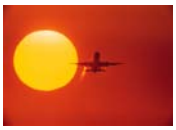
MPI

Metallurgical Processing, Inc.

Company Information



Company History

Metallurgical Processing was incorporated by John and Vera Ritoli in 1957. With four expansions in its first twenty years, the company gained a reputation among area businesses as a successful "Mom & Pop" heat treating factory.

In 1977 Elena Ritoli, daughter of John and Vera, joined the organization. Elena worked through the various departments to gain hands-on heat treating experience before taking over as president of the company. Under her direction the facility has expanded in two stages to triple its size in 1988. MPI is the only heat treating company in the United States that is owned and operated by a woman, continuing the tradition with the third generation, Verneen Ritoli.

MPI provides a wide range of metal treating services to area manufacturers including hardening and softening of parts for both wear resistance and machinability, as well as PVD coating, cold treating, and variety of support services. MPI trucks pick-up and deliver parts to customers over 120 mile radius five days a week.

The company employs 57 people and operates 24 hours a day 7 days a week. The staff includes maintenance experts who service the heat treating equipment in house. Government-approved profit/sharing and 401K plans are in place.

The six person management team has accumulated over 120 years of heat treating experience. With a solid customer base, an accomplished staff, an up-to-date facility, MPI is well positioned to continue its record growth and profitability into the future.

Personnel Contact List

Customer Service

Kris Lang, Sales Manager

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General Questions, Expediting

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Hugh McGurgan, Vice-President of Operations

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Technical Support, Questions and Concerns

Elena Ritoli, President

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General Business, Questions or Concerns

Verneen Ritoli, Vice-President

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Mobile: (860) 916-5015
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General Business, Pricing, Invoicing Questions or Concerns, Pricing

Heat Treat & Vacuum Braze Departments

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Order Scheduling & Expiditing, Quality Questions and Concerns

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Quality Questions / Concerns

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Quality Question / Concerns

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Quality Certifications, Pricing / Quotations

Minh Van Duong, Quality Process Manager

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Order Scheduling / Vacuum Harden / Technical Support

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E-Mail: gfebo@mpimetaltreating.com

Order Scheduling & Expiditing

Carl Thoresen, Quality Manager

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Quality Questions and Concerns

MPI

Metallurgical Processing, Inc.

Thermal Processing

Heat Treating

MPI is a quality oriented, heat treating company located in New Britain, Connecticut. In addition to heat treating, the company provides a variety of surface treatments and processes to metalworking companies in the aircraft, automobile, medical, machining, tool and die, and firearms industries. Its facilities include an onsite metallurgical laboratory, with pick-up and delivery services.

The third generation of MPI has been serving the metal working industry since 1957, and is one of the largest, independently owned, heat treating companies in the Northeast. Our reputation is based upon a strong commitment to customers and a strict quality control program which permits us to conform with military, aircraft and commercial specifications and certifications.

Atmospheric Control Furnaces

Four Endothermic Atmosphere furnaces of various capacities up to 36" x 48" x 36" working chamber. Oil, air, water quench hardening, carburizing, carbonitriding, normalizing, annealing. Maximum temperature 1950º F.

Vacuum Furnaces

Six Vacuum Furnaces of various sizes up to 60" x 60" working chamber. Three furnace types including several bottom loaders and one high speed, rapid quench unit. Furnaces used for: Solutioning, bright annealing, hardening, tempering, normalizing, stress relieving and aging. Maximum temperature 2400º F

Aluminum Furnaces

40" x 48" working area for stress relieving, annealing, solutioning, quenching and aging. Glycol and water quench capability.

