

# MELTING POINT

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## THE CASTING THAT TURNED BOATING UPSIDE DOWN



### Inside This Issue ● ● ● ● ►

Bots are like body guards p. 10

Cool schools for your future p. 15

Air show pilot needs a fast cap p. 19

**Why Metalcasting?...** Metalcasting produces engineered metal components for use in all facets of our world, including what you drive, where you live, what you eat, and how you work. The metalcasting industry maintains its traditions while embracing advanced manufacturing techniques. But the key to metalcasting is what is illustrated in *Melting Point* magazine—the diverse ways metalcasting helps propel society forward. If you are interested in joining this forward-thinking industry, look to the sections of the magazine dedicated to Metalcasting Universities & Scholarships and Career Opportunities on pages 20-23.

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# LIGHTS. CAMERA. CASTING

Check out these awesome videos online!  
Visit [meltingpoint.squarespace.com](https://meltingpoint.squarespace.com)  
or use the QR codes below.



*See how this 3D-printing company's student ambassadors—middle-schoolers and high-schoolers—take their classmates on tours of the high-tech additive manufacturing facility.*



*Watch this PBS video seen across the country, spotlighting the eye-opening world of modern metalcasting.*



*What do sand castles and metal castings have in common? This guy will show you!*



# THIS GUY CHANGED HIS COLLEGE MAJOR— BECAUSE NOTHING BEATS MAKING CASTINGS

**PEYTON POTTS WENT** to a special event for graduates from foundry college programs ... and the direction of his work life was changed.

Peyton graduated from Pittsburg State with a major in Manufacturing Engineering Technology.

Although he started his college career as a Plastics Engineering Technology major, he discovered a whole new world when he took a called Manufacturing Methods 1.

“I got introduced to metalcasting and the metal industry for the first time. I immediately fell in love and changed my major right away because of my fascination with the foundry industry,” Peyton said.

While he was still in college, Peyton attended the College Industry Conference hosted by the Foundry Education Foundation. There, he heard a speaker, Joe Costabile, and something hit home.

“It was a really neat story—inspiring,” said Peyton. “He talked about how when he was in high school, he made casting medals for his school’s swim team.”

### **Gimme Something Fun to Work On**

Peyton had been wanting to work on some fun, extra casting project outside of what his college instructors assigned to him. He talked to Joe and suddenly, Peyton had a great casting project he could do on his own, start to finish.

Joe wanted bottle openers with his company’s logo on them. For Peyton, it was the perfect opportunity to take on a solo project—and do it for someone he admired.

### **It Was a Success.**

“I had previously learned and had hands-on experience with everything necessary to conduct this project. My professors do a



*After graduation in December 2023, Peyton started his career in the metalcasting industry as a product engineer with Wellman Dynamics in Creston, Iowa..*

great job educating and allowing students to get hands-on experiences—we get to take things outside of the classroom and apply it.”

### **More Than Fun. He Learned A Lot!**

“The biggest thing I learned from this project is the importance of communication,” said Peyton. “For this project, I had to communicate with Joe, who is outside of my university. I also made a couple of mistakes along the way that would not have been resolved

without a good base of communication.”

As part of this special casting project Peyton did, he was able to use the investment casting process, which is his favorite method of casting.

“I had a 2023 summer internship at an investment casting foundry, so it was good to have more practice and understanding of the process,” he said. “I also enjoyed doing this for Joe because he was the reason I wanted to take on this project.”

How cool would it be to have a foundry expert trust you to make a special casting project?!

Foundries are full of fire, liquid metal, robots, automation, specialty imaging, data collection. They’re also full of really smart people who fell in love with this ancient-yet-modern science—they got educated to take metalcasting to the next level, and now they get to use all the latest digital tools to make crazy-complex metal parts that are in everything from cars, boats, and bulldozers to refrigerators, water pipes, and rockets.



**the casting  
that turned  
boating**

**upside  
down**

Have you ever been on a boat ride? Not a cruise – but a motor boat you take out on a lake. Do you remember where the engine sits?

Well, if you were sitting at the back of the boat trying to have a conversation, or worse, if you were water-skiing or trying to jump off to go swimming, then you already know: that big noisy engine is hanging off the back end. It can be pretty awkward and a little annoying.

