



## METAL POWDER INDUSTRIES FEDERATION

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# STATE OF THE PM INDUSTRY IN NORTH AMERICA—2010

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Presented June 28, 2010, at PowderMet2010, Hollywood, FL

Without a doubt the North American powder metallurgy (PM) Industry has endured the worst period of declining production and sales in all sectors (metal powders, equipment and parts) in its history. We have suffered along with many manufacturing and raw materials industries. But PM is still alive and well and has landed back on its feet despite the many naysayers. We are all survivors. That spirit of PM entrepreneurship, determination and resiliency born years ago in the hills and valleys of Western Pennsylvania and now evident in PM parts plants throughout our country, has seen this industry through again.

### Reviewing 2009

In 2009 the industry slowly began turning the corner, with a 28% rebound in iron powder shipments in the second half of the year. However, for the year total iron powder shipments declined 25% from 2008 to 222,118 mt (244,839 st), levels not seen since 1992, Figure 1. Essentially, the industry hit bottom in 2009, marking five years of dwindling powder demand.

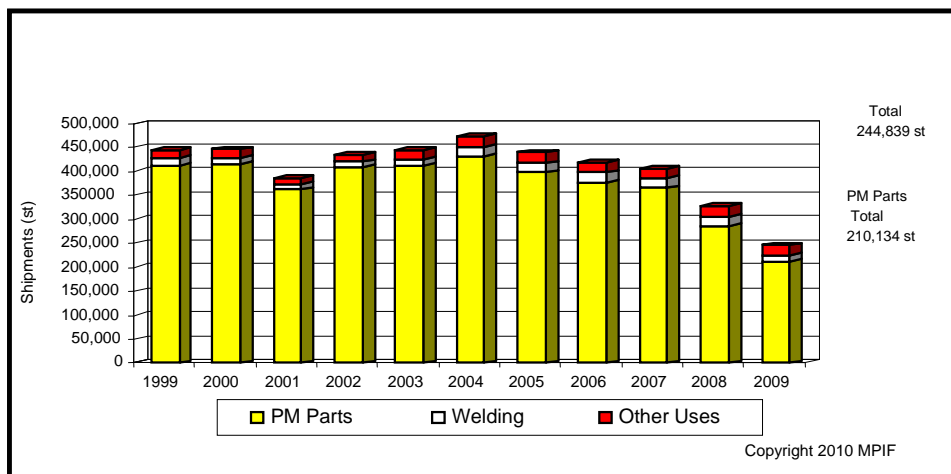


Figure 1. North American iron powder shipments (1 st = 0.9072 mt)

*Advancing Powder Metallurgy  
& Particulate Materials Worldwide*

A FEDERATION OF THESE TRADE ASSOCIATIONS:  
POWDER METALLURGY PARTS ASSOCIATION  
METAL POWDER PRODUCERS ASSOCIATION  
POWDER METALLURGY EQUIPMENT ASSOCIATION  
METAL INJECTION MOLDING ASSOCIATION  
REFRACTORY METALS ASSOCIATION  
ISOSTATIC PRESSING ASSOCIATION

Copper and copper-base powder shipments have declined as well, with 2009 shipments declining 24% to 12,010 mt (13,239 st), Figure 2.

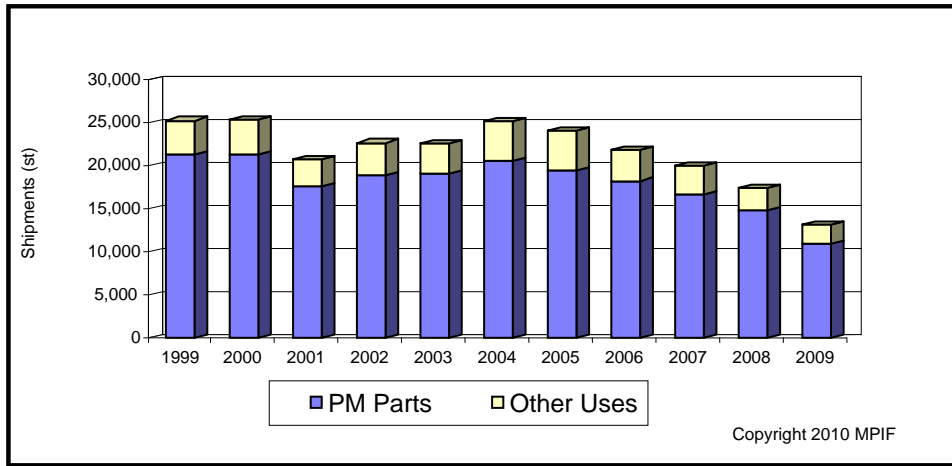


Figure 2. North American copper and copper-base powder shipments (1 st = 0.9072 mt) But 2009 ended on a positive note, especially during the final quarter. The turnaround predicted by many industry executives at the June 2009 Las Vegas conference certainly came true.

