

2023-4 **BRAND LOOKBOOK**

OUR BRAND IN ACTION

The Carpenter Technology brand represents who we are and where we're going. It reflects our legacy of transforming the toughest customer challenges into results-focused, holistic, and scalable solutions. It underscores our promise of unquestionable quality, expert collaboration, and trailblazing growth. It belongs to all of us.

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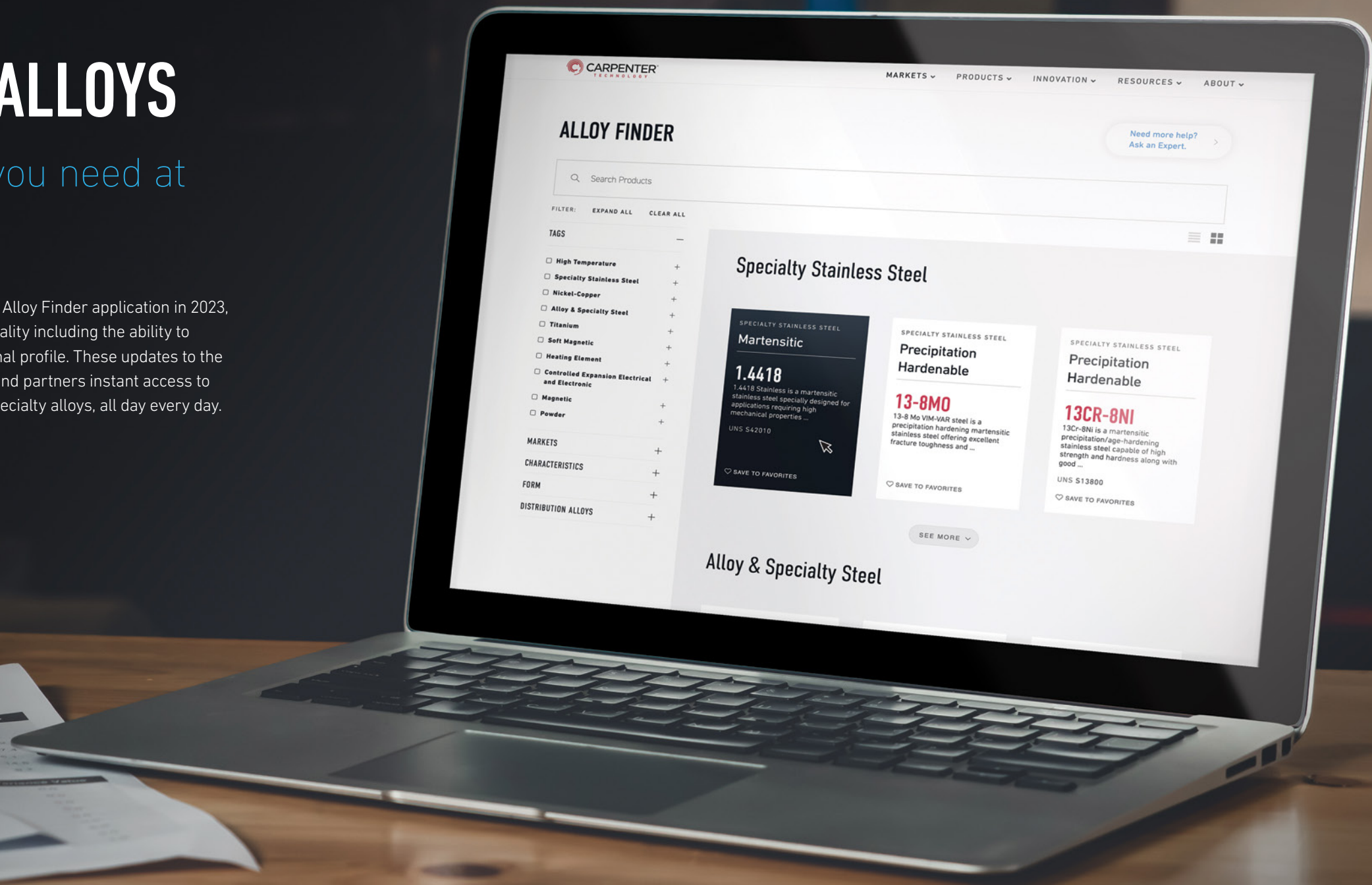
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BRAND

ALLIES IN ALLOYS

The materials you need at your fingertips

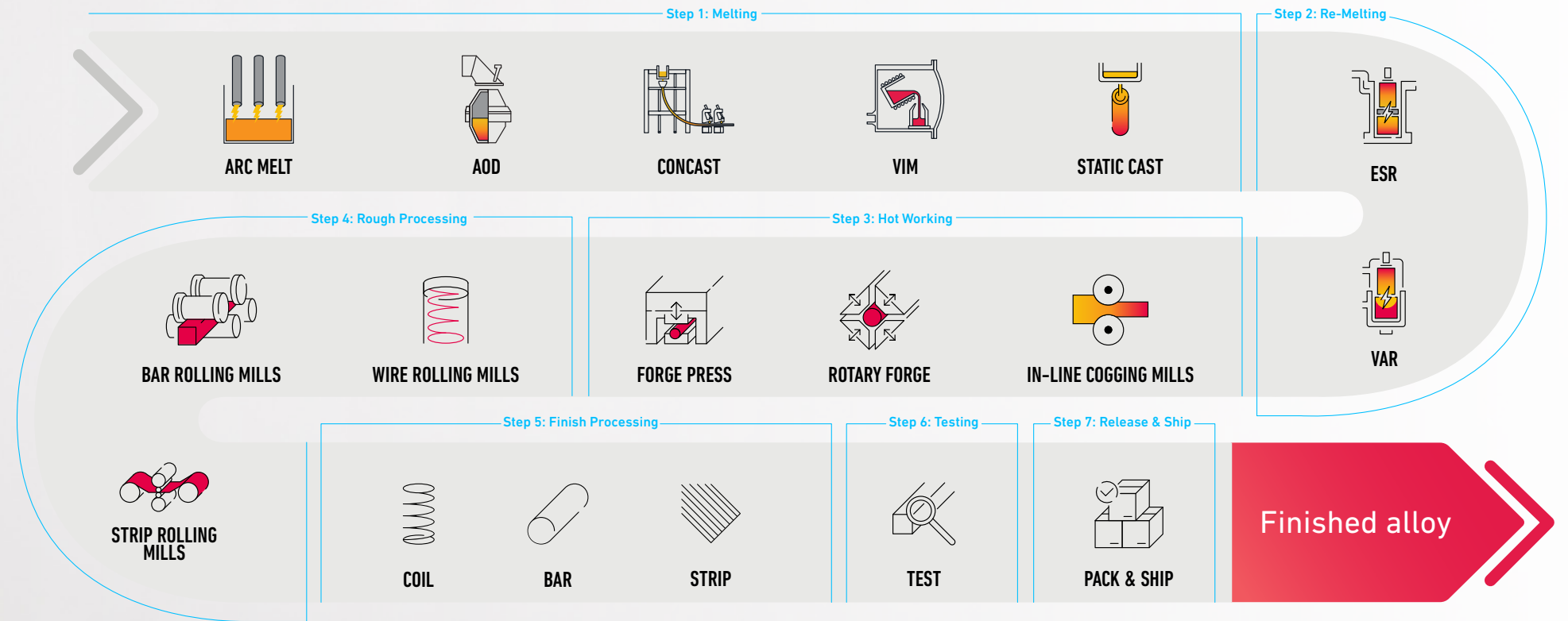
Carpenter Technology upgraded our Alloy Finder application in 2023, adding new personalization functionality including the ability to bookmark content to a user's personal profile. These updates to the interactive tool give our customers and partners instant access to information about our portfolio of specialty alloys, all day every day.





Putting picture to process

An expanded library of product and process icons allows us to illustrate how our alloys are made in detail.





MEDICAL MARKET

LIFE-CHANGING MATERIALS

Improving patient outcomes

Our materials for the medical market showcase the cutting-edge alloys and manufacturing processes that are making a difference in operating rooms and dental offices around the world.

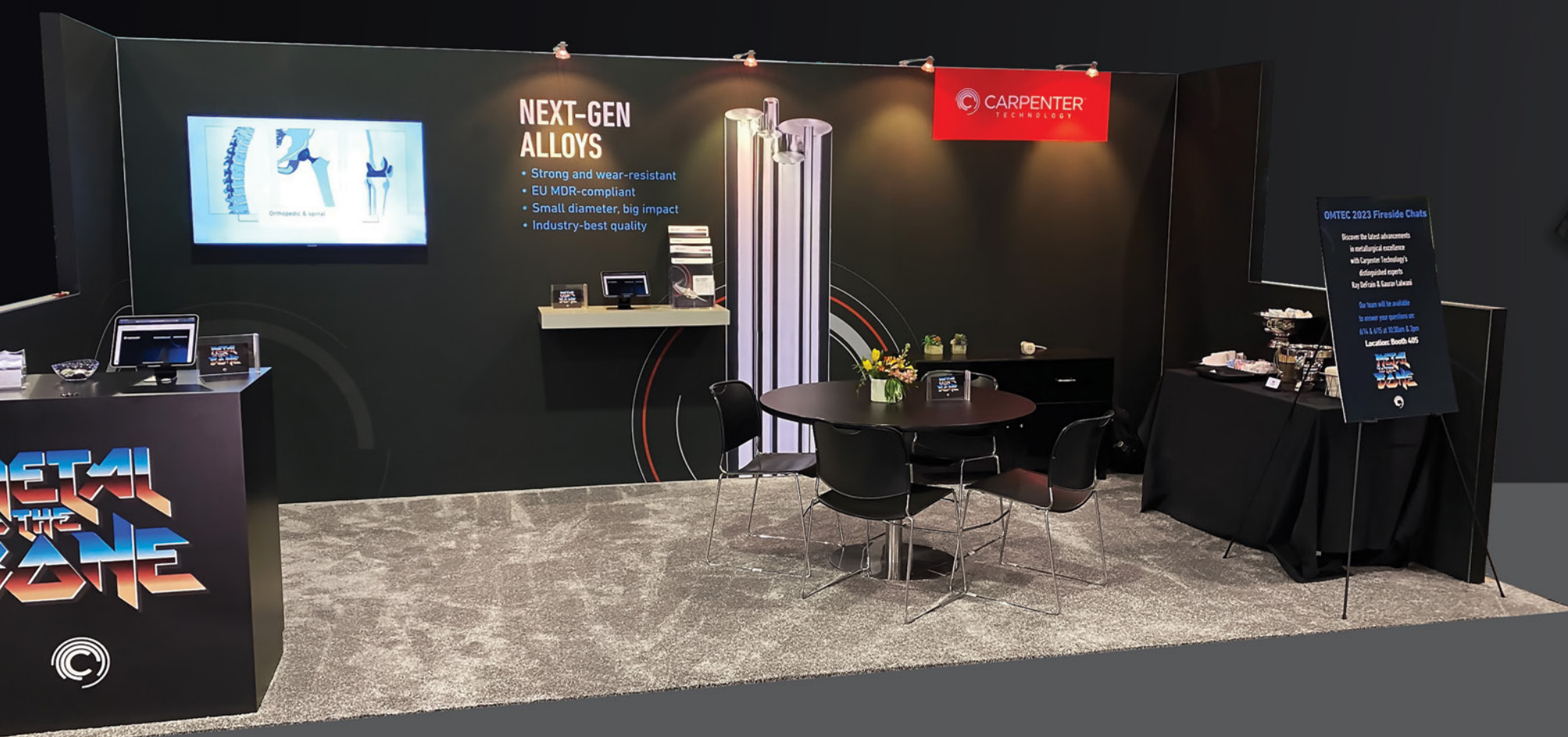


Standing out in a crowd

In a sea of OMTEC booths, most with by-the-book orthopedic device marketing, we channeled our inner Mötley Crüe and got Metal to the Bone—creating fans and generating so much demand for our t-shirts that attendees flocked to our booth for them the following year.



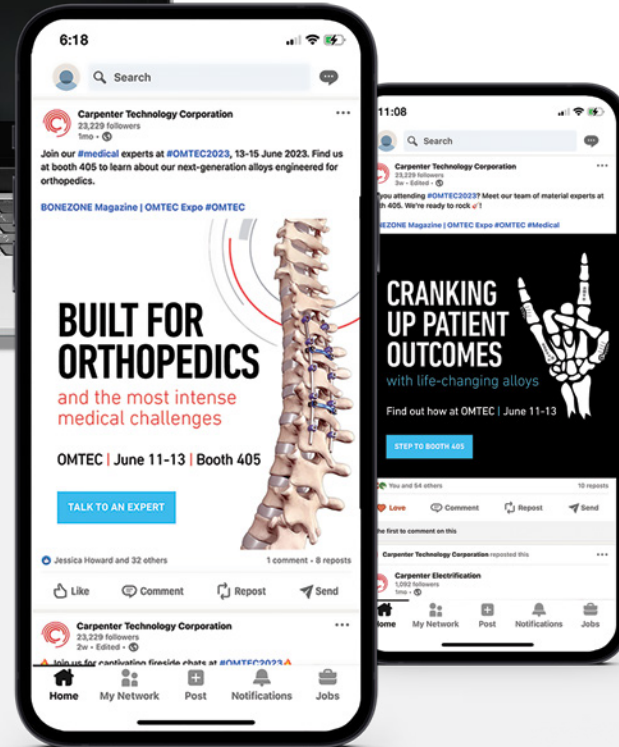
The rock stars of the booth, our medical alloy experts



