Metal Powder Industries Federation
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NEWS

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The winners in the 2025 Powder Metallurgy (PM) Design Excellence Awards competition, sponsored by the Metal Powder Industries Federation (MPIF), demonstrate outstanding examples of PM's diversity and ability to meet critical requirements. From electric vehicles to musical instruments to semiconductors, once again, parts fabricators have demonstrated PM's versatility and unique ability to challenge competing technologies. These award-winning components use PM's flexibility to push forward new concepts and process controls to demonstrate the inexhaustible range of PM's capabilities.

Eleven Grand Prizes and twelve Awards of Distinction were given in this year's competition, segmented into 3 categories: Conventional Press and Sinter PM; Metal Injection Molding (MIM); and Metal Additive Manufacturing (AM).

GRAND PRIZE AWARDS

In the Automotive—Engine Category for Conventional PM components, a Grand Prize has been awarded to **DSB Technologies** for a stainless-steel flange that connects a urea injector to the exhaust system of a diesel engine. Machining operations are utilized to add additional features that are not possible during compaction such as undercuts, a steep cone, and a threaded hole. The part experiences elevated temperatures and is exposed to urea, which requires the part to have high corrosion resistance. The part is welded onto the exhaust system, necessitating good weldability of the material used to make the part.

A Grand Prize in the Automotive—Transmission Category for Conventional PM components has been awarded to **PMG Holding GmbH** for a sliding sleeve used in a synchronizer for a dedicated hybrid transmission. The parts are produced net-shape except for the external fork groove. The back tapers and ball pockets in the internal spline are radially pressed using a patented surface densification process. Full density is achieved on the surface of the critical areas of the part. The components are made in a fully automated flow line that includes heat treatment. The PM components replaced a machined wrought steel part.

A Grand Prize in the Automotive Electric Vehicle Category for Conventional PM components has been awarded to **GKN Sinter Metals** for an electric selectable one-way-clutch wedge washer that enables seamless gear changes and provides regenerative braking capabilities. The wedge washer is made using a sinter-brazing process to join two compacted PM parts. The application requires tight tolerancing on mating faces and outside diameter dimensions, achieved by a machining operation. Using a selectable one-way-clutch offers reduced shift times and consistency. In hybrid transmissions, it provides significant improvement in fuel economy without the negatives associated with friction-clutch systems.

In the Automotive Electric Vehicle Category for MIM components, a Grand Prize has been awarded to **Hangzhou Sino-MIM Technology Co. Ltd.** for a MIM-316L stainless steel grounding diaphragm bracket that supports structural parts for optical lenses inside an automotive LiDAR (Light Detection and Ranging) unit. This challenging part has relatively high requirements for the overall dimensional accuracy, the edge chamfering, and the flatness of the product. Experience gained during the development of this product helped with the development of similar frame-structured parts.

A Grand Prize in the Military/Firearms Category for MIM components has been awarded to **ARC Group Worldwide,** for a pistol slide that encapsulates the barrel of the pistol and pushes the hammer back into the ready-to-fire position after every shot of the firearm. The complex part went through a successful 20,000 shot trial firing test for qualification, with tested parts X-rayed at several intervals to ensure they were acceptable. Most slides are produced by machining forged blanks which leads to considerable material waste. The MIM process allows features such as ribs and logos to be molded and leads to minimal machining waste.

A Grand Prize in the Lawn & Garden Category for Conventional PM components has been awarded to **Metco Industries, Inc.** for a throttle pedal for off-highway construction equipment. The part is compacted conventionally to near-net shape using a hydraulic press with fill compensation and selective ejection. Secondary machining is performed to ensure a tight sliding fit of a bushing, a snap-ring retention feature, and for the tab on the face of the post. The final operation is zinc electroplating with a clear chromate conversion for corrosion protection. Previous designs used stampings and castings that were machined and assembled.