Recirculating Air Furnaces

Several Air Furnaces including one with 43" x 44" working chamber. Water quench, Stress relieving, annealing, aging, tempering. Maximum temperature 1350º F

Additional Capabilities

- Cryogenic Treatment — Fully certified with recorded charts. 40" x 56" x 34".
- Laboratory Facilities — Micro Hardness (Vickers, Knoop), Tensile, Micrograph.
- Finishing — Glass Bead, Vapor Hone, Vapor Degrease, Hot Detergent.
- Straightening — Hydraulic Press (50 tons force), Hot Straightening (Eitel Press).
- **Press Quenching — Two Gleason Oil Quench Presses**

Accredited Nadcap Heat Treating

MTI METAL TREATING INSTITUTE

ISO 9001:2000 AS9100 PRI Registrar Registered Firm

Press and Plug Capabilities

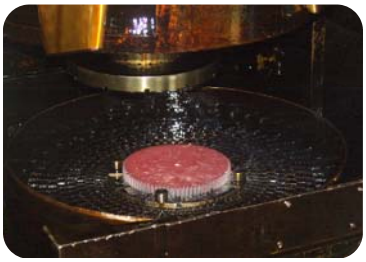
Metallurgical Processing, Inc. knows gears and bearing races are especially prone to dimensional changes during hardening and quenching, which can cause a number of problems during post-heat treatment manufacturing operations. Normally, additional stock allowances are needed to compensate for distortion so that parts can be machined to the proper finishing dimensions. The objective of press quenching is to hold parts round and flat while they are being cooled, thereby reducing, though not eliminating, distortion.

"If you are having problems with scrap, rework or excessive grinding costs due to distortions during hardening, you may want to consider press quenching."

How the Press Works

The component part is removed from the furnace and placed onto the lower die in the out position. Initiation of the automatic cycle moves the lower die into the center section of the machine. When this is fully advanced, the upper ram assembly and dies descend, with an expander centering the part just prior to the inner and outer dies locating on their pressure points. When the expander and dies are properly located, the ram holding them is latched in the down position and pressure is applied to all three. The inner die, outer die and expander have completely independent pressure controls, regulated by hydraulic valve and monitoring with pressure gauges. The expander cone pushes out against the segmental lower die to hold the part round and to size. The inner and outer dies keep the part flat.

A guard completely encloses the upper dies and forms a quenching chamber. A circulation path within the press is created as the quenchant is pumped into the quench chamber through apertures around the outside diameter or through holes in the lower die. Quenchant chamber fills the chamber around the component and flows out at the top.



Quality Assurance Considerations

Component design and manufacturing methods are the most critical in minimizing distortion. In engineering, the design should consider distortion from the initial concept through all phases of production.

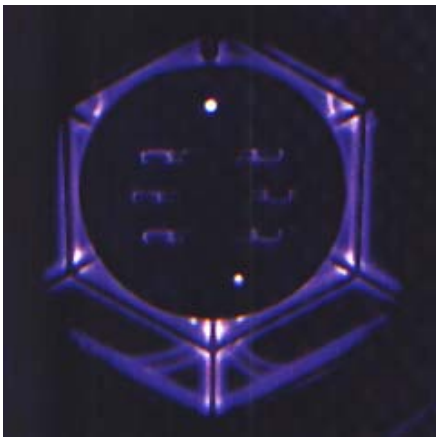
Part Design

Quench press tooling designed specifically for the needs of the part can satisfactorily reduce distortion problems. Some of the major gains in quench pressing have come from appropriately addressing the manufacturing processes.

Heat Treat Equipment

- *Batch Furnaces (controlled atmosphere)*
- *Capable of processing up to 3,000 pounds per load.*
- *Capable of atmosphere normalize, anneal, carburizing, carbon nitriding, neutral hardening and carbon restore.*
- *2 Gleason Press Quenching Machines*
  4" to 24" Diameter
- *Glass bead*
- *50 Ton Eitel Hydrylic Press*
- *Metallurgical Lab Fully equipped metallurgical lab capable of a wide range of destructive and non-destructive testing.*

Plasma Nitriding



Glow discharge of an extrusion die

Pulsed Plasma Nitriding provides MPI with special capability, other plasma nitriding systems can not offer. We can group different sized parts within the same load to educe your nitriding costs and to improve delivery time. Other plasma nitriders require all parts within the same load to be similar size. This generally prevented the treatment of many different sized parts with an acceptable delivery time. Surface areas that must not be nitrided are mechanically-masked, economically and without environmental pollution. There can be no degradation of the part surfaces from arching or over heating. Soft spots from inadequate plasma coverage are completely prevented. Previously, if parts were not arranged in a specific manner established by extensive experimental running, all part surfaces would not be properly nitrided. Plasma nitride eliminates this problem, using duty-cycle programming and thermocouples attached directly to the part for both temperature measurement and control. Other nitriders require experts to supervise nitriding of complicated parts. Plasma nitride requires high skill level, but with its advanced microprocessor control, it allows unattended operation and repeatable nitriding results. There is dedicated microprocessor to control the heating and cooling rates, the gas mixture and flow rates, and the ion current is established, it is stored in the computer memory and recalled for your on-going work.

