living and aware of them. We must redetermine the value of individuals apart from their commercial affect or potential for reward.

Time exists apart from any individual, and it will continue beyond the understanding or concern of any one of us. The great progress of human civilization over centuries and millennia is the result of incremental change, of humanity knowing well its own purpose and obligations. We should not celebrate or mourn our circumstances, but we should reconsider what we value.

Robert Brooks

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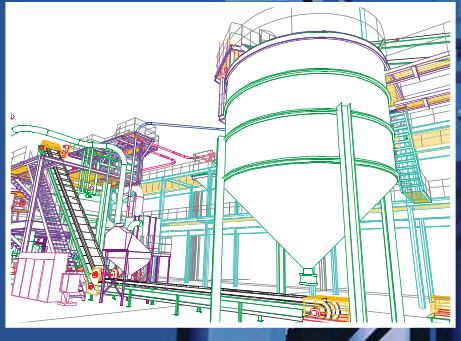

Master Planning

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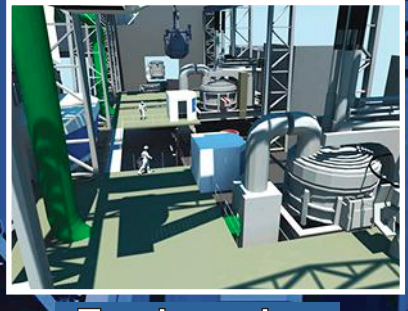
Operational Improvement

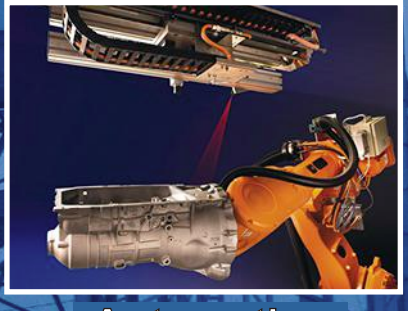
System Integration

From Concept to Casting



Engineering

Installation



Automation

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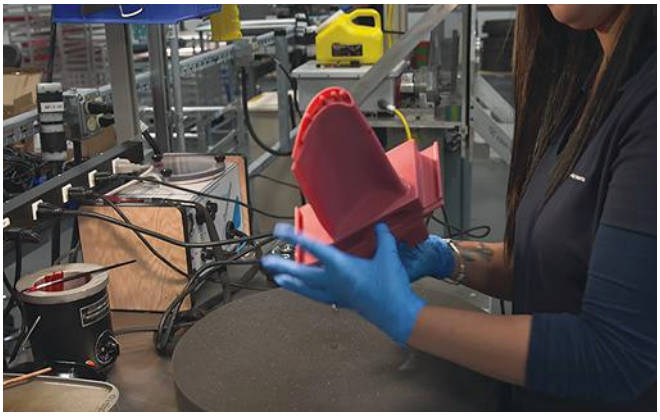
METALCASTING NEWS

Ceramic molds are fired at Advanced Airfoil Components, a Siemens/ Chromalloy joint venture producing investment-cast blades and vanes for Siemens gas and steam turbines.



Individual wax patterns are formed for each turbine blade: the patterns are assembled and dipped into ceramic slurry to create ceramic shells, which form the molds for each casting.

Siemens, Chromalloy Open New IGT Parts Casting Venture

Siemens Corp. announced the opening of its joint-venture investment casting operation with Chromalloy Gas Turbine Corp. in Hillsborough County, FL, a $139-million project that will produce blades and vanes exclusively for Siemens gas turbines. Advanced Airfoil Components (AAC), as the venture is known, is a 210,000-sq.ft., standalone plant that will continue to be built-out in stages and completed over the next four years.

The joint-venture project was announced in May 2017.

The investment casting process involves a series of production stages: patterns of the finished parts are formed in wax, and these patterns coated in a slurry to form a coating. The coated parts are fired in a furnace to form ceramic molds. With the wax evacuated the empty ceramic molds are placed in a specially constructed furnace and invested with the selected alloy. The filled molds are held under controlled atmosphere until the part solidifies according to a determined crystallization pattern.

Siemens noted that AAC will be capable of producing blades and vanes for the entire range of Siemens gas turbines, including its new 9000HL heavy-duty turbine.

"Not only does this joint venture help reduce costs and support our supply chain needs, but it will create 350 high-wage, skilled positions, including technical engineers, manufacturing technicians and production workers and expand Siemens more than 5,000 employees footprint in Florida," stated Lisa Davis, CEO Energy for Siemens AG, of which Siemens Corp. is a subsidiary.

Chromalloy has operated an investment casting foundry in Tampa since 2011, where it produces castings for turbofan aircraft engines, as well as a separate, adjacent plant producing cores to support the investment casting plant. It supplies turbofan and industrial-gas turbine engine manufacturers, and supports Chromalloy's global repair and replacement service program for aircraft engine parts.

"Our collaboration with Siemens in the creation of Advanced Airfoil Components is a natural progression in our partnership that will ensure success and financial profitability in this market space," stated Tom Mepham, CEO of Sequa Corporation, the parent company of Chromalloy. **... READ MORE**

Linamar in Deal to Manufacture Electric Drives

Linamar Corp. struck a manufacturing partnership deal with Protean Electric, the Michigan-based developer of in-wheel electric drive systems. Its ProteanDrive technology generates power directly in a vehicle's wheels, a change the developers claim improves torque response, vehicle handling, and acceleration, and reduces the charging requirements and increases the range for electric vehicles.

The in-wheel motor is conceived as a way to conserve space aboard the vehicle by placing the drive system behind a standard road wheel and applying torque directly to the wheel and tire. The electric motors are designed for front- or rear-wheel drive vehicles, and may be adapted to cars or trucks with internal combustion engines.

"Protean has developed excellent technology we think will revolutionize the drive of electric vehicles in the future," stated Linamar CEO Linda Hasenfratz.

Ontario-based Linamar has four operating divisions, Machining & Assembly, Light Metal Casting, Forging, and Skyjack — three of which produce metal components and systems for automotive manufacturers. It has nearly 50 plants as well as research and marketing operations in 14 countries.

The new agreement covers both the Protean Pd18 and Pd16 drive models, with

The ProteanDrive in-wheel motor system has integrated power electronics and digital control. The system includes (left to right) a brake disk and caliper, the power electronics, a capacitor ring, stator, bearing, and rotor, all to be situated behind a standard wheel and rotor.

Linamar providing manufacturing capacity that will support Protean's supply to North American passenger car and commercial vehicle OEMs, worldwide. Protean will provide the technology and product validation expertise, and Linamar will manufacture and sell the ProteanDrive products to its customers and through its existing supply chain.

According to CEO and chairman K.Y. Chan, Linamar's "expertise and reputation for manufacturing highly engineered components at scale makes them the perfect partner. This agreement allows Linamar and Protean Electric to focus on their independent strengths to give customers far better access to our technology at competitive pricing." **... READ MORE**

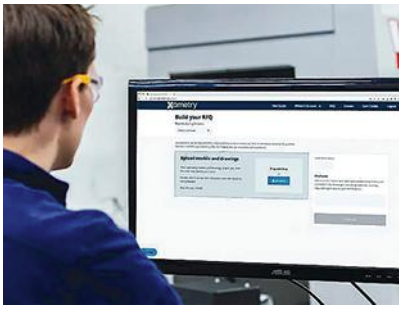
On-Demand Manufacturing Site Will Quote Diecasting

Xometry, an "on-demand manufacturing network," is adding diecasting producers to its portfolio of qualified suppliers available to quote work projects to operations needing finished parts. Previously offered capabilities include CNC machining, 3D printing, sheet metal fabrication, injection molding, and urethane casting, and it also will add stamping, and extrusion to its offering.

Diecasting is the process of forming metal parts by forcing molten metal into a mold under pressure. It's particularly applicable to nonferrous metals, and to production of complex small/mid-sized parts, in high-volume production. Diecastings typically present dimensional consistency and good surface-finish characteristics.

The Xometry service has over 2,500 U.S. shops (or "partners") available to quote production orders to customers' Requests for Quotes. It claims to have over 12,000 customers, including BMW, General Electric, and NASA.

"We are excited to offer an RFQ service to our customers," stated CEO Randy Altschuler. "This new offering allows us to serve additional needs for our customers



Xometry.com added diecasting, stamping, and extrusion to the range of manufacturing capabilities offered on its RFQ platform.

as well as the manufacturers in our partner network."