A Grand Prize has been awarded in the Electronic/Electrical Components Category for MIM components to **Hangzhou Sino-MIM Technology Co. Ltd.** for a copper alloy optical module housing used for efficient heat dissipation. The heat generated by the components inside the product need to be dissipated through the housing. The part is made from a proprietary copper-based alloy. The finished product has relatively high requirements for surface flatness and roughness, and secondary CNC machining is necessary. More than 55% cost saving can be achieved by MIM processing compared with machining wrought or cast materials.

In the Hand Tools/Recreation Category for MIM Components, a Grand Prize has been awarded to **ARC Group Worldwide** for a knife blade used in a consumer pocketknife. The critical requirements for this part were a hardness of 60 HRC or greater, an impact toughness equivalent to a machined billet, and straightness. By using a high carbon alloy steel in a MIM process for the first time it was possible to mold features such as the hollow grind blade geometry in the as-molded state, eliminating significant complex grinding and machining operations. MIM processing reduces material waste significantly.

A Grand Prize in the Hardware/Appliances Category for MIM components has been awarded to **INDO-MIM LIMITED** for pocket and keeper module parts for caravan door hinges. The parts are made from a niobium-stabilized austenitic chromium-nickel stainless steel. The pocket and keeper modules are essential parts, ensuring smooth door operation by securing the hinge pin in place. The components work together to provide reliable long-lasting performance in all conditions. Compared with casting, MIM offers significant cost saving, faster production, and fewer manufacturing steps, reducing waste, production time, and costs.

In the Medical/Dental Category for MIM components, a Grand Prize has been awarded to **INDO-MIM LIMITED** for an A-to-Z expander assembly used in dental orthodontic treatment and sleep apnea. The palatal expander widens a narrow palatal arch helping to normalize the shape of the palate and promote nasal cavity expansion. This allows better airflow through the nose. Seven intricate MIM stainless steel parts are assembled to make the expander. MIM processing simplifies the production process and reduces material waste.

A Grand Prize has been awarded in the Electronic/Electrical Components Category for Metal AM components to **3DEO, Inc.** for a copper heat sink used in semiconductor manufacturing. The heat sink's complex lattice design was developed in conjunction with the customer to maximize heat transfer efficiency while maintaining printability. The design is entirely self-supported during printing, eliminating the need for build supports, and is optimized for automated de-powdering. This critical component is HIP processed to achieve 99.9% relative density, critical for pure copper applications.

AWARDS OF DISTINCTION

In the Automotive—Engine Category for Conventional PM components, an Award of Distinction has been given to **Nichols Portland Inc., NPI–Ridgway Division** for a mounting boss for sensors used in automotive emission control systems. The bosses are made from stainless steels, chosen for their combined attributes of weldability and adequate corrosion resistance. The bosses are designed to be permanently welded in place, allowing quick assembly-line installation and long-term serviceability of a growing number of critical exhaust gas sensors. Machining these parts from wrought bar stock would result in a significant amount of wasted material compared with the PM process.

In the Automotive—Transmission Category for Conventional PM components, an Award of Distinction has also been given to **GKN Sinter Metals,** for an oil pump assembly used in a new cost-effective dual-clutch transmission. This is the first time an electric motor has been fully integrated in a hybrid electric vehicle. The assembly comprises upper and lower covers, a gerotor set, a pump core and a copper steel bushing. The initial part design called for a die-cast aluminum part that required extensive machining. A redesigned PM part replaced the aluminum cover with significant advantages including improved pump performance, reduced NVH scattering, enhanced sustainability, and cost reduction.

In the Automotive—Transmission Category for Conventional PM components, an Award of Distinction has been given to **Burgess-Norton Mfg. Co.** for a reaction block and cam plate used in a mechanical locking rear differential. This part is at the center of the assembly and sets the working distance between the four gears that are in constant contact with four sides of the part. The cam plate's angled design allows it to wedge against the side gear, creating a locking action when the flyweight system detects a significant speed difference between the wheels. The three detent protrusions prevent the cam plate from ramping until a predetermined torque is applied to the gear teeth.