But some very smart engineers at a boat company called BRP worked with LSI, a metalcasting foundry, which makes big, solid, one-piece aluminum castings from liquid metal. Together, they invented a whole new place for that big motor to go: Believe it or not, they figured out how to put it UNDER THE BOAT!

### **Project Ghost!**

They nicknamed their secret plan “Project Ghost,” and it was “code” for something they didn’t want their competitors to know about

till it was ready for people to buy. The BRP design engineers and the engineers at LSI foundry had a feeling the new design was going to transform recreational boating ... and they were right.

Up until then, boat manufacturers and their customers had only two options of where the engine could sit: (1) It could be an out-board engine that sits at the rear of the boat close to where passengers sit; or (2) It could be a stern drive/inboard engine that’s housed somewhere inside the boat, taking up limited storage space.

But BRP came up with the third brand-new option, which they called stealth technology.

Basically, they had to redesign the large tub-shaped casting that the engine sits in. Instead of being a vertical, up-and-down shape, everything had to be arranged to create a slim, horizontal shape that would be hidden underneath the boat.

The aluminum casting that holds all the



engine parts ended up being 76 lbs. and measured 28.33 in. long x 21.98 in. wide x 23.80 in. high. And BRP pontoon and fishing boats with this new, secretly positioned “Rotax S” engine, are now for sale.

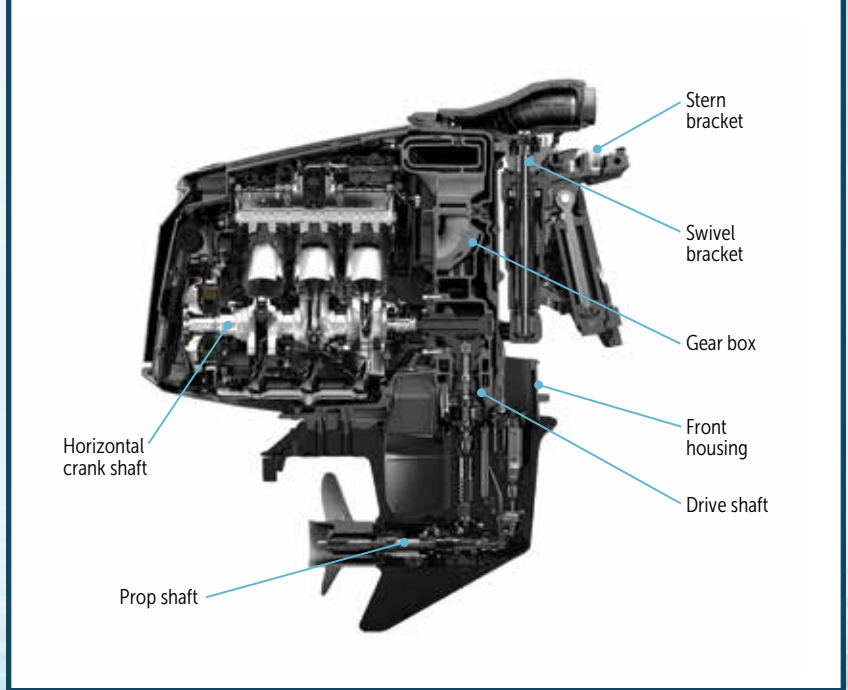
### Brains Plus Beauty

“The front housing that LSI makes is what holds all of this together, so it’s really an important casting,” said BRP Supplier Quality Development Engineer Dave Palmer. “That’s really what’s allowing us to make an outboard engine like this ... and it’s a brand-new part for us—I mean, this is something completely revolutionary.”

Not only did the new casting have to meet a ton of very strict requirements, it also had to look good, too. Why?

Dave said, “It’s not necessarily visible when you’re on the boat, but it is when you’re in the showroom,” said Palmer. “And that’s equally if not more important, because if the customer doesn’t like the way it looks in the showroom, they’re probably not going to buy the boat.”

To keep it looking great for a long time and to prevent corrosion in the water, the casting gets a lot of protective coatings before it’s painted ready for final assembly.



