WORLD FOUNDRY ORGANIZATION

The reference point for the global metal casting industry

WFO
WORKING GROUPS REPORT
2026

Activity during 2025 and plans for 2026



Documentation for the WFO Stakeholders

March 2026

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1 Introduction

The WFO is a neutral body that represents the collective needs of the members on a global stage. Through the involvement of its member associations from 30 different countries, the WFO creates a network of technical knowledge and resources that is a vital tool to every foundry association, foundry and foundry worker throughout the world.

One of the main purposes of the organization is to promote the development of the casting industry and to coordinate different working frames that allow the exchange of technical knowledge, best in class experiences and advanced materials, process and technological developments.

Among these frameworks, an important number of commissions have been active during many years. A solid historical background that has generated outstanding international and collaborative efforts, with a series of reports and published work available in the WFO bookshop and records.

From 2013 on, the World Foundry Organization took the decision to set an ongoing and clear new strategy for these groups, driven by the following main guidelines:

- The WFO shall continue promoting and supporting active working frames, either guided by a general interest (common challenges for the global casting industry) or by specific demands, focused on any matter of interest linked to the foundry industry.

- No fixed structures shall be established, but dynamic and active/collaborative initiatives designated as “WORKING GROUPS”, flexible in their working dynamics and open to regional, international or global participation.

- Official request shall be done to the WFO to define and to set ongoing a new WORKING GROUP providing the following basic information:

    - ✓ Name of the Working Group.
    - ✓ Chairman and working members (updated on yearly basis).
    - ✓ Main objectives of the Working Group.
    - ✓ Working Plan proposal (updated/reviewed on yearly basis).
    - ✓ Yearly reporting of the results (value added contents to be shared among all WFO Members).

- According to this proposal and working plan, the WFO shall give the official approval and make a yearly follow up and evaluation of the activity from all WORKING GROUPS.

- The WFO will provide the corresponding backup support to all WORKING GROUPS (space in the WFO web site, information and promotion of their activities, delivery of the results, …. etc).

- A yearly reporting from each official WORKING GROUP shall be done to the World Foundry Organization, providing the corresponding documents as well, proceedings or value added contents that shall be shared further on with all the WFO Member Associations.

- Follow up report will be presented in every WFO General Assembly meeting by the Secretariat.

- Finished, inactive or non-reporting initiatives shall be closed down after the yearly review (there is no sense in maintaining inactive proposals) and they shall be considered as flexible proposals, opened to be reactivated if needed.

Updated information about the WORKING GROUPS is available on the WFO website:

http://www.thewfo.com/working-groups/

2 List of Working Groups and contacts

WFO Working Group	Contact
Cast Metal Matrix Composites Chaired by Prof. Natalia Sobczak	Prof. Natalia Sobczak Institute of Metallurgy and Materials Science Polish Academy of Sciences 25 W. Reymonta Street, Krakow, POLAND
Die Casting Chaired by Mr. Liming Peng	Mr. Liming Peng School of Mater. Sci. Eng., Shanghai JiaoTong University P.R.China
Ferrous Materials Chaired by Dr. Li Yanxiang	Dr. Li Yanxiang Tsinghua University Beijing 100084 P. R. CHINA
Foundry Industry Clusters Chaired by Mr. GAO Wei	Mr. GAO Wei CFA Ms. YOU Yang CFA Mr. CAO Linfeng CFA
Management of Foundry Associations Chaired Ing. Vladimír Krutiš, Ph.D.	Ing. Vladimír Krutiš, Ph.D. Faculty of Mechanical Engineering Brno University of Technology Czech Republic
Minimising the Impact of Spent Foundry Sand Chaired by Lee Jenkins	Lee Jenkins Weir Minerals UK
Moulding Materials Chaired by Mr. Lou Yanchun	Mr. Lou Yanchun CAM - China Academy of Machinery Science and Technology Group Co., Ltd. Beijing, China
Non-Ferrous Alloys Chaired by Prof. Yanqing Su	Mr. Su Yanqing Harbin Institute of Technology Harbin City, P. R. CHINA
Training and Professional Development Chair to be renewed	

Should you need any contact with the WFO working groups, please contact with Mr. José-Javier González jjgonzalez@thewfo.com

3 Reports from Working Groups

3.1 Die Casting

January 2026

3.1.1. Brief description of the objectives of the Working Group

The **Die Casting working group** is aimed to promote global technical exchanges on die casting industry; to organize technical conference on die casting periodically by which establish a platform for exchanging and cooperation and enhance the global industrial influences of WFO.

3.1.2. Leader and participants

	Name	Organization	Country
Chairing	Peng Liming	Shanghai JiaoTong University	China
Secretary	Bao Linlin	Foundry Institution of Chinese Mechanical Engineering Society	China
Working member 1	Zhang Xiaoyan	Ningbo Die & Mould Industry Association	China
Working member 2	Fang Jianru	D Dalian Yaming	China
Working member 3	Er Eng Kiat	AGS	Malaysia
Working member 4	Gary Arthur Hughes	NIO	England
Working member 5	Mathias Manser	Bühler Die Casting	Switzerland
Working member 6	Mike Luu	Vietnam Foundry Association	Vietnam
Working member 7	Rungkamchorn Wannasai	Kinzoku Precision Company	Thailand
Working member 8	Emonts Manfred Claude Jean	Manfred Automation (China) Co.,Ltd	Germany
Working member 9	Steffen Dekoj	Georg Fischer Automotive (Suzhou) Co Ltd., China	Germany
Working member 10	Moritz Rudolf Martin Weidt	MAGMA Engineering (Suzhou) Ltd.	Germany
Working member 11	Ingo Kraus	BMW China Service Ltd.	Germany

	Name	Organization	Country
Working member 12	Makoto Yoshida	Waseda University	Japan
Working member 13	Toru Komazaki	Ryobi Limited	Japan

3.1.3. Main activities and outcomes of the Group during 2025

Hosted the 20th China Die Casting Congress, on March 26-28, 2025, in Nanjing, China.

The event was sponsored by the WFO Die Casting Commission, China Foundry Productivity Promotion Center, and organized by FICMES.

In the two-day event, focusing on the theme "ONE WORLD, ONE DIECASTING", 46 speakers and experts were invited to share their research results and latest technologies about new materials, processes, equipment, products, etc. onsite with audience by giving speeches or panel discussion. 33 enterprises displayed their specific high-quality products and new achievements. FAW Foundry, Brembo, Nemak, Baowu, GF, etc.,. displayed 14 excellent castings onsite. There were 701 delegates participated in the congress.



The topics of the presentations and name of speakers and experts are as follows:

Plenary Session

1. Influence of Processing Technology on Microstructure and Mechanical Properties of High Pressure Die Castings
   Xiong Shoumei, Vice President, FICMES; Professor, Tsinghua University

2. State of the North American Die Casting Industry
   Dr. Steve Midson, Research Professor, Colorado School of Mines

3. Mechanism and Prevention Measures of Aluminum Alloy Soldering in Die Casting Process
   Han Qingyou, Chief Professor, School of Mechanical Engineering, Southeast University

4. Recent Advancements in Magnesium Alloy Materials and Thixomolding Technology
   Dr. Gu Lidong, Research Assistant, Shanghai Jiao Tong University

5. Characteristics of Cast Aluminum Alloys for Structural Components
   Dr. Stuart Wiesner, Head of R&D, Aluminium Rheinfelden Alloys GmbH

Main Venue: Technical Session

6. Research Applications and Development Trends of Aluminum Alloy Pressure Die Casting
   Zhao Haidong, Professor, South China University of Technology

7. Enabling Lightweighting Designs by Detailed Description of Cast-Material-Properties
   Dr. Andreas Hennings, Product Development Director Europe & Asia, Nemak Europe GmbH

8. New Magnesium Alloy Semi-Solid Thixoforming Technology-TPI and Its Technical Advantages
   Dr. Awen, Tech Center/Associate Researcher, LK GROUP

9. Impact of Additive Manufacturing Parameters on Mechanical Properties of Maraging Steels
   Shueiwan H. Juang, Professor, National Taiwan Ocean University

10. Sustainable Megacasting Production for Body-inwhite
    Dr. Lu Hongyuan, General Consultant & Sale/Professor, Bühler (China) Machinery Manufacturing Co., Ltd.