To receive a quote, and for a fee of $20.00, customers upload part files to Xometry's site and specify their part requirements. An RFQ will go out to Xometry's partner network and qualified shops will respond within seven days. Customers may communicate with the shops who bid and select a supplier.

In addition to the RFQs, qualified partners are eligible to receive discounts through a "Shop Advantage" program, which offers purchase discounts on Sandvik Coromant cutting tools and tooling; Dell computer technology; supply-chain services from Geared for Green and Transportation Impact; financing from Manufacturers Capital; and custom metals and plastics from OnlineMetals.

... READ MORE

New and Newsworthy for Metalcasting

... READ MORE is your tip to visit FoundryMag.com for up-to-date, extensive, informative reporting on news and developments for metalcasting operations, including:

- Caterpillar to Restart New Iron Foundry in 2019
- Boeing Taps Aeromet to Supply New UK Plant
- Kimura Adopting SinterCast for CGI Research, Production
- New Investors Commit to Sivyer Steel
- Aluminum Coming to Ellwood Engineered Castings
- GKN is First to Adopt New Metal 3DP Process
- Lockheed, Arconic Developing 3DP Materials, Processes
- Can-Eng Developing Flexible System for HPDC Plant
- Simpson Buys EU Sand-Processing Supplier
- Expanded Auto Aluminum R&D for Constellium
- SinterCast CGI Production Stays on Record Pace
- Betz Industries Expanding to Add Machining
- CPP Buying Titanium Investment Caster
- Specialty Materials Producer Expanding Mag Foundry
- Amsted Rail Adding Heat-Treating Capacity
- Accuride Completes Acquisition, Achieves Global Status
- Permanent Mold Foundry Adds Casting Capacity, Automation
- IBC Wins Three-Year Lockheed Contract
- New Monthly Record for SinterCast CGI Output
- Chromalloy Wins Long-Term US Navy Contract
- EMI Adds Core/Mold Machine Specialist
- ASTM Proposes New Standards for Zinc Diecasting
- Magnesium Fire Disrupts Auto Supply Chain

The BMW X5 xDrive40e is a plug-in hybrid vehicle introduced at the 2015 Shanghai Motor Show.

GF Casting Solutions' aluminum diecasting plant at Suzhou, China.

GF Drawing Orders for EV Castings, Especially in China

GF Casting Solutions revealed it has contracts to supply lightweight cast components for electric vehicles in China, one of the world's most dynamic markets for EVs: Chinese economic planners have set a goal for total annual sales of 2 million EVs and gas-electric hybrid vehicles by 2020, and for manufacturers to have at least have one electronic vehicle in production by 2019.

China's EV market has expanded by 10X since 2014 and is forecast to grow 40% annually in the foreseeable future.

The Swiss metalcasting group — which has an iron foundry at Kunshan, China, and an aluminum and magnesium high-pressure diecasting plant at Suzhou — did not detail the orders, but estimated their total value at $366.3 million and noted they had been placed by both Chinese and European manufacturers.

One of the orders was estimated at $232.6 million, for light metal e-drive components for a new e-vehicle developed by a European OEM. These parts will be produced at the Suzhou plant, beginning in 2019.

GF Casting Solutions explained that 30% of its new orders recorded worldwide during 2018, and more than 50% for orders for Chinese customers, have been for components for hybrid and electric cars. **... READ MORE**

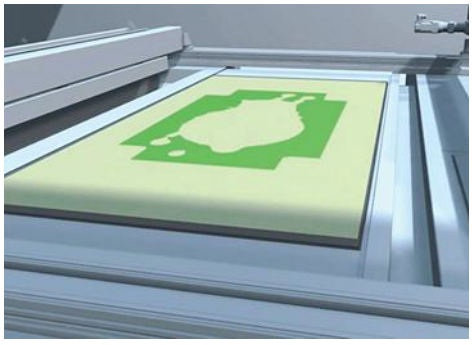
Denison Industries Adopts ExOne 3DP for Sand Molds

Denison Industries, an aluminum foundry in Denison, TX, has adopted additive manufacturing for sand molds with the ExOne S-Max 3D printer system, the centerpiece of an expansion project intended to add new customers as well as to accelerate and improve production processes.

"We really feel this will separate ourselves from the current industry," Bryan Petty, director of projects and process improvement stated, according to local reports. "What we really wanted to do is attract those customers like the department of defense, aerospace and defense and ensure we provide them a good service."

The sand-molding (as well as semi-permanent and permanent-mold) foundry produces aluminum castings ranging from 1 to 3,000 lbs. Its customers are aerospace, automotive, and commercial industrial manufacturers, as well as military and defense contractors.

The S-Max is ExOne Company's largest 3D printer for sand molds and cores, with a 1,800x1,000x700-mm build area (LxWxH), and a build speed of 2.12-3.00 ft^3/hour. Its printers combine foundry sand and with phenolic or sodium-silicate



The S-Max is ExOne Company's largest 3D printer for sand molds and cores, with a 1,800x1,000x700-mm build area

binders to deposit the bonded material in layers, as indicated by the CAD-defined pattern for the mold or core.

Denison Industries has adopted one printer, but has indicated a second unit may be installed in available space (now used for a 3D scanning operation.)

Denison Industries anticipates the new technology will accelerate its prototyping and tooling processes, in particular for new and prospective customers. **... READ MORE**

METALCASTING BRIEFS

■ **B&L Information Systems** added several metalcasters to its list of Odyssey ERP subscribers: **J&M Precision Die Casting**, Elyria, OH, **New GLDC**, Muskegon, MI, and **WDC Acquisitions LLC**, Creston, IA, adopted the browser-based ERP system; **Ancast Industries Ltd.**, Winnipeg, MB, **Fisher Cast Steel**, West Jefferson, OH, **Madison-Kipp Corp.**, Madison, WI, **Quality Castings Co.**, Orrville, OH, and **Superior Brass & Aluminum Casting Co.**, East Lansing, MI, adopted Odyssey ERP software. Also, **Pace Industries LLC** continued the conversion of its operations from B&L's BLIS ERP software to B&L's Odyssey Web UI with a "go-live" at **JEL Finishing**, Chelmsford, MA.

■ **OnRobot**, which develops end-of-arm tooling for collaborative robots, opened its first U.S. operation in Dallas. In addition to sales and marketing activity, the location will host customers for training and demonstrations.

■ CGW-Camel Grinding Wheels announces has rebranded as **CGW Abrasives**. CGW manufactures vitrified grinding wheels, resin grinding and cutting wheels, flap discs, coated abrasive belts, and paper-sanding discs.

■ **Solar Atmospheres** of Western PA, Hermitage, PA, commissioned a 20-foot long car-bottom furnace that has a total load capacity of up to 30,000 lbs.

New Sales VP for AFC-Holcroft

Tracy Dougherty was named vice president of Sales at AFC-Holcroft, Wixom, MI. Dougherty has been with the industrial-furnace developer since 2008 in several sales-related roles, most recently as the company's sales manager. As v.p.-Sales, Dougherty will have additional responsibilities, including overseeing AFC-Holcroft's activities in Europe.

Dougherty

"Tracy has a genuine ability of keeping the best interest of both AFC-Holcroft and our customers in mind as he deals with day to day activities within our group. This promotion will further reinforce Tracy's key leadership role within our company," according to William Disler, president and CEO.

NFFS Names Officers, Board

The Non-Ferrous Founders' Society, Park Ridge, IL, announced its board of directors and officers for the 2018-19 calendar year. Named to the group's executive committee as president is Chris Shanks, Ford Meter Box; vice president Jay Armstrong, Trialco Inc.; treasurer Andrew Iannettoni, Ford Meter Box; and immediate past president: George Mugford, Bunting Bearings LLC. The committee also includes Rolf Gretschmann, Standard Manufacturers Services Ltd. and John Mellone, Beck Aluminum Corp.; On the NFFS board, continuing as directors are: Paul Armstrong, Armstrong RM; Cathy Dolan, Calumet Brass Foundry Inc.; Bret Markum, Aluminum Castings Corp.; Allen Meskan, Meskan Foundry; Kevin Ruddock, N.T. Ruddock; Chip Shamburg, Erie Bronze and Aluminum Co.; and Jim Spalding, Stahl Specialty Co.