An Award of Distinction has been given, in the Automotive—Chassis Category for Conventional PM components, to **Metco Industries, Inc.** for a damping piston in an automotive shock absorber system. The compaction process requires several independent press functions to compact the damping piston to both the correct dimensions and mass. Special handling applications, secondary machining, and a specialty lathe and fixture are utilized throughout the process. With multi-level high precision PM compacting press capabilities, the parts can be made to near-net-shape. Due to the complexity, it would not be economical to produce using alternative manufacturing methods.

An Award of Distinction has also been given, in the Automotive—Chassis Category for Conventional PM components, to **Phoenix Sintered Metals LLC** and their customer **ZF Chassis Solutions** for an anti-rotational sleeve used in an electronic braking application. Maintaining part integrity through the compaction and ejection process is critical due to the thin cross-section where the flange joins the legs. The anti-rotation sleeve must meet tight tolerances. PM technology was chosen as the route that could pass all the testing requirements in an accelerated timeline.

In the Automotive—Chassis Category for MIM components, an Award of Distinction has been given to **INDO-MIM LIMITED** for an ASV top plate used in a vehicle suspension sub-assembly. The part is quite complex, featuring a circular shape with 30 narrow through slots around the edge and five rib-like structures that connect to a central hole. MIM processing resulted in a 40% cost reduction compared with the machining and wire cutting previously used. MIM is an excellent choice for making 120,000 parts annually while minimizing material waste.

In the Military/Firearms Category for MIM components, an Award of Distinction has been given to **Advanced Powder Products, Inc.** for a sear housing block used in a pistol firearm. There are numerous blind and through holes, all held to tight tolerances for position and depth, and thin walls that form functional features where subsurface defects are not acceptable. X-ray scanning was used to verify that the parts were free of subsurface defects. CNC machining of the part was not cost effective for the desired volumes or the requested speed to market.

In the Lawn & Garden/Off-Highway Category for Conventional PM components, an Award of Distinction has been given to **MPP** for a clutch shoe used in a centrifugal clutch used in a chain saw assembly. The offset features on the flange present compaction difficulties; potential for cracks, issues with density distribution, and tool life. These were overcome using an innovative compaction tool set that included two upper punches, four lower punches, two core pins, and a compensated fill die with a powder sweep. PM was selected because the complexity of the required geometry makes other manufacturing methods unfeasible and uneconomic, especially at the higher annual volumes needed.

In the Hand Tools/Recreation Category for Metal AM components, an Award of Distinction has been given to **Nichols Portland Inc., NPI–MIM/MAM Division** for a bar and yoke banjo capo assembly for **Paige Musical Products**. A capo is used to temporarily shorten the strings on a banjo, raising the pitch of the unfretted or "open" strings and changing the key of the open-position chords. The two parts are made from stainless steel and used in the as-printed-and-sintered condition with no secondary processing. The metal AM parts provide a 50% cost reduction compared with traditionally machined components.

In the Medical/Dental Category for MIM components, an Award of Distinction has been given to **Hangzhou Sino-MIM Technology Co. Ltd.** for an anvil of an endoscopic stapler used for tissue re-section and anastomosis in thoracic and abdominal surgical operations. The stapler uses titanium staples to cut off or anastomose tissues. It is quick and easy to operate and greatly shortens the operation time. The parts are made from stainless steel and are nickel-Teflon plated to meet biocompatibility requirements. Redesigning the machined parts that required extensive processing to MIM resulted in a 50% cost reduction.

An Award of Distinction, in the Electronic/Electrical Components Category for MIM components, has been given to **Hangzhou Sino-MIM Technology Co. Ltd.** for an ALN heatsink. This part is made from aluminum nitride and is very brittle. The part is used in the silicon photonics optical module for optical communication. A large number of heat-generating components are surface-mounted on the product, which not only serves as the mounting substrate but also plays a role in heat conduction and dissipation. Surface finish and tight tolerances on the flatness and parallelism are among the part requirements.

