Welcome to the 16th EPMA Powder Metallurgy Summer School

Universidad Politécnica de Valencia
27 June – 1 July 2016
The 2016 PM Summer School Overview

50 Participants
- 17 from Academia
- 29 from Industry
- 4 from Research

13 Countries

24 Speakers
- 11 from Academia
- 6 from Industry
- 4 from Research
- 3 Consultants
Presentation of the European Powder Metallurgy Association

PM Summer School
27 June – 1 July 2016

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www.epma.com
Overview

- What is EPMA
- EPMA missions
- Conclusions
Who are the EPMA?

The European Powder Metallurgy Association (EPMA) is a non profit association formed in Brussels in 1989 with three key missions:

• Promote and Develop PM Technology in Europe
• Represent the European PM Industry within Europe and Internationally
• Develop the Future of PM

• EPMA is what its members want it to be
Membership of the EPMA

EPMA members: ca. 190 Corporate + ca. 120 Individual Members

By activity

- Part Maker: 38%
- Powder: 17%
- Equipment: 18%
- Raw materials: 10%
- R&D: 8%
- End User: 6%
- Consultant: 3%

By geographical area

- Germany: 24%
- Sweden: 9%
- UK: 8%
- USA: 8%
- France: 6%
- Italy: 6%
- Spain: 6%
- Switzerland: 5%
- Other (23): 28%
Membership Levels of the EPMA

**Full Membership for the European PM companies:**
4 Levels (with the same rights) depending on the PM sales

- Over 10 Mio € (Annual Membership fee: 3395 €)
- Between 3 and 10 Mio € (Annual Membership fee: 2080 €)
- Less than 3 Mio € (Annual Membership fee: 1350 €)
- Affiliate membership for subsidiaries of full members (800 €)

**Associate Membership** (annual Membership fees: 1695 €) for

- Non European PM companies
- R&D organisations
- End users

**Individual Memberships**: 200 €
PM Processes and Materials covered by the EPMA

**Metal Powders**
- Chemical processes
- Water atomization
- Gas atomization
- Plasma atomization
- Crushing/Milling
- Etc.

**Powder shaping & consolidation**
- Press & sinter
- Hard materials
- Metal Injection Moulding
- Hot Isostatic Pressing
- Additive Manufacturing
- Etc.

**Parts and Components (Examples)**
- Automotive Parts
- Cutting Tools
- Consumer goods
- Semi-finish products
- Ultra complex parts
- Etc.

Specifically designed equipment & machinery

EPMA Background, Missions and Structures
History of the PM "Growing Tree" as covered by the EPMA

New Needs (Projects, Lobbying, Networking etc…)

New Processes

New Sectors

New Materials

www.epma.com
Organisation Chart of the EPMA

1 elected President
1 elected Treasurer
Election every 3 years

General Assembly
- Meet 1/yr
- All Corp. Members

Executive Board
- 20 elected Repres. from PM Industry

Council

Secretariat
- 9 pers. permanent staff

Working Groups
- Environmental, Health & Quality
- Research Education & Training

Sectoral Groups
- Hard Materials (EHMG)
- MIM (EuroMIM)
- Structural Parts (ESPG)
- PM HIP (EPHG)
- R&D (PMRadnet)
- Additive Manufacturing

EPMA Projects
- Global Property PM Database
- Club Projects
- EU Projects
- Roadmap

Projects and Groups coordinated by the Secretariat with the (strong!) support of the Members

www.epma.com
Some figures…

2015 EPMA Budget: ca. €1,200,000 including:

- Euro PM conferences: €500,000 (up to €1,500,000)
- R&D Projects: €200,000
- Training events: €60,000