*This engine cutaway image shows the changes that were made in order to accommodate the new horizontal crank shaft. This design trims the height of the engine so it fits compactly below deck.*

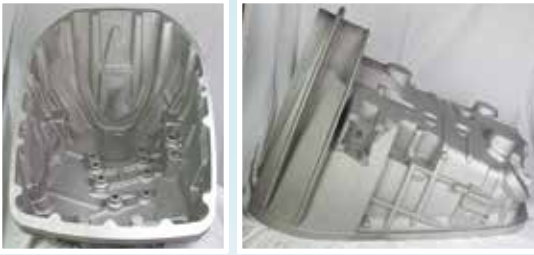


*BRP, a recreational products manufacturer, has blown the boating industry out of the water with a revolutionary below-deck engine that required a complex aluminum casting for its front housing.*

### Start Your Engines

The foundry engineers as well as Dave’s engineering team at BRP made it a priority to work closely together, communicating all





*Weighing in at 76 lbs, the front housing casting required more metal on the tall side than the short side, which created some feeding complexities for the foundry.*

the time, and sharing all their ideas to get the best result.

“We encountered many challenges that we were able to solve, and we were committed to helping BRP reach a new height in technology,” said LSI Director of Engineering and Quality Carlos Esparza.

“All the LSI engineers involved in the development of this project were excited and eager to participate, knowing that they were helping to push the boundaries on what had been done before.”

### **Technology That Predicts the Future**

In today’s modern foundry, casting experts use cool simulation technology that helps them accurately predict all the features of a casting, such as its strength. Simulation software also helps them precisely know how to make the casting perfectly.

Whenever there were design changes, the engineers would email them back and forth

between the two companies.

“LSI worked very aggressively with us to make adjustments,” said another BRP engineer. “Sometimes we were doing multiple simulations, two or three a week, trying to get to the final design that would be castable and meet our requirements.”

### **Under Pressure**

You know that feeling when the teacher gives you a last-minute assignment that’s due tomorrow?


That’s what happened to the foundry engineers, but they were up to the challenge.

This boat engine was going to be the first one of its kind ever, and BRP had to make sure everything was just right.

Just when everyone thought the casting was good to go, BRP’s team discovered that splashing water was creating a problem with how the casting would smoothly travel through a body of water — known as hydro-dynamics.

They solved the problem by having the foundry add “fins” right into the casting. Talk about a “whale” of an idea!

Being a technical expert at a foundry means you get to use your creativity and all kinds of new automation and technologies to produce amazing, strong products that are used everywhere around us. And that includes the boat you might have seen or ridden in this summer. **MP**



*Wildeboer explained that robots on the mold line help minimize ergonomic risks to foundry workers.*

# ROBOTS THAT PROTECT HUMANS

TWO FOUNDRIES TALK ABOUT HOW THEY USE ROBOTS WITH “EYES” TO KEEP PEOPLE SAFE IN THEIR SOMETIMES VERY HEROIC JOBS. SOMEDAY, YOU COULD BE SAFETY EXPERT OR A ROBOT EXPERT AT A FOUNDRY THAT MAKES CASTINGS FROM MELTED METAL!





*The primary goal for robots at John Deere's foundry is to provide a safer work environment.*

**J**eff Heishman (at a foundry called Clow Valve) and Calvin Wildeboer (at the foundry operated at John Deere ... you know, the tractor guys) are safety experts who work hard to prevent injuries in a metalcasting plant. Now, they've got helpers ... robot helpers.

Sometimes, robots do tasks that have to be done over and over again, or they do heavy lifting, and it's way better for the human to

be doing a job that uses their brain instead. Other times, robots work alongside the human workforce, taking on any dangerous or strenuous aspects of the person's job.

Clow Valve Machine Shop is currently using 26 robots, including 19 industrial robots, four paint robots, and three collaborative robots. Jeff says their robots help people work faster and smarter -- and more safely. "Workplace tasks considered to be repetitive and sometimes dangerous are performed by robots





*Heishman explained robotic bin picking with machine vision.*

that takes a picture of an object and then sends the precise location to the robot's "brain" to guide a robotic arm to the right location.

At John Deere's foundry, Calvin said the focus is on improving ergonomics (making jobs easier on the human body) and people safety.

"Robots in our metal-melting department take the load off of our operators and place it on

to protect the health and safety of our team members," he said.

He says that before they got the robots, employees sometimes had to lift things as heavy as 40 lbs. and without the support of a machine. Now, robots are picking up heavy objects, and the chance of injury for employees is way less.

### **I See You**

Did you know that robots can see you? Actually, they see everything around them. It's because they have vision systems, and foundry experts have to make sure they buy and install robots with the most advanced technologies.

A vision system is a specialized camera

something mechanical."