Elected to new three-year terms as directors are: ; David Angermeier, Sipi Metals Corp.; Chris Greenfield, Federal Metal Company; R.J. Kuhn, Reliable Castings Corp.; Jason Mugford, Bunting Bearings LLC; and Bill Surman, I. Schumann & Co.

"The real leadership for NFFS is provided by the directors and officers of the Society," stated NFFS executive director Jerrod Weaver. "These dedicated individuals ensure that the vision for NFFS is well articulated, that actions taken is very by the Society are efficient and well organized, and that the membership programs and services it provides are aligned with the needs and interests of the non-ferrous casting industry."

Working on its Swing, Callaway Offers a Sound Redesign

Reevaluated putter head is the first result of new additive manufacturing approach

Many metalcasters are golfers too, which may be the only explanation needed for the dedicated (or fanatical, or obsessive — choose your own descriptor) approach that many may take to getting their methods and procedures just right. On the links, and particularly on the green, mastering the details right will deliver the right results, right?

The connection from metalcasting to golf has been exhaustively explored (Carbon or stainless steel? Aluminum? Cast metal driver heads or forged? Or precision milled?) Now make room in these debates for additive manufacturing. Equipment designer and manufacturer Callaway Golf Co. likes the sound of that possibility, and has engaged GE Additive's consulting unit to help it integrate additive manufacturing processes to improve the performance of its putter products.

Callaway Odyssey R-Ball putter, formed in 17-4PH stainless on a Concept Laser M2 EBM system.

"Additive manufacturing is a new tool that is quickly going beyond the aspirational phase, and into the functionalization phase of the technology," according to Callaway's Brad Rice, director - R&D, Advanced Engineering.

GE's AddWorks team works with consumer and industrial product groups to apply additive-manufacturing technologies to improve existing product designs. According to an AddWorks mission statement. "Our assessment can determine if a part is appropriate for additive or better produced conventionally." Their first assignment with Callaway has resulted in a redesigned Odyssey R-Ball Prototype putter head.

Callaway designs and manufactures its products in various ways to suit the performance and aesthetic (or in this case, acoustic) tastes of professional and amateur golfers around the world. The modified Odyssey R-Ball Prototype putter was developed in Japan as a "tour preferred" model, but its design had an acoustic signature unique to that local market. Callaway's goal was to see how additive manufacturing could change that acoustic signature while retaining the preferred shape and performance.

So, what do acoustics have to do with a putter, or any club? The sound that the equipment produces as it strikes the ball matters to golfers, as golf equipment manufacturers have discovered in recent years as new materials and shapes have been adopted to improve force or handling, or some other function that matters to their results.

A general trend in club design (especially drivers) has been to adopt lighter materials, especially composite metals, so that the lighter products will accommodate heads that golfers may customize to their preferred style of play. One objective is to achieve a head design with a more favorable "moment of inertia" — the response of the mass that determines how it transfers force to the ball — to achieve drive trajectories that are straighter. A problem with this emerged when golfers reacted negatively to the sound of the club striking the ball.

Frequently a putter head features cavities or other details that provide an audible indicator of optimal contact between the putter head and a golf ball. The sound created by the putter may indicate how well the golfer has contacted the ball. Thus, in the ears of the golfer, the right sound is fairly significant to effective putter design.

In the case of the Odyssey R-Ball Prototype putter, the GE AddWorks team determined the best way to optimize the acoustic effect was to add geometric features that were too difficult to achieve by conventional casting. The engineering consultants worked with Callaway's design and engineering teams to apply additive manufacturing design practices and build upon the established design.

GE Additive offered electron-beam melting technology for design, prototype, or production scale additive manufacturing, converting CAD-based design information from powdered alloys in into three-dimensional metal structures by laser melting.

The AddWorks team provided Calloway with design insights drawn from past AM projects, and refined existing designs with new thermal stresses and overhang constraints to ensure the additive features were "self-supported or easily supported during the build." The new putter shows the results of topology optimization in conjunction with acoustical mapping to create the optimal design.

As Callaway develops an additive manufacturing strategy, the AddWorks team has provided it with information about additive processes and materials selection and is developing parameters and testing protocols to achieve desired material properties. It's also working with Callaway to identify other parts that may be produced or enhanced by additive manufacturing.

"This project has allowed us to add value to Callaway's business goals," stated Chris Schuppe, AddWorks general manager. "We're also taking away many new learnings from our first project together, especially around aesthetics. We have also used additive technology to create an acoustic map, which is certainly a first for us. We're looking forward to driving more successful projects with Callaway, as they continue their additive journey," he added.

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2019 METALCASTING OUTLOOK

North American foundry and diecasting managers and decisionmakers give the final word on industry conditions today — and the first word on their expectations for metalcasting growth and development in the coming year.

Metalcasting is not an ordinary industrial market: it is sensitive to all types of economic variables (raw materials, energy, labor) as well as financial conditions (interest rates, tariffs.) Shifts in industrial demand or consumer demand can punish metalcasters that are unprepared to respond to changes. The business forces producers to manage high operating costs, and it demands adherence to the behavior of long, complex supply chains.

Most economic indices suggest U.S. industrial economics are sound, with good prospects for sustained growth in output and demand. But, not every industrial or consumer sector has the same outlook. The problems they face are profound: "The casting industry is being pushed and tested more than ever," one correspondent told us. "Struggling to meet regulations, keep having retention issues and falling behind on our committed ship date to our customers," another wrote.

Evaluating metalcasting industry conditions and forecasting economic developments for foundries and diecasters demands a more concentrated look at their activities, who they do business with and what opportunities and challenges they face. That is the objective, and the purpose, of Foundry Management & Technology's 2019 Metalcasting Business Outlook.

What have we here? — Every October, *FM&T* surveys metalcasters to capture the insights, concerns, and expectations of men and women working in North America's foundries and diecasting plants. We seek to understand not only the current operating circumstances for these enterprises, but also the underlying conditions shaping the businesses, and how these are received and understood by the industry's decision-makers. We want a record of the issues the they face in their businesses and the economy, to learn what decisions they face in the coming business cycle, and to understand better their expectations for their future of their businesses.

We surveyed readers by email over a period of four weeks. We are pleased to note that the 2019 Outlook respondents are a recognizable portrait of the metalcasting industry we cover, and reliably representing the range and variety of operations included therein. In total, the respondents comprise 24.5% aluminum casting operation, 22.5% steel casting plants, 14.5% ductile iron plants, 12.9% gray iron foundries, and 12.6% brass/bronze

producers. A further 11.9% identify their operations as producing 'Other' metals: nickel-based alloys, stainless steel, chromium and high-silicon iron are among the metals and alloys listed.

Similarly, as in past years, the Outlook survey is designed to portray metalcasting operations of all sizes. In the current results, 25.5% of respondents are attached to operations with more than 250 employees, and 23.5% represent operations with 100 to 249 employees. On the other hand, 18.8% of respondents work operations with less than 20 employees, and 18.1% work with firms of 50-99 workers. The remaining 14.1% are affiliated with businesses that have 20-49 employees. And so, as with the distribution of the metals being cast by the survey respondents' plants, we are confident that the full spectrum of employment conditions and competitive concerns are reflected in the survey results.

Viewed from here — The first portion of the Outlook survey is designed to establish the respondents' sense of recent and current metalcasting business conditions — using 2018 casting shipment volumes (tonnage) as a frame in which to characterize their evaluate their assessments and expectations. And they are, without a doubt, upbeat: 75.84% of all survey respondents indicate that their businesses' 2018 casting shipments will increase on the 2017 total.

Within that majority of respondents we learn that more than half (50.85%) anticipate the current year's results will be a 10-25% improvement on the 2017 total, and 34.75% are counting on a rise of up to 10% over last year. A further 10.17% are expecting this year's shipment totals to be 26-50% better than last year's, and 2.54% foresee year-over-year rise in shipments above 90%

One the other side of the ledger, the great majority (71.43%) of those respondents who expect their businesses' 2018 shipments to decline over 2017 project a drop of up to 10%. A further 23.81% project the decline to be in the 10-25% range, and 4.76% expect a shipments decline of 26-50%.

What is the principal metal that you cast?

Aluminum	24.50%
Brass/Bronze	12.58%
Ductile Iron	14.57%
Gray Iron	13.91%
Steel	22.52%
Other	11.92%

How many employees work in your metalcasting operation?

