This booklet contains all of the entries into the EPMA 2016 Component Awards. The booklet also contains the winning entries from both the MPIF and JPMA annual awards.
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Introduction

The EPMA has organised the Powder Metallurgy Component Awards to coincide with the World PM2016 Congress & Exhibition in Hamburg, 9 – 13 October 2016. These awards were open to EPMA members who manufacture all types of components made by the following PM process:

- Additive Manufacturing
- Hot Isostatic Pressing
- Metal Injection Moulding
- PM Structural (including Hard Materials and Diamond Tools)

In all cases, a panel of independent experts drawn from across Europe, using the following criteria, refereed the entries:

- To what extent is the PM component described in the entry expected to provide cost savings and/or improved quality?
- To what extent is the entry expected to stimulate further usage of PM materials and technology?
- How well is the entry prepared (description of component, inclusion of diagrams, photographs and other illustrations)?
- How do you rate this component in terms of excellence in exploiting PM or in terms of novelty, surpassing borders or bringing new ideas into practice?

The awards were presented in the Opening Plenary Session of the World PM2016 Congress & Exhibition on 10 October. This booklet contains details of all the entries in this year’s EPMA competition together with the winning entries from both the MPIF and JPMA annual awards, which will be on display on the Awards Showcase in the exhibition area. The EPMA wishes to congratulate and thank all its member companies who entered the competition.

Further information on this year’s award entries can also be found on the EPMA website: www.epma.com/awards.
BIONIC PARTITION
Company Airbus Operations GmbH
End Use Sector Aerospace
Product Density 2.7g/cm³
Tensile Strength 490MPa
Yield Strength 450MPa
Product Hardness 177 (HVO,3)
Elongation 8%

The Bionic Partition is not only a new designed component for an A320. It also combines latest material and production trends with the most sophisticated design and optimization technologies to create a new baseline technology for the aviation industry. This new baseline technology will create a major impact on new generations of aircraft cabin components that are more valuable, lighter, and thus create less impact on the environment.

RATCHET
Company ASCO Sintering Co.
End Use Sector Medical
Product Density 6.5g/cm³
Tensile Strength 280MPa
Yield Strength 230MPa
Product Hardness 59HRB
Elongation 1%

This part is an example of a finely detailed medical part produced by conventional PM and not MIM. This part has a slot that measures 0.5mm x 2.5mm making the part extremely delicate in the green state. It has 74 teeth and is more than 52mm long with a minimal cross section nearest the slot of 1.29 square mm per side. All of this in a part that weighs just 1.6 grams.
### NEAR NET SHAPE HIPPED ASTROLOY CASING FOR HIGH SPEED TURBINE

**Company** Aubert & Duval  
**End Use Sector** Aerospace  
**Product Density** 2.7g/cm³  
**Tensile Strength** 50MPa >forg. Waspaloy-AMS5704  
**Yield Strength** 50MPa >forg. Waspaloy-AMS5704  
**Product Hardness** 340 HB10; 410 HV0.5  
**Elongation** >25% RT-760 °C

The next generation of aeronautic engines aims at continuously improving performances and efficiency, reducing at the same time emissions. However, increasing this temperature severely stresses the turbine constitutive materials. Current casing constitutive materials are designed to work at ca. 650°C and superalloys like Inconel 718 or Waspaloy are typically used. Different aeronautic propulsion producers have different strategies to develop more efficient turbines, but they are all trying to find materials and manufacturing routes capable to provide casings which can readily operate at 700 to 800 °C.

### STIRNRAD ABTRIEB

**Company** Carbosint s.p.a.  
**End Use Sector** Automotive  
**Product Density** 6.85g/cm³  
**Tensile Strength** 1200N/mm²  
**Yield Strength** 900N/mm²  
**Product Hardness** 320-500 HV10

At the start of customer project the gear has been produced as n° 1 gear and n° 2 bushing, both machined (wrought steel) and then assembled. The gear produced as PM technology showed a huge cost reduction. A strong design effort has been made to get the tight tolerance as specification with a long process steps with different dimensional variation (compaction, sintering, heat treatment, coating).
COVER

Company GEVORKYAN, s.r.o.
End Use Sector Automotive
Product Density 7.65g/cm³
Tensile Strength >800N/mm²
Yield Strength >660N/mm²
Product Hardness 32 HRC
Elongation >3%