The main reason foundries are bringing in robots is to protect workers from getting hurt while they do their jobs. There's a lot of heavy machinery plus fire and other hot stuff. Foundries take every precaution to make sure every single person goes home in the same condition they were in when they came to work that day. Thanks to robots, human equipment operators can be kept at a safe distance from the melting furnace, for example.

### **Molding a Better Way**

A foundry uses molds to make castings — and the faster the melted metal is poured into



*Heishmen said robots have helped reduce the chance of workplace injury by performing tasks such as palletizing, de-palletizing, and lifting heavy objects.*

molds, the more castings they can make.

Calvin said their big goal at John Deere is to reduce ergonomic risks by reducing human touchpoints on the mold line ... preventing operators from reaching over the molds, but keeping production moving along at a good clip.

“Robots offer the greatest productivity boost,” he said. “Now that our mold line is run by a robot instead of an operator (who has to keep making adjustments) you get a lot of repeatability and longer tooling life.”

Basically, robots are shouldering a lot of

the work people used to do so they can do tasks that only a person CAN do. People shouldn't be straining themselves with hard tasks that a robot can easily take care of. And most important of all, robots reduce risks in a pretty hot manufacturing environment.

The wellbeing and comfort of today's workers is Priority No. 1. Robots do that, and increase speed and accuracy in a lot of tasks.

Imagine how awesome it would be to work with robots. Especially making things that are used in every part of our world! **MP**



# SCHOOL

## College Foundries Get A+

EVEN OLDER KIDS LIKE TO PLAY WITH SAND. ONE DAY, YOU COULD GO TO SCHOOL, MAKE SAND MOLDS, AND POUR LIQUID METAL IN THEM TO MAKE A CASTING!

# A

lab full of 18-year-old college freshmen at Purdue University is about to begin. In just a little while, they'll be up to their

wrists packing sand molds with mallets.

What?! And you thought only toddlers like to play in the sand!

Yes, this school, and many other colleges, have brand-new "smart" foundries that are seriously fun while teaching the serious science behind metalcasting.

Their teacher, Dr. Milan Rakita, can't wait to see the looks on their faces in a few weeks when his students experience the rad sensation of producing castings with brand-new, sophisticated equipment inside the school's new 3,400-sq-ft smart foundry.

### All New at Purdue

In 2020, Purdue tore down an outdated metalcasting lab and in its place constructed the new Gateway building in which four smart manufacturing facilities are housed: a smart factory, a continuous process lab, an





*A panoramic view of Purdue's new smart foundry.*

# IS COOL!

## for High-Tech Upgrades

Industrial Internet of Things lab, and a smart foundry that was designed and deployed by Sinto, an equipment manufacturer.

The faculty, staff, students, and technologies of Purdue's School of Engineering moved into their bright and beautiful environment in January 2023. Since then, they've added several other pieces of highly technical equipment.

The students' first project was making a skateboard—as a casting!

Instructor Milan Rakita says they take a hands-on approach to learning and want their students to have the most modern and sophisticated technology available so they are totally ready to get good-paying jobs when they graduate.

### **You Go Far with Foundries!**

To create a modern "smart foundry" takes a lot of money. Over \$3 million has been invested in the smart foundry alone, not including equipment donations from Caterpillar (which donated over \$1 million) and Sinto, and many other donors and supporters.

If you're in to computers, get this: This college program focuses big time on using data to guide casting processes to eliminate casting defects and achieve consistently flawless casting production.

When they learn how to do that, these graduates will be ready for the cool, data-centric environment that manufacturing is becoming.



COURTESY UNI



COURTESY PENN STATE



Purdue is working with the federal government’s Department of Energy to solve a common problem with castings called porosity, where tiny holes form in the metal casting.

They’re also working with Microsoft to build an architecture that will connect the foundry to the cloud.

“Our goal is that can we use intelligence in the casting process so that we can make better castings, and it’s all driven by data,” said Milan. “We can’t eliminate the waste in metalcasting, but we are hoping to make the process as perfect as possible, which will reduce wasted energy.

#### 4 More Foundry Schools That Rule

**1** **University of Northern Iowa (UNI).** Smart is catching on. At UNI, faculty and leadership are updating a majority of the foundry equipment at their Foundry 4.0 Center.