2023 OMTEC tradeshow booth



2024 OMTEC t-shirt giveaway, cranking customer engagement up to 11

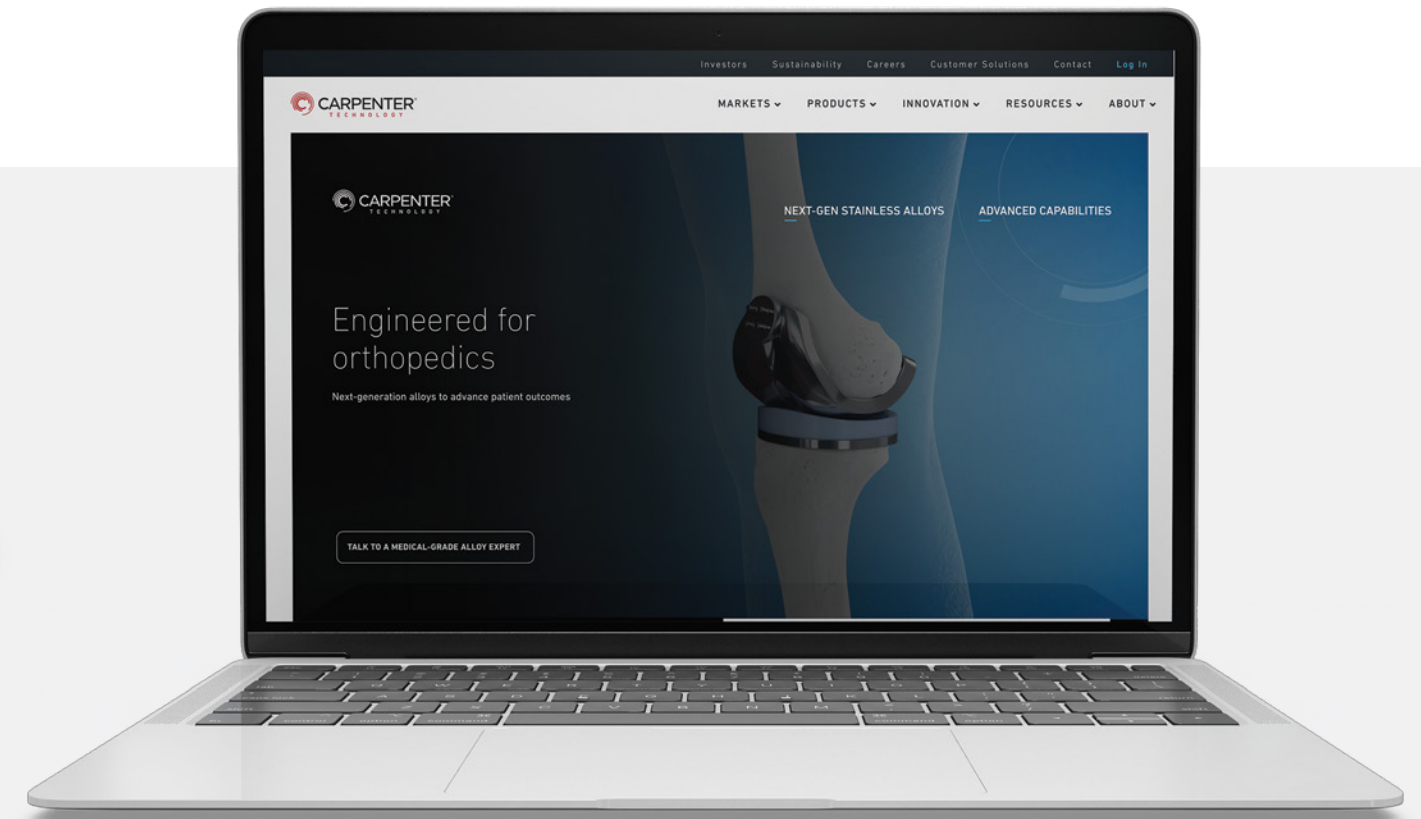


Creating experiences

Medical tradeshows give us access to some of our best customers and prospects, and we make the most of that opportunity with eye-catching booth design, relevant take-home materials, and targeted, interactive landing pages that live on long after the show.



Postcard handouts



CarpenterTechnology.com/MEDTEC

Building a body of digital work

Serialized social media posts and emails drive traffic to our interactive landing pages, in-depth webinars and data sheets, tradeshow booths, and medical alloy experts.



CARPENTER TECHNOLOGY DATASHEET

BIODUR® 316LS STAINLESS

Applicable specifications: ASTM F138, ASTM F139, ISO 5832-1 Composition D
Associated specifications: UNS S31673

Type analysis

Single figures are nominal except where noted.

Iron	Balance	Chromium	17.00–19.00 %	Nickel	13.00–15.00 %
Molybdenum	2.25–3.00 %	Manganese	Max 2.00 %	Silicon	Max 0.75 %
Copper	Max 0.50 %	Nitrogen	Max 0.10 %	Cobalt	<0.10 %
Carbon	Max 0.030 %	Phosphorus	Max 0.025 %	Sulfur	Max 0.010 %

Forms manufactured

Bar-Flats Bar-Hexagons Bar-Rounds Bar-Squares Sheet Strip Wire

Description

BioDur 316LS stainless is an electro-slag remelted (ESR) or vacuum arc remelted (VAR), low-carbon, high-nickel and molybdenum version of 316 stainless. The secondary premium melting step (ESR or VAR) imparts improved cleanliness. The chemistry modifications are designed to maximize the corrosion resistance of this alloy and provide a ferrite-free microstructure. The alloy is non-magnetic, even after severe cold forming operations.

The chemistry of BioDur 316LS stainless meets the recently implemented **EU MDR** regulatory labeling threshold of less than 0.10% cobalt by weight. Devices made from this alloy should not need to be labeled as containing a potential CMR (carcinogenic, mutagenic and reprotoxin) element.

Key Properties:

- EU MDR compliance
- Corrosion resistance
- Improved cleanliness
- Non-magnetic, ferrite-free

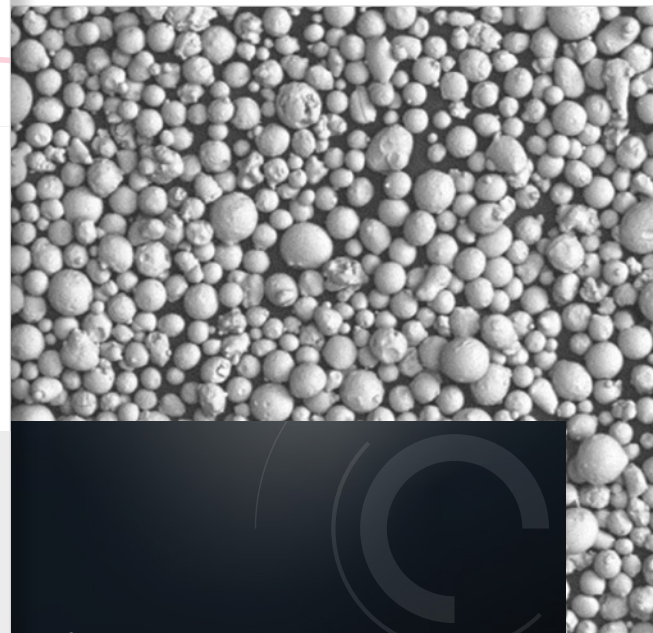
Markets:

- Medical

Applications:

- Fracture fixation devices
- Surgical implant devices
- Surgical instruments

info@cartech.com | 610 208 2000
CarpenterTechnology.com/Resources



BIODUR® 108 FOR ADDITIVE MANUFACTURING


...ly nickel- and cobalt-free stainless steel for ... length medical implants and surgical instrumentation

CARPENTER ADDITIVE

Diving into the details

Carpenter Technology's medical alloys are engineered for the rigors of medical and dental devices. Our white papers, data sheets, and other collateral highlight this precise engineering, delivering the information device designers need to make buying decisions—component elements, regulatory compliance, performance data, and beyond.

CARPENTER TECHNOLOGY WHITE PAPER



MEDICAL DEVICE INSTRUMENTATION

Materials solutions for strength, corrosion resistance, and performance

CARPENTER TITANIUM by Dynamet
CarpenterTechnology.com



SMALL DIAMETER. BIG IMPACT.

Carpenter Titanium by Dynamet manufactures a wide range of small-diameter alloys used in surgical, diagnostic, orthopedic, cardiovascular, dental, and medical applications around the world.

Small-diameter titanium, stainless steel, and cobalt alloys

- Exceptional wear and corrosion resistance
- Ultra-high tensile strength
- Superior ductility and toughness

Next-level performance, application after application

- Industry-best dimensional accuracy
- Manufacturing with fewer steps and scrap
- Better patient and end-use outcomes

Added value every step of the way

- Quality-assured, in-stock materials
- Metallurgy and manufacturing expertise
- Shorter lead times, on-time delivery

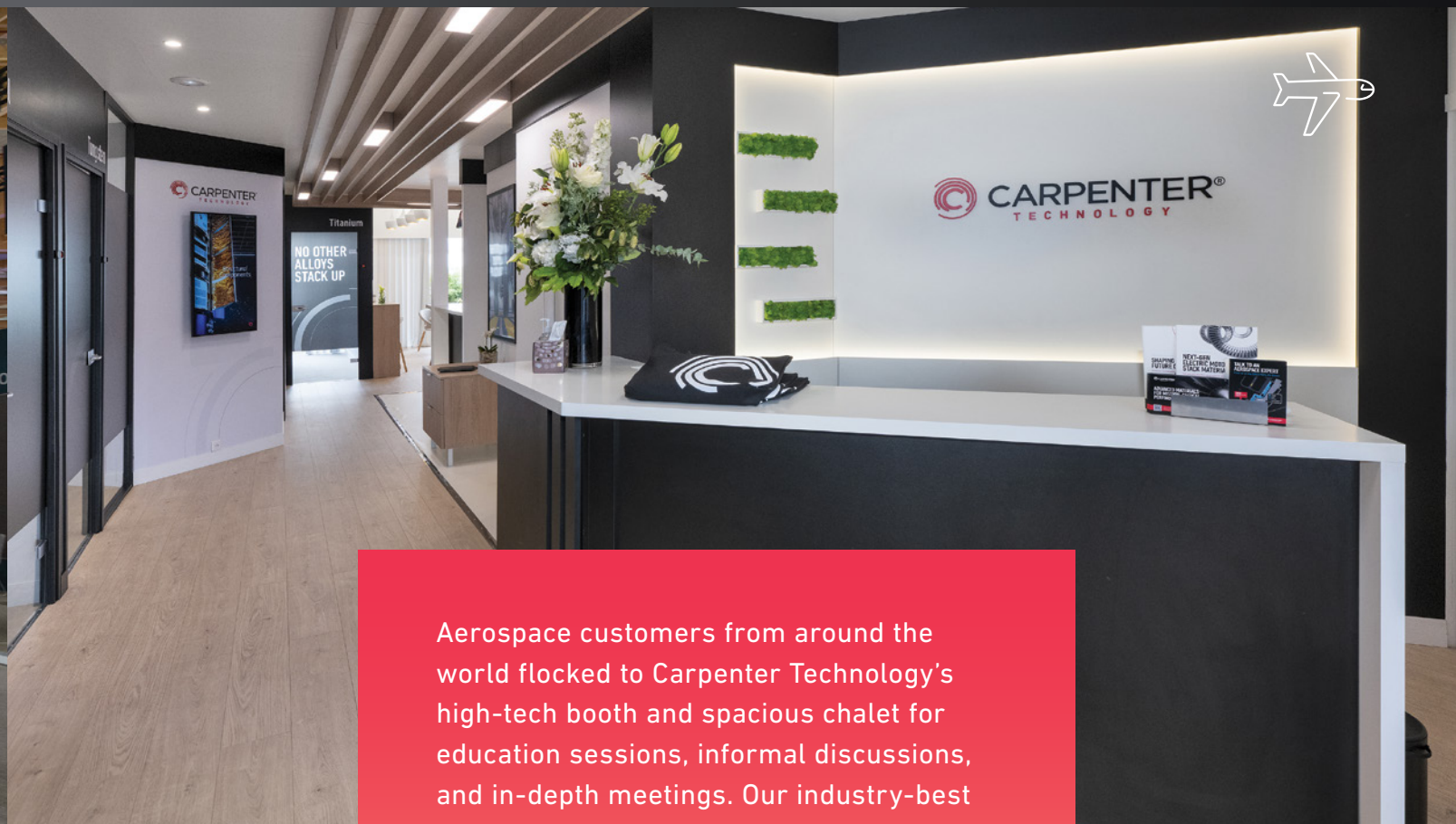


AEROSPACE MARKET

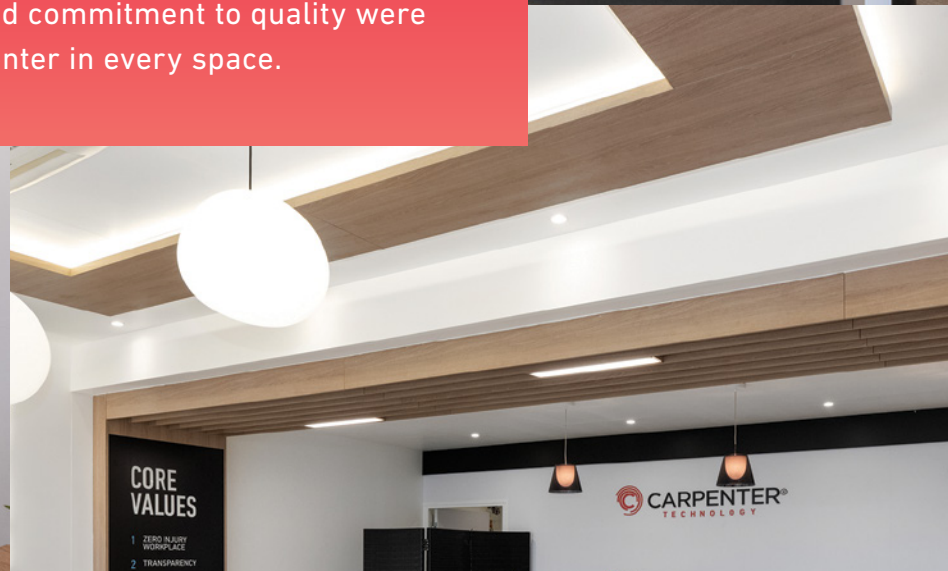
HIGH-FLYING PERFORMANCE

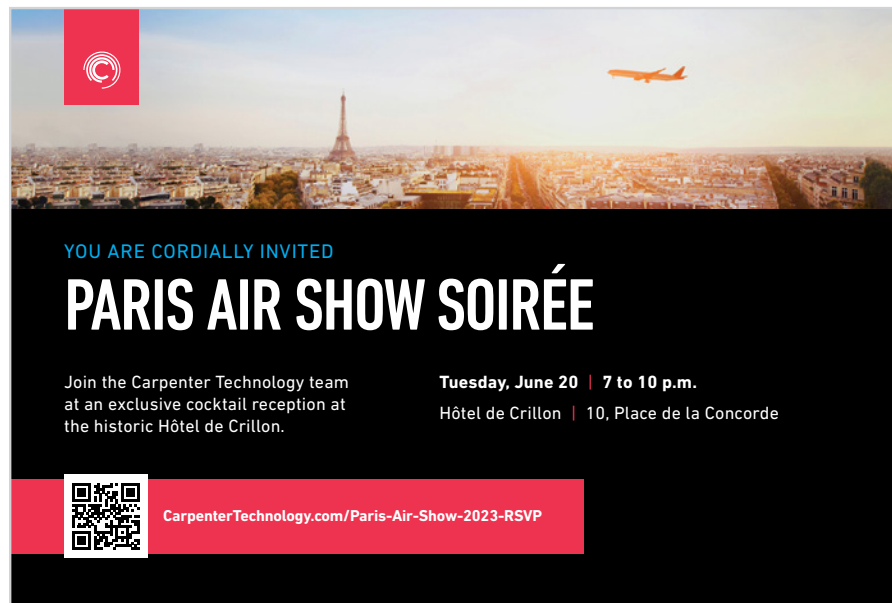
Pushing the limits

In addition to never-fail materials engineered for the friendly skies and less-than-friendly outer space, the aerospace market demands the wow factor. Carpenter Technology made a huge splash at the world's largest event dedicated to the aviation and space industry, the Paris Air Show.