11. Research on the Solid Liquid Composite Forming and Interface Control of Iron-Aluminum/Aluminum-Aluminum Bimetallic Materials Based on High Pressure Die Casting Process
    Wu Mengwu, Professor, School of Automotive Engineering, Wuhan University of Technology

12. Application of 2-platen Die Casting Machine on One-out-two Shock Towers
    Han Tao, Two-Plate Die-Casting Machine PM, Yizumi Holdings Co., Ltd.

13. Thai Die-Casting at a Crossroads: Opportunities and Obstacles in a Global Market

Chaowalit Limmaneevichitr, Vice President/Associate Professor, King Mongkut's University of Technology Thonburi

14. Interpretation of "High-Quality Die Casting Mold Steel and Heat Treatment Technical Specifications" and Quality Responsibility Identification
    Feng Yingyu, Professor, Northeastern University Wuxi Research Academy

15. Natural Ageing Behavior and Intelligent Prediction of Mechanical Properties of Heat Treatment-free Al Alloys for Integrated Die Casting
    Dong Xixi, Laboratory Director/Professor, Nanjing University of Aeronautics and Astronautics

16. Mastering the Technological Characteristics of Die Casting Machines to Enhance OEE
    Matt Yang, Die Casting Process Application Manager/Senior Engineer, Italpresse Industrie (Shanghai) Co., Ltd.

17. Advanced Development Technologies: Engineering Interior and Chassis Solutions for Next-Gen Vehicles
    Dominik Mahnig, Head of Product Development, GF Casting Solutions

18. Research and Application of BIW Megacasting
    Shi Zhaoliang, Chief Engineer, Dongfeng Motor Corporation Research & Development Institute

19. Diecasting One-body CNC Machining Siemens Solution
    Danial, E-Car Manager, Siemens China Co., Ltd.

Sub Forum: Magnesium Alloy Die Casting

20. EV Magnesium Alloy Motor Housing’s Development, Application & Issues
    Dr. Mao Mingzhi, ATC Director Meridian/Professorate Senior Engineer, Meridian Lightweight Technologies Ltd.

21. Complicated & Precise New Energy Car Product Injection with Magnesium Alloy Thixomolding
    Li Zhigang, Senior Engineer, FAW Foundry Co.,Ltd.

22. High Performance Magnesium Alloy Products Empowers Lightweight Manufacturing Industry
    Dr. Wang Zhuo, Staff Researcher, BAOWU Magnesium

23. Exploration into the Development and Application of Large Thixomolding Magnesium Machine

Ge Qiwei, Director of the Magnesium Alloy Product, Ningbo Free Trade Zone Haitian Zhisheng Metal Forming Equipment Co., Ltd.

24. Development of Large-sized Magnesium Components by Semi-Solid Moulding Technology
    Chen Shanrong, CTO/Professorate Senior Engineer, Ka Shui Group

25. Secure Connection · Efficient Changeover: Quick-Change Solution for Magnesium Alloy Die Casting Molds
    Wang Lei, General Industry SME, STAUBLI(Hangzhou) Mechatronic Co., Ltd.

    Research on Joining Technology of Die Casting Light Alloy for Automotive Lightweight
    Dr. Chen Juan, Associate Professor, Shanghai Jiao Tong University

26. The Design and Development of the First Mg Alloy Cases for Electrical Drive System in SAIC
    Chen Anhong, Case Design & Development Engineer/Senior Engineer, SAIC Motor R&D Innovation Headquarters (SRIH)

Sub Forum: Mega-casting Solution

27. Planning Process and Steps for Large Integrated Die Casting Plant
    Mira, Die-Casting Process Planning/Senior Engineer, Zhejiang ZEEKR Automobile Research and Development Co., Ltd.

28. Silicone Mold Release Agent Solutions for Megacasting
    Liu Yelei, Senior Technical Manager, Wacker Chemicals (China) Co., Ltd.

29. Current Status and Future Development of Giga Die Casting
    Jason Song, Casting Process Manager, Chenzhi Technology Co., Ltd.

30. Research and Application of Abrasion and Corrosion Resistant Equipment Materials
    Kui Wong, Associate Professor, Shanghai Jiao Tong University

Sub Forum: Zinc Alloy Die Casting

31. Interpretation of National Standard GB/T 13818-2024 "Die Casting Zinc Alloys"
    Dr. Chen Jiangbiao, Senior Engineer, Suzhou Xiangguan Alloy Rresearch Insititute

32. The Precision Zinc Alloy Diecasting Now and Future
    Howard Chiou, General Manager, Dynaplus Incorporated

33. Growth and Developments in Indian Zinc Die Casting Industry
    Dr. Rahul Sharma, Director, International Zinc Association (India)

34. Optimization, Cost Cutting and Smart Upgrade of Zinc Alloy Products via High-Speed Die Casting Machines without Nozzles
    Li Canming, General Manager, Guangdong Huazhu Casting Mould Science and Technology Co., Ltd.

New Product/Technology Release

35. Design and Development of the Robot Part of Magnesium Alloy Semi-Solid based on MAGMASOFT Simulation Analysis
    Jack Liu, Operations Manager, MAGMA Engineering (Suzhou) Co., Ltd. Ningbo Branch

36. Research and Exploration of the New Generation of Intelligent Guidance Technology for Deburring and Grinding
    Dr. Carry, CEO, Shenzhen Moreway Technology Co., Ltd.

37. Smart Manufacturing Upgrade, Dual-layer Empowerment - The Innovation Path of Dual-layer Aluminum Alloy Heat Treatment Furnace
    Wang Tiechen, Senior Sales Manager, Tianjin Ares Industrial Furnace Co., Ltd.

Theme workshops - panel discussion

Decoding Dual Carbon Compliance, Embarking on a Green

Panel Discussants:

38. Li Chengxi, Product Carbon Footprint Manager, SGS-CSTC Standards Technical Services Co.. Ltd.
39. Zhen Junjie, Energy Manager, IKD Company Co., Ltd.
40. Liu Yunxiang, Senior Consultant, Ningbo Jiwang Information Technology Co., Ltd.
41. Fu Gang, Dual Carbon Business Director, Phoenix Contact China Corporation

Offline Trial Training Session for Die-casting Technicians

Experts:

42. Liu Zunjian, Chief Engineer, Suzhou Union Precision Metal Products Co., Ltd.
43. Dong Xianming, Expert, Foundry Institution of Chinese Mechanical Engineering Society
44. Liu Zhentan, Executive Vice President, Dalian Yaming Auto Parts Co., Ltd.
45. Zhang Xiaoyan, Chairman, Ningbo Daxie Development, Zone Tianzheng Mold Co., Ltd.

3.1.4. Planning for 2026 and expected final outcome

1. Hold the rotation of the WFO Die Casting Commission in 2026.

2. Host the 21st China Die Casting Congress on March 25-27, 2026 in Wuhan, China.

As global manufacturing accelerates its green transition and pushes for lightweighting, Magnesium and Aluminium have become key materials in sectors like new energy vehicles, aerospace, and 3C electronics. Aluminium die-casting, with its mature technology, continues to expand into new applications such as auto body structures and battery housings, showing steady growth. Magnesium die-casting, with even greater lightweight potential and emerging process innovations, is rising rapidly, though challenges in corrosion and creep resistance remain. Currently, the global die-casting landscape is characterized by "steady Aluminium and advancing Magnesium". With increasingly close collaboration in the international industrial chains, technological innovation and market application are mutually reinforcing, presenting the industry with unprecedented opportunities and challenges.

In 2026, the China Die Casting Congress, under the theme of "Al & Mg, Casting a Lighter Future" will gather global industry leaders to shape the lightweight future together.

3.2 Ferrous Materials

February 2026

3.2.1. Brief description of the objectives of the Working Group

The **Ferrous Materials working group** is aimed to promote global technical exchanges on ferrous materials of foundry industry; To organize technical conference periodically by which establish a platform for international exchanging and cooperation, and therefore enhance the global industrial influences of WFO.