An Award of Distinction, in the Electronic/Electrical Components Category for MIM components, has been given to **Hangzhou Sino-MIM Technology Co. Ltd.** for a MIM-17-4 PH stainless steel middle plate used in the hinge of the folding screen of a mobile phone. The middle plate connects multiple mechanical devices and serves as the core part of the mechanical rotating part of the folding screen. The parts are processed by high precision equipment to ensure the dimensional accuracy. The thinnest part is only 0.3 mm (0.012 inch) thick

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Editor's Note: *For further details or digital photos contact Dora Schember at MPIF* dschember@mpif.org

About the Metal Powder Industries Federation
Metal Powder Industries Federation is the North American trade association formed by the powder metallurgy industry to advance the interests of the metal powder producing and consuming industries and provides a single point of reference for all MPIF member companies.

MPIF 2025 Powder Metallurgy Design Excellence Award Winners

2025 Grand Prize Winners

Foreground: knife blade, expander assembly, optical housing and heat sink
Middle Row: Pocket and keeper, pistol slide, grounding diaphragm bracket, and urea flange
Back Row: Throttle pedal, One-way -clutch wedge washer and sliding sleeve

2025 Award of Distinction Winners

Foreground: bar and yoke capo assembly, middle plate, ALN heatsink, endoscopic anvil and sear housing block
Second Row: oil pump components and clutch shoe
Third row: slanted sensor boss, damping piston, ASV top plate, cam plate
Back row: Anti rotational sleeve and reaction block

Digital Images Available Upon Request

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2025 MPIF Design Excellence Awards Grand Prize Winners

Automotive Engine
Urea Flange
DSB Technologies

Automotive: Transmission
Sliding Sleeve
PMG Holding GmbH

Automotive Electric Vehicle
One-Way Clutch Wedge Washer
GKN Sinter Metals

MIM Automotive Electric Vehicle
Grounding Diaphragm Bracket
Hangzhou Sino-MIM Technology Co., Ltd.

Lawn & Garden/Off-Highway
Throttle Pedal
Metco Industries, Inc.

MIM Hand Tools/Recreation
Knife Blade
ARC Group Worldwide

MIM Hardware/Appliance
Pocket & Keeper Modular Parts
INDO-MIM Limited

MIM Electronic/Electrical
Optical Modular Housing
Hangzhou Sino-MIM Technology Co. Ltd.

Metal Additive Manufactured
Electronic/Electrical
Copper Heat Sink
3DEO

MIM Medical/Dental
A to Z Expander Assembly
INDO-MIM Limited

MIM Military/Firearms
Pistol Slide
ARC Group Worldwide

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2025 MPIF Design Excellence Award of Distinction Winners

Automotive: Engine
Slanted Sensor Boss
Nichols Portland Inc.
NPI-Ridgway Division

Automotive: Transmission
Oil Pump Components
GKN Sinter Metals

Automotive: Transmission
Reaction Block & Cam Plate
Burgess-Norton Mfg. Co.

Automotive: Chassis
Damping Piston
Metco Industries, Inc.

Automotive: Chassis
Anti Rotational Sleeve
Phoenix Sintered Metals LLC

MIM Automotive: Chassis
ASV Top Plate
INDO-MIM Limited

Lawn & Garden
Clutch Shoe
MPP

Metal Additive Manufactured
Hand Tools/Recreation
Bar & Yoke Banjo Capo Assembly
Nichols Portland Inc.
NPI-MIM/MAM Division

MIM Electronic/Electrical
ALN Heat Sink
Hangzhou Sino-MIM
Technology Co. Ltd.

MIM Electronic/Electrical
Middle Plate
Hangzhou Sino-MIM
Technology Co. Ltd.

Medical/Dental
Endoscopic Anvil
Hangzhou Sino-MIM
Technology Co. Ltd.

Military/Firearms
Sear Housing Block
Advanced Powder Products, Inc.

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