Etc…
EPMA Executive Board

www.epma.com/epma-council

**President**
Mr Philippe Gundermann (Eramet, France)

**Treasurer**
Mr Peter Kjeldsteen (Sintex A/S, Denmark)

**Vice President**
Dipl Ing Ingo Cremer (Cremer Thermoprozessanlagen GmbH, Germany)
Mr Guido Degen (GKN Sinter Metals, United Kingdom)
Mr Thomas Lambrecht (Dorst Technologies, Germany)
Dr Cèsar Molins (AMES SA, Spain)
Dr Harald Neubert (Miba Sinter GmbH, Germany)
Representing the Additive Manufacturing Sector
Mr Ralf Carlström (Höganäs AB, Sweden)

Representing the Applications Sector
Dr Steven Moseley (Hilti AG, Liechtenstein)

Representing the Hard Materials/refractory Metals Sector
Dr Lorenz Sigl (Plansee SE, Austria)

Representing the Hot Isostatic Pressing Sector
Mr Peter Selbach (Bodycote Hot Isostatic Pressing AB, Sweden)

Representing the Metal Injection Moulding Sector
Dr Bruno Vicenzi (Clayver srl, Italy)

Representing the Metal Powders Sector
Mr Michael Rehnig (Höganäs Sweden AB, Sweden)

Representing the Plant & Equipment Sector
Dipl Ing Ingo Cremer (Cremer-Thermoprozessanlagen GmbH, Germany)

Representing the PM Semis Sector
Mr Philippe Gundermann (Eramet, France)

Representing the PM Based Parts Sector
Dr César Molins (AMES SA, Spain)

General Representatives
Dr Pierre Blanchard (Erasteel Kloster, Sweden)
Mr Martin Blömacher (BASF AG, Germany)
Mr Guido Degen (GKN Sinter Metals, United Kingdom)
Mr Magnus Ekelund (Sandvik Coromant AB, Sweden)
Dr Ing Matteo Federici (Sacmi Imola SC, Italy)
Ms Vania Grandi (Rio Tinto, Germany)
Mr Peter Kjeldsteen (Sintex A/S, Denmark)
Mr Christoph Laumen (Linde Gases Division, Germany)
Mr Thomas Lambrecht (Dorst Technologies, Germany)
Dr Harald Neubert (Miba Sinter GmbH, Germany)
Mr Jim Shaul (Hoeganaes Corporation Europe, Germany)
+ Prof. Alberto Molinari (Univ Trento) as guest from PM Academia
Working and Sectoral Groups Chairmen

**Working Groups**

**Research Education and Training (RET)**
Prof José Torralba (UC3M) / Dr Pierre Blanchard (Erasteel)

**PM RADNET (Academic Network)**
Prof. Alberto Molinari (Univ. Trento)

**Sectoral Groups**

**European Structural Parts Group (ESPG)**
Dr César Molins (AMES) / Peter Kjeldsteen (Sintex)

**European Metal Injection Moulding Group (Euro MIM)**
Dr Frank Petzoldt (FhG IFAM) / Dr Bruno Vicenzi (Clayver)

**European Hard Materials Group (EHMG)**
Dr Steven Moseley (Hilti) / Dr Leo Prakash (UNIMERCO)

**European Powder Metallurgy HIP Group (EPHG)**
Dr Susan Davies (Bodycote Hot Isostatic Pressing AB) / Pr Christophe Broeckmann (RWTH)

**European Additive Manufacturing Group (EAMG):**
Claus Aumund-Kopp (FhG IFAM) / Ralf Carlström (Höganäs AB), Adeline Riou (Erasteel) / Keith Murray (Sandvik Osprey)
Vision 2025: What are our objectives?