Under 20	18.79%
20 to 49	14.09%
50 to 99	18.12%
100 to 249	23.49%
Over 250	25.50%

How will your 2018 casting shipments (tonnage) compare with 2017 shipments?

Stay the same	17.45%
Increase	75.84%
Decrease	6.71%

How do you expect your 2019 casting shipments (tonnage) to compare with 2018 shipments?

Stay the same	22.15%
Increase	71.81%
Decrease	6.04%

How will your 2019 capital expenditures compare to your 2018 capital expenditures?

Stay the same	29.80%
Increase	60.26%
Decrease	9.93%

What types of capital expenditures are you planning in 2019?

New Plant	6.67%
New Equipment	72.67%
Expansion/Addition to existing plant	28.00%
None	11.33%

What are your borrowing plans for 2018?

More debt	6.62%
Retire debt	9.93%
Stay about the same	52.32%
Not currently carrying any debt	31.13%

The Outlook survey takes the same approach to study expectations for 2019. Among all respondents, 71.81% expect their businesses' 2019 casting shipments to exceed the 2018. Another 22.15% foresee next year's shipments matching ("About the same") 2018, and 6.04% look for a volume decrease next year.

Among the more optimistic of this cohort, more than half (53.15%) expect their businesses' 2019 casting shipments to improve by 10-25%, and 39.64% expect the increase to be up to 10%.

There is a further 4.5% of these respondents who look for 2019 shipments to increase 26-50%, and less-then-1% results for respondents in the 51-75%, 76-90%, and over-90% ranges.

Recall that 6.04% of all respondents expect 2019 casting shipments to decline versus 2018 shipments: among these, 57.89% expect the decline to be in the 0-10% range, and 26.32% expect a decline of 10-25%. 10.53% of this respondent group anticipate a 26-50% decline in 2019 shipments.

Investing strategies

The Outlook survey seeks to examine metalcasters capital spending plans, taking the view that investment is a reliable indicator of business confidence. It's also the case that the nature of investment plans will indicate how metalcasters will seek to improve or extend their current business results.

We asked survey respondents to compare 2019 capital spending plans to 2018 investments: 60.26% indicated next year's capital investments will top the current year's total, and 29.80% indicated next year's investments will match the current year's total.

The remaining 9.93% acknowledged they will invest less capital in 2019 than they have invested this year.

Looking first at the 60.26% of all respondents that indicated plans to raise their investment total, 44.68% expect that increase to range up to 10% more than the current year's amount, and 34.04% estimate the increase to be 10-25% higher than the current year's amount. 13.83% peg the coming increase to be in the range of 206-50%. Even higher increases (51-75%) are expected by 4.26% of these respondents; 1.06% predict a spending increase of 76-90%; and 2.13% are looking forward to a CapEx increase of more than 90%.

Among the other 9.93% of all respondents (the spending-cutters), 40.0% will reduce their 2019 investments by 0-10%; 24.0% will reduce by 10-25%; 4.0% will reduce by 51-75%; 4.0% will reduce by 76-90%; and 4.0% will reduce by 90% or more.

The particular nature of 2019 capital investments is instructive, too: 72.67% of all respondents will invest to install new or replace metalcasting equipment. 6.67% will invest in new production capacity, and 28.0% will invest to expand or extend their existing production capabilities. 11.33% of all respondents have no current plans for capital spending in 2019.

Do you plan to purchase any of the following types of equipment in 2019?

Air compressors	15.71%
Automatic pouring system	10.71%
Blast cleaning equipment	15.71%
Continuous mixers	14.29%
Conveyors	20.00%
Coremaking machines	15.71%
Cranes/hoists	20.00%
Cutoff equipment	8.57%
Design software/hardware	12.14%
Diecasting machines	7.14%
Grinding equipment	24.29%
Heat treating equipment	15.71%
Investment casting system	2.86%
Lab equipment	32.86%
Lift trucks or loaders	16.43%
Lost foam system	1.43%
Machine tools	25.00%
Melting equipment	22.14%
Molding machines	10.00%
Permanent mold system	5.00%
Pollution controls	24.29%
Power control equipment/systems	9.29%
Process computers	12.86%
Rapid prototyping equipment	10.71%
Robots/manipulators	17.14%
Sand Prep equipment	12.14%
Sand reclamation equipment	18.57%
Shakeout/punchout equipment	7.14%
Simulation software	11.43%
Testing/inspection equipment	25.71%
Other (please specify)	8.57%

Indicate which of the following issues are likely to be significant problems for your operation in 2019

Availability of Capital	12.33%
Energy Costs	22.60%
Energy Shortages	1.37%
EPA Requirements	15.75%
Human Resources	37.67%
Imported Castings	4.11%
Interest Rates	6.85%
Labor Costs	23.29%
Labor Shortage	58.90%
Lack of Orders	8.90%
Material Shortages	9.59%
Medical/Insurance Costs	13.01%
On-Time Delivery of Castings	18.49%
OSHA Requirements	18.49%
Plant Management	10.27%
Plant Operations	18.49%
Product Liability	0.68%
Product Marketing/Sales	3.42%
Quality of Castings	11.64%
Raw Materials Cost	30.82%
Training	19.86%
Workers' Compensation Costs	5.48%
Other (please specify)	1.37%

Within the remaining 88.67%, 2019 CapEx budgets look like this: 20.5% will invest less than $100,000, and 17.12% will invest $101,000-$250,000. 19.9% will invest $251,000-$500,000, and 15.75% will invest $500,000-$1 million. Another 19.9% will invest $1 million-$5 million, and 6.85% plan to invest over $5 million.

Among these investors, 52.32% expect to keep their 2019 borrowing total "about the same" as it has been during 2018; 6.62% will increase their debt total over the current level; and 9.93% expect to retire debt during 2019. Impressively, 31.13% of all respondents are not carrying any debt currently.

The Outlook survey asks metalcasters to identify where their capital investment funds will go in the year to come, which reveals what they know to be their manufacturing needs and where they believe investments will determine (or extend) their growth. We allow respondents to list all the functions or processes in which they will invest (so, the totals exceed 100%.)

The top choice for 2019 capital investments among the respondents (32.86%) is "laboratory equipment," an indicator of the enduring importance of product quality and quality assurance in metalcasting operations. And, to reemphasize the point, the respondents' second choice (25.71%) is "testing/inspection equipment." Their third choice is "machine tools" (25.0%), followed in by "grinding equipment" (24.29%), a choice that is tied with "pollution controls." These choices are followed by "sand reclamation equipment" (18.57%) and "lift truck/loader" (16.43%.)

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Indicate which of the following issues have been significant problems for your operation during 2018	
Availability of Capital	15.33%
Energy Costs	28.00%
Energy Shortages	2.67%
EPA Requirements	14.67%
Human Resources	46.67%
Imported Castings	6.00%
Interest Rates	4.00%
Labor Costs	16.67%
Labor Shortage	58.67%
Lack of Orders	6.67%
Material Shortages	10.00%
Medical/Insurance Costs	13.33%
On-Time Delivery of Castings	26.67%
OSHA Requirements	18.67%
Plant Management	10.67%
Plant Operations	16.67%
Product Liability	1.33%
Product Marketing/Sales	2.00%
Quality of Castings	22.67%
Raw Materials Cost	28.67%
Training	22.67%
Workers' Compensation Costs	6.67%
Other (please specify)	4.67%

In addition to the various choices offered by the survey, we discovered a significant interest in computer hardware, machine tools, scrap shredding equipment, and high-pressure molding among the metalcasting respondents.

Management issues — The Outlook survey is as interested in the issues and concerns shaping metalcasting decisions as the respondents' future plans. Taking the same "all that apply" approach, we offered respondents a selection of subjects that have proven noteworthy to metalcasting management in past surveys. Asked to name the issues that have presented significant problems to their operations during 2018, well more than half (58.67%) cited is "labor shortage", a circumstance reinforced by their second choice, "human resources" (46.67%.) The third-place problem has been "raw-materials cost", followed by "energy costs" (28.0%), and "on-time delivery of castings", indicating the competitive spirit currently at work in metalcasting.

Other respondents named "skilled workers" and "employee turnover" as their most noteworthy problems.