3.2.2. Leader and participants

	Name	Organization	Country
Chairing	Mr.Li Yanxiang	Tsinghua University	P.R.China
Vice-Chairing	Mr. Chen Xiang	Tsinghua University	P.R.China
Vice-Chairing	Mr. Wei Shizhong	Henan University of Science and Technology	P.R.China
Working member 1	Mr. Li Kerui	Zhengzhou Research Institute of Mechanical Engineering	P.R.China
Working member 2	Mr. Zai Qijie	Shanghai University	P.R.China
Working member 3	Mr. Li Wei	Jinan University	P.R.China
Working member 4	Mr. Liu Zhongli	Yantai University	P.R.China
Working member 5	Mr. Dong Hongbiao	University of Leicester	UK
Working member 6	Mr. Lacaze, Jacques	Université de Toulouse	France
Working member 7	Mr. Yang Yunfeng	Foshan Fenghe PSF Technology Limited	Finland
Working member 8	Mr. Adel Nofal		Egypt
Working member 9	Mr. Marcin Górny	AGH University of Krakow	Poland
Working member 10	Mr. Mitja Petrič	University of Ljubljana, Faculty of Natural Sciences and Engineering	Slovenia
Working member 11	Mr. Longyun PIAO	Nippon Crucible Co., LTD	Japan
Secretary	Ms. Liu Xiuling	Foundry Institution of Chinese Mechanical Engineering Society	P.R.China

3.2.3. Main activities and outcomes of the Group during 2025

The 2025 International Forum on Ferrous Materials and Casting Technologies was successfully held in Xian!



From Oct. 26–28, 2025, the " The 2025 International Forum on Ferrous Materials and Casting Technologies " took place successfully in Xian . Organized by the Ferrous Alloys Committee of the World Foundry Organization (WFO) and the Productivity Promotion Center for Foundry Industry, and co-organized by the Foundry Institution of China Mechanical Engineering Society, Shenyang Research Institute of Foundry Co., Ltd., China Academy of Machinery Science & Technology Group, and the State Key Laboratory of Advanced Casting Technologies for High-End Equipment, the forum was held concurrently with the 17th Asan Foundry Congress.



Titles of reports are as follows:

1. Possible Trends of ESR Development
   Lev Medovar, Ukraine, Chief Foreign Scientist, China First Heavy Industry

2. Forming Process Control and Application of High-performance Wear-resistant Materials
   Wei Shizhong, President, Zhengzhou University of Light Industry, China

3. Erosion Property of WC Reinforced Spheroidal Carbides Cast Irons
   Kazumichi Shimizu, President/Professor/Former President, National Institute of Technology Hakodate College/Japan Foundry Engineering Society, Japan

4. Research and Application of Ceramic Particle Reinforced Steel Matrix Spatial Configuration Casting Composite Materials
   Jiang Yehua, Director, Kunming University of Science and Technology, China

5. Optimization Design and Application of Steel Wear- resistant Materials under Different Working Conditions
   Li Zulai, Vice President, Kunming University of Science and Technology, China

6. Regulation of Microstructural and Properties in Heavy Section Pearlitic Ductile Iron
   Qu Yingdong, Vice President, Shenyang Aerospace University, China

7. Research Progress and Development Trends in Foundry Coatings

Song Huizong, Deputy Technical Director/ Research Fellow, Suzhou Xingye Material Technology Co., Ltd., China

8. Casting Process Research and Production of Ultra-long, Ultra-deep, and Thick QT600-3 Column Castings
   Pan Mi, Director of Smelting Process, State Key Laboratory of Material Forming and Mold Technology, Huazhong University of Science and Technology/Wuhan Heavy Duty Machine Tool Group Corporation,China Ordnance Industry Group Co., Ltd., China

9. Intelligent Design of Sustainable Ductile Iron and Its Casting Process Based on Deep Active Learning
   Yang Chao , Assistant to Dean, Shanghai Jiao Tong University, China\

10. Influence of Rare Earth Metals on the Phase Precipitation and Modification of Non-metallic Inclusion in Low Alloy Steel
    To Duy Phuong, Professor, Vietnam Academy of Science and Technology, Vietnam

11. Study on the Microstructure and Properties of Fe-Cr-B White Cast Iron
    Liu Zhongli, Dean, College of Nuclear Equipment and Nuclear Engineering/Professor, Yantai University, China

12. Fabrication of Ductile Iron with High Manganese
    Tran Duc Huy, Associate Professor, Hanoi University of Science and Technology, Vietnam

13. Development of Hundred-ton-grade Ultra-low Carbon Martensitic Stainless Steel Castings
    Su Zhidong, General Manager of Steel Casting Division, Tongyu Heavy Industry Co., Ltd. , China

14. Alloy Design and Engineering Application of ZGMn13 Steel in Heavy-haul Railway Frogs
    Sun Junjie, Professor, Xi'an Jiaotong University, China

15. Research on Abrasion-corrosion Damage of Cast Wear-resistant Steel and the Micro-alloying Modification
    Zheng Zhibin, Deputy Director/Professor-level Senior Engineer, Institute of New Materials, Guangdong Academy of Sciences, China

16. Performance Evaluation and Service Safety of Heat-resistant Steels for Large Energy Equipment

Wang Yu, Director, Shaanxi Institute of Special Equipment Inspection and Testing, China

17. Research Progress of Wear and Corrosion Resistant High-boron Iron-based Alloys
    Ma Shengqiang, Assistant to Dean/Professor, Xi'an Jiaotong University, China

18. Production and Research for Silicon Solid Solution Strengthened Ductile Iron Castings
    Mu Xinghui, Vice DTRD, Foundry Branch Company of QCMT&T, China

3.2.4. Planning for 2026 and expected final outcome

Ferrous Metals Technical Committee holds the International Forum on Ferrous Materials and Casting Technologies every two years, with the next forum scheduled for 2027. In 2026, the committee's primary focus will be on organizing this event, including finalizing the venue and theme, inviting speakers, and conducting preliminary promotion.

3.3 Foundry Industry Clusters

October 2025

3.4.1. Brief description of the objectives of the Working Group

The **Foundry Industry Clusters Working Group** is aimed to promote regional economic growth and improve the overall competitiveness of the region; through effective cooperation among enterprises, it gives play to the role of resource sharing, increases the innovation capacity of enterprises, and produces a regional effect that promotes the growth of economic benefits.

The purpose of setting up this working group is to regulate and guide the scientific planning and healthy development of foundry clusters, to further optimize the environment for industrial agglomeration, to improve the level of professional collaboration, to enhance the ability of independent innovation, to strengthen the industry resource conservation and environmental friendliness, to enhance the awareness of public services, to strengthen the construction of a variety of service platforms, to gather more market competitiveness, so as to promote the development of foundry industry.

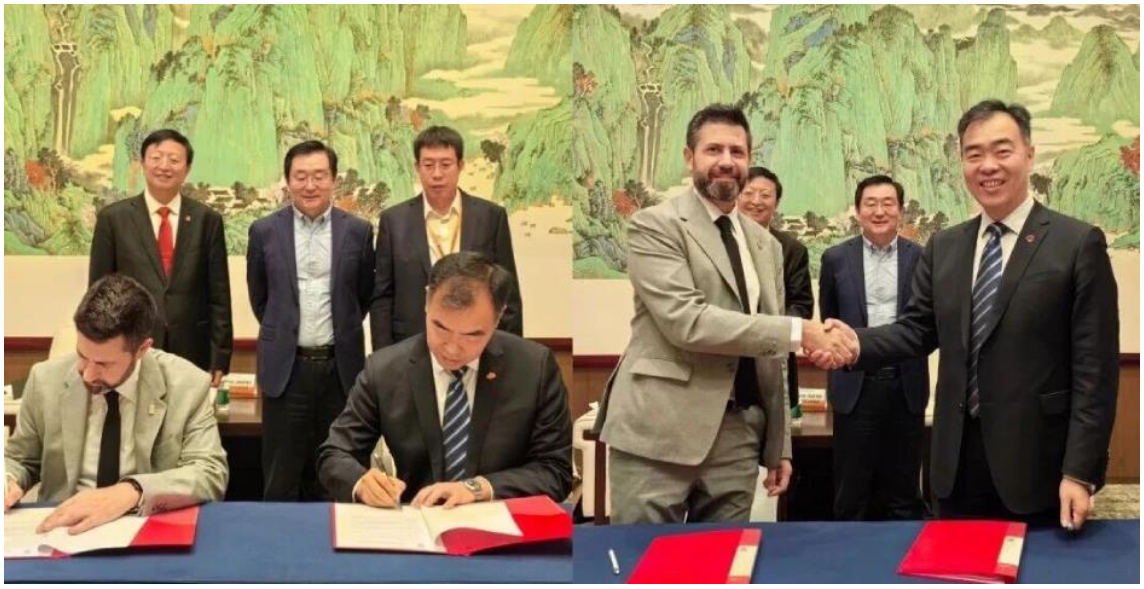
Initial Scope: 3-9 people

3.4.2. Leader and participants

	Name	Country
Director	Prof. LOU Yanchun	P.R. China
Standing vice director	President, Prof. ZHANG Libo	P.R. China
Working member 1	ZHAO Jun	P.R. China
Working member 2	Chief Economist Ma Hongru	P.R. China
Working member 3		P.R. China
Working member 4		India
Working member 5		Japan
Working member 7		Spain

3.4.3. Main activities and outcomes of the Group during 2025

The creation of the working group was agreed and the agreement signed in Xi'an.