Plasma Nitride for a Variety of Manufactured Parts

- Punches
- Forging Dies
- Extrusion Dies
- Extrusion Screws
- Crankshafts
- Camshafts
- Intake & Exhaust Valves
- Valve Lifters
- Springs
- Piston Rings
- Casting Dies
- Plastic & Rubber Molds
- Gears
- Pinions
- Shafts
- Couplings
- Cams
- Cam Followers
- Stampings
- Form Tools

Excellent Surface Properties

MPI produces a mono-phased, highly ductile gamma prime compound zone for high strength, or a relatively thick epsilon zone for abrasive of corrosive applications, or no compound zone at all.

Your parts can be completely finished before nitriding, in their softer state at a lower cost. Changes in part dimensions and surface roughness are minimal, grinding after nitriding is not a requirement, and generally not desirable.

Metallurgically Superior Process

An optimum compound zone can be formed that will properly match material properties to the application requirements. The characteristics of the nitrided surface can be controlled to produce a variety of results, including;

The structure of the compound zone
The percentage of nitrogen in the compound zone
The thickness of the compound zone
The final concentrations of the new elements added to the surface

All of these characteristics influence the final hardness profile, and is completely reproducible.

Some Steels for Plasma Nitride

- **Tool & Die Steels** *A-2 & D-2*
- **Hot Work Steels** *H-10 & H13*
- **PH Steels** *17-4, 17-7, 15-5 & 13-8*
- **High Speed Steels** *Moly & Tungsten*
- **Stainless Steels** *300 & 400 Series*
- **Alloy Steels** *4000 & 8000 Series*
- **PM Alloys, Nitralloy, & Cast Iron**

Brazing

MPI is a highly technological heat treating and surface treatment operation which has major aircraft and commercial certifications. Our extensive capabilities is a direct result from our metallurgical and vacuum expertise.

We can help your company determine the best design, alloy, and fixturing options for your braze application. Finished assemblies are fully 100% inspected to ensure joint area quality. Typical assemblies include; aerospace and commercial parts, medical and dental instruments. Types of parts include; machined, stamped, tubing, cast and sintered.

We are able to recommend how to assemble, design, or redesign your assemblies for better joint integrity and more economical fabrication.

Typical Part Assemblies

Aerospace
Automotive
Medical Instruments
Dental Instruments
Scientific Instruments
Firearm Components

Typical Part Types

Machined
Stamped
Sheet Metal
Tubing
Wires
Formed
Castings
Sintered

Types of Material

Stainless Steel
Carbon Steel
Titanium
Inconel
Molybdenum
Carbide

Alloys for Joining

Copper
Nickel
Silver
Copper / Gold
Gold / Nickel

Vacuum brazing usually uses a nickel braze alloy as a filler material in the gap between the parts being joined. The filler melts at a lower temperature than parts being joined and diffuses into the metal, creating the non-corrosive bond

Approvals

Pratt & Whitney

General Electric

Sikorsky

Thermal Processing

Vacuum brazing can provide several simultaneous thermal treatments with some stainless steels and precipitation hardening alloys. The potential exist to braze, harden, and temper 400 series stainless steel; braze and anneal 300 series stainless steel; braze solution anneal, and age PH grade alloys without ever removing the parts from the vacuum furnace.

Single assemblies, or large quantities of assemblies, can be efficiently brazed in our vacuum furnaces. This enables MPI's braze operation to process a small assembly with other jobs with the same brazing cycle. This allows us to schedule vacuum braze production very efficiently for just-in-time delivery.

