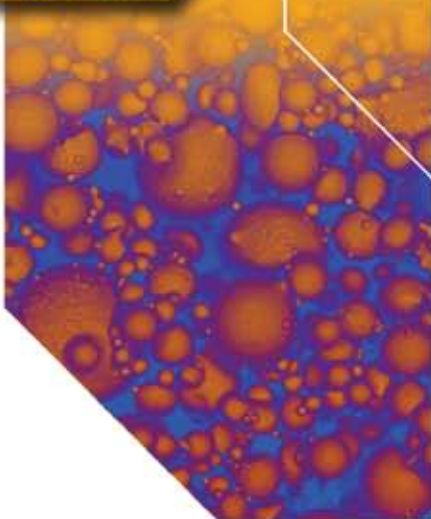


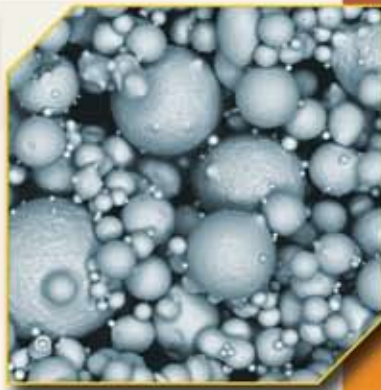
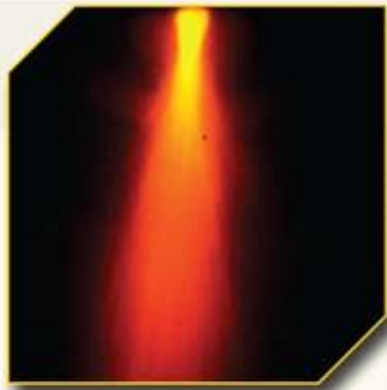


**ATI POWDER METALS**  
**ADVANCED SOLUTIONS**  
**FOR HIGHER PERFORMANCE**  
**AND LONGER LIFE**





*Up to 6,600 lb. blending under vacuum and heat, and vacuum loading for optimum density.*



## POWDER METALLURGY: BETTER LIFECYCLE PERFORMANCE IN EXTREME ENVIRONMENTS.

### ADVANTAGES OF PM PARTS

- Longer useful lives / reduced lifecycle costs
- Greater wear resistance and superior high temperature properties
- Enhanced UT inspectability
- Increased design flexibility
- Improved machinability

### ADVANTAGES OF OUR PM PROCESS

- Superior cleanliness
- Homogeneous microstructure
- Free-flowing spherical powder particles
- Almost limitless alloying possibilities

You've known ATI as the leader in the development and manufacture of Mission Critical Metallics®, including titanium and titanium alloys, nickel- and cobalt-based superalloys and specialty alloys, for more than five decades.

Now, ATI Powder Metals, an ATI company, extends your options for higher performance, longer life solutions for aerospace, defense, oil and gas, power generation and other markets. ATI Powder Metals brings fully integrated, industry-leading powder metal (PM) technology together with the full network of ATI capabilities and ATI's heritage of quality, customer service and advanced technology.

*Atomizing capacities  
up to 8,000 lbs.*



*A full range of heat sizes  
to match your needs.*



*Strict quality control for  
the highest yields.*



## ADVANCED TECHNOLOGY FOR EXTREME APPLICATIONS

Powder metal (PM) technology delivers what no other process can: extreme alloy compositions and an ultra-clean microstructure that offer increased performance and longer life in high-temperature and high-corrosion environments. ATI Powder Metals' gas atomized, homogeneous pre-alloyed powders achieve a uniform microstructure that isn't attainable by the blending of elemental powders.

Powder metal (PM) technology boosts the efficiency of jet engines and power generator turbines. It extends service intervals in critical parts for oil and gas systems, marine systems, nuclear systems, and other components in high-corrosion, hard-to-service environments. Powder metal delivers the most uniform grain structure achievable, in near-net shapes, to cut reject rates and costs in highly machined components. In sputtering target applications, like magnetic data storage, PM delivers the extreme uniformity needed to provide accurate angstrom-thin coating and higher yield.