Of course, the same inquiry is relevant to respondents' view of 2019. For the year to come, their most widely shared (58.90%) problem issue is "labor shortage", reinforced by their second choice (37.67%), "human resources." These are followed by "raw materials cost" (30.82%) and "energy costs" (22.60%.) In the next rank, "training" looms as a problem for 19.86% of respondents. Others anticipate problems "on-time delivery of castings", "OSHA requirements," and "plant operations" in 2019.

The perennial problems of global trade imbalances reemerged as a contentious issue during 2018, with sanctions on Iran and China trade barriers earning mentions by Outlook survey respondents. "President Trump's tariffs on imported steel and aluminum is the best policy-change to benefit the U.S. domestic metalcasting business in years," asserted one respondent, who expects "it will lead to increased opportunities to grow my business to meet the metalcasting needs for my existing domestic clients, as well as the opportunity to acquire new American clients for years to come."

Some others made similar claims, citing new economic opportunities due to business "reshored" from China or Mexico.

Economic policies — Asked specifically "How are casting imports affecting your business?", 42.0% of respondents claimed no

How are casting imports affecting your business?	
No affect	42.00%
Becoming more of a competitve factor	29.33%
Becoming less of a competitive factor	17.33%
We're building our own export business	11.33%

How do you feel the overall U.S. economy (GDP) will perform in 2019 compared to 2018?	
Significantly Improve	14.77%
Improve Somewhat	44.30%
Remain About The Same	31.54%
Decline Somewhat	8.05%
Decline Dramatically	1.34%

Do you plan to increase employment totals during 2019?	
Yes	66.67%
No	33.33%

Which of these will be most effective at encouraging professional growth in metalcasting?	
Additional scholarships and internships	15.28%
Additional or alternate training programs (programs at colleges, trade schools)	48.61%
More active involvement of metalcasters with trade associations and colleges	29.86%
New professional associations (geographical? market-focused? industry-specific etc.)	6.25%

Which of these market areas offers the most promise for the growth of your metalcasting operation?	
Alternative energy (nuclear, wind, solar)	5.33%
Automotive engines	8.67%
Other automotive components	13.33%
Off-road vehicle and equipment	10.67%
Medical / surgical equipment or devices	2.00%
Infrastructure and construction	17.33%
Oil/natural gas	19.33%
Other, please specify	13.33%
None of the above	10.00%

affect; but 29.33% said imports are a worsening problem. 17.33% indicated imports are becoming less relevant factor in their businesses. 11.33% said their businesses are increasing export volumes.

The Outlook survey inquired about metalcasters' 2018 production activity, using plant capacity as the baseline. Asked "What percentage of 'normal' plant capacity is represented by your 2018 average monthly casting production?," 30.14% of respondents put the average utilization rate at 76-90%, and 19.86% put the level at 61-75%. Equal percentages of respondents (17.12%) put the normal rate at 0-50%, and at 91-100%. Just 11.64% of respondents indicated their normal utilization rate during 2018 has been 51-60%, and a happy 4.11% indicated their operation's capacity utilization rate during 2018 has been above 100%.

The respondents' view of 2019 economic conditions is generally positive. Asked how they expect the U.S. economy to perform (GDP) in 2019 compared to 2018, 44.3% believe it will "improve somewhat" and 31.54% believe it will "remain about the same." 14.77% expect the U.S. economy to "significantly improve," and 8.05% expect it to "decline somewhat", while just 1.34% expect economic conditions to "decline dramatically."

A more tangible indicator of economic conditions is employment: 66.67% of Outlook survey respondents indicate plans to increase their businesses' employment totals during 2019; 33.33% plan no such employment level increase.

Asked what developments would be most effective at encouraging professional growth in metalcasting, 48.61% named "additional/alternative training programs," and 29.86% selected "more active involvement" with trade and student association. 15.28% identified scholarships and internship activity to promote professional development.

As to what customer segments they perceive as most promising for metalcasters, 19.33% named Oil/Natural Gas and 17.33% names Infrastructure/Construction. 13.33% named Automotive Components (other than engines), and 8.67% selected Automotive Engines. Other consumer segments that respondents named include Mining, Aerospace/Defense and Military, Renewable Energy, and Heavy Equipment/Trucks.

Such opportunities, wherever they turn up, will have metalcasters anxious to respond. The competition is such that no prospect can be overlooked. What some cheer, others will reject. "*Make American Great Again* has been more beneficial than anything in the past decade for American manufacturing," one respondent enthused, while another was more hesitant: "Some manufacturers are moving back to pouring castings in North America because of issues overseas. Hopefully this continues, but U.S. trade (policy) has the entire industry in a state of standstill, and I worry for 2019."

Moreover, trade policies do nothing for those worrying about the availability of skilled labor or how to control the costs of EPA and OSHA compliance.

But none of this will alter metalcasters' commitment to their businesses or industry. "I believe that the foundry industry will remain strong for the next couple of years due to the increased casting demand coming from oil-and-gas, mining, and energy sectors," a respondent explained, keeping an eye on the future.

Aluminum Preshredder Saves Time and Space

A specially developed system has made scrap collection and handling safer and more efficient for BMW's aluminum foundry

BMW Group operates one of the more efficient aluminum foundries in the world at Landshut, Germany, and after a recent updating it's even more so. The operation was designed to remelt all scrap metal (punch waste, sprues), first collecting the material in containers in what had been largely a manual process — one demanding considerable manpower.

The automaker developed the operation to cast about 5 million parts per year, including light-metal engine parts and structural components. Different casting processes are in place, but the total volume of metal cast is estimated at 84,000 metric tons/year.

During aluminum casting, scrap is produced that is melted down again. Previously, these parts were collected in containers without being shredded and required so much space that the containers had to be emptied constantly.

In the course of a foundry modernization, casting cells were replaced. In the process, the recycling process was also required to be optimized. Erdwich Zerkleinerungs-Systeme developed a shredding plant for the BMW Group foundry in Landshut, Germany, to reduce the volume of rejects.

As is typical now for high-volume automotive industry operations, there is exceptional emphasis on process efficiency at Landshut, where the focus on productivity and efficiency has been in place from the earliest design stage, to keep scrap rates as low as possible.

In the past, all the scrap that occurred regularly in the melting, pouring, and molding processes was collected in containers without being shredded and then returned to the melting process. The cast aluminum parts had dimensions up to 2,000x1,400 mm, meaning it occupied a lot of space in collection containers, and that the containers had to be emptied frequently as a result. In turn, this required a lot of production time and manpower.

During a recent round of facility remodeling at BMW Landshut, during which each of the casting cells was replaced in turn, the recycling process was optimized too.

A German scrap-handling machinery manufacturer, Erdwich Zerkleinerungs-Systeme GmbH, took BMW's contract assignment to plan and commission a new metal shredder for the foundry. "When we visited the site, it quickly became clear that the solution required in the tender would not have the desired effect," according to Erdwich project manager Richard Adelwarth. "We therefore carried out many trials and consulted another company in the industry, with whom we work regularly on larger projects in order, to be able to offer an optimal solution."

The final design submitted by Erdwich involved its RM 1350 pre-shredder. According to the developer, this machine is characterized by fast and easy maintenance, long service life, optimal shredding performance, and high throughput. To date, seven systems with soundproof enclosures have been installed for the Landshut foundry's eight casting cells and punch presses.

"Loading takes place in free fall, which means that the molds that are to be returned to the melting process now fall from the pressing plant directly into the hopper of the pre-shredder, and then into a container measuring 1,400x1,400x900 mm," according to Adelwarth. When the container is full, it is transported outside, emptied into a larger container, and this in turn is brought to the smelter.

The shredding process has reduced the volume of cast parts by 50 to 60%, Erdwich noted, which means that the disposal containers have to be emptied less frequently and thus require less time and manpower.

The pre-shredders were adapted to the special conditions of

The scrap parts such as punching waste and sprue systems fall directly from the press into the hopper of the shredding plant, and then into containers. These are regularly emptied into a large container and then transported to the melter.

The intermediate shredding systems allowed the volume of diecasting scrap parts to be reduced by 50-60%. As a result, the containers have to be emptied less frequently, which results significantly lowers the time and manpower requirements.

the BMW site. For example, the drives of the machines had to be mounted on one side instead of two, as usual. The reason for this was the columns of the building are located at the pre-shredder installation site, thereby calling for a narrower design. In addition, the crushing tools themselves and their arrangement within the cutting chamber were adapted to the local conditions.