NADCAP CERT: #109441—expires Jan. 21, 2008

ISO 9001:2000 and AS 9100 CERT: #05-0693 expires June 9, 2009

Arkwin Industries

Bell Aerospace

Bendix - Energy Controls

Boeing / McDonnell Douglas

Chandler Evans

Garrett Turbine Engine Co.

General Electric

Hamilton Sunstrand - Accredited

Honeywell Aerospace

Hughes Helicopter

Kaman Aerospace

Lockheed - Martin

Messier - Dowty

Menasco Aerospace / BF Goodrich

Moog

National Water Lift

Pratt & Whitney (LCS Approved)

Pratt & Whitney Canada (LCS Approved)

Raytheon

Rohr Inc.

Rolls Royce - Allison

Rolls Royce Gear Systems

Sealol

Sikorsky Aircraft

Vickers

Woodward Governor

MPI

Metallurgical Processing, Inc.

PVD Coating

Thin-Film Coatings

The Newest Generation of PVD Coating Technology

Coatings for Better Machining and Longer Tool Life

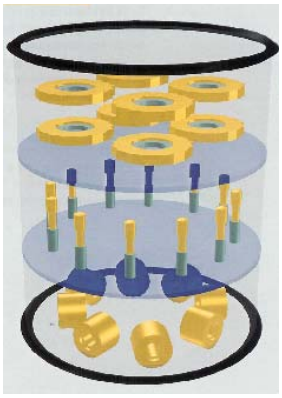
In today's competitive marketplace, maximizing productivity and improving quality is a vital element in the continued success of your organization. MPI is a full service treatment facility including ultrasonic cleaning to coordinated heat treatments like pulsed plasma nitriding and then wear resistant PVD coatings. Our comprehensive surface treatment capabilities means complete and optimized anti-wear applications for your tools and wear parts which other coating centers can not supply under one facility. Every stage of your tool or wear part is kept under accurate control. We also have a fully equipped metallurgical laboratory offering analytical support, developing new coating applications as well as wear mode analysis.

At MPI, our advanced coating system we can fully maximize tool and wear part performance, productivity and help with your profitability. Our goal is to have a thorough understanding of your coating requirements. Our knowledgeable and professional surface treatment specialist will provide you with the optimal coating solutions for your applications.

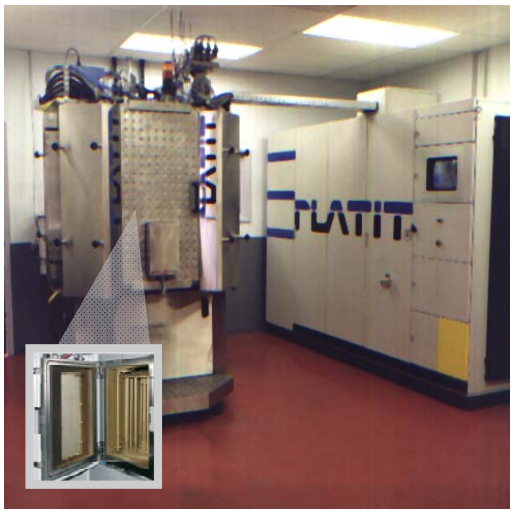
We offer a full range of coatings for tools and wear parts. Based on TiN, TiCN, TiAlN, TiAlCN, AlTiN, CrN, AlCrN and ZrN are available for all types of carbide and high speed end mills, drills, inserts, taps, saws, blades, broaches, hobs, gear shapers and cutters, dies, punches, stamps, extrusion molds, die cast molds, medical and dental tooling, also wear components, like shafts, pump parts, compressor parts, bushings, bearings and others.

Key Benefits of Service

- ***Flexible Coating Capabilities***
- ***Dedicated Coating Capabilities***
- ***Large Volume Coating Capabilities***



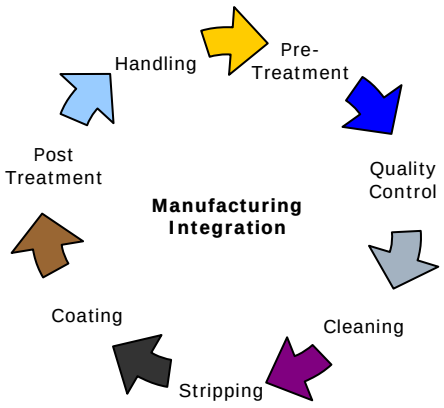
MPI has targeted performance options for close tolerance situations. We can customize coating thickness to complement your tool edge geometry to allow increased performance on cutting speeds.