The school was recently awarded \$2 million funding from the National Center for Defense Manufacturing and Machining (NCDMM) and has wasted no time allocat-

ing the money toward an equipment overhaul that will support the digitization of the campus foundry.

The purpose of the funding is to support the supply chain of the U.S. military.

**2** **Penn State.** The oldest industrial engineering department in the world, with roots dating to America’s post-Revolutionary War period, constructed a new building in 2020 to house its next-gen foundry lab.

Currently, Penn State is about to finalize its proposal for a 3D printer—a \$750,000 investment—which is also tied to the Department of Defense (DOD).

“We have to compete for student interests,” said instructor Bob Voight. “They see robots, they see 3D printers. We want them to understand that this technology is embedded in the metal casting industry and will continue to lead this industry and make it grow.”

**3** **Missouri S&T.** For five years, Missouri S&T’s Robert V. Wolf Foundry has been undergoing modernization with over \$2 million in



COURTESY MISSOURI S&T



COURTESY TENNESSEE TECH



*From left to right: Purdue freshmen make sand molds; University of Northern Iowa students shake out castings from sand molds; Bob Voight talks to one of his Penn State students; Missouri S&T students work together while wearing the proper protective clothing for metalcasting; and Fred Vondra at Tennessee Tech smiles for the camera. All these schools are preparing students for good-paying jobs in the metalcasting industry.*

equipment upgrades.

The most recent additions in 2023 were a 3-ton-capacity foundry gantry crane valued at \$166,500, as well as foundry audio visual equipment

But the most substantial acquisitions have been its 3D sand printer (2020) worth nearly three-quarters of a million dollars, as well as a 500-lb. induction furnace (2018) and power supply, both of which were purchased for the school through a large cooperative agreement with the Army Research Lab.

"The Army is looking at being able to re-make parts in the field at the point of need," said Laura Bartlett, associate professor of metallurgical engineering. She said they do a lot of work with the DOD.

**4** **Tennessee Tech.** Every great renovation begins with a great innovation that gradually progresses from vision to drawing board to reality. Tennessee Tech is way past the dreaming phase as it nears completion of plans for a brand-new, 80,000-sq-ft building that will house a smart

foundry expected to be move-in ready in 2027.

When a new dean was hired, he said to the teachers, "There are colleges of engineering everywhere. What makes us unique?"

Instructor Fred Vondra raised his hand and said, "We have a metalcasting program," and the dean's eyes grew large right there in front of everybody. "We're the only one in the state of Tennessee," Fred added.

Fred says he was inspired by all the upgrades happening at Purdue.

The new foundry they're building will have a big range of the latest equipment and technology.

"I always want to leave things better than I found them," said Fred, who plans to retire once the smart foundry is created, and he doesn't plan to teach in it. "When this new building is finished, I will have done that." **MP**



# DO YOU HAVE 'CASTING DREAMS?'

## HERE'S A CONTEST THAT FUELS YOUR IMAGINATION!

**MEET PHILLIP HARRISON.** He's an artist and metalcasting specialist who has been wowed by the science and art of metalcasting since 1984. He loves it so much that he wants your generation to learn about it and pursue it as a career when they leave high school or college.

"Casting is really, really fun. There's nothing else like it," says Phillip. "You can make anything! It doesn't matter whether it's a fun thing or a tool.

For fun, sometimes Phillip wears his "Iron Pouring" t-shirt to the grocery store ... when people say, "What? You can't pour iron!," he replies: 'You can when you melt it!' 😂

Other times, Phillip wears his admiral costume ... in his "spare time," he also restores (and kind of collects) old ships!

He's also been known to pull a furnace on a trailer and do metal-melting and casting demonstrations at schools ... well, out back, far



*Above: Phillip shows a conference visitor the display of castings made by students. Below: One student entered this dragon in the contest.*

from the building!

Another thing Phillip does to get kids excited about metalcasting is the **Casting Dreams** competition. Kids 14–18 years old from all over the country enter the contest—Phillip gets them connected with a nearby casting expert in their town to help them make their own, unique metal casting. All those castings are then displayed and judged at the American Foundry Society's big convention.

This year, someone wanted to *BUY* a kid's casting because it reminded the man of someone he loved. He paid \$200 for it!

Casting Dreams is open to any young person who wants to participate. The whole idea is to be creative and have fun while learning about a manufacturing method that is over 5,000 years old!