The Cover is a complicated part, not only from shape point of view, but also because of customer/consumer aesthetic demands. The part has to be visually good-looking. No visual marks should occur. Made on complex MIM tool with ejection packet fixed on half of the mold. Volume per annum: 13000+

4TH DRIVE TRANSMISSION GEAR

Company Höganäs AB
End Use Sector Automotive
Product Density 7.3g/cm³
Tensile Strength 1100 MPa
Yield Strength 990 MPa
Product Hardness 32 HRC
Elongation 0.38%

This component has been developed to exploit and demonstrate the full potential of technical possibilities and enduser benefits when deploying a holistic (novel material-process-design) engineering approach with PM. This project has enabled the constitution of a major European PM industry effort together with 12 more tech partners and suppliers from the entire pm value chain, and resulted in the world’s first design optimized 6 speed manual transmission designed for PM gear technology.
CATCHER, TENSION BAR & NEW BASE CAP

Company: INDO-MIM PVT Ltd.
End Use Sector: Off-Highway
Product Density: 7.65g/cm³
Tensile Strength: 1550N/mm²
Yield Strength: 1400N/mm²
Product Hardness: 42-48 HRC
Elongation: 3%

These parts are converted to MIM process from the conventional manufacturing process. Previous process involved machining, welding, PM and fastening. Indo-MIM designers worked with the customer and completely re-designed the 3 parts to make them cost effective via MIM. The redesigned MIM products helped customer avoid field failures and minimize the supply chain.

OUTPUT SHAFT, LEVER & COVER

Company: INDO-MIM PVT Ltd.
End Use Sector: Power Tools
Product Density: 7.65g/cm³
Tensile Strength: 1550N/mm²
Yield Strength: 1400N/mm²
Product Hardness: 42-48 HRC
Elongation: 3%

Made from 4605 low-alloy steel, the three parts are made close to net shape, with only a few secondary operations performed to achieve close tolerances. The output shaft is a complex part with three small holes at 120deg inter crossing each other, and thin wall thickness in the cover part and close GD&T makes them good parts for MIM. As MIM is able to produce 3 parts of 5 part assembly and make the supply chain lean, MIM is a sustainable process. These 3 parts get assembled in the Dremel tool. This is called as “Quick Change Assembly” since one can change any tool bit within seconds. The tool will run at 35000 rpm.
GDI PUMP COMPONENTS
Company: INDO-MIM PVT Ltd.
End Use Sector: Automotive
Product Density: 7.55g/cm³
Tensile Strength: 1770N/mm²
Yield Strength: 1550N/mm²
Product Hardness: 53-63 HRC
Elongation: 1% Max.

Four MIM parts—blank discharge check, stop discharge check valve, valve discharge check, and CRV spring seat—that go into a device that controls fuel flow in Gasoline Direct Injection (GDI) pumps. Three of the parts are made of 440C stainless steel, while the fourth is made of 17-4 PH. The extremely complex geometry of the blank discharge check, with the intercrossing of holes, required tooling with six side cores, three of which move at different timings. The annual volumes are close to 1.2 million pcs a year each. The parts are designed for MIM. All the 4 parts go into a device which controls the fuel flow in Gasoline Direct Injection (GDI) Pumps of passenger cars.

UNDERBARREL
Company: MIMEcrisa
End Use Sector: Defence
Product Density: 7530000g/cm³
Tensile Strength: 1223N/mm²
Yield Strength: 1123N/mm²
Product Hardness: 36 HRC
Elongation: 5%

It is necessary to design a suitable MIM process to prevent distortion and cracking in the final parts. The part is an underbarrel, which has led significant savings in terms of manufacturing costs to the customer, especially in machining operations.
COSMETIC SURGEON DEVICE

Company MIMEcrisa
End Use Sector Medical
Product Density 7800000g/cm³
Tensile Strength 516N/mm²
Yield Strength 213N/mm²
Product Hardness 120 HV10
Elongation 51%

This component particularly highlights for its complexity of form such as thin walls. The main idea of the customer was to make the part by machining, but after refusing several manufacturers of machining, the customer turned to MIMECRISA to raise production by MIM technology, assuming the costs of making the mould for short production batches. The main difficulties found at the time of development of the part were a correct mould design, especially when ejecting the part from the mold without breaking the most fragile areas of the part. The main advantages obtained by making this part with MIM technology are cost savings respect to manufacture by machining, saving secondary machining and welding operations, and therefore better final mechanical properties. The part is the head of a laser surgery machine.