**If your performance goals are limited by conventional alloys and processes, contact us. ATI Powder Metals can take your design to the next level.**





- 1) Screening is done under clean-room conditions.
- 2) TIG welding for complex alloys and designs.
- 3) High-capacity autoclave.
- 4) Advanced process controls help assure quality.

## FROM ALLOY DEVELOPMENT THROUGH PRODUCTION, ATI PROVIDES A FULL RANGE OF POWDER CAPABILITIES

ATI Powder Metals is the best choice for developing a new powder metal (PM) solution through production. We are the industry's only PM manufacturer that is completely integrated, from atomization through hot isostatic pressing (HIP). Through a full range of atomizer capacities, we can produce your alloy in heat sizes from one pound up to 8,000 lbs. in the world's largest vacuum induction melt (VIM) inert gas atomizer. Our process maintains powder cleanliness from start to finish for optimal quality.

### ATOMIZATION

A full range of atomizers includes a heat size that matches your production and metallurgy needs.

- 8,000 lb. vacuum induction melt (VIM) inert gas atomizer: nickel base superalloys, nickel base corrosion resistant alloys, & ferrous alloys, among others. This is the industry's largest system, designed and built by ATI Powder Metals.
- 800 lb. atomizer: iron, nickel, cobalt, copper, and chromium base alloys, tap temperatures up to 3,400°F.
- 50 lb. laboratory gas atomizer: excellent for developing advanced alloy powders
- Titanium gas atomizer: ultra-clean, induction-skull melting process for titanium alloys and aluminides for advanced aircraft engine and airframe components. 100 lb. capacity

### SCREENING

Controlled under clean-room conditions for maximum cleanliness and quality.

- Multiple independent screening systems to process several alloys simultaneously



### BLENDING

Up to 6,600 lb. capacity under vacuum and heat, computer controlled to yield homogeneous, thoroughly characterized powder lots.

### LOADING

Custom-engineered containers for manufacturing near-net-shape (NNS) parts are assembled internally and filled with powder under vacuum for optimum packing density and sealed for maximum cleanliness.

### HOT OUTGASSING

Our computerized Automatic Outgas System (AOS) for consistent conditions for removing air and other gases from the powder prior to HIP.

### HOT ISOSTATIC PRESSING (HIP)

ATI's HIP vessel is one of the world's largest. Hot extrusion is also available for standard mill forms or tubulars.

- 43" x 110" furnace capacity
- 51" x 115" furnace capacity
- 9 individual heating zones
- Up to 2,250°F & 15,000 psi
- Post-HIP hot-working available, such as forging, GFM, and extrusion.