Learn more at: [steamextreme.com](http://steamextreme.com) —while you're there, check out Phillip's videos. **MP**

Excerpted from an article by Jeff Cook.



**WHEN A STAR JET PILOT** had a missing fuel cap at the “Wings Over Muskegon” Air Show, the Eagle Group stepped in to replicate the part in less than 48 hours.

John Workman, co-chairman of the board at AFS Corporate Member Eagle Group (a show sponsor), performed at the event with his formation flying team, the Hooligans. Another notable performer was Randy Ball, an airline captain and premiere fighter jet pilot. His plane for the event was the MiG 17F #1611, a Soviet fighter jet that was originally in service from 1960-1990 and was the primary enemy aircraft engaged by the U.S. during the Vietnam War.

When Ball arrived for the air show, he found the fuel cap from one of his plane’s 106-gallon drop tanks was missing. The organizers



reached out to Workman from the Eagle Group for help.

Workman got the remaining fuel cap to Eagle Alloy, where engineers scanned the part using the Keyence VL-550 laser scanner. Eagle Alloy packaged the data into a 3D model file and sent it to Eagle CNC for production, along with the OEM part. After powder coating the parts, Eagle CNC engineers created laser programs to laser-etch inscriptions into two of the new fuel caps: “МиГ-17Ф ТОПЛИВО,” or “MiG-17F Jet Fuel.”

They also added a special touch of their own: “Eagle CNC/ Made in the USA.” And inside that circle: a laser-etched homage to the Hooligans Flight Team. **MP**

## Find a College to Study Metalcasting

Ready to launch your metalcasting career? Want to know where to get started? These colleges are optimal institutions to consider if you are interested in metalcasting as a career.



**Arizona State University**  
Tempe, AZ

**California Polytechnic State University**  
Pomona, CA

**California State Polytechnic University**  
San Luis Obispo, CA

**Central Washington University**  
Ellensburg, WA

**Eastern Michigan University**  
Ypsilanti, MI

**Georgia Southern University**  
Statesboro, GA

**Instituto Tecnológico De Saltillo**  
Saltillo, Coah, Mexico

**Kent State University**  
Kent, OH

**Michigan Technological University**  
Houghton, MI

**Milwaukee School of Engineering**  
Milwaukee, WI

**Missouri University of Science & Tech**  
Rolla, MO

**Mohawk College**  
Hamilton, ON, Canada

**Penn State Erie—The Behrend College**  
Erie, PA

**Pennsylvania State University**  
University Park, PA

**Pittsburg State University**  
Pittsburg, KS

**Purdue University**  
West Lafayette, IN  
**Saginaw Valley State University**  
University Center, MI

**Tennessee Tech University**  
Cookeville, TN

**Texas State University—San Marcos**  
San Marcos, TX

**The Ohio State University**  
Columbus, OH

**Toronto Metropolitan University**  
Toronto, ON, Canada

**Trine University**  
Angola, IN

**University of Alabama—Birmingham**  
Birmingham, AL

**University of Alabama—Tuscaloosa**  
Tuscaloosa, AL

**University of Michigan**  
Ann Arbor, MI

**University of Northern Iowa**  
Cedar Falls, IA

**University of Wisconsin—Madison**  
Madison, WI



College Scholarships  
Available...

**YES!**

.....  
Visit  
**American Foundry Society  
Chapters at:**

**[www.afsinc.org/chapters](http://www.afsinc.org/chapters)**

.....  
Visit the Foundry  
**Educational Foundation at:**  
**[www.fefinc.org](http://www.fefinc.org)**

**University of Wisconsin—  
Milwaukee**  
Milwaukee, WI

**University of Wisconsin—  
Platteville**  
Platteville, WI

**University of Wisconsin—  
Stout**  
Menomonie, WI

**Virginia Tech**  
Blacksburg, VA

**Wentworth Institute of  
Technology**  
Boston

**Western Michigan University**  
Kalamazoo, MI

**Youngstown State**  
Youngstown, OH

## CAREER OPPORTUNITIES

### Do You Like:

- Science?
- Building things?
- Designing things?
- Being creative?
- Working with people?
- Solving problems?