Aerospace customers from around the world flocked to Carpenter Technology's high-tech booth and spacious chalet for education sessions, informal discussions, and in-depth meetings. Our industry-best materials and commitment to quality were front-and-center in every space.

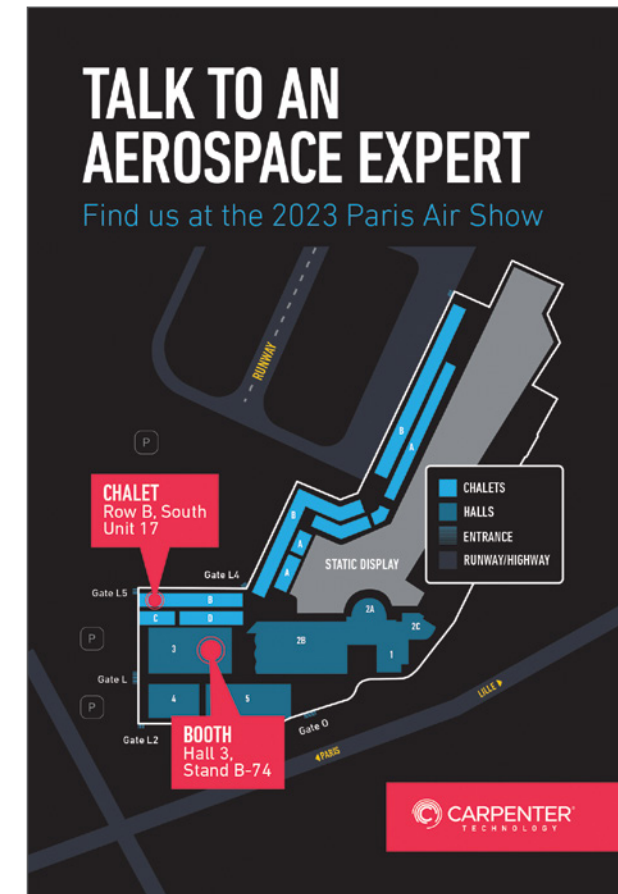




Invitation for an exclusive Paris Air Show cocktail reception



Presentation brief



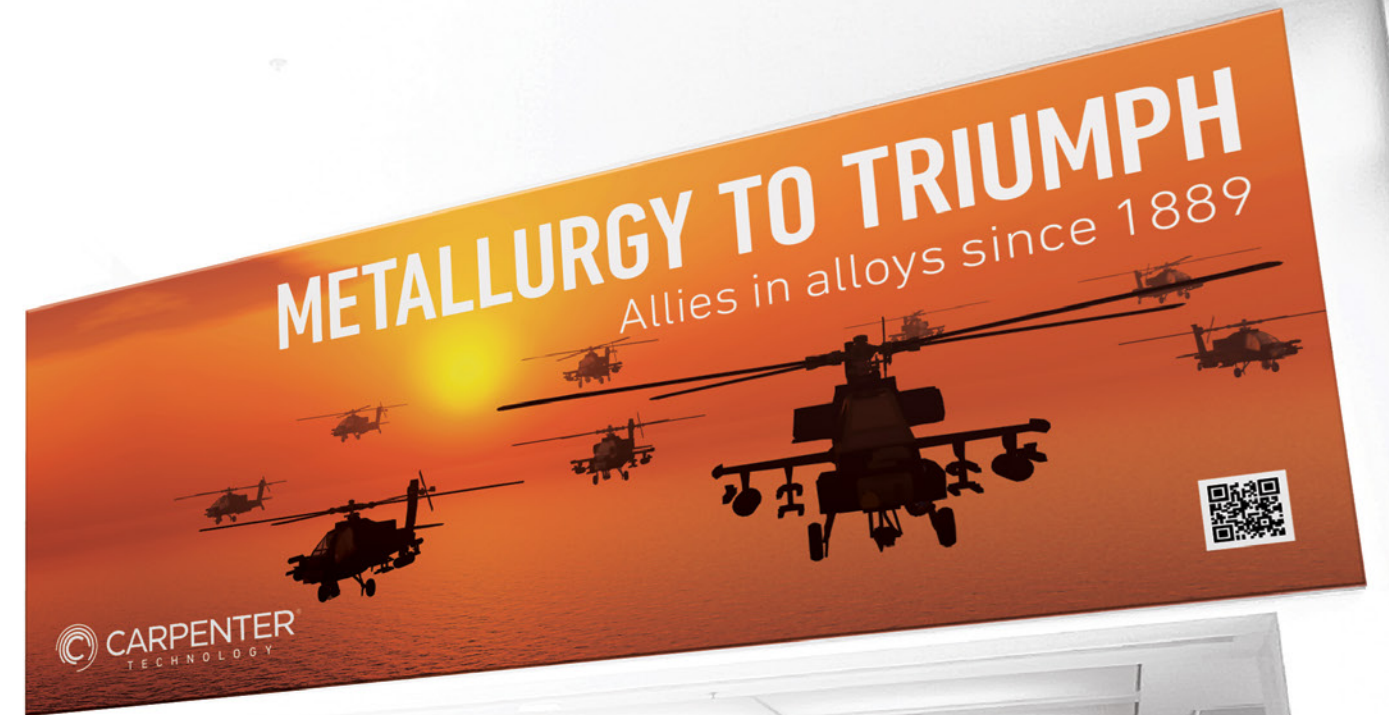
Wayfinding handout

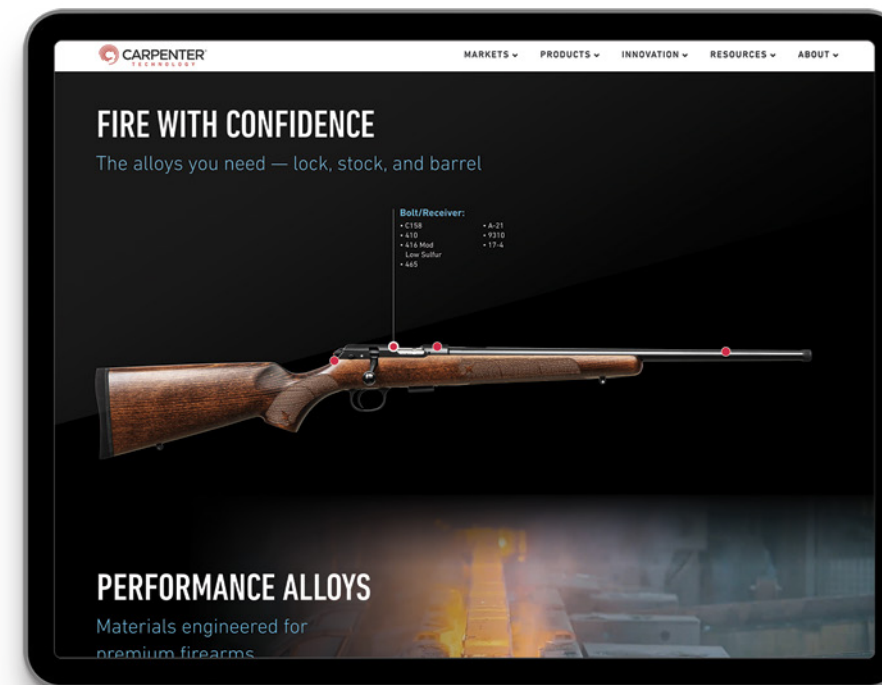
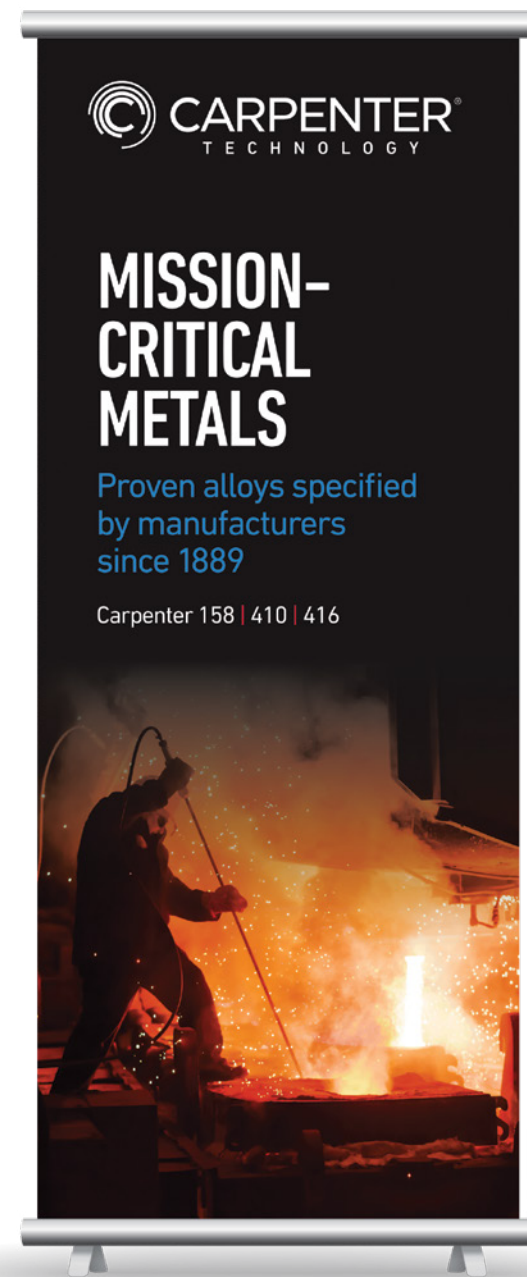
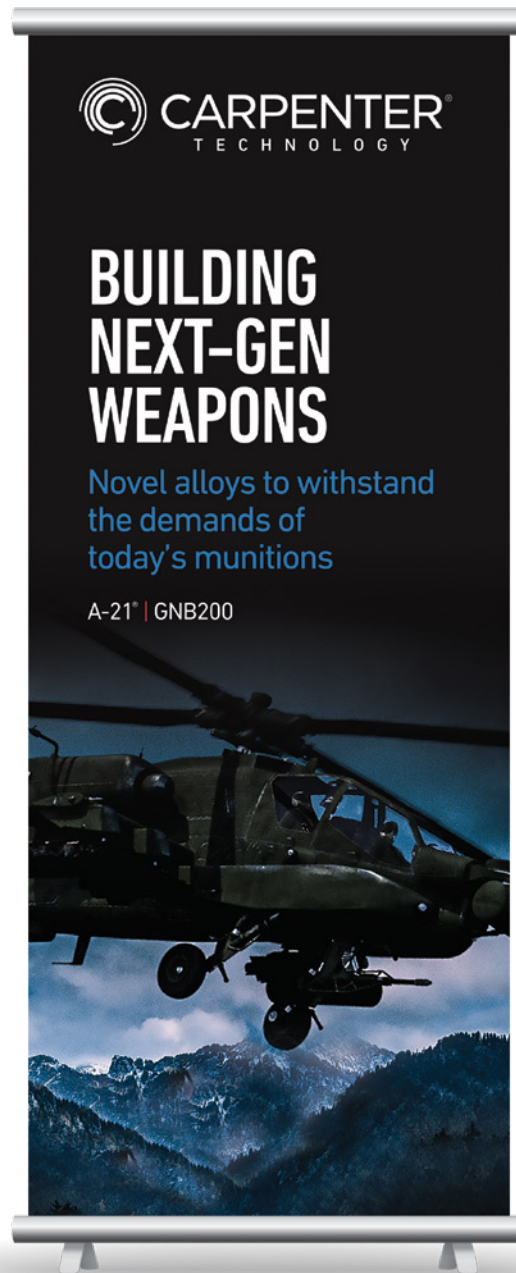
DEFENSE MARKET

MISSION-CRITICAL CAPABILITIES

Built to withstand extreme conditions

Right-place, right-time placement is key for the defense market, like this banner posted prominently at Ronald Reagan Washington National Airport security for defense contractors to see on their way home from a major defense conference.