DOUBLE HAMMER

Company MIMEcrisa
End Use Sector Defence
Product Density 7600000g/cm³
Tensile Strength 1897N/mm²
Yield Strength 1304N/mm²
Product Hardness 525 HV10
Elongation 3%

The part is a double hammer for a double barrel gun, which has led significant savings in terms of manufacturing costs to the customer, especially in machining operations.
Together with the University of Design in Pforzheim/Germany OBE developed an exclusive earbud concept based on the MIM-technology. Two industrial design students became the task to create different complex earbud housings made from metal. Target for them was to utilise as much as possible the benefits of the design freedom of the MIM-technology by considering at the same time ergonomic aspects of an earphone. Only the relevant inner components of an earbud gave the design limitations. On the other hand the intention was to create also a more visible and valuable product compared to small and rather invisible plastic earbuds.

The special challenge in the design of a touring binding is that it must be equally suited for uphill walking on skis and downhill skiing. It guarantees the same safety level as conventional downhill bindings. One special challenge with touring bindings is that low weight is of even bigger importance than for downhill bindings. The challenge during the development phase was to address space constraints, weight constraints, functionality and ease of use. MIM proves with this challenging application that it is capable of achieving not only excellent functional properties but also cost savings of 50% compared to competing manufacturing technologies.
‘TIGER-METAL’ RINGS

Company  RHP-Technology GmbH
End Use Sector  Consumer Goods

The ‘Tiger Metals’ can be composed of two or more metals and characterised by a specific macrostructure. These can be made from different compositions; most prominent material combinations are: Ag-Ti (Silver-Titanium), Ag-Au (Silver-Gold) and Red Gold-White Gold-Yellow Gold. Additionally tiger metals are of relevance for watch cases and have potential to be used in consumer products.

PM HIP QUAD METAL EXHAUST VALVE SPINDLE

Company  Sandvik Powder Solutions
End Use Sector  Transportation: Marine
Product Density  100%

Quad metal part: four different alloys in one part. All four alloys are diffusion bound together in one single HIP cycle using a proprietary process for positioning of each alloy. Finishing: Machining and aging.
**LIQUID DIVIDER**

**Company** Sandvik Powder Solutions  
**End Use Sector** Chemical Manufacturing  
**Product Density** 100%  
**Tensile Strength** >860MPa  
**Yield Strength** >650MPa  
**Product Hardness** >170 HV10  
**Elongation** >30%

The liquid divider is a central and important component in a urea manufacturing plant and its integrity is crucial for the pant to operate at peak capacity and produce a high quality product. HIP opens up new opportunities to use the material in components as well as solves a number of issues with the conventional material. Furthermore, thanks to a newly developed process the part is HIPed net shape on the inside and thereby greatly reduces machining costs and makes this economically viable.

**2C-PIN**

**Company** Schunk Sintermetalltechnik GmbH  
**End Use Sector** Automotive  
**Product Density** >7.6 / >8.2  
**Tensile Strength** >500 / >1000  
**Yield Strength** >200 / >900  
**Product Hardness** >120 / >440  
**Elongation** >50 / >2

2C-Pin is the first serial part worldwide produced by Metal Injection Moulding of two different materials. A customer problem was solved: combination of wear resistance in a wide range of temperature and weldability of materials in one complex part. The innovation was to modify the two alloys to get nearly the same sintering behavior. Cracks are fully avoided and between the two components a continuous gradient in chemical composition instead of an abrupt joining zone can be determined. Schunk opend a new area for PM business with big growing potential.
HELCAL GEAR WHEEL

Company Schunk Sintermetalltechnik GmbH
End Use Sector Automotive
Product Density 6.60-6.95
Tensile Strength >700MPa
Yield Strength >600MPa
Product Hardness 320-500 HV10
Elongation >50 / >2

The helical gear wheel with toothing of >4.0° helix angle is used in a mechanical gear unit in an electric parking break and is, therefore, a security-relevant part. The mechanical-tribological demands placed on the component or on the entire subassembly are fulfilled by the helical gear wheel through geometry, material used and finishing treatment within a fully linked process with completely automated steps with pick & place robot loading and 100% acoustical resonance inspection.