### Consider Metalcasting. We Need:

- Business Managers
- Chemical Engineers
- Computer Engineers
- Electrical Engineers
- HR Professionals
- Safety Managers
- Accountants
- Quality Control Technicians
- Marketing & Salespeople
- Mechanical Engineers
- Metallurgists
- Skilled Tradespeople

### Careers: Post High School

- Molder, Machine Operator, Pourer, Crane Operator
- Lab Technician, Quality Assurance, Welder, Furnace Operator
- Patternmaker, Maintenance Mechanic
- Electrician

### Careers: Post College

- Metallurgist, Quality Assurance Manager, Facilities Manager
- Engineering Manager, Plant Manager, HR Manager, Controller, Computer Programmer, IT Manager
- Sales Manager, Technical Director
- VP, President

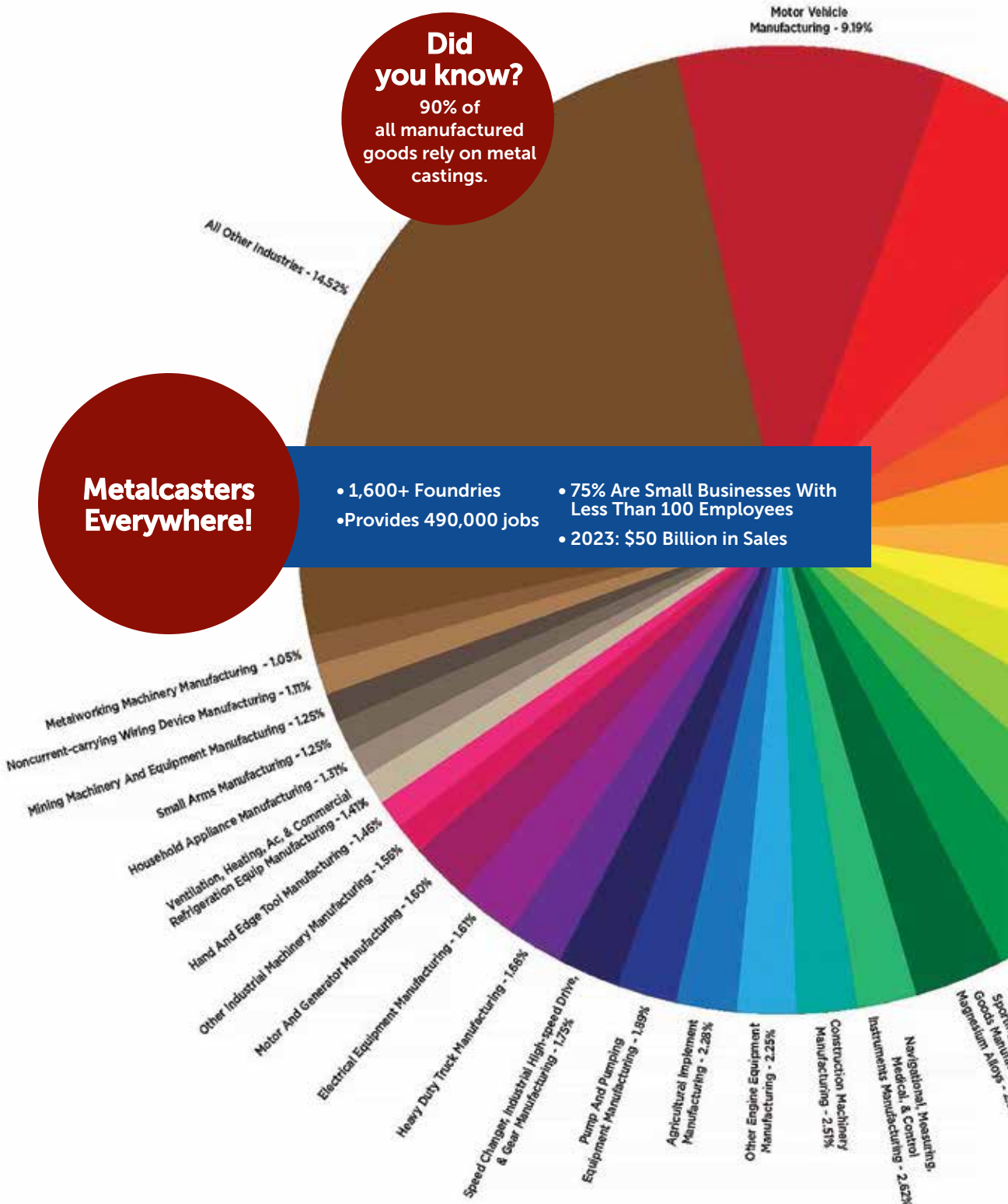
# WHERE DO CASTINGS GO?