Our new advanced coating system represents the highest standard of modern hard coating technology for tools and wear parts. It is unequaled in both coating quality and long term coating process reproducibility. The revolutionary Platit Linear-Arc-Concept, with a new type of arc control (MAC), magnetic arc confinement allows maximum coating flexibility, efficiency and guarantees incomparable production consistency and coating performance.

Advantages

- *Reduced wear, extended tool life*
- *Superior coating performance*
- *Coating reproducibility*
- *Excellent coating adhesion*
- *Coating uniformity*
- *Exceptional color and appearance*
- *Coating can be applied to almost any type, shape and*



BETA TiN

The gold *Titanium Nitride* has had much success in a wide application of machining and tooling. It is an excellent, all-around, cost effective and improved to even a higher level of performance than other coatings. BETA coated parts can last up to five times longer than tools uncoated, and improves the wear resistance of the tool and allows for higher operating speeds. The new generation of BETA offers new solutions for new applications.

ALPHA TiCN

The blue-gray *Titanium Carbon Nitride* is a new functional hard coating that achieves superior results when machining tool steels and steels over 40 HRC. It offers an optimal combination in its layering structure of hardness, toughness and anti-friction characteristics. ALPHA recommended for high-shock resistance such as tapping, interrupted cuts in drilling, milling, and heavy-duty forming operations, such as punching stamping and broaching.

ZETA ZrN

The white gold *Zirconium Nitride* is recommended as an alternative to titanium nitride when extra lubricity is needed. It is an excellent functional coating for drilling, forming, punching and machining aluminum, Brass and copper. Like the other coatings, ZETA improves the wear resistance of the tools or wear parts. Also used for many decorative applications.

GAMMA Ti_2N

The advantage of this silver *Titanium Nitride* based coating is the improvement of the tribologic behavior of the coated tool in front of "cold welding" well known in the cutting and forming of stainless steels as well as a similar problems with milling, drilling, turning other alloys over 40 HRC such as inconel. GAMMA offers a fracture toughness which means extended lifetime for the tools.

DELTA CrN

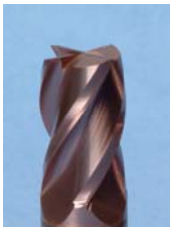
The Silver-Gray *Chromium Nitride* is characterized by a favorable combination of resistance to corrosion and oxidation. DELTA CrN exhibits much higher hardness and coating adhesion than chromium coating or platings; corrosion resistance is at least as good as with hard chromium for a given thickness.

SIGMA DLC

The Silver-Gray *Chromium Nitride* is characterized by a favorable combination of resistance to corrosion and oxidation. DELTA CrN exhibits much higher hardness and coating adhesion than chromium coating or platings; corrosion resistance is at least as good as with hard chromium for a given thickness.

UNIVERSAL TiAlN

UNIVERSAL, a violet *Titanium Aluminum Nitride* is recommended when extra hardness and heat resistance are required, as when machining abrasive materials such as cast iron, titanium and high silicon-content aluminum alloys. During cutting, an oxide layer forms over the TiAlN coat, providing extremely high heat resistance. The UNIVERSAL coating makes machining at higher speeds possible and smaller amounts of coolant needed.

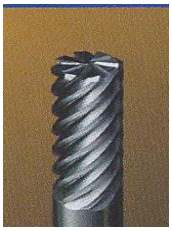


UNIVERSAL 4x TiAlCN

UNIVERSAL 4x, a new generation of hard tool coating for premium roughing and finishing endmills. This *Titanium Aluminum Carbon Nitride* is a high performance coating that combines the properties of TiN, TiCN and TiAlN (super high hardness and impact resistance, excellent adhesion for heavy chip loads, reduced friction and superior wear protection, temperature and oxidation stability).