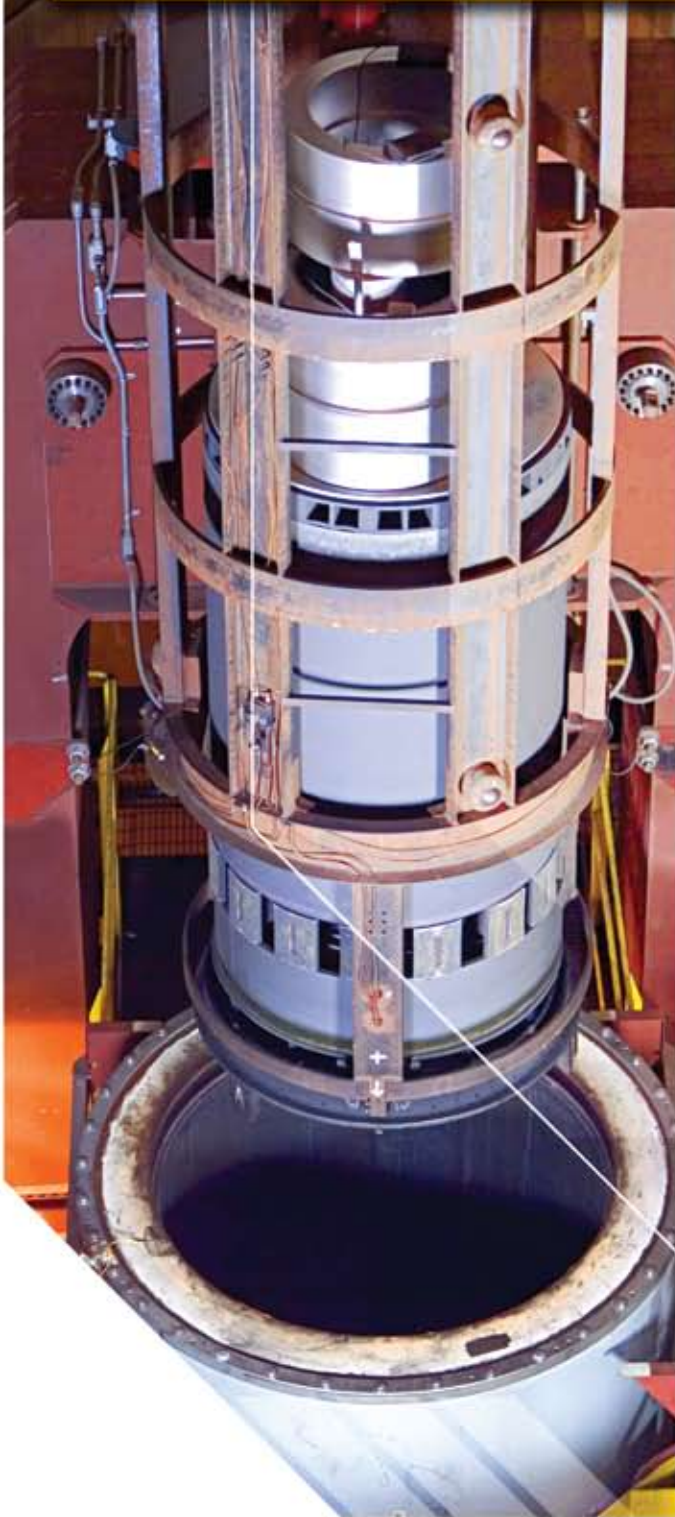
Aerospace



Defense



Atomization



## ATI POWDER METALS: A KEY PART OF ATI'S MISSION CRITICAL METALLICS® PORTFOLIO

As an ATI company, ATI Powder Metals serves customers with the global resources of a world leader in the development and manufacture of Mission Critical Metallics® for a wide variety of strategic markets. Combined with ATI's unsurpassed specialty metals technology and manufacturing capabilities, ATI Powder Metals provides a platform to develop and apply new advanced alloys and expand the application of these technically superior specialty metal powders to customers through ATI's market sector teams.

### ATI AEROSPACE

ATI Aerospace offers aerospace customers a variety of proven metallic and manufacturing resources needed to make commercial and military aircraft, and the jet engines that power them, in the 21st century. ATI has been a world leader in the development and manufacture of Mission Critical Metallics®, including titanium and titanium alloys, nickel- and cobalt-based superalloys and specialty alloys, for more than five decades.

### ATI DEFENSE

ATI Defense is a leading U.S. producer of a broad range of Mission Critical Metallics® for the defense industry, combining the necessary scale and flexibility to deliver the highest quality specialty metals solutions to our customers, on-spec and on-time. ATI Defense offers a breadth of titanium, steel and other specialty metals for defense applications, as well as fabricated parts and tooling systems.

### ATI OIL & GAS

ATI Oil & Gas offers an extensive array of high-strength, corrosion-resistant materials and cutting tools necessary for the most challenging oil and gas exploration, drilling and refining applications.

### ATI NUCLEAR ENERGY

ATI Nuclear Energy offers the widest array of advanced metallic solutions for nuclear applications in the specialty metals industry, satisfying uncompromising requirements for corrosion resistance, radiation shielding, quality, strength and performance. Beyond the nuclear market, ATI's complete array of specialty metals for electrical and nuclear energy applications serve every corner of the sector, from power generation and distribution systems to nuclear power plant applications and renewable energy sources such as wind, solar and thermal.