3.4.4. Planning for 2026 and expected final outcome

Initial draft of possible activities and outcomes of the group (starting date, target completion date, draft plan of tasks and actions, expected results…):

1. To identify terms, scope of work, development situation and basic elements of foundry industry clusters;

2. To investigate the current situation and problems of foundry industry clusters in various countries, and put forward measures and suggestions;

3. To summarize the experience, achievements, existing problems and development suggestions of China's foundry industry clusters with a history of 40 years;

4. To organizing Working Group Meeting during the WFO conference.

5. To make Standard of Foundry Industry Clusters

Resources needed

CFA will recommend experts to participate in the working group from members of both BRICS Foundry Association and Asia Foundry Association, who may not be WFO members, in this case will need to coordinate with WFO.

3.4 Management of Foundry Associations

February 2026

3.4.1. Brief description of the objectives of the Working Group

The **Management of Foundry Associations Working Group** is aimed to share expertise and best practices in management among national foundry associations. While some national associations have achieved a high level of management excellence, others face challenges in certain related areas. Adopting best practices can significantly raise standards and improve the overall performance of WFO Associations.

The purpose of this working group is to help associations enhance their performance by identifying and developing best practices and by enabling the sharing of information and experience among members through:

- Identifying key aspects of management excellence.
- Enabling associations to structure discussions around these aspects.
- Developing deliverables for WFO Associations, such as white papers and other documentation.

3.4.2. Leader and participants

	Name	Country
Chairing	Vladimír Krutiš	Czech Republic
Working member 1	Ion-Alexandru Bacanu	Romania
Working member 2	Mirjam Jan-Blažić	Slovenia
Working member 3	Drago Brence	Slovenia
Working member 4	Lionel Alves	France
Working member 5	Carsten Kuhlgatz	Germany
Working member 6	Katarzyna Liszka	Poland
Working member 7	Sandy Majatladi	South Africa
Working member 8	José Javier González	Spain
Working member 9	Tuncag Sen	Turkey
Working member 10	S.Koray Hatipoglu	Turkey
Working member 11	Doug Kurkul	USA

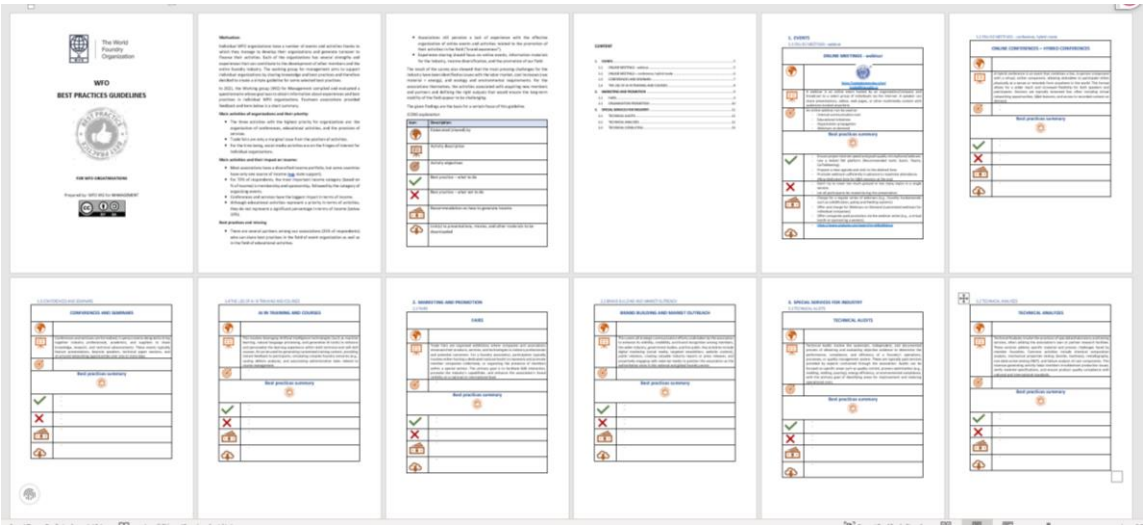
3.4.3. Main activities and outcomes of the Group during 2025

In the previous report, it was stated that the group leader, Ing. Krutiš, would try to hand over the management of the group to another member due to his workload.

Unfortunately, it was not possible to find anyone willing to take over this role. Therefore, the working group leader, Ing. Krutiš, continues to lead the group for the time being.

At the end of 2025, a revised version of the template for the best practice guideline was prepared. This version was subsequently sent to the working group's individual members, with a request for their input and contributions. The feedback was expected to be provided by the end of January 2026.

Unfortunately, apart from Ion Bacanu, who forwarded the email to his colleagues, no responses or contributions were received from any other members. Therefore, a reminder will be sent again so that the BP guideline can be completed in 2026.



3.4.4. Planning for 2026 and expected final outcome

The following activities are planned for 2026:

- In February, send a reminder to all members and, if necessary, include relevant members from other organizations.
- In Q2, consolidate the data received.
- In Q3, finalize the graphical layout of the document and share it with the other members.

3.5 Minimising the Impact of Spent Foundry Sand

January 2026

3.5.1. Brief description of the objectives of the Working Group

The **Minimising the Impact of Spent Foundry Sand working group** is aimed to identify best practice for reuse internally of waste foundry sand, along with beneficial reuse externally.

Recycled Foundry Waste Aggregates in concrete production – research meets industry.

3.5.2. Leader and participants

The participants of the working group are as follows;

	Name	Organization	Country
Chairing	Lee Jenkins	Weir Minerals	UK
Working member 1	Robert Jenkins	Cardiff University	UK

3.5.3. Main activities and outcomes of the Group during 2025

WASTEREBUILT 2.0 Project – The Next Steps (Funded by EPSRC)

Industry Workshop on the Re-use of Waste Foundry Sand in Concrete Production

- **Date**: 27 January 2026
- **Time**: 11:00 – 16:00
- **Location**: Institute of Materials, Minerals and Mining (IOM3) - 297 Euston Road, London

This event will bring together industry leaders, policy makers, and researchers to discuss the current state of the art, challenges, and opportunities surrounding the reuse of waste foundry sand (WFS) in the built environment.

More than 100 million tonnes of WFS are generated annually, with around 85% of this waste product landfilled. Typically, around 5 million tonnes of industrial sand is produced in the UK each year, hence there is a major opportunity to limit both virgin resource extraction and environmental impact associated with manufacturing waste disposal, were WFS to be widely incorporated within concrete production.

The workshop aims to:

- Present the latest research evidence and site trial outcomes on WFS reuse in concrete and construction materials.
- Explore industry appetite, feasibility, and barriers to large-scale adoption.
- Facilitate dialogue between researchers, designers, contractors, concrete manufacture and production, and policymakers to shape future pathways and collaborations.

3.5.4. Planning for 2026 and expected final outcome

To support and communicate the existing findings.

3.6 Moulding Materials

February 2026

3.6.1. Brief description of the objectives of the Working Group

The **Moulding Materials Working Group** is aimed to promote global technical exchanges on moulding materials of foundry industry; to organize technical conference on moulding materials periodically by which establish a platform for exchanging and cooperation and enhance the global industrial influences of WFO.