In addition, the standard version of the RM 1350 already has a safety system that includes a PLC control system with automatic reverse and cut-out control, so that the machine is protected from damage in the event of overload or bulky solid parts. Also, each shaft is equipped with an energy-optimized frequency converter, which ensures that the two cutting gear shafts are driven separately. This optimizes the adaptation to the shredding process.

Working with the BMW plant engineering team, the safety system was augmented with new features. "Both the filling level of the removal box located in the basement and the monitoring of the shredder itself now are displayed transparently, so that a quick response can be made if necessary," Adelwarth explained.

Once all casting cells were replaced at BMW Landshut a conveyor belt system was installed, in order to optimize the scrap-disposal process even further. As such, the shredded rejects would no longer to be collected in containers that have to be removed and emptied by hand. Now, the rejects are transported directly into the large container via a conveyor belt. In this way, scrap products and punching waste from all casting cells can be disposed of simultaneously and without additional logistical effort.

A total of seven systems were installed. In cooperation with BMW foundry technicians, Erdwich also developed a sophisticated safety system, so that it now has a transparent filling level control of the closed removal box in the basement, as well as a control display of the shredding plant itself.

AWARD-WINNING PARTS Make Good Designs Better

The ICI's best designs for 2018 exhibit the efficiency and integrity of parts designed (or redesigned) as investment castings.

The Investment Casting Institute selected the best designed products for 2018 in five different categories during its annual event in October. ICI' 65th Technical Conference and Exposition in Kansas City, MO, offered the platform for exhibiting the winning products as well as to honor the foundries that developed and produced the castings.

The annual contest recognizes the design and production achievement in investment castings produced for aerospace, automotive, fine art, energy and industrial hardware. Finalists also are recognized in each category.

Aristo-Cast Inc., Almont, MI, earned the top honor for automotive investment casting design. The steering wheel armature was developed for an automotive OEM that sought "to have the outside ring machined from 304 stainless steel billet, which then would have the armature over-molded around the ring in AZ91E magnesium using the investment casting process," explained the foundry's Eric Ziemba explained. "The customer wanted two armatures to simulate the diecast design, which would be used for testing purposes while the diecast tooling was under construction."

To optimizes investment casting process, Aristo-Cast engineers worked with the customer to eliminate machine stock and design a net-shape armature pattern. Using a Voxeljet VX1000 3D printer, Aristo-Cast produced sample armature patterns, while the steel rings were concurrently machined from 304 stainless billet. The resulting patterns were assembled around the rings, and then four investment castings were produced. This approach resulted in the first armature being produced in less than five days, meeting the customer's specifications and schedule.

The award-winning design for aerospace investment casting is a pump housing developed and produced by O'Fallon Casting, O'Fallon, MO. "This pump housing is an excellent example of how the investment casting process offers the versatility to consolidate a fabrication made from multiple components, made from a variety of processes, into a single piece casting," explained the foundry's Jake Robben.

Aero engine pump housings contain complex internal passages so frequently they are produced by assembling multiple parts produced in several processes. Using investment casting, O'Fallon reduced the overall component weight while eliminating future failure points at the assembly location.

This winning design contains multiple interconnected core passages with varying diameters and depths. Combining thin walls, large masses of metal, and grade B metallurgical requirements, the component lends itself to the investment casting process. Working with the customer, and applying its own expertise, O'Fallon Casting reduced the number of weld openings from 10 to five, saving production cost and establishing a more robust part.

Aristo-Cast Inc. redesigned a steering-wheel armature in 304 SS and AZ91E Magnesium to simulate diecasting.

An investment-cast aerospace pump housing designed by O'Fallon Casting conserves production time and improves the product's performance reliability

See more award-winning investment casting designs at www.foundrymag.com

The casting contest is open to members of the Investment Casting Institute and was instituted to recognize foundries that manufacture parts and components that illustrate and promote the benefits and flexibility of the investment casting process, or which demonstrate problem-solving techniques for customers.

Accurate, Safe Molten-Metal Temp Reading DELIVERS ROI

Simple, point-and-measure non-contact thermometer reliable measures in the 1000°-2000 °C range, reducing reliance on consumable DIP thermocouples.

It costs money to make money, regardless of the industry. The secret to increasing cast-metal productivity is to maintain or enhance process performance standards, while increasing production volume. That way, more metal poured does not result in more metal wasted. The number of variables that must be monitored in this effort is vast, but technology is helping foundries make the change a little bit easier.

At Coimbatore, the metalcasting center of India, by some descriptions, PSG Foundries has adopted a portable, non-contact thermometer to measure the temperature of liquid iron during pouring. The Ametek Land Cyclops 055L-2F Meltmaster measures temperatures with reliable accuracy and enhances operators' safety, while achieving significant savings on consumables.

Molten-metal temperature readings are triggered from a distance of 3 to 4 meters, providing a much higher standard of operator safety.

PSG Foundries was established in 1974 to supply cast iron parts and components for automotive, heavy-equipment and machinery manufacturing, in India and abroad. It is a fully integrated operation anchored by high-pressure molding, cold-box coremaking, and electric induction melting, with auxiliary capabilities like CAD/CAM/CAE design and development, rapid prototyping, die and mold machining, and spectroscopic testing. The plant produces about 600 metric tons/month of gray iron, nodular and ductile iron, and Ni-hard castings.

The plant's operators needed an effective way to measure liquid metal accurately, but also efficiently. It had been buying over 10,000 DIP thermocouple consumables every year and was looking for an safer, as well as more cost-effective approach to optimize the process.

Ametek Land recommended the Cyclops 055L-2F Meltmaster, a high-precision portable non-contact device that measures liquid metal temperatures in the range of 1000° to 2000 °C (1832°-3632 °F). In use on the melt deck, an operator stands 3-4 meters' distance from the molten metal and points the Cyclops Meltmaster at the liquid, pulling the trigger to take a measurement.

The measurement is displayed in four simultaneous modes, including continuous, peak, valley and an advanced Meltmaster measurement mode customized to meet users' specific requirements.

A clear, wide angle field of view and small, clearly defined measurement area help to ensure accurate sighting. All processed temperature values are shown continuously when the trigger is pressed.

Since adopting the Cyclops 055L-2F PSG Foundries has achieved an annual savings on DIP thermocouples, a consumable cost running to about $6,000 per year. Thus, with a return on investment of less than six months, the Meltmaster has recovered its purchase cost.

In addition, according to the product developer the Meltmaster will accrue greater value as the foundry optimizes and maintains the consistent value of its molded parts using the thermometer.

But Ametek Land also noted other advantages to the Cyclops 055L-2F Meltmaster, starting with operator health and safety. In addition, there is the high accuracy of the thermometer and the process, even while taking the temperature of the pouring of the last mold. The instrument is noted for its ability to measure real liquid metal temperatures, regardless of high-temperature sparks, low-temperature water vapor, dust and smoke, which may cause errors in temperature measurement.

The instrument features four trigger operating modes for datalogging. Modes are available from logging a measurement for each trigger release to precisely executed pre-configured routes for consistent, repeated long-term readings. The unit can store up to 9,999 readings.

Emissivity compensation is shown via an icon-based menu. The operating waveband is chosen to minimize errors due to uncertainty in emissivity and the effects of atmospheric vapor components, e.g., steam or hot sparks.

With on-board storage, the Cyclops 055L-2F provides fast, simple data logging via Bluetooth® and USB connectivity to download this data to PC or mobile device for analysis and trending.

The instrument carrying case is designed to withstand metalcasting work environments for extended periods, and the device has a lens protector that maintains the optics in good condition.

Further, the device is ergonomically friendly and designed for single-hand operation, with contact-free measurement for better safety and easier use in hazardous environments.

"Ametek Land's Cyclops Meltmaster infrared, non-contact thermometer is a highly effective solution for accurate temperature measurement of molten metal," commented S. Kuppusamy, PSG Foundries vice president. "It provides easy, accurate point-and-measure temperature readings. Since its introduction, our plant has significantly reduced our expenditure on disposable DIP type thermocouples."