• By 2025 PM is recognised as a resource-efficient industrial process
• PM is the preferred net shape metal forming process
• The European PM industry is recognised as the world leader in technology application and productivity leading to enhanced growth and profitability
• PM is seen as a source of constant innovation for European industry
Promoting and Developing PM Technology

- End User Seminars
- Spotlight on PM
- Design for PM e-learning Website
- Global PM Property Database
- Website and Guides for End Users
- Events

www.epma.com
EPMA - [http://www.epma.com](http://www.epma.com)

- Information about EPMA, Powder Metallurgy processes and case studies.
- Development of an e-commerce solution
- Developing subsections with application/registration forms for EPMA events/activates: General Assembly, WINTEREV, Benchmarking
- Creating the ‘Spotlight on PM’ case studies area showcasing PM products
- Expanding the Sectoral & Working groups section to include profiles of chairpersons and group information


Summer School Microsite - [http://summerschool.epma.com](http://summerschool.epma.com)

Thesis Competition Microsite - [http://thesiscompetition.epma.com](http://thesiscompetition.epma.com)

Seminar Microsite - [http://seminar.epma.com](http://seminar.epma.com)

Component Awards - [http://componentawards.epma.com](http://componentawards.epma.com)

Wall of fAMe - [http://walloffame.epma.com](http://walloffame.epma.com)

PM Database - [www.PMDBase.com](http://www.PMDBase.com)

E-learning - [www.designforpm.net](http://www.designforpm.net)
Promotional Events Schedule (e.g. 2015)

Attended 4 events:
• Develop 3DLive!
• Medtec UK
• MTC Centre
• Rapid 2015

Exhibited at 4 events:
• Advanced Engineering UK 2015
• Formnext
• GALM – Lightweight Vehicle Manufacturing: Joining, Forming & Assembly Summit
• Powdermet 2015
Developing the PM Future

- Congress and Exhibition
  - Euro PM / World PM
- Sectoral Groups
- Working Groups
- Education and Trainings
  - Summer Schools
  - Seminar
  - Workshops
  - Young Engineers Day
- Synergies
  - Industry funded R&D programmes
  - EU Programme
- Roadmapping
Euro PM Congress & Exhibition: Ensuring the Cohesion of the PM community

- 1 new Venue every year
- Ca. 1/2 Million Euros Budget
- **Congress**: 400-500 Delegates in 30-40 tech. sessions
- **Exhibition**: 70-100 Exhibiting Companies on c4000 m²
- The Euro PM 2014 attracts ca. 800 participants in total
- Every 6 years the EPMA has the responsibility of the **World PM Congress & Exhibition** settled in Europe: *Euro PM x3.*
- **World PM 2016** in Hamburg, Germany, October 9 - 13
- Every 2 years: world Congress EU – Asia – US
World PM2016 Congress & Exhibition

Back in Europe after 6 years!

- 9-13 October 2016, Hamburg, Germany
- Up to 1,500 Participants expected
- 70 technical sessions featuring:
  - Additive Manufacturing
  - Core PM
  - Hard Materials and Diamond Tools
  - Hot Isostatic Pressing
  - New Materials and Applications
  - Powder Injection Moulding
  - PM Structural Parts
  - Over 450 Technical Papers
  - 5 Special Interest Seminars
  - 8 Sectoral Group Meetings

More at [www.worldpm2016.com](http://www.worldpm2016.com)
Plenary speaker

• Dr. Oliver Schauerte (head of material development at VW) on Current And Future Application Of Powder Metallurgical Materials In The Automotive Industry
• Dipl. –Ing Roland Käppner, (head of Business Development & Sales, Thyssen Krupp Industrial AG) on Hydrogen - A New Vector For Our Future Energy System

Specific Interest Seminars

• Global Progress of Metal Additive Manufacturing
• 90 Years of Cemented Carbides – Past, Present and Future
• A Global View on Metal Injection Moulding: Case Studies from Asia, Europe and North America
• New Trends in the Automotive Drivetrain and Powertrain and their Impact on the Future of Powder Metallurgy Applications
• Global Trends in HIP Technology for PM
EPMA Powder Metallurgy Component Awards 2016
componentawards.epma.com

Open to EPMA members
For major achievements in successful commercialisation or innovation of a product