SINTEX SENSOR HOUSING

Company Sintex A/S
End Use Sector Pump & Motor Industry
Product Density 7.95g/cm³

Part was previously produced in plastic, but more demanding requirements led to the consideration of a solution in metal. There was a wish for greater strength because the sensor housing is primarily used for industrial purposes in environments that degrade plastic materials both thermally and chemically. With the technology behind MIM, we were able to produce a sensor housing with the same geometry as plastic, but with the same strength as steel. The entire sensor housing is produced as a single component – in a single process. The sensor housing is fitted into a flow pipe that is used to measure flow and pressure in pipe systems. The housing is used to protect and enclose the electronics for the measurements.
SMC LOUDSPEAKER SOLUTION

Company  Sintex A/S
End Use Sector  Consumer Goods (Electronics)
Product Density  App. 7.45g/cm³

Soft magnetic composites in loudspeakers were new when Sintex and our business partner began the joint cooperation. SMC was, however, an obvious solution as it is attractive in applications that require low losses – in particular at high frequencies, as the advantages of SMC increase with the magnetic frequency. At frequencies above 200 Hz SMC has lower losses, which in turn has benefits in terms of maximum rated power, running costs and the environment. Sintex and DALI has thus designed a speaker system in which the measurable third harmonic distortion components are reduced by no less than 20 dB compared to units operating with traditional magnetic systems. The loudspeaker is therefore a speaker with a relatively high sensitivity that represents a light and uncomplicated load for the amplifier.

PLANETARY CARRIER

Company  Stackpole International
Product Density  Spider: 7.0g/cm³, Guide Plate: 7.5g/cm³
Tensile Strength  Spider: 510MPa, Guide Plate: 730MPa
Yield Strength  Spider: 420MPa, Guide Plate: 520MPa
Product Hardness  Spider: 80HRB, Guide Plate: 90HRB
Elongation  Spider: 1%, Guide Plate: 3%

Planetary Carrier 4 is an excellent example for design collaboration between teams with expertise in powder metal process and automotive transmission design. ZF and Stackpole technical teams defined the engineering properties required for this application through joint reviews of initial bench test results and shortened the development cycle through successful simultaneous development. Stackpole International, although did not have design responsibility, undertook the bench testing and established better options for material selection.
VBN Components has developed the additive manufactured wear resistant material Vibenite® 60 and tested this in a number of gear hobs at Volvo Powertrain, Sweden. In the tests, the hard and heat resistant material performed very well resulting in twice the lifetime and also the possibility for running with double feed in hobbing. The possibility to build lightweight structures resulted in a weight reduction of 40% of these heavy tools, from 15 to 9 kg.
AUTOMOTIVE - ENGINE

Parts Maker Division of HHI/MPG  
Part Name Rubberized Crankshaft Sprockets  
Composition FC-0208 & FL-4405  
Product Density 6.8g/cm³ - 7.1g/cm³  
Yield Strength 660-1210MPa  
Tensile Strength 640-1100MPa  
End Use High performance double overhead camshaft V6 engine

AUTOMOTIVE - CHASSIS

Parts Maker Capstan  
Part Name Electronic Power Steering Assist Pulley  
Composition FC-0200-24  
Product Density 6.9g/cm³  
Yield Strength 200MPa  
Tensile Strength 230MPa  
End Use Drive pulley for an electronic power steering system

AUTOMOTIVE - CHASSIS

Parts Maker Keystone Powdered Metal Company  
Part Name Cams, Guides & Teeth  
Composition FD-0205-140HT  
Product Density 6.95g/cm³  
Yield Strength 1450MPa  
Tensile Strength 1030MPa  
End Use Manual tilt telescope steering column components

AUTOMOTIVE - CHASSIS

Parts Maker GKN Sinter Metals  
Part Name Driven Pulley  
Composition FC-0208-50  
Product Density 6.7g/cm³  
Yield Strength 350MPa  
Tensile Strength 410MPa  
End Use Retains pulley belt for power steering activation
AUTOMOTIVE - TRANSMISSION
Parts Maker GKN Sinter Metals
Part Name Forged PM Electronic Locking Differential Gear Set
Composition P/F-4620
Product Density >7.8g/cm³
End Use Electronic locking rear differential

LAWN & GARDEN/OFF-HIGHWAY
Parts Maker Indo-US MIM Tec Pvt. Ltd.
Part Name Diesel Leak Off Union
Composition MIM-17-4 PH
Product Density 7.5g/cm³
Yield Strength 730MPa
Tensile Strength 900MPa
End Use Diesel engine fuel injector line