3.6.2. Leader and participants

	Name	Organization	Country
Chairing	Mr. Lou Yanchun	China Academy of Machinery Science and Technology Group Co., Ltd.	P.R.China
Secretary	Ms. Wang Yunxia	Foundry Institution of Chinese Mechanical Engineering Society	P.R.China
Working member 1	Mr.Fan Zitian	Huazhong University of Science and Technology, School of Material Science and Engineering	P.R.China
Working member 2	Mr. Zhu Jianxun	Jinan Shengquan Group Share Holding Co.,Ltd.	P.R.China
Working member 3	Mr.Zhu Shigeng	Donghua University	P.R.China
Working member 4	Mr. Xiong Yin	Chongqing Changjiang River Moulding Materials (Group) Co	P.R.China
Working member 5	Mr.Benny Yang	Vesuvius Foundry Technology (Jiangsu) Co.,Ltd	P.R.China
Working member 6	Mr. Yin Shaokui	Shenyang Research Institute of Foundry Co., Ltd.	P.R.China
Working member 7	Mr.Zhang Xulang	Shanghai Spaceflight Precision Machinery Institute	P.R.China
Working member 8	Mr. Luo Guimeng	Guangxi Lanco Resources Recycling Co., Ltd.	P.R.China
Working member 9	Mr. Li Lianjie	Wuxi Diesel Engine Factory of FAW （ First Automobile Works ）	P.R.China
Working member 10	Mr. Song Huizong	Suzhou Xinye Materials Technology Co. Ltd.	P.R.China
Working member 11	Mr.Yin Dawei	Dalian Xunke Industry Co., Ltd.	P.R.China
Working member 12	Yasuhiro Maeda	Dept. of Mechanical Engineering, Daido University	JAPAN
Working member 13	Yasuhiro Nagai	GUN EI Chemical Industry Co., Ltd	JAPAN

	Name	Organization	Country
Working member 14	Dr. Christian Appelt	ASK Chemicals GmbH	Germany
Working member 15	Mr.Markus Schabrucker	Hüttenes-Albertus Chemische Werke GmbH	Germany

3.6.3. Main activities and outcomes of the Group during 2025

1. Organized the Molding Materials Forum of the 17th Asian Foundry Congress

The Committee planned and organized the Molding Materials Forum of the 17th Asian Foundry Congress, which was successfully held on October 27, 2025. A total of 6 speakers delivered presentations and conducted in-depth exchanges focusing on key topics in the field of molding materials, including inorganic binders, foundry sands (mainly sintered ceramic foundry sand and artificially silica sand), and organic binders. This forum provided an important platform for academic and technical communication in the Asian molding materials industry, facilitating the sharing of advanced experience and cutting-edge technologies among professionals.

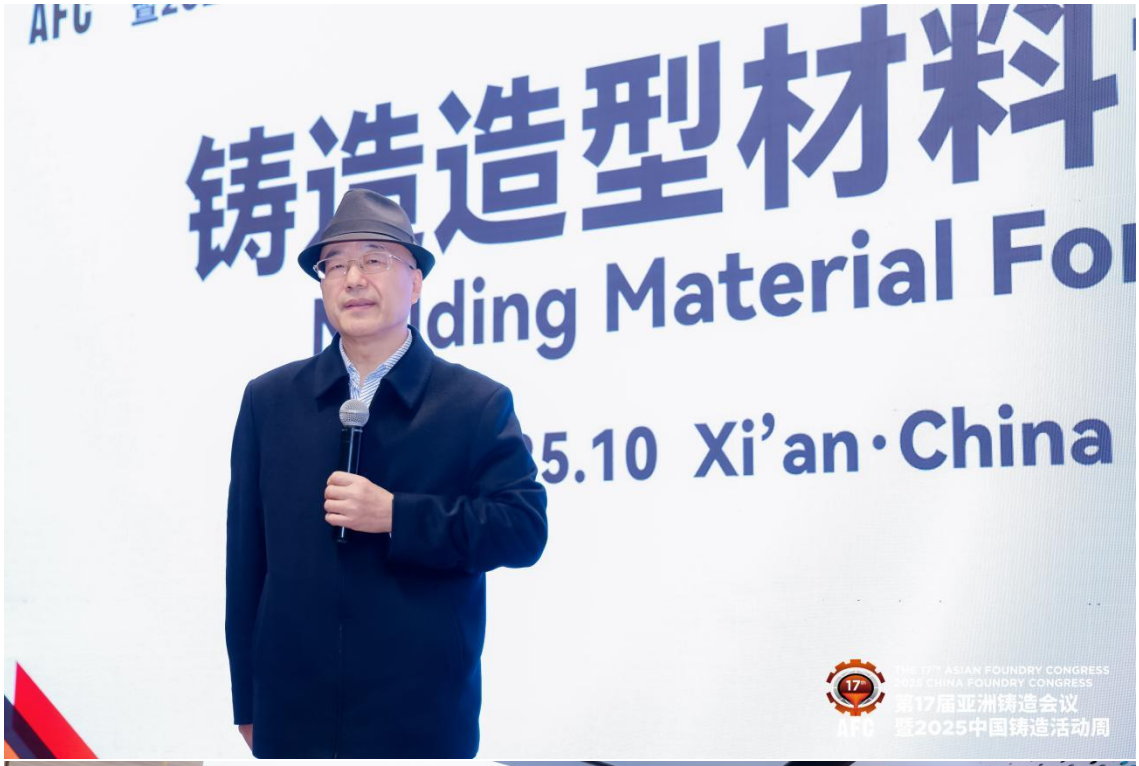



THE 17TH ASIAN FOUNDRY CONGRESS
2025 CHINA FOUNDRY CONGRESS
第17届亚洲铸造会议
暨2025中国铸造活动周
AFC
绿色铸造 创新亚洲 GREEN FOUNDRY INNOVATE ASIA
2025.10.25-28
铸造造型材料论坛
Molding Material Forum


THE 17TH ASIAN FOUNDRY CONGRESS
AFC 第17届亚洲铸造会议
2025 10.25-28 xi'an · China
无机粘结剂砂芯在汽车铝合金铸件中的应用
Title of the Presentation
张宏奎，一汽铸锻，中国
Zhang hong kui, FAW FOUNDY&FORGING, China


10.25-28
铸造造型材料论坛
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THE 17TH ASIAN FOUNDRY CONGRESS
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第17届亚洲铸造会议
暨2025中国铸造活动周
AFC


THE 17TH ASIAN FOUNDRY CONGRESS
第17届亚洲铸造会议
2025 10.25-28 xi'an · China
铸造用复合硬化磷酸盐粘结剂的改性工艺及机理
Modification Process and Mechanism of Composite Hardened Phosphate Binder for Casting
刘伟华，沈阳工业大学，中国
Weihua Liu, Shenyang University of Technology, China
THE 17TH ASIAN FOUNDRY CONGRESS
2025 CHINA FOUNDRY CONGRESS
第17届亚洲铸造会议
暨2025中国铸造活动周
2025.10.25-28
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综合降低呋喃树脂砂工艺废气排放的对策探索
谢树忠[1]，刘春晶[1]，梁家豪[1]，谢应杰[2]
省铸力铸材科技有限公司，广东省 珠海 519100；2. 香港理工大学, 香港 九龙）
THE 17TH ASIAN FOUNDRY CONGRESS
2025 CHINA FOUNDRY CONGRESS
第17届亚洲铸造会议
暨2025中国铸造活动周
2025.10.25-28
西安国际会展中心
XI'AN · CHINA





Abstract:

1. Application of Inorganic Binder in Aluminum Alloy Castings

Compared to organic binders, inorganic binders for casting demonstrate advantages such as reduced workplace odors and improved labor conditions, positioning them as a key direction for future development in casting molding materials. However, inorganic binders exhibit weaker bonding strength and greater sensitivity to environmental humidity. Moreover, the recycling of used sand from organic binders presents greater

challenges, limiting their widespread adoption. To address these challenges, FAW Foundry has developed an application process for aluminum alloy castings through years of technological research. By employing thermal regeneration, the company has successfully recycled inorganic waste sand, which has been widely implemented in aluminum alloy cylinder blocks and heads.