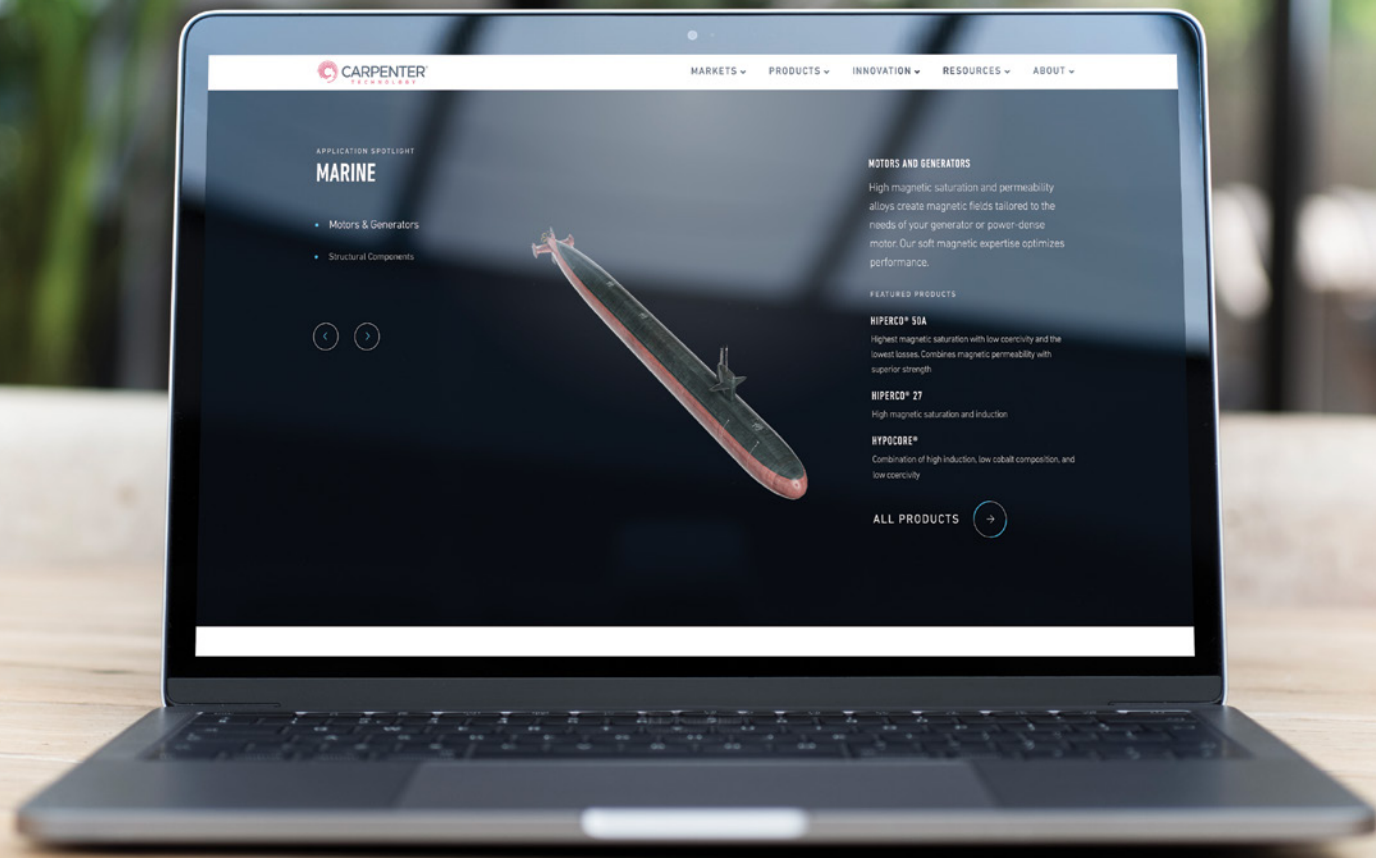


Reaching a wide audience

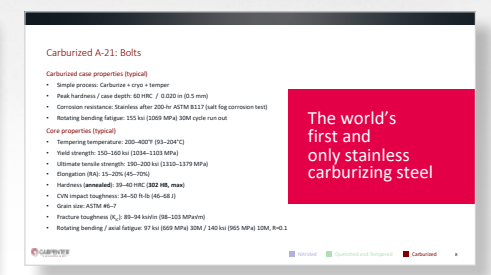
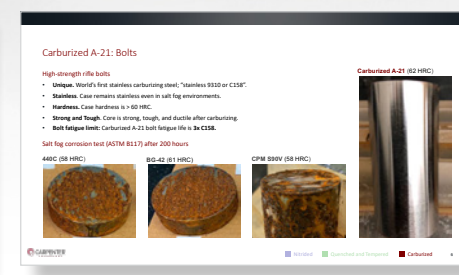
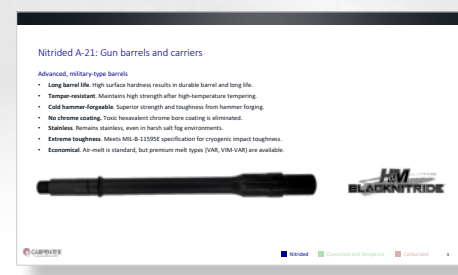
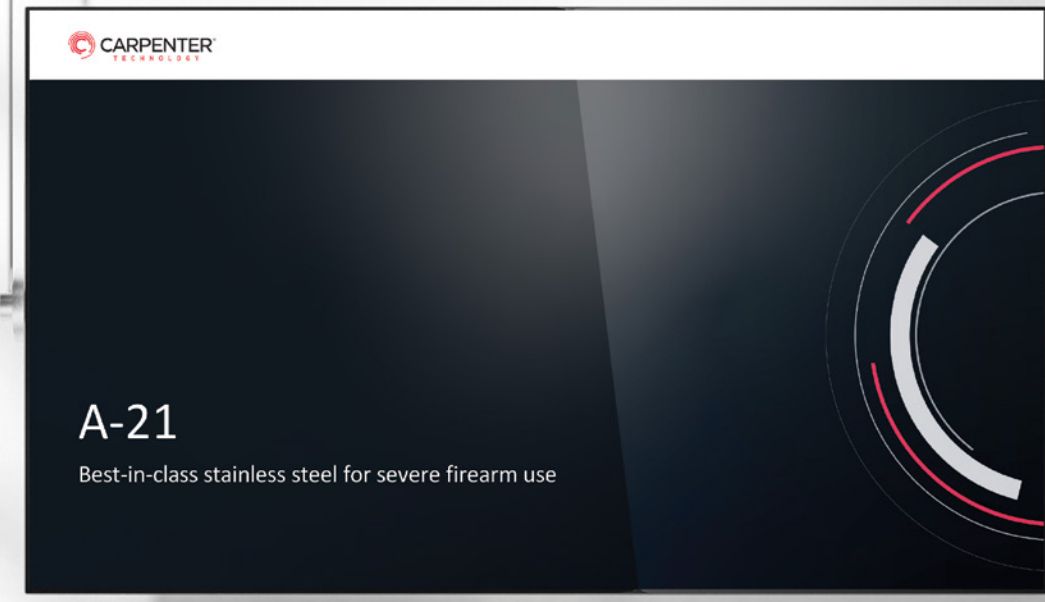
Carpenter Technology's defense audience ranges from military defense contractors to consumer weapon manufacturers. Our marketing efforts are similarly diverse, from materials that address life and flight-critical applications to those that speak to hunting and shooting sports.



SHOT Show retractable banners, interactive website, and print ad



As our defense markets expand, so does our web content and presence.



The world's first and only stainless carburizing steel

The first line of defense

Detailed PowerPoint decks give Carpenter Technology experts what they need to lead webinars, hold conference presentations and have powerful leave-behind materials after meetings.



Science fiction

Carpenter Technology's alloys are the best in the defense industry. The proof is in the data, which we presented in the form of large-format technical posters at the Department of Defense Steel Summit.

ELECTRON BEAM WELDING AERMET® 360

Ultra-high strength and weldable

Heat treatment key

Solution annealed	SA
Solution annealed and aged	SAA
As welded	AW
Post-weld heat treated	PWHT

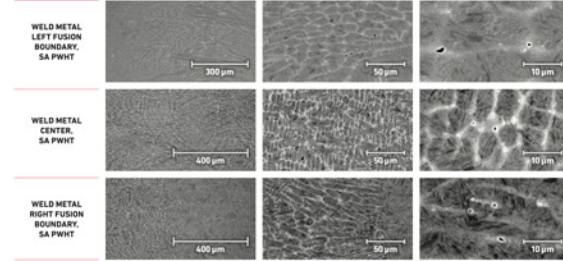
Heat treatment of samples

SAMPLE IDENTITY	1	2	3	4	5	6	7	8
PLATE IDENTITY	SA-PWHT	SA-AW	SAA-PWHT	SAA-AW				
SOLUTION ANNEALING	1775°F, 1 hour, gas quench to RT, re-temperate 1820°F, 1 hour, air warm							
AGING TREATMENT	1820°F, 2.5 hours, AC to RT + re-temperate 1820°F, 1 hour, air warm + 1820°F, 2.5 hours, AC to RT + re-temperate 1820°F, 1 hour, air warm							
AS WELDED	N/A							
POST WELD HEAT TREATMENT	Re-temperate 1820°F, 1 hour, air warm + aging treatment							

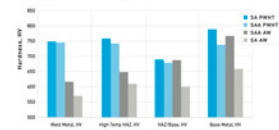
Type analysis of AerMet alloys

	AERMET 360	AERMET 360	AERMET 360	AERMET 360
Carbon	0.25	0.25	0.25	0.25
Chromium	3.0	2.40	2.25	1.80
Nickel	10.0	10.0	10.00	10.0
Cobalt	13.0	10.00	10.00	13.00
Molybdenum	1.25	1.40	1.85	2.25
Titanium				0.10

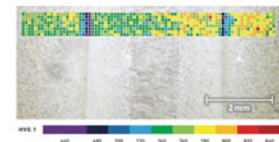
Macrostructure



Average hardness by test location



Hardness traverse plate, SA PWHT



Tensile testing results

LOCATION	SA PWHT	SA AW	SAA PWHT	SAA AW	TYPICAL VALUES FOR REFERENCE
0.2% YIELD STRENGTH (MPa)	2209	1542	2218	2140	2231.0
ULTIMATE TENSILE STRENGTH (MPa)	2438	2030	2405	2435	2021.0
ELONGATION (%)	3.8	6.0	1.3	2.8	5.8
REDUCTION OF AREA (%)	15.8	15.4	1.3	1.7	17.4
CHARPY V-NOTCH (J)	5.0	25.0	8.0	28.0	5.8



H&M BLACKNITRIDE+® QPQ NITRO-CARBURIZING A-21® STAINLESS STEEL

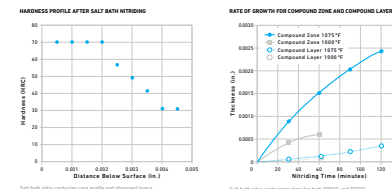
Stainless and nitridable

Type analysis

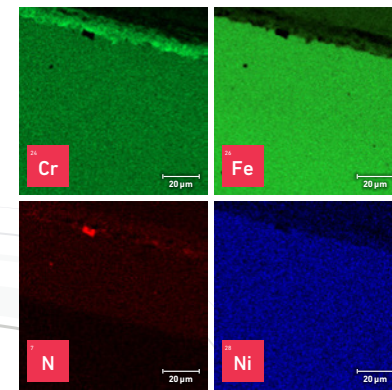
Iron	Balance	Chromium	19.20%	Nickel	0.00%
Manganese	0.15%	Silicon	0.30%	Titanium	0.10%
Carbon	0.01%	Molybdenum	0.05%	Neptunium	0.00%
Aluminum	0.01%	Copper	—		

Physical properties

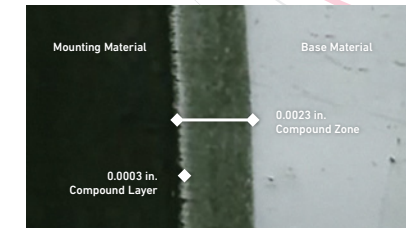
0.2% OFFSET YIELD STRENGTH	1870 MPa	LONG HARDNESS	2000 HRC
ULTIMATE TENSILE STRENGTH	1830 MPa	CHARPY V NOTCH IMPACT	142 J @ 20°C
ELONGATION	21%	TENSILE	1000 MPa
REDUCTION OF AREA	17%		