HAND TOOLS/RECREATION
Parts Maker Parmatech Corporation
Part Name Shotgun Trigger
Composition MIM-4605
Product Density 7.5g/cm³
End Use Shotgun trigger

MEDICAL/DENTAL
Parts Maker FloMet, LLC An ARC Group World Wide Company
Part Name Tungsten Electrode
Composition Proprietary Tungsten Alloy
End Use Surgical ablation device

MEDICAL/DENTAL
Parts Maker Advanced Forming Technology An ARC Group World Wide Company
Part Name Wedge Blank
Composition MIM-440C
Product Density 7.6g/cm³
Yield Strength 1586MPa
End Use Endoscopic staple gun

MEDICAL/DENTAL
Parts Maker Parmatech Corporation
Part Name Articulating Endoscopic Surgical Device Parts
Composition MIM-1704 & MIM-420
End Use Articulating Endoscopic Surgical Device
ELECTRONIC/ELECTRICAL

Parts Maker Indo-US MIM Tec Pvt. Ltd.
Part Name Mirror cover, base and middle
Composition MIM-316L
Product Density 7.5g/cm³
Yield Strength 150MPa
Tensile Strength 480MPa
End Use Gas analyzing equipment

ELECTRONIC/ELECTRICAL

Parts Maker GKN Sinter Metals
Part Name Aluminum PM Heat Sink
Composition Special PM Aluminum Alloy
End Use Car stereo

AEROSPACE/MILITARY

Parts Maker Advanced Forming Technology An ARC Group World Wide Company
Part Name Front Sight Base
Composition MIM-4605
Product Density 7.5g/cm³
End Use AR-15 rifle

AEROSPACE/MILITARY

Parts Maker Advanced Forming Technology An ARC Group World Wide Company
Part Name Ferrule
Composition MIM-17-4 PH
Product Density 7.64g/cm³
End Use Provides a conductive path between screen and engine
Category New Design
Company FINE SINTER CO., LTD.
Title Higher Cost Performance By Reduction Of Wear Resistant Material On The Valve Sea

Overview This valve seat has improvement of cost performance with minimum amount of high wear resistant material (seat material) by reviewing layer boundary angle. The valve seat has expensive seat material on the seat surface where the valve hits because hitting the valve wears the seat. Therefore, to improve cost performance, the valve seat has two layers with cheaper material on the other side because wear resistance is required only on the valve hitting side. This development improves layer boundary angle to 45 degree, which is parallel to valve hitting surface angle and wear progress. This change reduces expensive material amount and cost, drastically. Moreover, the valve seat needs heat conductivity since inside temperature of the engine becomes higher with high efficiency of the engine on recent trend, yet seat material has low heat conductivity because it includes carbide. Decreasing amount ratio of seat material improves total heat conductivity and gains heat reduction effect. This effect contributes controlling knocking by higher temperature of the engine and is able to apply to all engines. This availability creates more demands. In addition, machinability of outer diameter is improved because of reduction of seat material area on outer diameter, which requires heavy machining.

Category New Design
Company Sumitomo Electric Industries, Ltd.
Title Development of soft magnetic composite cores for rectangular-shaped ignition coils with high-power output

Overview This product is a soft magnetic composite core for the rectangular-shaped ignition coil possessing superior ignitable stability resulting in high ignition energy output. The key points pertaining to this development are: (1) Improvement of magnetic saturation-resistance that is a characteristic of soft magnetic composites. (2) Improvement of volumetric efficiency. This was achieved by re-designing the cross-sectional circular shape owing to the shape flexibility of soft magnetic composite cores. This type of circular shape is difficult to be formed using conventional electromagnetic steel sheets. (3) Achievements of high productivity and cost competitiveness through an automated process from compacting to packing which is unprecedented in the manufacture of sintered parts. As a result of the above improvements, we have succeeded in developing soft magnetic composite cores for the rectangular-shaped ignition coils possessing superior ignitable stability resulting in high ignition energy output.
**Category** New Design  
**Company** Porite corporation  
**Title** Development of bearing for linear vibration actuator to be used in wearable device

**Overview** This product is sintered bearing which is used for linear vibration actuator on wearable device. The vibration motor began to be mounted on Pocket Bell since around year 1990s. And vibration motor has increased in number with the spread of mobile phone. Mobile phones in the world market are transforming into a smart phone from feature phone. Besides, small, high performance and health-conscious wearable device with vibration feature has entered to the market. The wearable devices are thin and curved so that thin flat shape linear actuator is required, instead of cylinder and coin type actuator which were mainstream till now. We had developed the sintered bearing which satisfied characteristics for linear vibration actuator (vibration characteristic, low noise, shock resistance). This product was required different characteristics from rotating vibration motor. Product shape, Radius shape on inner diameter formed by special tooling in order to remove fine burr, Low noise material with high oil film strength brought about by fine porous and high viscosity oil specialized for linear sliding motion were the key to success of this development. Customer was considering full machining stone bearing, such as Ruby and Sapphire, at initial stage of the development. However, as a result of this development, We were able to enter this new market.