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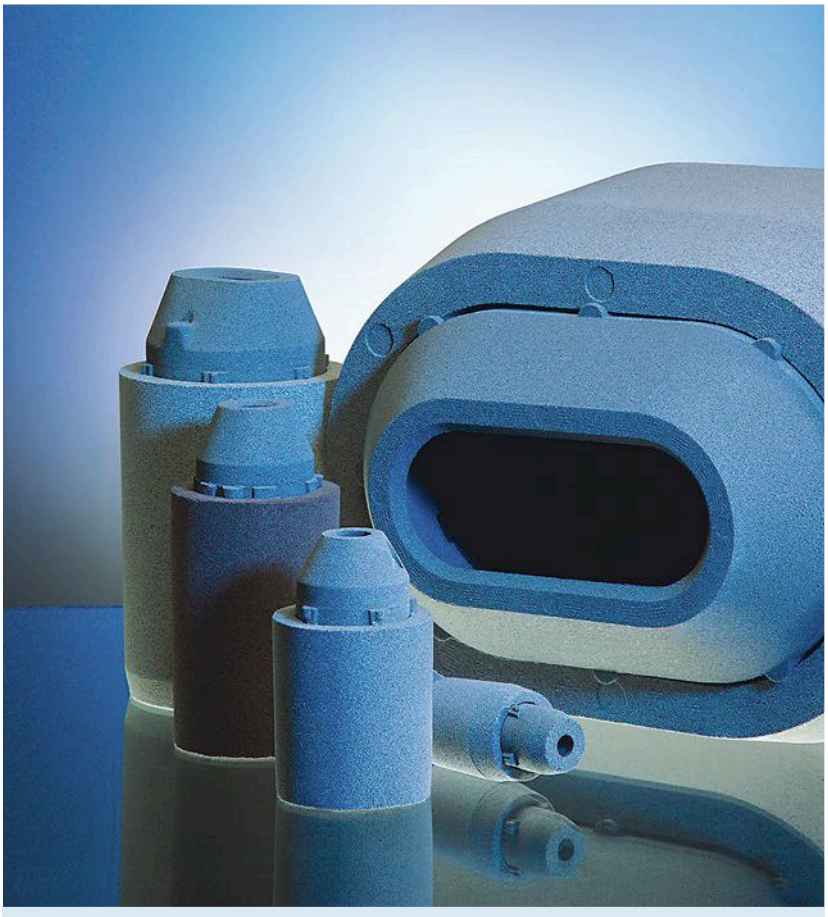


The Chemex feeding system offers improvements in productivity as well as environmental advantages.

Fluorine-Free Material for Feeder Systems

HA INTERNATIONAL is introducing fluorine-free material for feeding systems developed by Chemex GmbH (part of the HA Group) that it said delivers a "shrinkage-free" product and increases casting productivity, even for complex designs. The material composition also results in reduced surface defects, and the new product line allows feeder placement in previously inaccessible locations, HA noted.

Chemex-fabricated cold-box binder systems, combined with the "tele-feeder technique", represents a major advancement in the area of feeder technology, it added.

"As foundries move their production into more complex and thin-walled castings, they will appreciate a feeding system that offers increased productivity with important environmental advantages," according to HA International president, Michael Feehan, "All of this makes for higher quality castings at less cost."

As for the environmental advantages of the new material, the Chemex material means that oven-curing of cold-box (CB-bonded) parts is not required, conserving energy and raw materials. Further, the low fluorine content in the material results in less fluorine content in the molding sand, which decreases material scrap **... READ MORE**

Fast Refractory Repair for Steel, Aluminum Furnaces

PLIBRICO is offering its Redi-Shapes line of precast refractory shapes for quick lining replacement in recurring high-wear zones — helping high-volume operations to maintain productivity rates during periods of high activity. Custom-engineered Redi-Shapes are formed to exact specifications, in any size or configuration, and supplied ready to install, to reduce downtime and lower repair costs.

As domestic production of steel and aluminum continues its upward trajectory, the furnaces used in mills to process these metals are running at near capacity to meet surging demand. Ramped-up production of steel and aluminum is taking a toll on the refractories installed to protect furnace linings against mechanical stress, abrasion, and corrosion.

Redi-Shapes precast shapes are manufactured from high-quality castable and plastic refractory materials. The refractories control heat loss, and overcome the problems imposed by controlled atmospheres or reactive environments.

In-plant manufacturing conditions enhance consistent production, and Plibrico's molds are engineered to ensure perfectly contoured, dimensionally accurate shapes. Precast shapes may be supplied from 10-lb. bricks to 15,000 lb. engineered blocks.

Redi-Shapes can be manufactured and zoned in the furnace to resist specific problem areas such as abrasion, erosion, thermal shock, and metal and slag penetration. Custom firing also optimizes shape properties for specific applications.

Precast shapes allow operators to

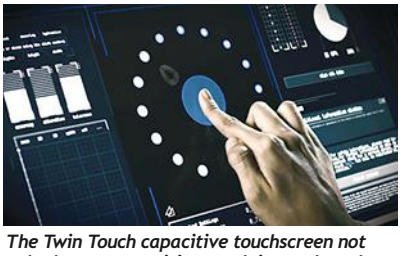
NEW PRODUCTS

isolate repairs and return quickly to production. Confining replacement work to high-wear areas eliminates costly, time-consuming tear-outs of major portions of the adjacent refractory lining. Quick installation of Redi-Shapes reduces downtime and saves on labor costs.

... READ MORE

First Industrial Touchscreen with Force Detection

RAFI GROUP introduced a touchscreen technology called Twin Touch that not only detects capacitive touch inputs but also the pressure exerted on the panel. This new feature prevents false inputs through external forces, and it increases operating reliability and allows implementation of additional input levels.



The Twin Touch capacitive touchscreen not only detects capacitive touch inputs but also the pressure exerted on the panel.

Pressure thresholds for input recognition can be set via software.

Also introduced were the Flexscape input devices for integration in touchscreens: the Flexscape One pushbutton is activated by touch, but is only switched when a certain pressure threshold is exceeded. Tactile feedback to confirm switching enables safem no-look operation. A low-cost alternative to milled contours in the touchscreen, Flexscape Wheel is a finger guide that comes as a sticker, which can be attached to the glass surface.

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Five Special Ops Skills to Motivate DIGITAL INNOVATION

Tactics and practices that should be recognized, learned from, and capitalized upon

You may see no comparison between highly skilled soldiers, waiting in darkness, prepared for action, and a business using digital tools to create better products and services for customers. But look closer at the skills that Special Operations Forces (SOF) personnel use to create mission success: there we discover an extraordinary set of capabilities that can drive and inspire digital business innovation.

U.S. Army, Navy, Air Force, and the Marine Corps Special Ops soldiers represent only about 3% of all U.S. military personnel, but despite their small number they are deployed in hundreds of countries and perform essential tasks like training, conducting reconnaissance, attacking terrorist cells, and rescuing downed military aircraft crews.

It's the tactical methods and operational standards that SOF teams embody which business digital innovation teams should recognize, learn from, and capitalize on for their own missions.

1. Select for Character, Train for Skill. SOF organizations have a highly specialized, lengthy, and demanding candidate selection process. During "selection" candidates are stressed with fatigue, physical challenges, mental challenges, and leadership problems — all designed to make the candidates reveal their true character. SOF units almost exclusively select (or "hire") a candidate based on the character and personal performance characteristics they exhibit. It is only after a candidate's character has been validated that they begin the unique and specialized training.

Business can learn and understand that personal character, unique experiences, and diverse backgrounds are what generate true innovation. Unique skills can be taught, but personal character cannot.

2. Deep Understanding of Customers' Needs. Before a SOF team conducts a mission, the members will undergo a detailed, specialized, and physically isolated mission planning process. The entire purpose of SOF mission planning is to develop a deep understanding of the military commander's needs in ordering the mission, and all the possible options the team can create to accomplish the mission.

Business organizations must learn that understanding the customer and his current needs, and anticipating his future needs, are the bedrock of innovation. Great technology matched with intimate understanding of customer needs fuels tangible innovation.

3. Build Success from Data, Experiments. SOF teams use their own form of data and analysis to support decisions on how best to accomplish a mission. First, a team will us a collaborative and non-rank hierarchy to evaluate its own skill sets and the skill sets of team members. To an outsider this appears "unmilitary" but to a SOF teams every team member needs to call out on their shortcomings as well as what they need to improve.

The primary data for SOF teams are the results of mission rehearsals — full-up experiments, in business terms, that prove or disprove if the team can accomplish the mission as planned. After a rehearsal, SOF teams do extensive performance reviews to improve shortcomings and maintain actions and techniques that performed well.