### 2010 Outlook

The strong rebound of last year's fourth quarter has continued into the first quarter of 2010 when iron powder shipments soared 64% above the same period in 2009 to 80,206 mt (88,410 st), Figure 3. The first quarter's average monthly shipments of 26,935 mt (29,470 st) project into annual shipments exceeding 317,520 mt (350,000 st). However, it would be more realistic to forecast shipments in the 290,304 to 299,376 mt (320,000 to 330,000 st) range.

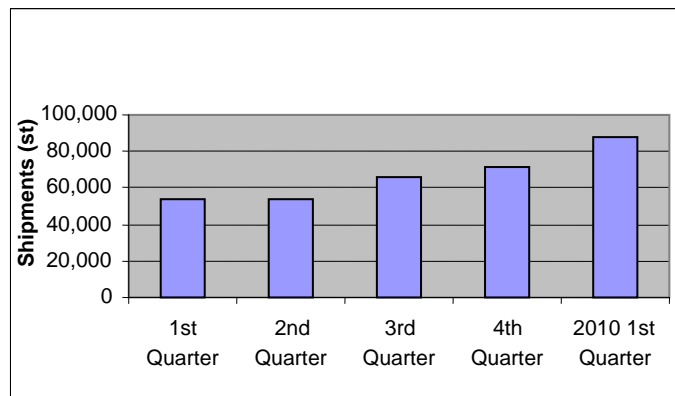


Figure 3. 2009–2010 North American quarterly iron powder shipments (1 st = 0.9072 mt)

First quarter 2010 copper and copper-base powder shipments rose 36% to 3608 mt (3,977 st), Figure 4.

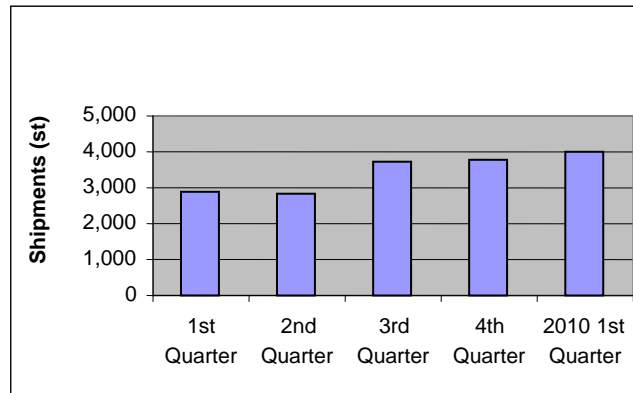


Figure 4. 2009–2010 North American quarterly copper and copper-base powder shipments  
(1 st = 0.9072 mt)

The turnaround for our industry has not been without challenges. The nickel-powder supply shortage has wreaked havoc on our industry. The prolonged Vale Inco strike in Canada, exacerbated by rising demand, has created severe issues for our industry throughout the supply chain. *American Metal Market* reported that nickel-powder consumers in the United States were in a panic mode at the end of May 2010. MPIF has communicated to Vale Inco the impact on our industry and continues to closely monitor and report on this situation. A most recent development is Vale Inco's sale of Novamet Specialty Products Corp. in New Jersey. Vale has reported that it will continue to supply Novamet with nickel products from its Sudbury, Canada, and Clydach, Wales, nickel refineries.

### **The Automotive Market**

Whether we like it or not, the light-vehicle market remains the dominant force impacting the PM industry's financial health and future growth. The industry's OEM structure and product mix have changed dramatically as well as geographically. It is no longer just North America, but Europe, Asia, and South America. Survival demands that we think and act globally. For example, IHS Global Insight forecasts the total world light-vehicle sales to reach 79.6 million units in 2012, including U.S. sales of 15.6 million. And if you need more positive statistics, according to *Automotive News* an official in China reported that China's annual market for cars, trucks, and buses will reach 30 million sometime in the not-too-distant future. While both

forecasts may be overly optimistic, especially China's, the industry needs more hopeful news like this. With the unquestioned quality and innovation of North American PM products, exporting systems is a definite, positive option.