**Category** New Design  
**Company** DIAMET CORPORATION  
**Title** A set of sintered joints for the motor used in valve lift actuator

**Overview** The products are a set of sintered joints for the motor used in valve lift actuator of SOHC engine. One of the products has projections, and the other has grooves. In a combination of the projections and grooves, it is width between the projections to be the most important. The compaction tool and the compaction conditions were optimized to minimize the distortion caused by springback, and sintering method and conditions are also optimized to improve the scatter of dimensional change. As a result, we succeeded in the development of a set of sintered joints for the motor used in valve lift actuator eliminating the sizing process, which contributed to the practical use of the new mechanism improving the mileage and environmental performance and downsizing.

**Category** New Materials  
**Company** Hitachi Chemical Co., Ltd.  
**Title** Austenitic high heat and wear resistance sintered material for turbocharger

**Overview** The austenitic sintered material has excellent heat and wear resistance and it has been used for the valve bushing in turbocharger. Recently, on-board rate of turbocharger in vehicles is increasing. Turbocharger has mainly been used in diesel engine automobile conventionally, but nowadays, on-board rate has rapidly increased in gasoline engines, too. Since the exhaust gas temperature of gasoline engines is higher than diesel one, austenitic materials tend to be used as turbocharger parts in term of its highly heat resistance. According to the backgrounds, a development of newly austenitic sintered material, which has higher wear resistance, was started. The technical point of the material is dispersion condition of carbide for wear resistance improvement.
**Category** New Materials  
**Company** Hitachi Chemical Co., Ltd.  
**Title** Ferrous sintered bearing material with high permeability and oil content

**Overview** Because of both shortly operation time and reversible rotation, printer head driving motor is one of difficult applications for oil impregnated sintered bearing to get oil film effect. Copper materials, which have highly self-lubricity, were thought to be suitable for such application but the development of ferrous material was started in order to get more cost competitiveness. Increasing oil supply ability of bearing material is important for getting oil film effect under usage condition mentioned above. Therefore, increasing permeability and oil content are thought to be the solutions and these will be achieved by lower density. The concern point was that lower density has negative influence on the productivity through poor green strength. New lower density material achieved 5 times higher permeability than conventional ferrous material, which has 80% density ratio. The green strength kept equally level to the conventional one by using newly compaction lubricant. As the results, the ferrous bearing material, which can be used in difficult condition for getting oil film effect, has been adopted successfully in printer head driving motors.

**Category** Process Development  
**Company** Hitachi Chemical Co., Ltd.  
**Title** Development of high-density sprocket for automobile engines made by die wall lubrication compacting at room temperature

**Overview** This development relates to die wall lubrication compacting, which makes it possible to achieve high density without additional manufacturing processes. The developed technology realized products with densities of 7.5Mg/m³ and higher and diversity of the shapes of applied parts, and eliminated the compacting speed rate-determining step in the lubricant coating process. In lubricant coating by the conventional spray method, reduction of compacting speed and the ability to respond to the shape of lightening holes were challenges. To solve these problems, a new die wall lubrication compacting method was developed, in which coating of the lubricant is completed in the die operation cycle from ejection from the compacting process to return for filling, thereby achieving the same compacting speed as in conventional compacting. In addition, in the spray method, the die is generally heated for the purposes of drying the solution of a solid-liquid mixed lubricant. The developed method makes it possible to obtain the desired product properties under a cold condition without heating the die. As a result of this development, industrial production of high density sprockets with higher productivity in comparison with the tooth flank form rolling method and the conventional warm die wall lubrication compacting method was successfully realized.
**Category** Effort Prize  
**Company** Sumitomo Electric Industries, Ltd.  
**Title** Development of planetary carriers for E-4WD applied with sinter brazing technology