4 categories:
  – Additive Manufacturing
  – Hot Isostatic Pressing
  – Metal Injection Moulding
  – PM Structural

Image courtesy of AMES
PM Thesis Competition

- Operated on a biennial basis
- Designed to stimulate and encourage young researchers
- Open to any students studying within the EU

Aim of the competition

- Develop interest in and promote powder metallurgy
- Encourage research

Offers to the winners

- Financial prizes
- Opportunity to present their work to the EPMA conference
- Be published in “Powder Metallurgy”
- Receive a plaque from the EPMA President

epma.com/epma-thesis-competition

www.epma.com
# The 5 EPMA Sectoral Groups + PM RADNET

<table>
<thead>
<tr>
<th>Technology</th>
<th>Group name</th>
<th>Date of creation</th>
<th>Number of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Press &amp; sinter</td>
<td>ESPG European Structural Parts Group</td>
<td>1989</td>
<td>130</td>
</tr>
<tr>
<td>MIM</td>
<td>EuroMIM Group European MIM Group</td>
<td>2001</td>
<td>76</td>
</tr>
<tr>
<td>HIP</td>
<td>EPHG European PM HIP Group</td>
<td>2009</td>
<td>41</td>
</tr>
<tr>
<td>EAMG (Additive Manufacturing)</td>
<td>EAMG European Additive Manufacturing Group</td>
<td>2013</td>
<td>50</td>
</tr>
<tr>
<td>PM RADNET</td>
<td>Research &amp; Development Network (PMRADNET)</td>
<td>2005</td>
<td>16</td>
</tr>
</tbody>
</table>
EPMA Sectoral Groups

5 Sectoral groups:

- 9 Open and special group meetings
- 5 Trends and Benchmarking surveys
- 1 Statistics report
- 2 New Brochures on MIM and HIP
- 1 New flyer on Additive Manufacturing
Education and Training Activities

EPMA PM Summer Schools
• 2015 Sheffield (52 Students & 21 Lecturers)
• 2016 Valencia

EPMA Seminar
• 2015: MIM – 15-17 April, Barcelona (33 part. / 16 lect.)
• 2016: Additive Manufacturing 13-15 April, Bremen (49 part.)

EHMG Hardmaterials Workshops
• 2015 -2016: Superhard Materials & Superabrasives Properties and Characterisation in Didcot, UK (43 participants) and Hilti, LI (June)

Young Engineers’ Event: During Euro PM and World PM

EPMA Website: What is PM / Design for PM

www.epma.com
Synergies Activities: EPMA Club Projects

Industry defined projects open to EPMA members and coordinated by the EPMA

- Budget: Between €10k and €100k
- Time frame: Between 6 and 18 months
- 16 Projects so far: [www.epma.com/projects](http://www.epma.com/projects)
- €600k collected in total
See epma.com/projects