SEM/EDS chemistry mapping

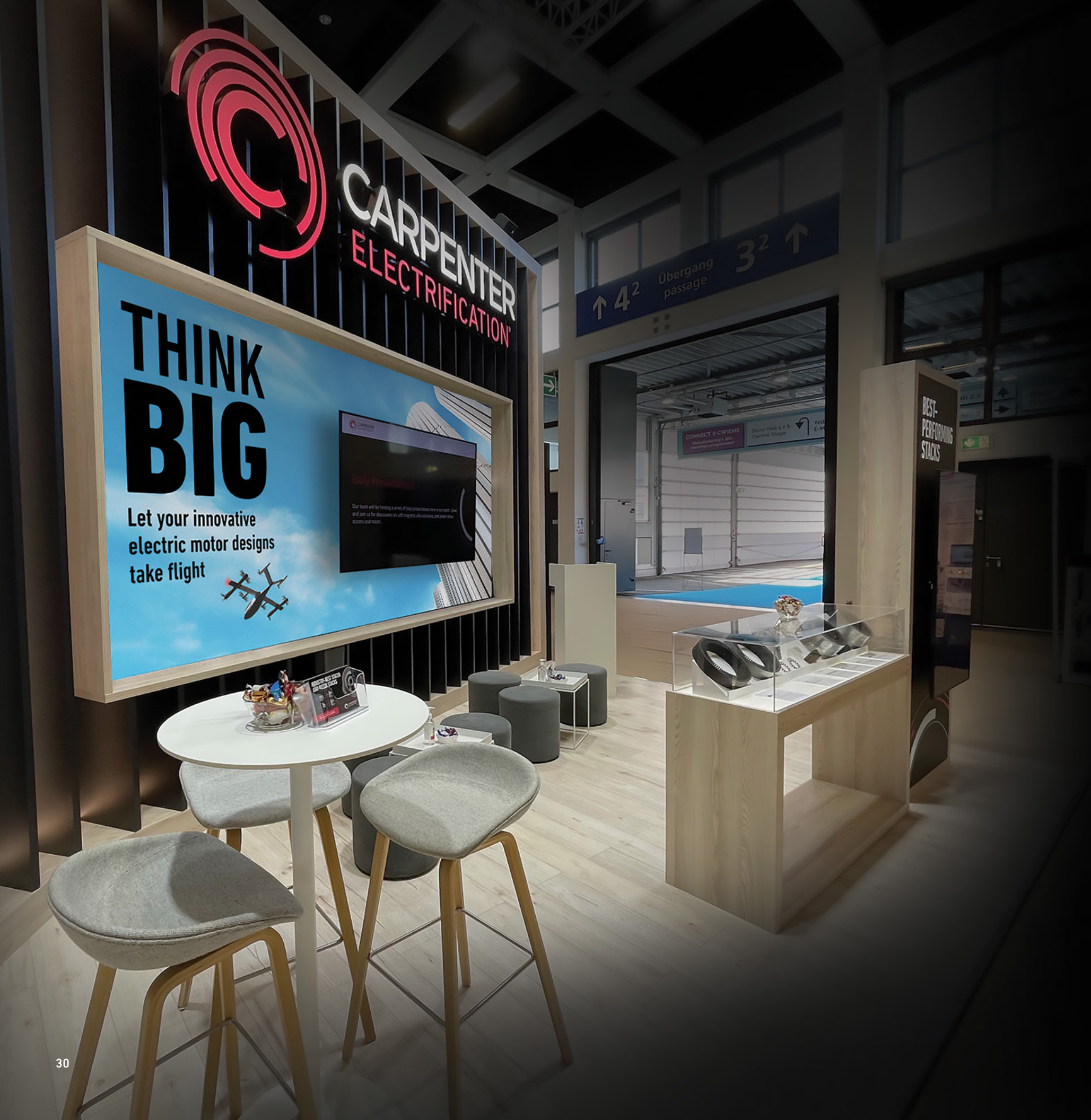


Sample coupon cross section at 250X



Salt spray (fog) corrosion test



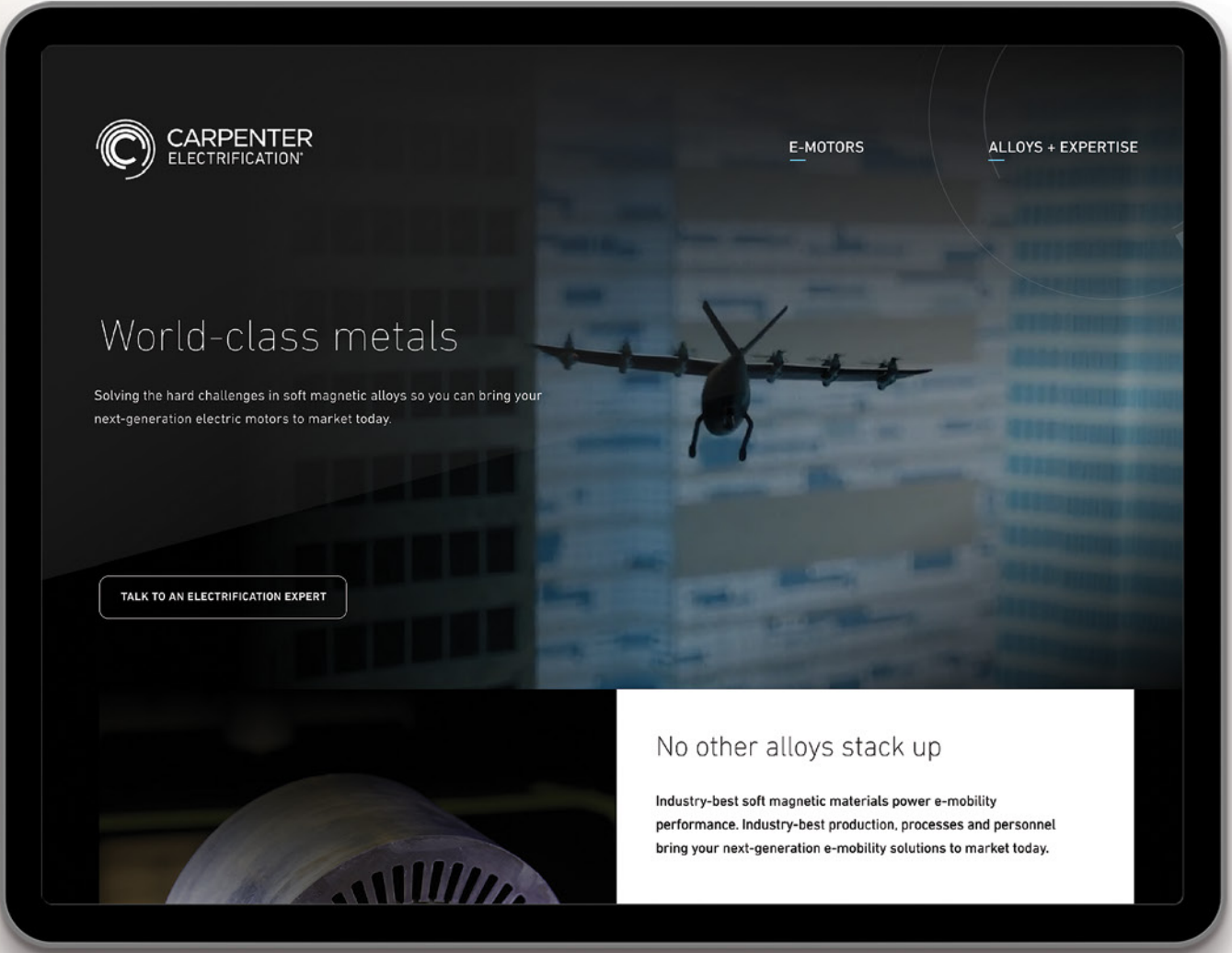
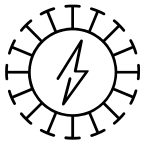


ELECTRIFICATION MARKET

ADVANCED ELECTRIFICATION

Transforming e-motor performance

Beyond providing groundbreaking soft magnetic alloys, Carpenter Electrification is a true partner in e-motor innovation for our customers, including manufacturing world-class electric motor stacks and end-to-end application development. Our brand efforts have been both focused and far-reaching to spread the word.



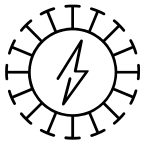
Sparking conversation

Carpenter Electrification's tradeshow appearances at the Global Coil Winding and Electrical Manufacturing Event (CWIEME), Coiltech, the Electric & Hybrid Aerospace Symposium, and beyond are backed by eye-grabbing booth design, printed materials, and interactive web pages.

ALLOY TO STACK
World-class materials, performance at scale

- ALLOYS USED IN **80%+** COMMERCIAL AIRCRAFT ENGINES & GENERATORS
- STACKS WITH UP TO **30%** HIGHER POWER DENSITY
- BACKED BY **134+** YEARS METALLURGY AND PROCESS EXPERTISE

Partner with the electrification leader
CarpenterElectrification.com/CWIEME



WHITE PAPER



THE EVOLUTION OF THE ELECTRIC VEHICLE MARKET

Materials solutions for advanced powertrain design

CONCLUSION

The future of electric vehicle design

There are many advanced technologies available for improving the powertrain for high-performance EVs. The electric motor is a critical sub-component of the powertrain. There are multiple design levers for improving motor performance; notable among these is the use of FeCo stator and rotor stacks as an alternative to NOES. There are several design options using FeCo, each with different levels of complexity and performance improvement.

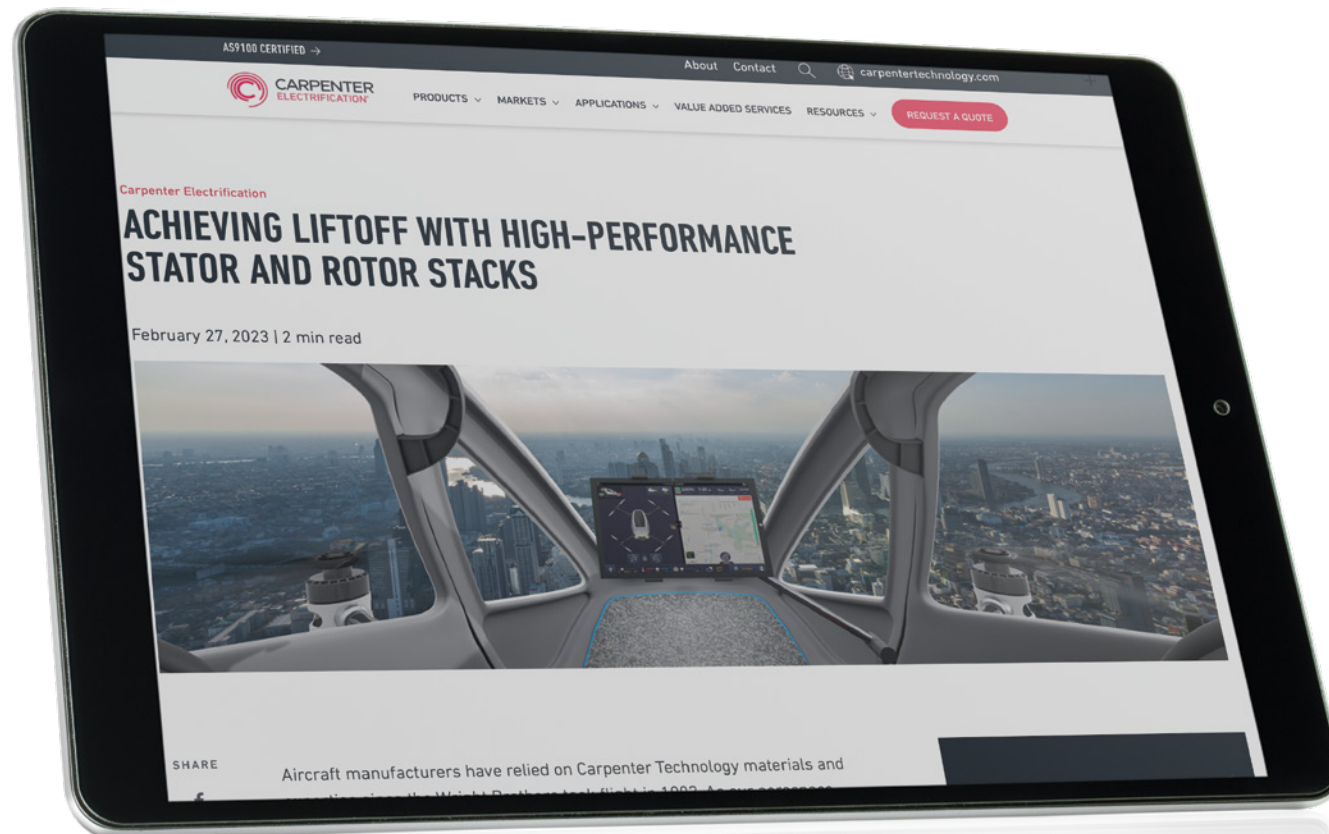
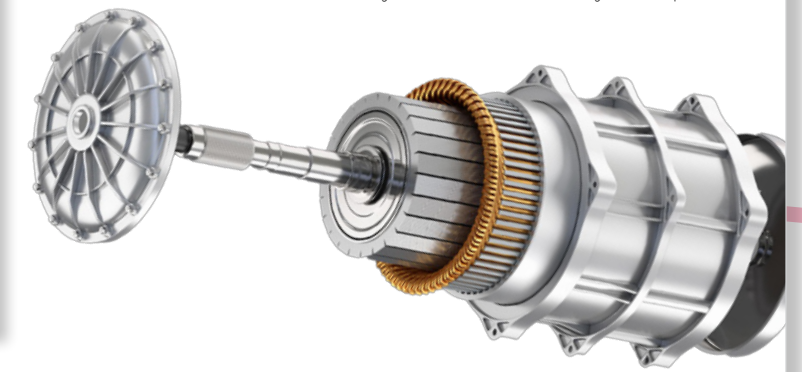
- With a direct material swap of Hiperco 50 for 0.35 mm NOES, without any additional changes, motor torque is increased by 18%, maximum continuous motor power is 60% higher, the motor would run up to 60°C cooler, and the EV using this motor would use 8% less battery power throughout a typical UDDS drive cycle.
- The Hiperco 50 motor can be made 15% smaller and generate the same torque as the NOES motor with 45% higher maximum continuous power. The EV using this motor would use nearly 11% less battery power throughout the UDDS drive cycle.

• The high magnetic saturation and permeability of Hiperco can be accessed through further design changes for even higher performance. Increasing the inverter power allows for more current to the FeCo motors to better access the advantages of the Hiperco stators and rotors.

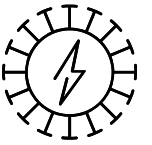
• With a direct material swap of Hiperco 50 for 0.35 mm NOES and with a higher power inverter, the motor torque can be up to 32% higher. This allows for even faster EV acceleration upon demand (perhaps up to 20% faster times from 0–60 mph, though that is dependent upon a number of factors beyond the motor), while otherwise leaving the continuous power, motor temperature, and EV battery power draw unaffected for the typical UDDS drive cycle.

• Alternately, the Hiperco 50 motors can be 25% smaller and generate the same torque as the NOES motor with 35% higher maximum continuous power.

These examples highlight performance improvements using FeCo alloys within a limited set of design modifications. The expert designer will note that additional improvements in performance may be obtained using Hiperco 50 by making greater use of modifications in EV design rules and options.