**Overview** This product is used in planetary gears and for mechanism thereof. This was designed to possess large reduction ratio especially in large planetary gears to meet the requirements of weight savings and also being suitable for transfer rotation from motor to rear wheel. Therefore, stress reduction is one of the key factors in planetary carrier design. The application of conventional sinter-bonding carriers was restricted to low torque units due to their R feature design at the base of the column forming hollow shapes, which was formed at only one side. In contrast, our novel proposal allows carriers to have R feature design on both sides of columns to relieve the high stress from the both sides of the columns. We have succeeded in commercialization of carriers that can withstand high torque generated during high speed driving by sinter-bonding the columns, despite the weight savings features such as miniaturization. This development has led to implementation of a sinter bonding carriers in high torque application, which was conventionally difficult to be achieved. Consequently, this product was adopted in 4WD system of hybrid vehicles.

**Category** Effort Prize  
**Company** Fukuda Metal Foil & Powder Co., LTD.  
**Title** Partially Alloyed Bronze Powder with High Compactibility Suitable for High Sintered Density

**Overview** This development is about the partially alloyed bronze powder with high compactibility to enable the prevention of demixing and segregation and achieve a homogenized sintering structure. Either a mixture of copper and tin powders, or alloyed powders produced by the atomizing method, have been generally used for bronze sintering parts. But the mixed powders cause demixing and segregation, and the decrease of densities of sintering compacts also occurs because a large amount of liquid phase tin appears during sintering, and the gas inside sintering compacts has difficulty escaping smoothly, especially in the case of the compacts with higher densities. On the other hand, the alloyed powders do not cause demixing and segregation, and achieve homogenized high density sintering compacts because the liquid phase does not appear. However, their compactibility is so poor that it is difficult to produce complex shaped parts. In order to solve these problems, electrolytic copper powder and bronze alloy powder with a high melting point are used. These powders are diffusion-bonded to each other, in which a heat treatment is carried out at a relatively low temperature. Thus the target property is achieved and we succeeded in the commercialization of the powder.
Spotlight on PM is a database containing a wide range of PM products, materials and applications that are in current production. Each and every day a new PM part helps a company to open up new market opportunities.

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1 - 4 October 2017
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For all the latest details about the EPMA 2016 Powder Metallurgy Component Awards, please visit: epma.com/awards

Comprehensive Powder Metallurgy Information: epma.com

The EPMA Website is a world leading source of Powder Metallurgy (PM) information, from the easy-to-use searchable EPMA Members Directory database, through to PM case studies and information on associated industry events and news.

The EPMA online PM publications catalogue is one of, if not the comprehensive listing of Powder Metallurgy and associated titles in Europe. All publications are English language titles, with some exclusive titles only available to the EPMA.

For more information on the EPMA and the benefits of using the Powder Metallurgy Process for component manufacture, please visit: www.epma.com

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Introducing the latest material database development for Designers and Engineers worldwide

The Global Powder Metallurgy Property Database: a special online resource

The Global Powder Metallurgy Database (GPMD) was created in response to the absence of a readily accessible source of design data which was acting as a significant impediment to the wider application of PM products. The database was the result of a global collaboration between the three major regional trade associations: EPMA (Europe), MPIF (North America) and JPMA (Japan). Since its launch in 2004, the content has been steadily increased to a total of nearly 4000 lines of high quality data.

The GPMD provides physical, mechanical and fatigue data for a range of commercially available PM materials. Originally covering the mechanical and physical properties of PM Steels and Stainless Steels from 6.4 gm/cc upwards, Powder Forged Steels, non ferrous materials and bearing alloys over one thousand new lines of data have been added since the launch. These now additionally cover ferrous and non ferrous MIM materials, fatigue endurance limits and SN curves.

A well tested system of data collection and validation means that the maximum amount of technical information can be displayed without compromising the source and confidentiality of donating organisations. Current areas to be further developed include expanding the available MIM data, obtaining and verifying data from the PM HIP sector and additional data for fatigue properties. With over 9000 registered users from all parts of the world the database provides a significant resource to a very wide range of designers and engineers who may not be familiar with PM technology.

The free to access database allows detailed searches on physical and mechanical properties to be made and results downloaded as either spreadsheets or into well-known FEA packages such as Abacus or MSC. The associated website at www.pmdatabase.com also provides background data on the PM process and designing for PM. Users can also view a list of contributing PM parts makers with contact details. For more first class data please visit:

www.pmdatabase.com

Visit the website for more information on:
- How it works
- How it can benefit you
- How to access it