2. Issues and solutions of inorganic warm core box process in the application of aluminum alloy castings

The two-component warm-box inorganic binders have been developed and applied on mass production of aluminum castings for more than 20 years. However, extensive practices suggest that there are still challenges in sand flowability, collapsibility, casting porosity, reclamation efficiency, and moisture resistance. For these challenges, we have been trying to improve the properties of warm-box inorganic binders, and also made great progress. The comparative study on the application properties of SQ and European inorganic binder indicates that the SQ inorganic binder can absolutely replace the foreign binder for large-scale production of castings. The SQ inorganic binder demonstrates exceptional flowability, collapsibility, and minimal gas emission characteristics, making it highly effective in addressing common casting defects such as sand adhesion, incomplete sand core formation, and gas porosity frequently encountered in cylinder head and sub-frame aluminum castings.

3. Composite hardening phosphate binder for casting

Inorganic binders used for casting include silicate and phosphate binders. Phosphate binders have the advantages of excellent high-temperature strength, low outgassing and good collapsibility compared with silicate binders. However, their poor hygroscopicity and slow hardening speed limit their large-scale application. In this paper, we focus on improving the hardening strength and speed of the phosphate binder through the study of phosphate modification and composite hardening processes. The initial strength can be as high as 0.9 MPa, and the final strength as high as 1.2 MPa.

Using first-principles simulation calculations, we reveal the rapid curing mechanism of the modifier in the phosphate binder.

4. Study on Suitable Particle Size of Sintered Ceramic Foundry Sand

By adopting the orthogonal design method and taking a mass percentage of 10% as the grade difference, we established the mathematical models of the three-sieve and four-sieve particle size gradations of sintered ceramic foundry sand. Based on these mathematical models, different particle size gradations were carried out to obtain. Under the same process conditions, these sands were used to mix with furan self-hardening resin respectively, and their 24-hour tensile strength was tested. The quality of the particle size gradation of sintered ceramic foundry sand was evaluated according to the level of 24-hour tensile strength. Thus, the "optimal" and "worst" gradations under the conditions of three-sieve and four-sieve gradations were identified, which

provides a basis for determining the suitable particle size of sintered ceramic foundry sand.

5. Exploration of Countermeasures for Comprehensive Emission Reduction in the Furan Resin Sand Process

This paper addresses the issue of waste gas emissions in the furan resin self-hardening sand casting process from a few perspectives, listed as follows:

The selection and quality control of molding materials (including furan resin, base sand, curing agents, and coatings);

The design and choice of equipment and facilities (including molding equipment, tooling, sandboxes, and environmental protection systems);

The control of used sand recycling as well as process control during production.

This study provides a comprehensive analysis of the sources and discharges of waste gases across each stage and section of the furan resin self-hardening sand production process. Based on this analysis, a set of general countermeasures for emission reduction is proposed.

6. Performance Optimization and Application Research of High-End Graded Spherical Artificial Silica Sand for Foundry

The scarcity of high-grade natural silica sand resources poses a severe constraint to the high-quality growth of China's foundry sector. This study successfully developed high-performance artificial silica sand through advanced processing technologies including morphology control, Precision Grading, and fines management. Key properties were significantly enhanced: SiO_2 content >98.5%, adjustable angularity factor (1.15-1.35), precisely controllable gradation with AFS fineness variation <±1%, and clay content below 0.08%. Moreover, the material exhibits exceptional properties including absence of latent cracks, low friability, and high recyclability. Industry trials and field applications demonstrate that this synthetic silica sand exhibits superior comprehensive performance, enabling its unequivocal replacement of natural high-silica sand in steel casting production. This study further investigates the influence of synthetic silica sand's acid demand value (ADV) on various molding processes through comprehensive analysis of silica ore's SiO_2 content and alkaline oxide characteristics, providing both theoretical foundations and technical support for optimized design of foundry materials.

The list of Call for Paper:

(1) Issues and Solutions in the Application of Warm-box Inorganic Binder on Production of Aluminum Casting. Ye Liu, Yong-ji Zhang, Chang-xu Wang, Chuan-cheng Gong. (03-1025)

(2) Research and Application of Complete Process Materials for High-Efficiency CO2 Resin Core-Making. Wei Jia, LAN Xiao-dong, Liu Yuan, KONG Yi-bo, Ma Shuang, Yin Hang. (03-1035)

(3) Application of a Novel Fiber Surface Treatment Method in Fiber-reinforced Shells for Investment Casting. Zhicheng Feng, Kai Lü, Lei Che, Xinyu Li.(03-1037)

(4) Research on Inorganic Adhesive Technology and Its Application in Steel Castings. Kong Yibo, Wei Jia, Li Feng, Lan Xiaodong. (03-1038)

(5) A Study on the Effect of Sintering Temperature on the Interfacial Reaction Between Calcium Zirconate Shells and TA15 Titanium Alloy. LI Xin-qi, LIU Shi-bing, ZHANG Jia-shuo, WANG Wei-long, Qiu Wei-chen, LIU Bo-liang, LI Hong-ju .(03-1099)

(6) Formation and Kinetics of Oolitic Deposits on Green Sand. Qi Yuyang, Peng Xin, Yin Yajun, Lin Pengfei, Wan Peng, Ji Xiaoyuan, Zhou Jianxin, Li Yuancai. (03-1119)

(7) Research on High-Temperature Mechanical Properties of No-bake Resin-bonded Sand. PENG Xin, QI Yu-yang, LIU Zhen-wei, WAN Peng, LI Wen, SHEN Xu, JI Xiao-yuan, YIN Ya-jun, LI Yuan-cai and ZHOU Jian-xin.(03-1120)

Scan QR code to check full papers

2 Carried out the Revision of the Investigation Report on Application Status and Development Trend of Casting Molding Materials in China

To accurately reflect the latest development of the industry, the Committee took the lead in planning and organizing the revision of the Investigation Report on Application Status and Development Trend of Casting Molding Materials in China. A professional expert group was established for this revision work. On the basis of the first edition, the report was updated from 5 sections to 6 sections, with a new chapter on investment casting molding materials added. The revised report will focus more on the technical development trends of the industry, providing more targeted and forward-looking reference for industry decision-makers and technical researchers.

3 Prepared for the General Election of the Molding Materials Committee

In 2025, the Committee initiated the preparation work for its general election. Relevant preparations such as sorting out the work rules of the Committee, nominating candidate

list were carried out in an orderly manner, laying a solid foundation for the smooth progress of the subsequent general election work and ensuring the continuity and stability of the Committee's work.

3.6.4. Planning for 2026 and expected final outcome

(1) Complete the General Election of the Molding Materials Committee

The Committee will continue to promote the general election work in an orderly manner. It is planned to complete the adjustment on the working members and hold appointment ceremony before the end of 2026.

(2) Conduct Industry Research and Complete the Revision of the Research Report and Special Reports

In 2026, the Committee will carry out in-depth research on the molding materials industry. On the basis of the preliminary revision work, it will further improve the content of the Research Report on the Application Status and Development Trend of Foundry Molding Materials and complete the revision task. At the same time, focusing on the key development directions of the industry, the Committee will organize the expert group to complete 6 special reports in subdivided fields before the end of 2026, covering core technologies and key application areas of molding materials, so as to provide more detailed and professional technical support for the high-quality development of the global molding materials industry.

At present, the recruitment of participating units for the research report is in progress, and global foundry molding materials production enterprises are warmly welcome to actively participate.

3.7 Non-Ferrous Alloys

January 2026

3.7.1. Brief description of the objectives of the Working Group

The **Non-Ferrous Alloys Working Group** is aimed to promote global technical exchanges on nonferrous materials of foundry industry; to organize technical conference on nonferrous materials periodically by which establish a platform for exchanging and cooperation, and enhance the global industrial influences of WFO.