Speaking of forecasts, it appears that North American light-vehicle production this year could top 11.5 million units. With that output the automotive industry will consume an estimated 208,656 mt (230,000 st) of PM parts. It is also estimated that PM parts content in the average-size vehicle will end up at 18.6 kg (41 lb.), about the same as in 2009. This is based on typical Detroit 3 usage and on overseas brands such as Toyota, Honda, and Hyundai-Kia actually increasing their PM content. The U.S. number continues to compare favorably with the European PM average parts content in 2009, 7.2 kg (15.8 lb.) as reported by the European Powder Metallurgy Association, and with that of Japan, 8 kg (17.6 lb.) in 2008, as reported by the Japan Powder Metallurgy Association.

GM's use of PM parts continues to be very strong at an average of about 21.8 kg (48 lb.) per vehicle. Ford is next at 20.5 kg (45 lb.), Chrysler at 19.5 kg (43 lb.), followed by the Asian brands at 17.3 kg (38 lb.). However, some European SUVs and light trucks contain as much as 19.1 kg (42 lb.) of PM parts.

There is more good news about the automotive market. The new six-speed transmissions introduced by GM and Ford have a high PM content, in the 13.6 kg (30 lb.) range. Several of Ward's 2010 Best Engine choices have high PM contents as well. Ford's 3.5L EcoBoost Turbocharged V-6 engine has 81 PM parts weighing a total of 9.5 kg (21 lb.). The engine contains PM valve guides and valve seat inserts, connecting rods, oil pump, sensor ring, cam caps, VVT assemblies, camshaft sprocket, and crankshaft sprocket and hub.

The MPIF Technical Board continues to update the PM Automotive Parts Catalog launched last year. Aimed at automotive design engineers and materials specifiers, the catalog identifies up to 1,000 PM parts representing 325 applications in a typical vehicle. The applications are in the engine, transmission, and chassis. In addition to North America, the catalog also covers Europe, Japan, and Korea.

And there are some new high-profile PM stars to showcase. The heralded Tata Nano model contains PM parts in the valve train, as well as in the timing, hydraulic, and suspension systems.

On the other end of the price range, luxury models like the Ferrari California and 456 Italia, and the Mercedes AMG SLS, all use advanced PM hydraulic-pump parts that are assembled into a double-clutch transmission.

However, there are still challenges ahead, especially in 2016. That's when the recently approved government Corporate Average Fuel Economy (CAFE) regulation of 35.5 mpg kicks in. It is a dramatic increase from the current 27.5 mpg regulation, and a far cry from the original CAFE 1978 standard of 18 mpg. The new 2016 standard will open the door for smaller engines—four- and even three-cylinder engines—and more hybrid/electric vehicles, as well as the next generation of transmissions. New smaller engines are being designed now for production in 2014 and 2015. They will usher in a new era of more demanding performance requirements that will put a serious strain on current PM technology.

Selling PM's benefits to the overseas OEMs is another challenge that is vital to our survival. Foreign vehicle manufacturers need to be educated about PM's capabilities and how to apply the technology. The industry must maintain an ongoing concerted effort to reach transplant decision makers in North America but also in design centers in Europe and Asia. International relationships must be cultivated through a sustained overseas sales and marketing effort, but that takes a large investment to fund. So perhaps more consolidations are in order. On the other hand, industry-sponsored trade missions could open up new doors to reach decision makers in Tokyo, Seoul, Mumbai, and Shanghai.

## **Industry Transitions**

Although seriously impacted by the economic downturn, the PM industry has experienced relatively few corporate changes since 2008. A private equity firm purchased Engineered Sinterings & Plastics (now called Wakefield Solutions) in 2008. Last year Capstan purchased the assets of MPP Anaheim and SSI purchased certain assets of Hazen Powder Parts, with both plants now being out of business. So far in 2010, Melling Engine Parts purchased Rush Metals from Cloyes Gear & Products, and Alpha Sintered Metals purchased the assets of Maxtech (Quebec).

However, in the past two years eight PM parts plants have closed, with three more shutdowns expected by the end of the year. Several multi-plant companies have rationalized production

and closed inefficient facilities. On the other hand, a leading European PM parts maker recently announced the opening of a new greenfield plant in Ohio.

The industry will struggle with overcapacity for at least several more years. Despite this, many companies have learned to operate in a leaner way and have improved productivity with reduced workforces. Bottom lines have clearly strengthened.