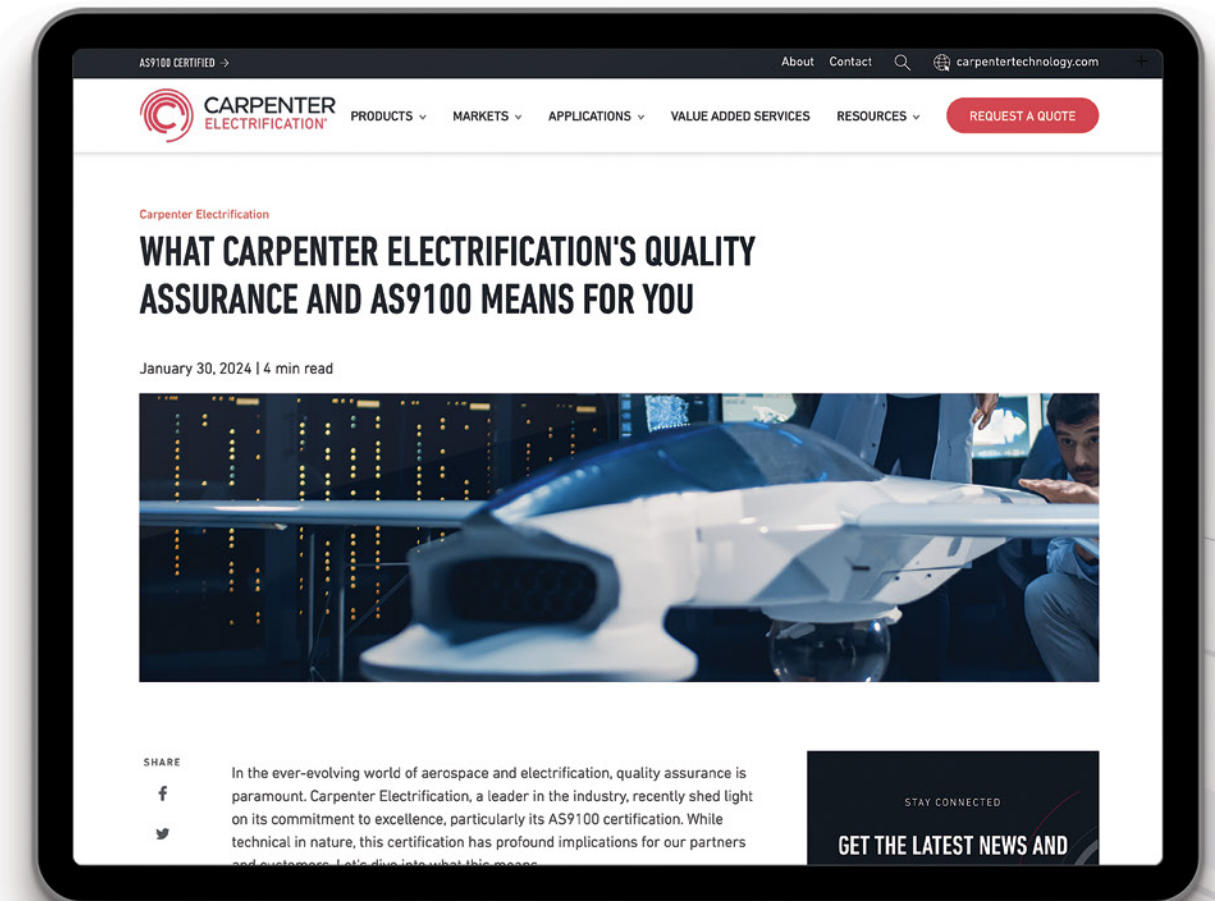
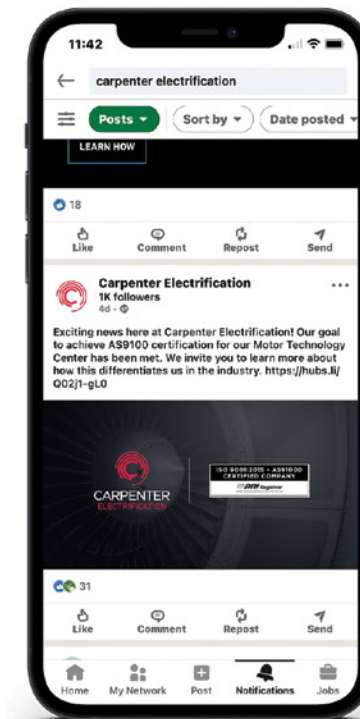
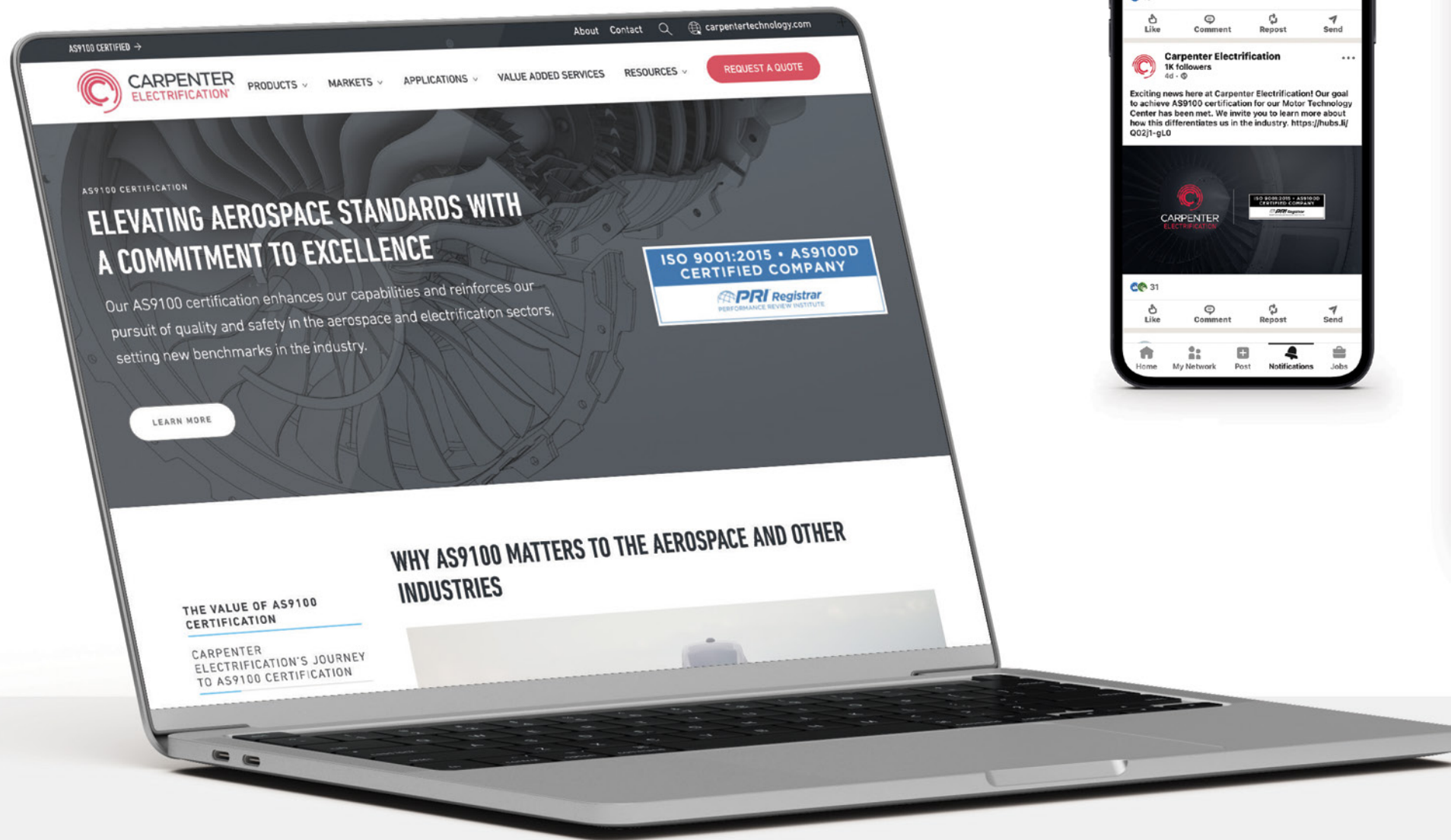


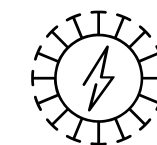
Carpenter Electrification's thought leadership is embodied by our physical presence at events, our digital presence on social media, technical documents, blog posts and articles, and our marketing efforts across industry publications.



High-quality communication

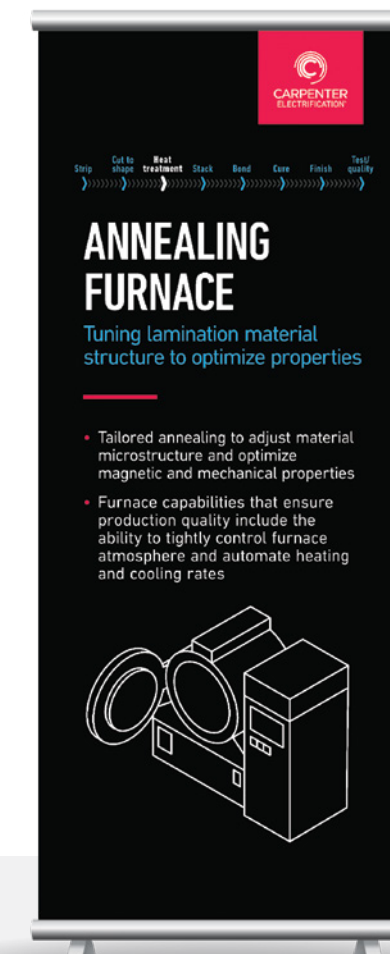
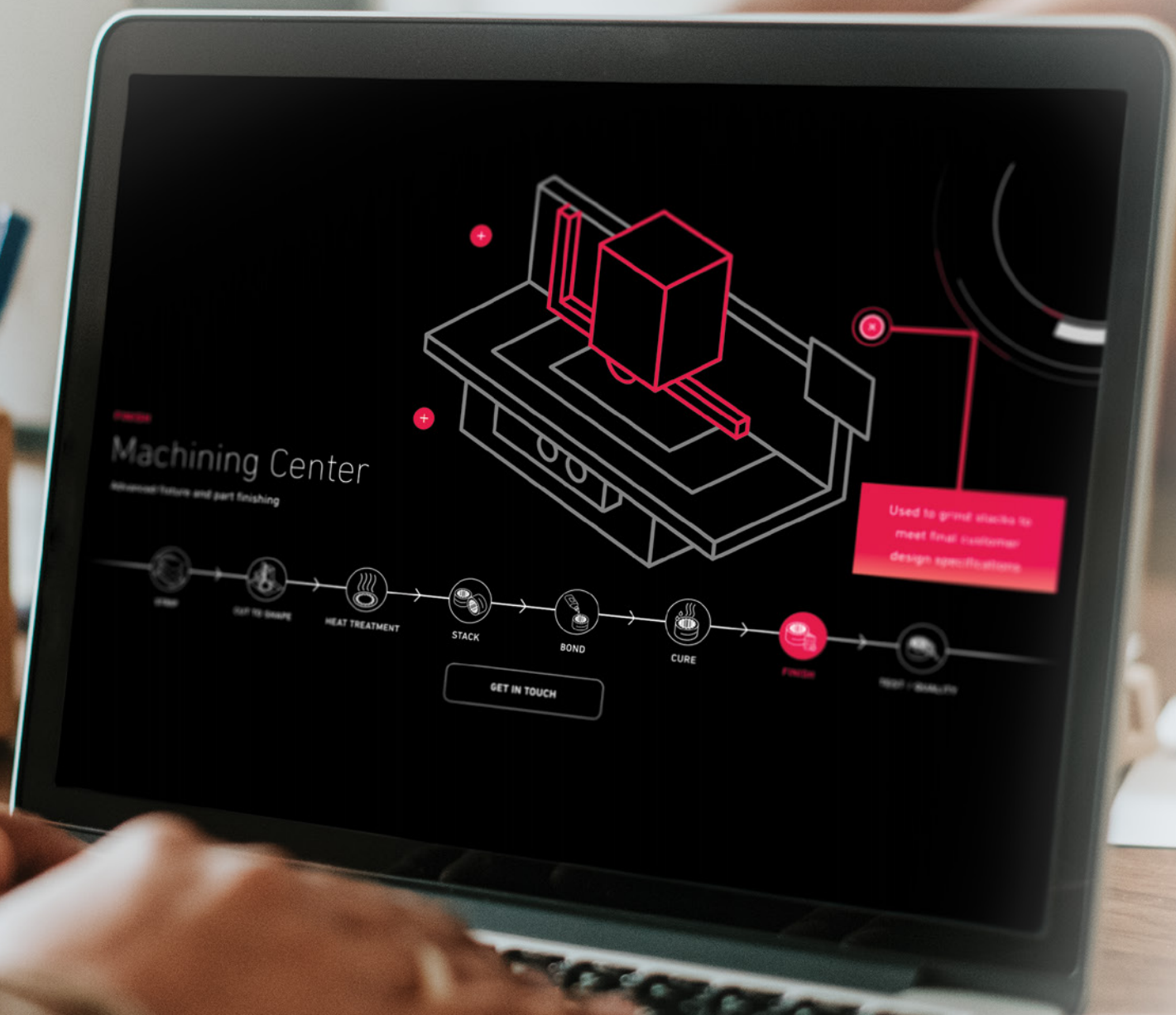
Our recent AS9100 campaign is an example of our multi-channel approach—reaching out to audiences via e-mail and LinkedIn and backing it up with in-depth online content.





Revved up possibilities

The Motor Technology Center (MTC) is where Carpenter Electrification builds the future of electrification. Our banners, print materials, and interactive online landing page showcased the MTC's expanding capabilities and capacity.