3.7.2. Leader and participants

	Name	Organization	Country
Chairing	Su Yanqing	Harbin Institute of Technology	China
Vice chairing	Chen Ruirun	Harbin Institute of Technology	China
Secretary	Zhang Chunyan	Foundry Institution of Chinese Mechanical Engineering Society	China
Working member 1	Wu Shusen	Huazhong University of Science and Technology	China
Working member 2	Li Peijie	Tsinghua University	China
Working member 3	Nan Hai	AVIC Beijing Institute of Aeronautical Materials	China
Working member 4	Peng Liming	Shanghai Jiao Tong University	China
Working member 5	Qigui Wang	GM - Global Powertrain Engineering	USA
Working member 6	Mingdong Cai	Bodycote Testing Group Houston, USA	USA
Working member 7	Toshimitsu Okane	National Institute of Advanced Industrial Science and Technology (AIST)	Japan
Working member 8	Long Siyuan	Chongqing University	China
Working member 9	Ki Young Kim	Korea University of Technology and Education	Korea
Working member 10	Andrea Niklas	Engineering, R&D and Metallurgical Processes Department, Azterlan, and Metallurgy Research Centre	Spain
Working member 11	Natalia Sobczak	Foundry Research Institute, Krakow Poland	Poland

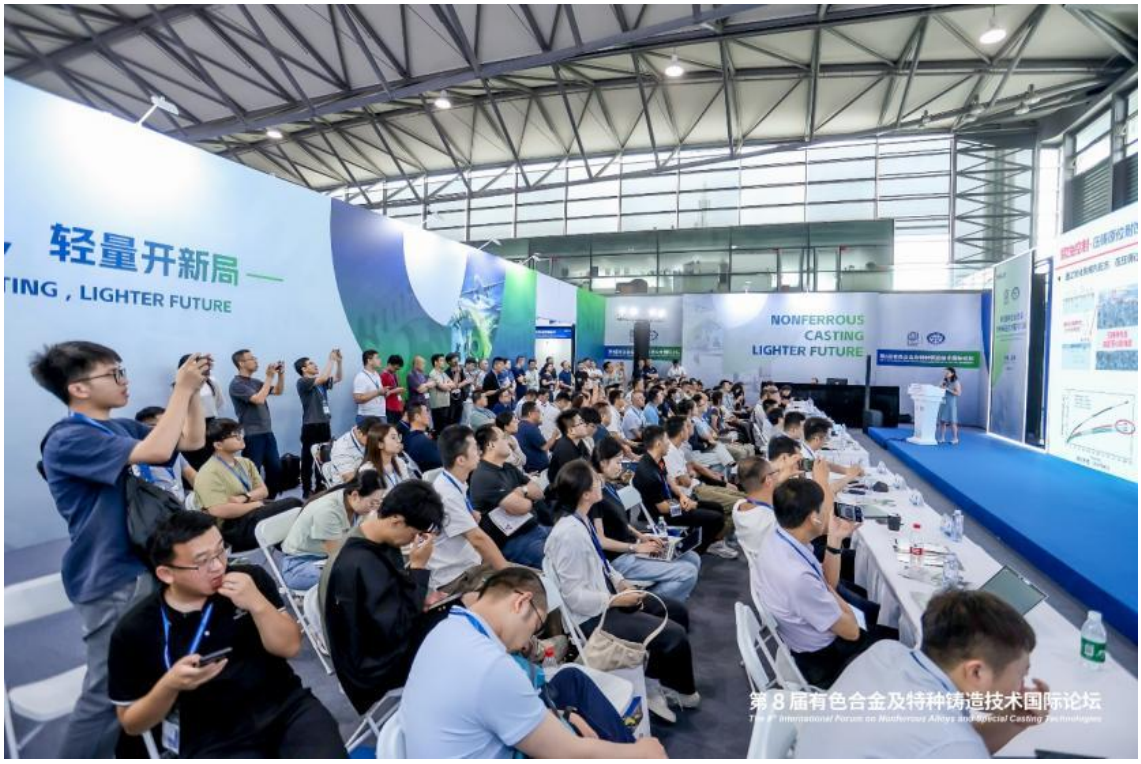
3.7.3. Main activities and outcomes of the Group during 2025

The 8th International Forum on Non-Ferrous Alloys and Special Casting Technologies was successfully held in Shanghai!

From July 16–18, 2025, the "8th International Forum on Non-Ferrous Alloys and Special Casting Technologies" took place successfully in Shanghai. Organized by the Non-Ferrous Alloys Committee of the World Foundry Organization (WFO) and the Productivity Promotion Center for Foundry Industry, and co-organized by the Foundry Institution of China Mechanical Engineering Society, Shenyang Research Institute of Foundry Co., Ltd., China Academy of Machinery Science & Technology Group, and the State Key Laboratory of Advanced Casting Technologies for High-End Equipment, the forum was held concurrently with the 19th Shanghai International Die Casting & Non-Ferrous Casting Exhibition. Under the theme "Casting National Strength with Non-Ferrous Alloys, Forging a New Era of Lightweighting," the event brought together experts, industry leaders, and professionals from around the world in the field of non-ferrous alloys and special casting technologies, creating a high-level platform for in-depth exchange and collaboration.

The forum was structured into four main sessions: Squeeze, Differential Pressure, and Semi-Solid Casting Technologies; Magnesium Alloy Casting Technologies; Titanium Alloy Casting Technologies; and Additive Manufacturing Technologies. A total of 27 speakers delivered outstanding presentations, attracting over 200 participants.

Through a diverse range of formats, the forum comprehensively showcased the latest advancements in non-ferrous alloys and special casting technologies. During the keynote sessions, leading experts addressed current technological challenges and hot topics, sharing cutting-edge research findings, innovative concepts, and successful practical experiences, while jointly analyzing future industry trends. The successful hosting of this forum not only highlighted the latest achievements in the industry but also served as a significant catalyst for technological innovation and industrial upgrading in the field of non-ferrous alloys and special casting.



Titles and abstract of reports are as follows:

1. **Research on Local-loading and Forced-feeding Squeeze Casting of Aluminum Alloy Flywheel Housing with Large Size and Complex Shape**

Professor Jiang Jufu

Professor Harbin Institute of Technology

In order to meet the forming requirements of large and complex aluminum alloy components with large wall thickness difference, 12500 kN low-cost and high efficiency squeeze casting equipment was developed. Squeeze casting technology of local loading and forced feeding was put forward by combining finite element simulation technology with hydraulic loading technology. It was found that the 12500 kN low-cost and high-efficiency large aluminum alloy squeeze casting equipment developed could reduce the cost by more than 60% compared with foreign equipment. The ultimate tensile strength, yield strength and elongation of the 35 kg flywheel housing component after heat treatment reached 306.1 MPa, 237.5 MPa and 13.3%, respectively.

2. **Order Parameter Controlling Semi-Solid Melt Injection Squeeze Casting Molding**

Professor Zhao Yuhong

North University of China University of Science and Technology Beijing

To resolve the challenges of unadjustable pressure and high porosity caused in injection molding, a novel "melt injection+squeeze casting" integrated device and process was developed. This technology employs screw-stirred injection to deliver semi-solid melt

into the mold, followed by squeeze casting. Based on intelligent system optimization, the process regulates the melt's solid fraction and refines the casting's solidified microstructure, achieving an ideal multi-level unified distribution of order parameter fields. Through feedback-controlled adjustments of parameters, improved homogeneity of microstructure and mechanical properties in critical structural zones are achieved. This innovation significantly improves the pass rate of castings with different wall thicknesses.

3. Application and Future Tendency of Domestic Squeeze Casting Technology

Zhou Zongzhen

Vice President/ Senior Economist

Suzhou Sanji Foundry Equipment Co., Ltd.

The following aspects will be included: (1) Squeeze casting traits and advantages, (2) Squeeze casting application in different industries, (3) Squeeze casting limitations in generalization and solutions, and (4) Squeeze casting future tendency.

4. Aluminum Alloy Semi-Solid Forming Process and Mass Production Practice

Yao Hui

General Manager

IKD Shenzhen Precision Components Co., Ltd.

Current semi-solid mass production slurry-making process and characteristics of aluminum alloys. Different practical semi-solid forming processes Process control of semi-solid forming application of semi-solid forming process problems in promoting semi-solid mass products of aluminum alloys

5. Development of Aluminum Alloys for High Solid Fraction Rheo-Die-Castings

Li Daquan

Professor

GRIMAT Engineering Institute Co., Ltd.

(1) Introduction and application of high solid-fraction rheo-diecasting process

(2) Properties of the widely used aluminum-silicon rheo-diecasting alloys

(3) Development progress of the cast-forging integrated rheo-diecasting aluminum alloys

6. Application of Aluminum Alloy Squeeze Casting Technology in Welding

Alexander Han

Technical Development Manager/ Senior Engineer

Shandong Honho Lightweight Technologies Co., Ltd.