### **MIM and HIP Trends**

Bucking the negative PM marketplace trend last year, the U.S. metal injection molding (MIM) business performed fairly well, supported by the growing firearms and medical markets. In a survey conducted by the Metal Injection Molding Association (MIMA), 77% of the responding companies expect increasing sales in 2010. The three most significant business challenges faced by the MIM industry are global competition, raw materials costs, and meeting customer requirements. The top manufacturing challenges are new material development, continuous improvement, and maintaining and improving quality.

The MIM business will continue growing by replacing complex CNC-machined parts and investment castings. The annual U.S. MIM market is estimated at \$170–\$200 million, about the same as in Europe. The current market in Asia, which includes Japan, Taiwan, Singapore, Korea, and China, is estimated at \$300 million. Europe's dominant MIM end-markets are automotive and high-end jewelry, while Asia focuses on electronics and consumer products. The total annual worldwide MIM market is estimated at \$640 to \$700 million.

The future of hot isostatic pressing (HIP) is bright, supported by growing sectors such as casting densification, MIM parts densification, aerospace and energy, near-net-shape powder parts, diffusion-bonded parts, cladding, and metal powder billets. New near-net PM applications in oil and gas exploration and land-based turbines are growth markets. HIPed PM tool steels, titanium, and more exotic alloys are growing as well, along with diffusion bonding for nuclear applications. For example, pilot projects involve diffusion bonding of the first wall of a reactor. In the electronics sector, sputtering targets made from metal powders represent the leading application. HIPed parts can range in size from tiny dental brackets to massive billets weighing more than 4,545 kg (10,000 lb.).

Recognizing the growing influence and importance of isostatic pressing technology, this past year MPIF formed its newest association, the Isostatic Pressing Association.

## **Technology Developments**

Our industry's future will undoubtedly depend on new technology. Metal powder producers, equipment makers, and PM parts and products makers are all busy investing in new materials and process improvements. We must never write off the creative resiliency of the PM industry to overcome obstacles.

Metal powder companies are studying new materials and processes to advance PM's dynamic properties and competitiveness. New materials include lean diffusion-bonded alloys for heat treating and new materials for warm compacting and sinter hardening. Equipment builders are developing new electronically controlled compacting presses, rapid-tooling-change systems and higher-temperature and higher-efficiency furnaces.

The MPIF Technical Board is assessing technology issues that will impact PM's future growth. Its' programs include single-press-to-full-density, an update on MIM trends, and evaluating the potential threats of competitive and disruptive technologies and processes. The Technical Board is also studying potential PM applications in green energy and power.

The Center for Powder Metallurgy Technology (CPMT) is conducting programs aimed at generating a path to higher density via new tooling concepts and higher-tonnage presses capable of compaction pressures above 827 MPa (60 tsi). Final densities of more than 7.45 g/cm<sup>3</sup> have been achieved on complex parts. The center is also developing data for establishing machinability guidelines and life-cycle-fatigue data. In all, CPMT is investing \$150,000 in programs in 2010. Recognizing the shortage of trained PM engineers, CPMT continues to provide annual scholarships through the Clayton Family Foundation and the Howard I. Sanderow endowment.

Educating design engineers and the end-user industrial public has always been a focus and steady theme woven into many MPIF programs. To this end, MPIF released a new 13-minute video, "PM Touches Your Life," illustrating why PM is the preferred metal-forming solution. The video has already attracted more than 1,200 viewings on YouTube.

Standards development is another important industry program. In 2009 MPIF published a new edition of Standard 35, *Materials Standards for PM Structural Parts*. We also published new editions of *Standard Test Methods for Metal Powders and Powder Metallurgy Products*, and Standard 35, *Materials Standards for PM Self-Lubricating Bearings*. The new information contained in these standards is vital in educating design engineers, purchasing agents, and other specifiers of materials. In addition, the Global PM Property Database continues to grow in content and serve global needs for information about PM products and materials.

With the launch of MPIF's sustainability initiative at the PowderMet2010 conference, PM's advantages as "a recognized green technology" are receiving prominent attention. More than a buzz word, PM's sustainable value comes from its net-shape capabilities and its very high materials-utilization advantage. We are an energy-efficient and green technology that must be promoted as such. We have a very positive message to tell.

Let us view 2010 as a transition year leading us to a new era of opportunity in the global marketplace. The industry has been challenged and shaken, yet the future is still positive. Again, never underestimate the creative resiliency of this industry to overcome and rise again to new heights. Competitive technologies that do, do so at their peril!