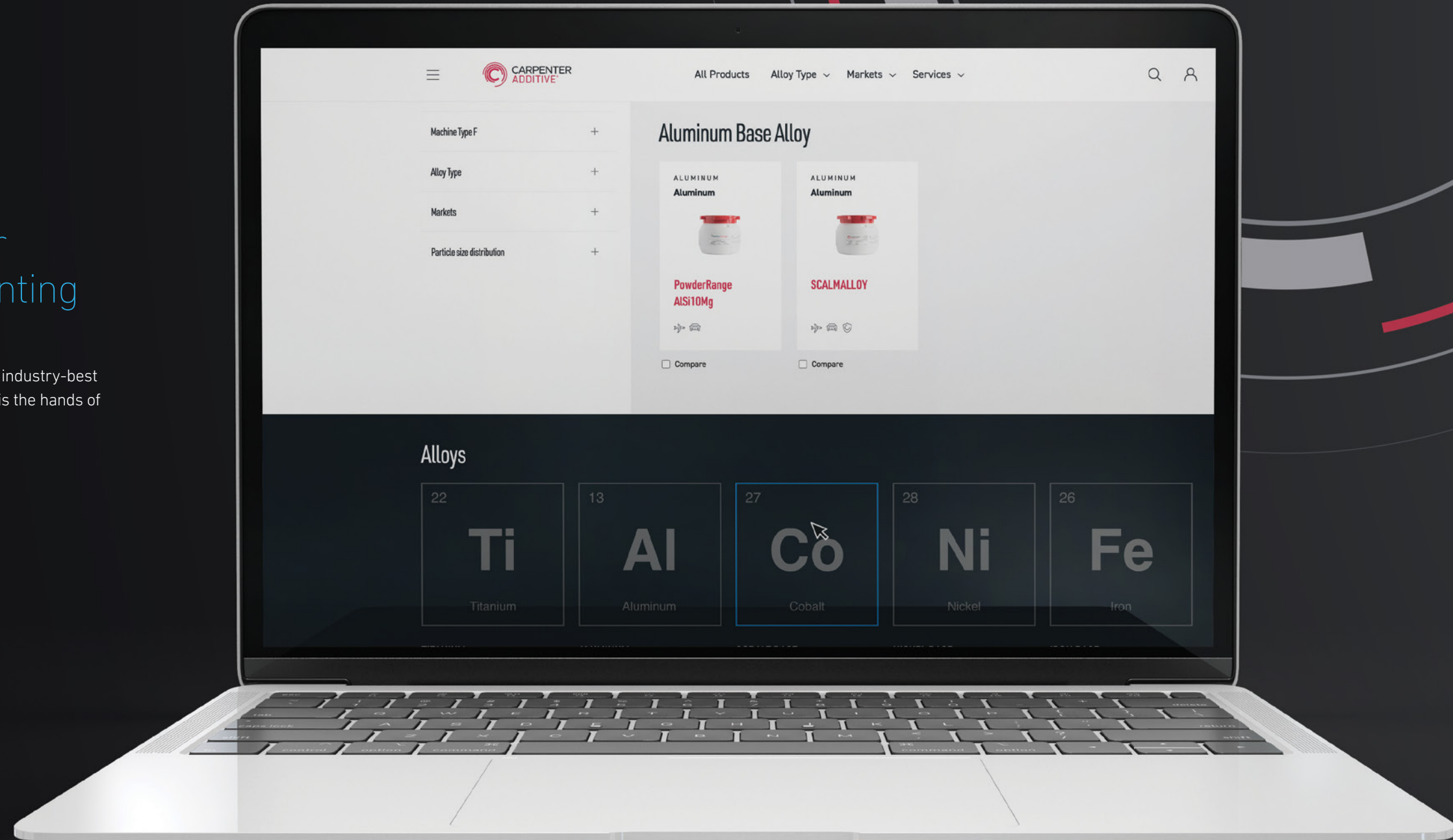


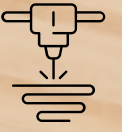
ADDITIVE MARKET

THE POWDER TO POWER AM

Materials and more for
industrial metal 3D printing

With the launch of the Carpenter Additive online shop, industry-best metal powder engineered for additive manufacturing is the hands of customers around the world 24/7.





Illustrating the evolution of AM

Carpenter Additive's next generation Hopper is an absolute game-changer for large-scale additive manufacturers. We launched a game-changing multi-media campaign to match, with a fresh landing page, print and digital ads, social media and email outreach, and technical literature.

CARPENTER ADDITIVE **POWDERLIFE**

ECONOMIES OF SCALE IN AM

IT'S IN THE HOPPER

PREMIUM AM POWDER: TITANIUM | IRON | ALUMINUM | NICKEL | COBALT | COPPER

powder escape

- UN certification pending for the transport of hazardous goods
- Multi-position access for hand trucks, forklifts, and cranes

HOPPER 500 L
Maximum fill 2000 kg / 4409 lb

HOPPER 250 L
Maximum fill 1000 kg / 2204 lb

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CARPENTER ADDITIVE

THE HOPPER HAS LANDED

Your full-scale AM revolution starts now with the next-gen stainless steel Hopper, a bulk supply of premium AM powder.

- Think big:** More than 1 metric ton of powder per Hopper
- Eliminate waste:** One Hopper replaces 100+ non-recyclable plastic bottles
- Lock down safety and quality:** Minimize contamination, maximize efficiency and traceability

PREMIUM AM POWDER: NICKEL | STEEL | TITANIUM | ALUMINUM | COBALT | COPPER

Hop to it:
CarpenterAdditive.com/Hopper



Carpenter Additive is a world leader in the AM space, with experts on hand at all the major in-person and virtual industry events, including FormNext, RAPID+TCT, Additive Manufacturing Strategies, and the Cool Parts Show.



CARPENTER ADDITIVE

Use code **RAPID** for
10% OFF
 your first order*


Shop.CarpenterAdditive.com

*Valid for purchases in May only.

AM POWDER ON DEMAND


Order from our online shop today, ships in 24 hours

Shop.CarpenterAdditive.com




YOUR AM SUPERHERO

With great powder comes great possibilities




Get the materials you need
CarpenterAdditive.com/Formnext



PROVEN ALLOYS + POWDER EXPERTISE

- 25+ metal powders in stock
- Industry-best quality
- Optimized for your machines
- Custom alloys created to spec



Order today, we'll ship tomorrow
CarpenterAdditive.com/Formnext



CARPENTER ADDITIVE

THE MATERIALS TO ADVANCE MANUFACTURING

Premium metal powders for protective surface enhancements and coatings

- Industry-best wear, corrosion, and oxidation resistance
- Engineered for a range of surface enhancement processes
- Easy to use and more cost-effective than solids
- 30 metallurgy powders in stock, custom alloys created to spec
- Production facilities around the world = supply chain security

Get the materials you need
CarpenterAdditive.com/Metal-Powders

Beyond 3D printing

Carpenter Additive's world-class metal powders also serve manufacturers who produce products with metal injection molding, hot isostatic pressing, and surface enhancements and coatings. Our targeted brand materials speak directly to this market and its pain points.

CARPENTER ADDITIVE POWDER METALLURGY

WHEN PERFORMANCE IS EVERYTHING

Premium metal powders for protective surface enhancements and coatings

Additional standard powders are available upon request, and Carpenter Additive will partner with you to create custom metal powders to fit your exact specifications.

Find out more and download datasheets
CarpenterAdditive.com/Resources

COMPOSITION (TYPICAL VALUES IN WT.%)												
	CR	NI	MO	FE	CO	SI	MN	N	S	CU	V	OTHERS
300	22.50	5.50	3.20	Bal	—	1.00 max	2.00 max	0.17	—	—	—	—
200	26.00	4.00	3.00	Bal	—	1.00 max	1.00 max	0.27	—	2.00	—	—
170	15.00-17.50	3.00-5.00	—	Bal	—	1.00 max	1.00 max	0.30 max	0.30 max	3.00-5.00	—	P-0.040 max, Ni 0.05-0.15, O: 0.10
200	16.00-18.00	10.00-14.00	2.00-3.00	Bal	—	1.00 max	2.00 max	—	0.30 max	—	—	P-0.045 max
200	—	—	—	—	—	—	—	—	—	—	—	—
200	24.50	22.00	7.50	Bal	—	0.50 max	3.00	0.50	—	0.15	—	—
30	4.20	—	5.00	Bal	—	0.35	0.30	—	—	—	3.10	W: 6.30
—	—	—	—	—	—	—	—	—	—	—	—	—
45	5.30	—	1.30	Bal	—	0.90 max	0.50 max	—	0.080 max	—	9.50	—
70-185	4.75-5.75	—	1.30	Bal	—	0.75-1.00 max	0.5-0.60 max	—	—	—	8.00	—
30	12.50	—	1.10	Bal	—	0.40 max	0.40 max	—	—	—	4.00	—
45	4.50	—	4.50	Bal	—	0.40 max	0.40 max	—	0.130 max	—	4.00	W: 5.75
40	4.25	—	—	Bal	5.00	0.35 max	0.30 max	—	0.070 max	—	5.00	W: 12.25
30	4.20	—	3.00	Bal	3.00	0.30	0.30	—	—	—	1.10	Ni: 1.00
90	28.00	7.00	3.75	1.75	Bal	0.75	1.00 max	—	—	1.60	—	Nb: 5.50
30 max	14.00-17.00	72.00	—	4.00-10.00	—	0.50 max	1.00 max	—	0.015 max	0.50	—	—



TEAMS, SAFETY, COMMUNITY

TAKING CARE OF BUSINESS

Employees are
our greatest assets

A culture of innovation starts with teams who are
celebrated and empowered to succeed.



ERGONOMICS. EVERYWHERE.

Our project started when our workload significantly increased. It takes six months for a new operator to become certified, which meant our existing staff would have to work much longer hours manually testing products. Concerns were raised by the operators, who were experiencing wrist and neck fatigue. Our collaborative solution addressed both ergonomic risks and production needs.

ENGAGEMENT

- ✓ SEE IT.
- ✓ OWN IT.
- ✓ SOLVE IT.
- ✓ DO IT.

At Carpenter Technology, the safety and well-being of our workers is an essential value of our organization. Ergonomics is one of our Critical Safety Activities.

GETTING OUT OF A SLIPPERY SITUATION
ALL-HANDS COLLABORATION YIELDS HANDS-FREE SOLUTION

Contact Sonic Testing Resolutions

CarpenterTechnology.com/Ergo

Vote Booth 431
in Workplace Solutions

THE PROBLEM
MANUAL TESTING

Non-destructive testing (NDT) operators at our Athens facility were manually testing 800 collars. They'd rotate each 35-foot, 1.5-ton steel bar with slippery couplant (80-85% propylene glycol) and hand roll it 360 degrees end-to-end—once for contact ultrasonic testing (UT), then again for magnetic hot spot testing. Over and over. Over 2,667 bars a year.

The ergonomic strain of this high-volume manual testing was substantial. Our operators knew there had to be a better way.

THE SOLUTION
INNOVATING AUTOMATION

Operators partnered with engineering and metallurgy to design an automated solution. Using Carpenter Technology's in-house 3D printing capability, the team repurposed an unused rotating bar inspection system (RBIS) to perform both sets of tests. After intense collaboration, 5 rounds of prototyping and only \$200 in materials, the new process was perfected:

- Replacing all manual testing
- Using water instead of slippery couplant
- Providing additional data in a strip chart record

THE IMPACT
FULL CIRCLE

The solution was as elegant as it was impactful. The process changed overnight.

UT and magnetic hot spot testing are now conducted on the reutilized RBIS—automatically, hands-free, couplant-free, in a fraction of the time.

3+ million fewer wrist rotations every year

3,467 work hours saved annually, freeing the team to work and innovate in other areas

2,5 days faster lead times for customers

Team safety protected

Extended manual task
90-minute test time

Repetitive motion
1346 passes per bar gripping a small device

Pinch point risk
Rolling heavy bars by hand

Prolonged awkward posture
Neck, back, and wrist strain

Slip risk
Couplant drips and spills

Quick automated process
12-minute test time

Hands-free
No in-hand movement or gripping required

Motors, not muscle
Mechanized loading and rotation

Ergo friendly
Neutral posture to operate the RBIS

Safer work environment
Water requires compliant

"Now, the machine does the work. I monitor the equipment and make the final pass/fail decision from a computer screen. Not only did we eliminate the ergo hazards, we sped up production time and can keep up with the workload!"
—Jason Bolton, UT LVL 3 Operator

Award-winning safety

Multiple Carpenter Technology teams collaborated to design and implement an automated solution to an ergonomically hazardous testing process. This new process and the Brand Team's efforts to promote it were so successful, Carpenter Technology was awarded the Ergonomics Cup.

CARPENTER TECHNOLOGY

MARKETS | PRODUCTS | INNOVATION | RESOURCES | ABOUT

BEFORE | MANUAL TESTING

- 90-minute test time**
Keeping techs from other vital tasks
- Repetitive motion**
1346 passes per bar gripping a small device
- Prolonged awkward posture**
Neck and back strain, pinch point risks

AFTER | INNOVATIVE AUTOMATION

- 12-minute test time**
3,467 work hours saved annually
- Hands-free**
3+ million wrist rotations saved yearly
- Ergonomic challenges eliminated**
Team safety protected

The problem
MANUAL TESTING

Non-destructive testing (NDT) operators at our Athens facility were manually testing drill collars, very large tubular pieces of solid steel used in industrial drilling operations. The operators would slather each 35-foot, 1.5-ton steel bar with a slippery couplant (similar to an ultrasound gel used for pregnancies) and then hand roll the bar 360 degrees end-to-end. They would do this once for contact ultrasonic

The solution
INNOVATING AUTOMATION

Working together with Carpenter Technology's engineering and metallurgy groups, the NDT operators designed an innovative, automated solution to this problem. Using the company's in-house, 3D printing capabilities, the joint team repurposed an unused rotating bar inspection system (RBIS) to perform both sets of tests. After multiple, comprehensive collaboration sessions and five different rounds of



Reaching future innovators

Carpenter Technology created an exhibit for the Reading Science Center designed to explain our manufacturing processes to the next generation, including hands-on activities for each section. Beyond showing what we do, the exhibit is a wonderful example of internal cross-departmental collaboration, external community engagement, and a long-tail recruitment effort for our company. The exhibit will open in mid-2024.

MELT

RAW METAL → INGOT

Heat raw metals to 2800°F or hotter to make alloy ingots

Steel ingredients (metals like iron, chromium, nickel) are melted and mixed at 2800°F in furnaces, then poured into a mold where they cool to form a solid ingot. As a comparison, milk chocolate ingredients (cocoa, milk powder, sugar) are melted and mixed at only 130°F, then poured into a mold where they cool to form a candy bar.

The great melting pots

- Electric Arc Furnaces run alternating current (AC) through electrodes. Electric arcs like lightning bolts shoot out — ZAP! — and melt the metals.
- There's no air in Vacuum Induction Melting (VIM) furnaces — just like in outer space! Electricity is run through a coil inside the chamber, creating electromagnetically induced currents that melt the metals.
- Remelting happens when alloys need special powers, like super strength or corrosion resistance.

Did you know?
1 ingot can weigh 60,000+ pounds, as much as 5 elephants!

HOT WORK

Heat alloy ingots and stretch them into different shapes

It's no stretch of the imagination

Rolling mills come in all shapes and sizes, and so do the alloys that make them. Mills forge, press, and mill to take our humble ingot and twist, stretch, pull, and roll it into final forms.

Leggo my ingot!

Follow the process as our LEGGO ingot is forged into billets and rolled into wire.

Did you know?
1 ingot can make more than a mile of wire!

CHARACTERIZE

Examine the alloy's microstructure

What you see is what you get

Metallography is the study of the physical structure of metal. Under a microscope, the grain structure of our alloy comes into focus, showing just how strong and tough it will be.