UNIMAX AlTiN

UNIMAX is a powerful coating available for high speed, high velocity machining of today's hard to machine materials. This specially designed *Aluminum Titanium Nitride* coating has the ultimate resistance to heat and premature wear when machining at high speeds and feeds. This black coating features a unique microstructure that allows freer cutting and better chip evacuation in dry machining applications.



UNIMAX Pro AlTiSiN

MPI's new nanocomposite UNIMAX Pro AlTiSiN PVD coating is the new benchmark for hard, dry and high-speed machining applications. UNIMAX Pro shows extremely high resistance against oxidation in combination with high thermal hardness. This is the result of a special structural composition deposited in our high performance PL1000 PVD coating system. The properties of the new UNIMAX Pro yield significant advantages for applications formally covered by our standard AlTiN UNIMAX coating.

UNICHROME AlCrN

UNICHROME is newest high-performance coating added to our Universal Series. Once again pushing the envelope for high a high level of oxidation resistance and hot hardness. This special combination of elements give this coating excellent adhesion properties which lead to high wear resistance under severe machining conditions. Recommended for steel in the 40 to 50 HRc range and has proved itself in a wide range of applications.

Key Characteristics

HIGH PERFORMANCE COATINGS	Color	Process	Deposition Temp.	Max. Usage Temp.	Layer Structure	Thickness	Hardness (HV 0.01)	Applications	Advantage
Beta TiN	Gold	PVD-ARC	750-930°F	1112°F	Mono	1-7µm	2500	Machining Iron-based Metals. Forming, Plastic Molding	General Purpose and Cost Effective
Alpha TiCN	Blue/Grey	PVD-ARC	840-930°F	752°F	Mono/ Gradient	1-4µm	3300	Machining Tool Steel over 40 HRc, Interrupted cutting, Forming, Punching.	High Shock Resistance, High Hardness
Gamma Ti_2N	Silver	PVD-ARC	840-930°F	1,112°F	Mono	1-4µm	2700	Machining Inconel and Stainless Steel	High Thermal Resistance to Cracking
Zeta ZrN	White/Gold	PVD-ARC	840-930°F	1022°F	Mono	2-5µm	1850	Machining Aluminum, Brass, Copper. Decorative Applications.	General Non-Ferrous Alloy Machining and Decorative
Delta CrN	Metal-Silver	PVD-ARC	400-930°F	1292°F	Mono	2-8µm	1750	Machining Super Alloys. Molds, Dies, punches	Universal Use for Lower Friction
UnversAL TiAlN	Violet	PVD-ARC	840-930°F	1382°F	Mono/Multi/ Gradient	1-4µm	3000	High Speed Machining Cast Iron, Nickel-Based High Temp. Alloys	High Heat Insulation, Semi-Dry Machining
UniverAL 4x TiAlCN	Light Violet	PVD-ARC	840-930°F	932°F	Multi	1-4µm	3500	High Speed Machining Hard / Soft aerospace alloys	High Heat and Shock Resistance, Semi-Dry Machining
UnimaX AlTiN	Black	PVD-ARC	840-930°F	1652°F	Multi/ Gradient	2-4µm	3600	High-Velocity Dry Machining Nickel-Based High Temp. Alloys	Extreme Heat Insulation, Dry Machining.
UnimaX Pro AlTiSiN	Black	PVD-ARC	840-930°F	2012°F	Multi	2-4µm	3800	Hard Machining, Drilling, Reaming. Cutting of Highly Alloyed Material.	Carbide Tools, Ultimate Heat Insulation for Machining 60 Hrc
UniChrome AlCrN	Dark/grey	PVD-ARC	840-930°F	1652°F	Multi	2-4µm	3200	Milling, Hobbing, Sawing Alloy Metals	Machine Challenging Material with Improved Wear
Sigma DLC	Black	PVD-ARC	400-450°F	842°F	Mono/Multi	1.5-7µm	1200	Machining Non-Ferrous Alloys. Aerospace, Auto Wear Components. Decorative	Reduces Break-In Period, Prevents wear Due to Tribological Properties