## Oil & Gas

## Nuclear Energy

## Medical

# Mission Critical Metallics®

## Screening/Blending

## Loading/Hot Outgassing

## Hot Isostatic Pressing

### Product Breadth

- Armor Solutions
- Specialty Steels
- Nickel-Based Alloys
- Titanium
- Zirconium
- Tungsten
- Specialty Alloys
- Powder Metals

### Technical Depth

- Alloy Development
- New Materials
- Corrosion Engineering
- High-Temperature Metallurgy
- Surface Science
- Metallurgical & Corrosion Testing
- Failure Analysis
- Machining Specialty Metals
- Powder Metallurgy

### Unsurpassed Manufacturing Capabilities

- Extraction & Reduction – Ti, Zr
- Melting – PAM/EB/VAR – Ti  
VAR/EAF/ADD/VIM/ESR – Ni/Steel
- Fabricating – Sheet, Plate, Extrusions, Forged & Cast Products
- Tube and Pipe
- Precision Finishing
- Atomization
- Hot Isostatic Pressing

### Value-Added Resources

- Next-Generation Applications
- Integrated & Controlled Supply Chain
- Material & Product Optimization
- Application Engineering
- Contract R&D
- Long-Term Agreements
- Engineered Parts
- Cutting Tool Solutions

### Investing to Meet Customer Needs

- Greenfield & Brownfield
- Stable Value Chain
- Reliable
- Security of Supply
- Manufacturing Facilities U.S.- and UK-Based

### Enabling Sustainability

- Efficient Energy Transmission
- Improved Resource Extraction
- Enhanced Fuel Efficiency & GHG Performance
- Demanding Environments
- Recyclable
- Renewable Energy
- Value-Added By-Products
- Longer Product Life



## ADVANCED SOLUTIONS FOR HIGHER PERFORMANCE AND LONGER LIFE

From its beginnings in the early 1970s as a process for making wear-resistant tool steel products, powder metal technology has expanded to cover major markets in aerospace, power generation, marine, oil and gas, medical products and manufacturing – wherever superior performance in extreme temperature, corrosion and wear environments is needed.

### AEROSPACE/DEFENSE

We pioneered HIP PM in jet engine design, producing the first rotating turbine parts for the General Electric T-700 engine. Today, over 150,000 of our superalloy PM turbine discs, seals, spacers and blade retainers are currently in service on commercial and military airplanes and helicopters. In the demanding environment of today's jet engines, ATI Powder Metals parts perform with elevated temperature creep resistance and fatigue life superior to that of conventional cast and wrought superalloys. PM parts, with their fine, equiaxed grain structure, can be ultrasonically inspected with greater sensitivity than other materials, permitting designers to make full use of the higher strength and fatigue life of PM parts. In addition to superalloys, with our Titanium Gas Atomizer (TGA), we can produce advanced PM titanium alloys, titanium aluminides, and powder for metal matrix composites (MMC) and intermetallic matrix composites (IMC) for exhaust ducts and hot airframe parts in next-generation aircraft.

We are also the world's leading supplier of GRCop-84, developed at NASA Glenn Research Center to manage the enormous thermal stresses rocket engine liners undergo while separating rocket flame from liquid hydrogen fuel.

### Nickel-Based Alloys and Superalloys

- ATI Rene® 95
- ATI 625™
- Low Carbon Astroloy (LCA)
- ATI 720™
- Gas turbine manufacturer proprietary grades

### Titanium Alloys

- CP Titanium
- ATI 6-4™
- Titanium aluminides
- Ti-Boron

### ELECTRICAL ENERGY

Our ability to create PM components as large as eight tons makes us a leading supplier in the power generation industry. Our large capacity hot isostatic press produces large billets for long life, high-temperature operation in land-based and marine gas turbines. Our PM HIP cladding process delivers high strength, high corrosion- and wear-resistant bimetallic and monolithic near-net-shape products for the nuclear industry. Our PM valve bodies, pump components, wear pads and other auxiliary products for this industry offer the high performance and high reliability demanded by hot and corrosive applications.

### Alloys

- ATI 625™
- ATI 625M™
- ATI 690™
- ATI 825™
- ATI 276™
- Duplex and super austenitic stainless steels
- ATI A286
- Titanium
- Others upon request

### Product Forms

- Mill or forging preforms
- Wear pads
- Valve bodies and trim
- Clad pump components
- Pump housings
- Piping, tubing, and fittings





## OIL & GAS

In the extreme environments of oil and gas exploration and processing, the corrosion resistance and enhanced mechanical properties of PM parts deliver higher production rates and less downtime. ATI Powder Metals is a pioneer and leader in the manufacture of PM products for this demanding application, and flexibility in component geometry is one of our key strengths. With our experience, and our extensive product design capabilities, we can provide everything from standard mill forms to complex near-net shapes, in solid and clad compositions and in standard and custom alloys to meet your requirements.