- Ti64: Ti64 helped build the Mars Perseverance Rover.
- 718: Ti8 and A286 helped build the Space Shuttle's main engines.

Human Hair

Alloys are made up of grains. Each one can be smaller than a human hair!

INSPECT

Check for quality from the inside out

Put it to the test

Every alloy product is inspected before it leaves our building. We can't cut up the metal to see if there's anything wrong, so we use ultrasonic testing to look inside — just like doctors use ultrasound machines to examine the insides of our bodies!

What are we looking for?

- Seams
- Cracks
- Flaking
- Contamination

Small bar entering tanks

Large bar inspection tank

Probe scanning bar

Lifting inspected bar from tank

Characterization methods shown: Ultrasonography 10-100, Optical microscopy 10-1000X, Scanning electron microscope 100-100,000X, Microprobe for compositional analysis.



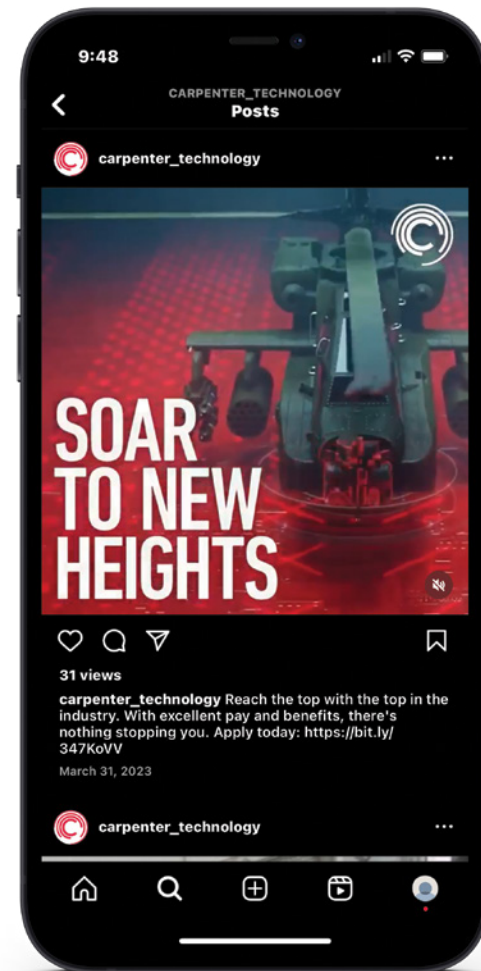
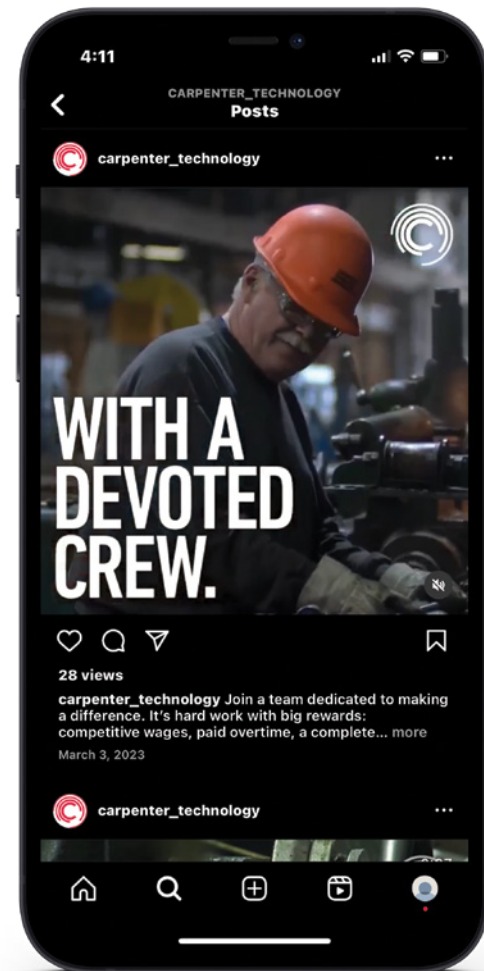
Building more than metal products

Our Brand Team collaborates with other departments to:

- Build teams with engaging recruitment campaigns (below)
- Build morale with t-shirts that celebrate successes (right)
- Build community with home-run outreach (far below)



Production prowess



Instagram recruitment campaigns



Safety success



Signage at the Rocket City Trash Panda ballpark



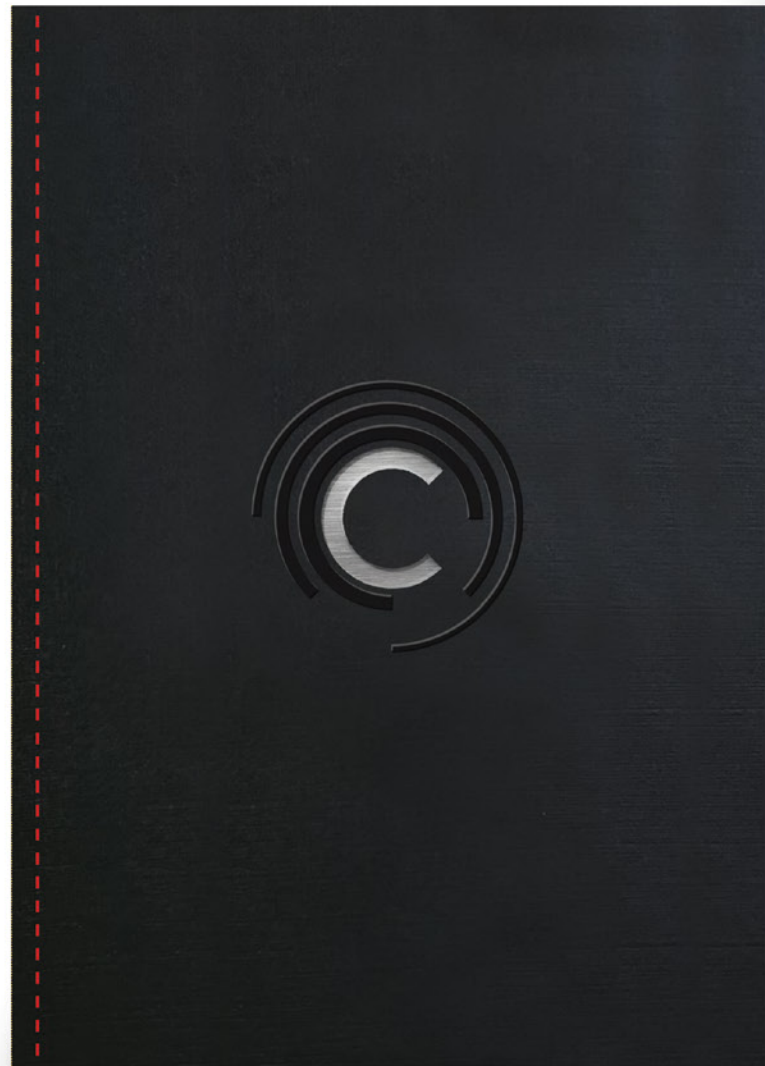
Investor brochure

INVESTOR RELATIONS & SUSTAINABILITY

SPREADING THE WORD

Reaching investors and global markets

Beyond our internal teams and external clients and partners, Carpenter Technology must speak to the global marketplace and communicate our innovations, capabilities, and commitment to a sustainable future.



FOUNDED IN
1889

4,000+
EMPLOYEES

\$1.8B
NET SALES FY22

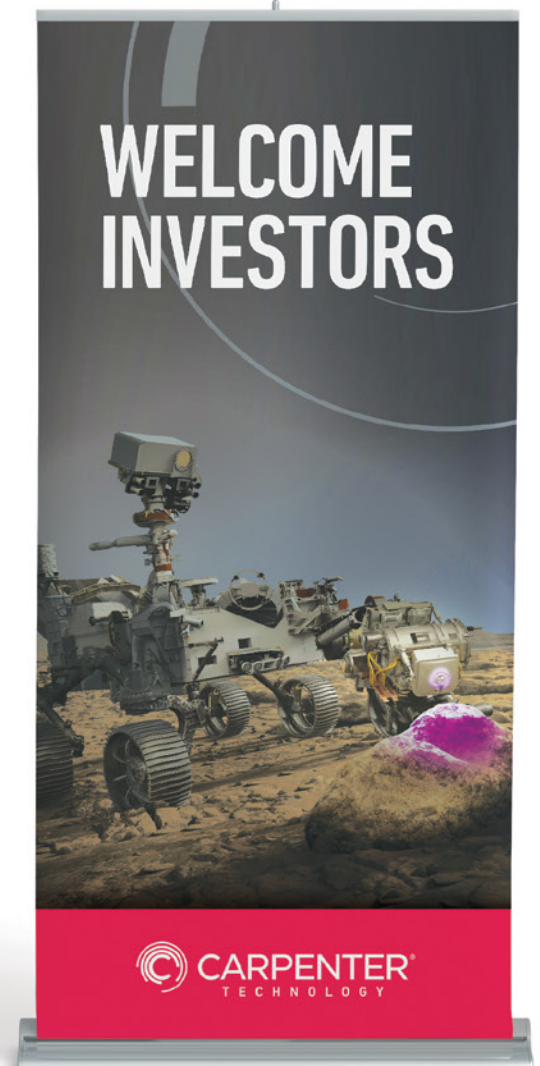
Locations

Athens, AL	Kutztown, PA	Mont Saint Guilbert, Belgium	Torshälla, Sweden
Rancho Cucamonga, CA	Latrobe, PA	Ontario, Canada	Taipei, Taiwan
Clearwater, FL	Orwigsburg, PA	Changshu, China	Liverpool, UK
Chicago, IL	Philadelphia, PA	Suzhou, China	
Dundee, MI	Reading, PA	Monterrey, Mexico	
Elyria, OH	Washington, PA	Mexico City, Mexico	
Vienna, OH	Hartsville, SC	Singapore	
Wauseon, OH	White House, TN	Seoul, South Korea	
Franklin, PA			

Carpenter Technology is a global leader in high-performance specialty alloy-based materials and process solutions for critical applications in the aerospace, transportation, defense, energy, industrial, medical, and consumer electronics markets.

4 Global leader

CarpenterTechnology.com/About 5



Showing our metal—and mettle

Carpenter Technology hosted an Investor event at NASDAQ, highlighting everything our global company is accomplishing across markets via presentations, videos, and takeaways that included a premium brand book with a removable sample of Hiperco® 50 showing through our logo on the cover.

PRECISION PERFORMANCE
From deep inside to the great beyond

Pushing our limits to Mars

PEOPLE FIRST

R&D IS IN OUR DNA

Our expert teams and world-class facilities give our customers a critical advantage in a competitive marketplace.

55%
R&D IN 2022

COLLABORATION FUELS INNOVATION

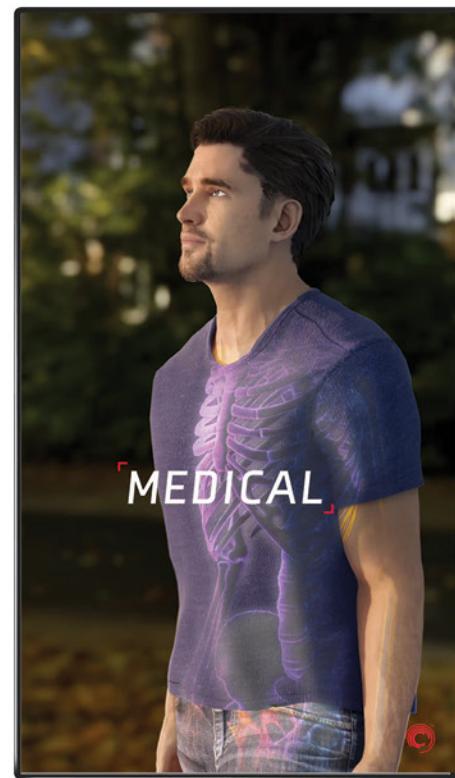
Your partner for never-fail products

Our solutions put us—and you—at the forefront of innovation and excellence.

Brand book



**BUILDING
A BETTER
FUTURE**




CORE VALUES
**DIGNITY AND
RESPECT**

We value each person as an individual, respect their aspirations, and **act honorably** in our interactions.

Expertise in motion

Our collection of engaging videos demonstrate Carpenter Technology's ever-expanding portfolio of capabilities across all the markets we serve.



Low Carbon Production

Our product portfolio and specialty alloy manufacturing operations are differentiated from the many traditional metal manufacturers around the world, resulting in lower GHG emissions intensity compared to those metal manufacturers:

- Our specialty alloys do not require the coking or iron ore operations that are found in carbon steels, which require carbon-intensive inputs like coal.
- Our melting operations use low-carbon electric arc furnaces and vacuum-induction melting furnaces, as opposed to blast furnaces.
- The majority of our material inputs are from reclaimed or recycled steel and alloys.
- Over 90% of our electricity is sourced from nuclear power and other carbon neutral sources of power.



2023 SUSTAINABILITY REPORT

SUSTAINABILITY REPORT

Sustainable Solutions for Global Impact

Lasting impact, lighter footprint

Carpenter Technology's continued commitment to sustainability is impressive and well-documented in our Sustainability Report and Sustainability section of the website.

Supporting the Future of the Aerospace Industry

Our specialty alloys do not require the coking or iron ore operations that are found in carbon steels, which require carbon-intensive inputs like coal.

Crude Steel Emissions Intensity

Through Carpenter Technology's specialty alloy manufacturing operations, we are able to produce specialty alloys with lower GHG emissions intensity compared to those metal manufacturers.

GHG EMISSIONS

GREENHOUSE GAS (GHG) EMISSIONS

In 2022, our Scope 1 and 2 emissions remained nearly flat over 2021 levels, despite the increase in production. As a result, our emissions intensity dropped to 3.14, more than 20% lower than our 2021 level. This came as a result of increased efficiencies in our plants, including higher manufacturing productivity and reduced heat waste. We also replaced certain equipment that ran on natural gas with an electrical alternative.

CO₂ Emissions Intensity

Year	Intensity
CY22	3.14
CY21	3.98
CY20	2.82
CY19	2.93

Intensity Target: 2.05

OUR GOAL BY 2035: 30% REDUCTION



Brand.CarpenterTechnology.com

For additional information,
please contact the Brand Team
brand@cartech.com