Even without extensive data organizations can use rehearsals, lesson-learned sessions, and iterations of experiments to test their ideas.

4. Share Information, Source External Ideas. Sharing information is a central principle to all SOF team operations. The teams isolate themselves to prevent information loss outside their teams. Internally, the teams share as much as they can on intelligence, operations, out-of-the-box ideas, and contingency plans. SOF teams also create extensive idea sets and different ways to accomplish the mission, in case timeliness, resources, and conditions change. They believe in equality regardless of rank, experience, and skill, so they work constantly to share, update, and listen to new information and ideas.

How SOF teams share information is an invaluable point for teaching non-military organizations that focus too heavily on position, roles, and hierarchy. Information needs to be set free to inspire and guide innovation.

5. With a Plan, Everyone is "All In". SOF teams disagree during planning, rehearsals, and mission preparation. During these stages, team members expect and agree to allow everyone to provide input, suggestions, and ideas to improve the outcome of the mission and to help guarantee success. However, once a mission is decided, "new ideas" stop and the entire team is "all in" to make the mission a success.

This characteristic — going from suggestion-driven to mission-driven in the space of minutes — is essential to the success of SOF. Non-military organizations need to have lively discussions to allow full input on ideas. The individuals and groups in these same organizations also need to support each other fully in the hard tasks of mission execution.

Business leaders frequently look to Jobs, Whitman, Bezos, Ma, and Gates for insight on digital innovation. Instead, look to the Army Night Stalkers, Marine Raiders, Navy Special Warfare Combatant-craft Crewmen, and the Air Force Para-Rescuemen for inspiration on how teams should create, inspire, test, and execute digital innovation.

Chad Storlie is a retired U.S. Army Special Forces Lieutenant Colonel with 20+ years of active duty and reserve service in infantry, Special Forces, and joint headquarters units. He is an adjunct lecturer of marketing at Creighton University, a mid-level marketing executive, and the author of "Combat Leader to Corporate Leader" and "Battlefield to Business Success." Contact him at Chad.Storlie@CombatToCorporate.com, or visit www.CombatToCorporate.com

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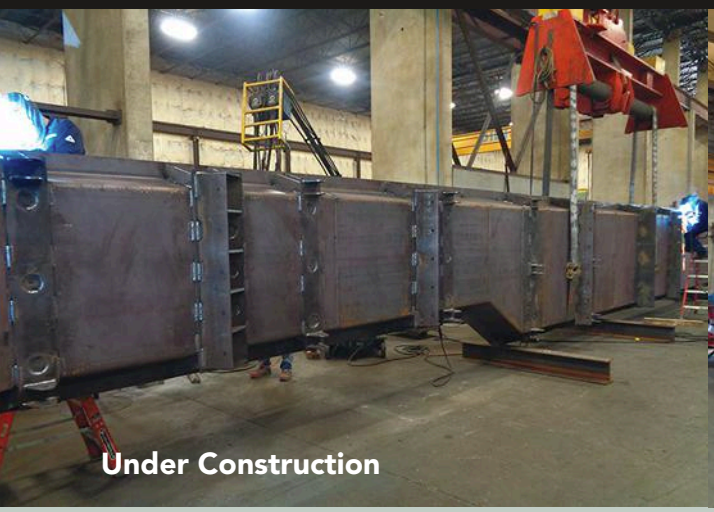

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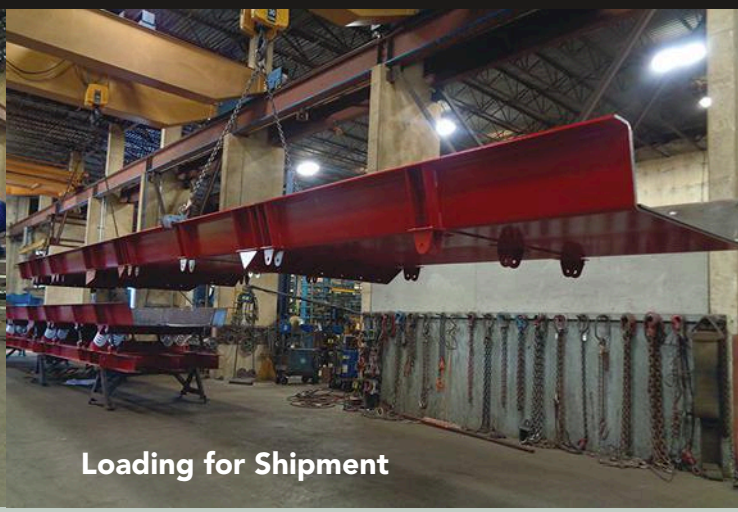

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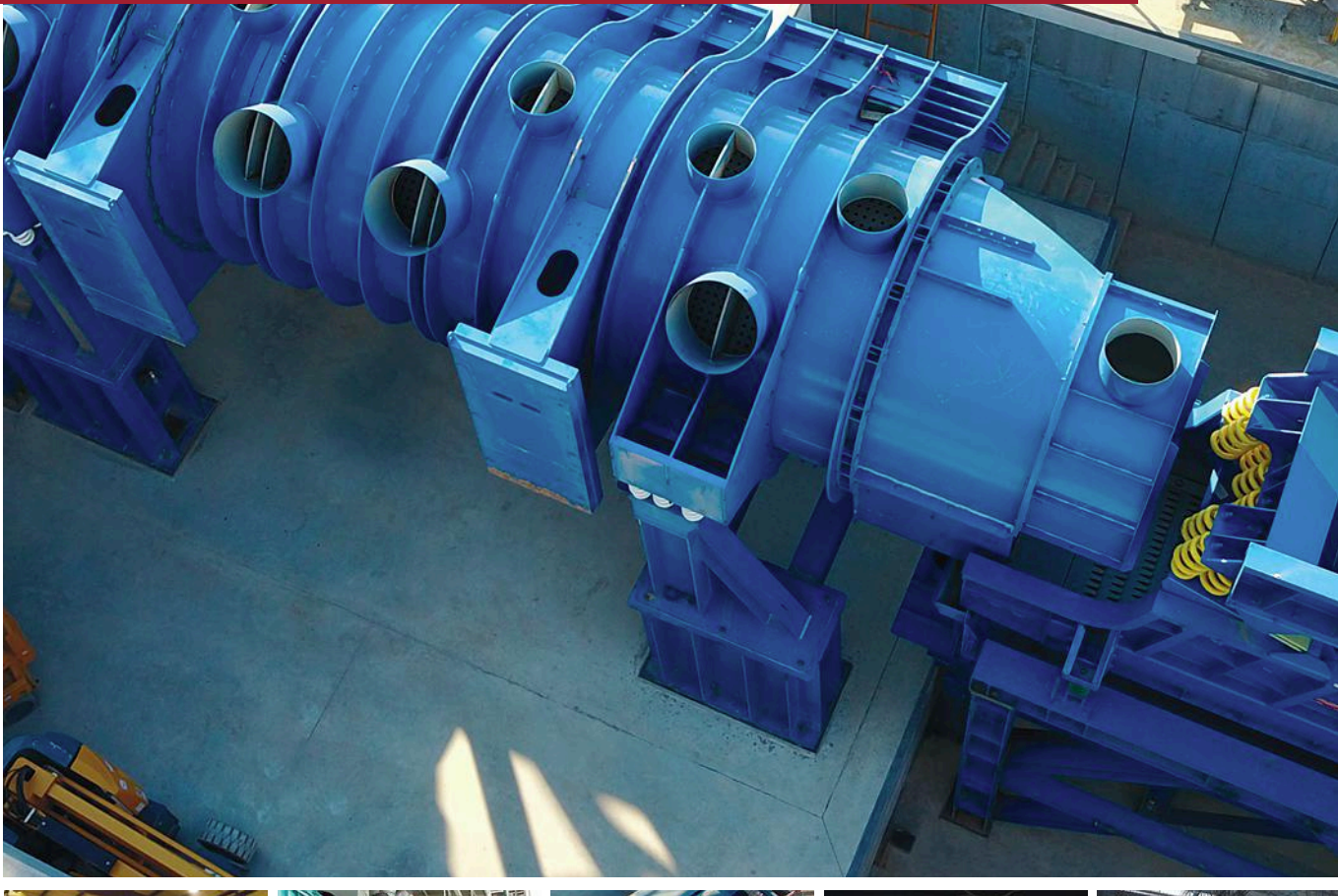

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