New Projects/On-Going Projects/Project Proposals

<table>
<thead>
<tr>
<th>Topic</th>
<th>Sectoral Group</th>
<th>Contractors</th>
<th>Status</th>
<th>Overall Budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toughness of PM HIP Steel - Stage 2 (88.03 kN)</td>
<td>EPHG</td>
<td>IMM RWTH, Aachen (Christoph Broeckmann)</td>
<td>on-going (Start Sept 2014)</td>
<td>€45,000</td>
</tr>
<tr>
<td>Simulation of Fatigue Crack Growth in Hardmetals at a Mesoscopic Scale Project Phase II (342.35 kN)</td>
<td>EHMG</td>
<td>IMM RWTH, Aachen, CIEFMA UPC Barcelona, NPL London</td>
<td>on-going (Start June 2013)</td>
<td>€52,723</td>
</tr>
<tr>
<td>Ultrasonic Fatigue Testing of Hardmetals in the Eutectic Stage 2a (630.81 kN)</td>
<td>EHMG</td>
<td>TNO, Uni. Vienna, NPL London, CIEIT Sant Sebastian, CIEFMA UPC Barcelona</td>
<td>on-going (Start March 2014)</td>
<td>€40,852</td>
</tr>
<tr>
<td>Anemometry of Dimensional Change on Sintering of Uniaxially Cold Compacted Parts (424.91 kN)</td>
<td>ESGP</td>
<td>Univ. Trento</td>
<td>Proposal</td>
<td>€42,138</td>
</tr>
<tr>
<td>Correlation Study of Mechanical Properties/Microstructure/Fracture Behaviour of Industrial Parts and Standardized Tensile Specimens (345.18 kN)</td>
<td>ESGP</td>
<td>INDEA, Madrid</td>
<td>Start June 2015</td>
<td>€40,000</td>
</tr>
<tr>
<td>Kinetic simulations in Hardmetals - Evaluation of Mobilities by Coupling Experiments and Simulations (606.95 kN)</td>
<td>EHMG</td>
<td>Sverker KIMAB and the KTH Royal Institute of Technology</td>
<td>Start Jan 2015</td>
<td>€11,300</td>
</tr>
<tr>
<td>Harmonization of Safety Data Sheet (355.49 kN)</td>
<td>ESGP</td>
<td>Powder Metallurgy Solution</td>
<td>Start Feb 2016</td>
<td>€13,200</td>
</tr>
</tbody>
</table>
Synergies Activities: Eu Funded Projects

Dissemination / Exploitation support:

- 2011: DIRA-GREEN
- 2013: EFFIPRO
- 2016: AM-Motion (November)

Support/Participation to/in Member’s Proposals:

- Horizon 2020
- Marie Curie Initial Training Network
- EURAMET
- Knowledge Innovation Community (KIC)
- Etc..

www.epma.com
Involvement of the EPMA in EU funded Projects

Role of EPMA

• "Calls Watch" (Participation to EU meetings, Information to the Members)
• Consortium formation facilitator (for Members)
• Dissemination / Exploitation support to the Project’s Proposal through our dissemination events (c€800k).

“Involvement of EPMA in dissemination/exploitation is noted and would be an asset”

“EPMA has some experience with the organization of dissemination events and the attendance rate is very high”

“EPMA will ensure a broad dissemination of the project outcomes by using its established network and website.”
Representing

- An equal partner as a regional association
- Links to European level
- Inputs and support for members on legislative issues
EPMA Lobbying Activities

The Lobbying Activities cover the Environmental, Health & Safety, the Energy and Climate Change and the Research and Development areas at an European level.

- The EPMA lobbying activities intend to fulfil the key mission(s) of the EPMA that are to Represent, Promote, Develop (and sometime Defend) the European PM Industry outside the PM community.

- Therefore we have joined other Associations to rely on their Expertise and Network.
EPMA Lobbying Membership Overview

Environmental, Health & Safety (since 2005)

Energy & Climate Change (since 2014)

Research & Development Programmes (since 2014)
Other Lobbying Activities

- **New Version of the EPMA "Vision 2025 Future Developments for the European PM Industry" Roadmap**: Useful tool for external communication

- **Developing new Standards**: The EPMA liaises between the ISO committee and the PM community
Summary and Conclusions

- European PM community: small but strong because united at the European level.
- EPMA: efficient tool to achieve cohesion, synergy, visibility and permanence of PM.
- Efficiency due to the large involvement of the PM community in EPMA activities...

PM has a great development potential as it is:

- Lean
- Sustainable
- Cost-efficient
- Innovative
- Fast

We need each of you to help all of us to enforce the Future of PM!

www.epma.com
THE EPMA WISHES YOU ALL A SUCCESSFUL
PM SUMMER SCHOOL 2016!

THANK YOU!
In order to improve future Summer Schools, we would greatly appreciate your feedback.

If you would like to participate in the Summer School Survey, please go to:

bit.ly/1Ye9LJv