**Did you know?**

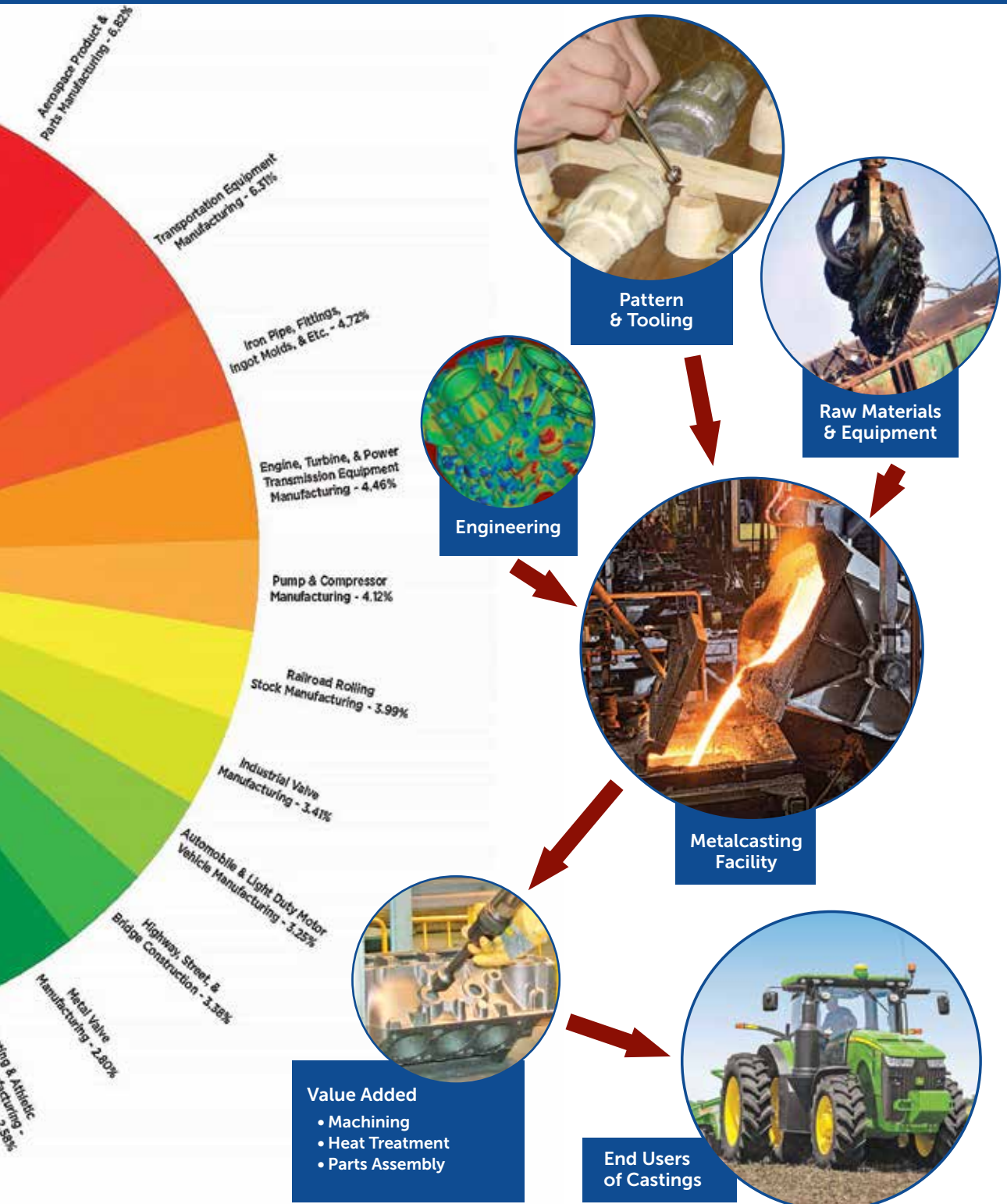
90% of all manufactured goods rely on metal castings.

**Metalcasters Everywhere!**

- 1,600+ Foundries
- Provides 490,000 jobs
- 75% Are Small Businesses With Less Than 100 Employees
- 2023: \$50 Billion in Sales



# METAL CASTING SUPPLY CHAIN







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