### Alloys

- ATI 625™
- ATI 625M™
- ATI 825™
- ATI 276™
- Duplex and super austenitic stainless steels
- Titanium
- Others upon request

### Product Forms

- Bearing sleeves
- Valve bodies
- Sealing plates and rings
- Tubing head adapters and hangers
- Pump housings
- Special components

## PLASTICS MANUFACTURING

Count on our full line of PM solutions for plastic extrusion press screws, barrels, and other components for higher throughput, longer life and lower costs under the harsh wear and corrosion conditions of today's advanced plastics materials. Our experience and leadership in this application includes the ability to provide both monolithic and OD or ID clad bimetallic parts.

### Products

- Single and twin screw barrel blanks
- Segmented screws

### Alloys

- High vanadium wear- and corrosion-resistant tool steels
- Cobalt and nickel base alloys (extreme wear and corrosion resistance)

## INDUSTRIAL

PM technology can deliver longer life and lower costs in many applications in manufacturing, particularly where wear and corrosion are factors. ATI PM clad mill rolls for steel and food processing reduce lifecycle costs in these competitive industries. PM cladding is also used successfully in valve seats and gates; bearings for pumps and many other critical wear components for processing equipment. Our clean, monolithic material can greatly reduce costs in highly machined components like manufacturing dies, where high reject rates caused by material defects can be expensive.

### Alloys

- High vanadium wear- and corrosion-resistant tool steels
- Cobalt and nickel base alloys (extreme wear and corrosion resistance)

## OTHER MARKETS

Wherever there's a need for the highest possible lifecycle performance in conditions of extreme heat, wear and corrosion, powder metal (PM) technology can be a cost-saving option. ATI Powder Metals has the industry's best combination of experience, technology, integrated production, and customer service. In addition, PM's superior microstructural characteristics give it an advantage over other materials.





## AN EXPERIENCED RESEARCH PARTNER FOR LEADING-EDGE POWDER TECHNOLOGY

Count on ATI Powder Metals for technology leadership when developing new alloys, processes and products. With four decades of experience, hundreds of patents, and leading-edge processes like Titanium Gas Atomization, ATI Powder Metals can work with you to extend performance horizons and move new ideas into production faster.

Our research facility in Pittsburgh, Pennsylvania supports your new design with a fully equipped metallurgy lab and prototyping equipment, integrated with our nearby full-scale production plant. Lab-scale atomization and HIP equipment, supported by experienced staff scientists and technicians and lab services, deliver the complete support you need to get new designs into production quickly.



*Near-net-shape parts for high performance at minimal machining cost.*

### Lab Services

- **Atomization:** Four pilot scale atomizers handle a wide variety of material and production requirements, fully integrated with our 8,000 lb. production atomizer.
  - 1 lb. Research Atomizer
  - 50 lb. Laboratory Gas Atomizer
  - 100 lb. Titanium Gas Atomizer
  - 800 lb. Pilot Gas Atomizer
- **Hot Isostatic Pressing (HIP):** Our laboratory HIP unit has a 7.25" diameter and is 13" tall. It heats up to 2,375°F at pressures up to 28 ksi.
- **Hot and Cold Rolling:** With our Nash and Stanat rolling mills we can conduct hot and cold rolling trials for your material up to 8" wide.
- **Forging:** Our Erie 200-ton hydraulic forging press is capable of forging a 50-pound workpiece to a finished length up to 48".
- **Chemical Analysis:** We have the ability to quantitatively determine major, minor, and trace elements in iron base, nickel base, rare earth and titanium base alloys. Facilities and know-how are also available to do routine and complex wet analysis.
- **Technical Service/Failure Analysis:** Our engineers have vast experience in determining modes of failure and suggesting improved materials/processing for structural, thermal, electrical, corrosive and magnetic components.
- **Material Consulting:** We often use our laboratory facilities to conduct experimental tests and consult with clients on what material system should be used in their application. We can give you the edge when you run into a situation where your application demands advanced material systems.





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