Aluminum alloy squeeze casting technology, through material densification, microstructural refinement, and process synergy innovation, has established itself as a high-performance, cost-effective solution for welding applications. Its largescale adoption in new energy vehicles and aerospace industries marks the maturity of the "casting instead of forging & lightweight integration" technical pathway. Moving forward, the focus must be on intelligent process chains, green material systems, and penetration into high-end applications as core drivers. By integrating rare earth microalloying technology, the aim is to overcome bottlenecks in interface control and complex structural compatibility, thereby accelerating China's consolidation of technological leadership in global automotive thermal management and aerospace manufacturing. This will require achieving breakthroughs across materials, processes, and applications, advancing comprehensively in the field.

7. Precision Casting Technology for High-Performance Magnesium Alloy Thin-Walled Components

Xiao Lv

Associate Chief Research Engineer/Research

Professor

Shanghai Institute of Spaceflight Precision Machinery Research

Research has been focused on the material system for lost foam casting of magnesium alloys, particularly for complex thin-walled structures with a framework. This includes the study of casting shell materials and preparation processes, the impact of shell materials and processes on the metallurgy and forming quality of magnesium alloys, flame retardancy in magnesium alloy lost foam casting, optimization and development of lost foam casting processes for typical components, and experimental assessments of the application of hydrazine bottle support components. Breakthroughs were achieved in key technologies for the preparation of low-reactivity flame-retardant shells and for controlling defects and deformation in complex thin-walled magnesium alloy lost foam castings. The development of precision cast components for typical hydrazine bottle supports and guidance head frame boxes has been completed, achieving technical specifications including a minimum wall thickness of 4mm for castings, Class I castings, and base strength not lower than 300 MPa. These have been verified through static testing, laying a technical foundation for the application of precision casting of magnesium alloys in various aircraft components.

8. Research Progress in Integrated Die Casting of Magnesium Alloys

Song Jiangfeng

Professor

National Engineering Research Center for Magnesium Alloys, Chongqing University

China's electric vehicle (EV) industry has experienced rapid development, with production and sales volumes increasing steadily. However, the additional weight from battery packs has created an urgent demand for lightweight solutions. Magnesium alloys, as the lightest metallic structural materials with a density merely two-thirds that of aluminum alloys and one-fourth of steel, demonstrate significant potential for weight reduction in EVs. Integrated die-casting technology, recognized for its efficiency, cost-effectiveness, and environmental benefits, has emerged as a pivotal advanced manufacturing method in modern industrial production. Consequently, the development of large-scale integrated die-cast magnesium alloy components has become a critical priority. This report systematically elaborates on material design, defect modulation, corrosion resistance optimization, innovative joining techniques, and engineering applications of integrated die-cast magnesium alloys.

9. New Progress in Large, Complex and High-Performance Magnesium Alloy Sand Casting for Aviation Applications

Cai Zenghui

Chief Engineer/Senior Engineer

AECC Harbin Dong'an Engine Co., Ltd.

Firstly, the development trend of lightweight aviation products and the characteristics of thin-walled and integrated development of magnesium alloy castings were introduced. Then, the development of high-performance magnesium alloy casting material system was explained, and the key technologies of magnesium alloy sand casting were introduced, such as complex sand mold preparation, simulation modeling, high-quality metallurgical control, and precision forming control. Typical cases of aerospace magnesium alloy casting were shared, and finally the technical challenges and future prospects of magnesium alloy sand casting were discussed.

10. Research on the Ignition Mechanism of Large Size Complex Magnesium Components during Casting

Zhang Lunyong

Associate Professor Harbin Institute of Technology

Aerospace lightweighting demands large, complex Mg alloy castings, but exceeding their safe weight limit significantly increases combustion and explosion risks. Therefore, Understanding Mg alloy combustion is urgently required. Based on a review of the current research status of Mg alloy combustion, this talk focuses on our recent findings on combustion mechanisms and influencing factors in large/complex sand castings. These works found that Mg alloy ignition is triggered by surface oxide film rupture.

During sand casting, CO2 is the main oxidizing agent for Mg alloy combustion, with CO and nitrides in pyrolysis gas coupling with and promoting the process, intensifying Mg alloy combustion. The addition of Nd elements can increase the ignition point and help suppress the combustion of Mg alloys. The above works provide theoretical guidance for further development of anti-combustion and flame-retardant technologies for Mg alloys.

11. The Formation Mechanisms and Solutions of Three Typical Metallurgical Defects in Magnesium Alloy Castings

Xin Shiwei

Senior Engineer

China Academy of Machinery Shenyang Research Institute of Foundry Co., Ltd.

In the aerospace field, magnesium alloys have great application prospects due to their lightweight advantages. However, casting defects such as Cuboid REDominated Phase , flow lines, and segregation of Mn-containing phases restrict their performance. In this study, techniques such as scanning electron microscopy (SEM), metallographic analysis, and radiographic inspection were employed to deeply characterize the features of Cuboid RE-Dominated Phase, flow line defects in rare earth magnesium alloys, and segregation of Mn-containing phases in magnesium alloys. The influences of alloy composition, casting process, etc. were analyzed, and the formation mechanism was clarified. Targeted solutions, including optimizing alloy composition, improving the casting system, and adjusting melting and casting process parameters, were proposed, which are of great significance for enhancing the quality of magnesium alloy castings and promoting their application in the aerospace field.

12. Study on the Microstructure Control and High-Cycle Fatigue Behavior of ZM51 Magnesium Alloy

Mu Tong

Assistant Researcher Qinghai Institute of Salt Lakes, Chinese Academy of Sciences

Longevity, high reliability, and safety are the developmental goals and urgent needs for automotive components. Magnesium alloy, with its unique advantages such as low density and high specific strength, plays an increasingly pivotal role in reducing vehicle weight and enhancing performance, establishing itself as one of the key materials for vehicle lightweighting. This study focuses on the Mg-5Zn-1Mn (ZM51) alloy to systematically investigate its hot deformation behavior, microstructural evolution, and high cycle fatigue (HCF) behavior. Through microstructural tailoring (including grain refinement, texture adjustment, and heat treatment), the influence of grain size, grain orientation, and precipitated phases on fatigue performance is revealed. The results show that grain refinement significantly enhances fatigue strength, while texture anisotropy influences fatigue crack initiation and propagation paths. The T5-treated

alloy achieves a favorable balance between static strength and fatigue resistance. Overall, the study emphasizes that designing fatigue resistant magnesium alloys requires a microstructure-centric approach, integrating grain refinement, texture control, and age hardening. This strategy aims to improve resistance to cyclic damage rather than merely increasing static strength, thereby fulfilling the service requirements of automotive structural applications.

13. Performance Optimization of Thixomolded Mg Alloys and Development of Large Automotive Structural Parts

Gu Lidong

Doctor/ Research Assistant

Shanghai Jiao Tong University

The application of magnesium is now booming. The author first reviewed the features and evolution of Mg thixomolding, summing up its research status and application potential. Then, to meet the needs of structural parts in new energy vehicles, research was done to optimize the mechanical, corrosion-resistance, and heat-resistance properties of semi-solid magnesium alloys. Using giant thixomolding, several "world-first" large magnesium alloy structural components were created, like integrated subframes, electric drive casings, and 20-inch wheels. In the future, high-performance magnesium materials and eco-friendly manufacturing technologies are likely to propel magnesium alloys to a new level in automotive lightweighting.

14. Application Prospects in Lightweight High-Temperature Structural Materials and Their Precision Thermoforming Technology

Chen Yuyong

Professor

Harbin Institute of Technology

High-Mach vehicles face extreme thermal environments (650-1000°C) and demand lightweight, heat-resistant structural materials to overcome the weight limitations of conventional high-temperature alloys. This study advanced a novel in-situ particle reinforced titanium matrix composite optimized for prolonged 700°C service, building upon 650°C titanium alloys. A robust thermomechanical processing system was developed, enabling the production of critical aerospace components (e.g., cabin and air rudder) via investment casting. Additionally, nanoparticle-doped TiAl alloys were engineered to enhance mechanical properties while achieving scalable manufacturing. Breakthroughs include precision casting of large thin-walled TiAl components (e.g., Φ715 mm front diffuser) and prototypes for high-Mach engine igniters and CJ-1000 engine blades. These innovations provide technical support for the engineering application of TiAl alloys in aerospace.

15. Development and Prospect of Lightweight and Green Titanium Alloy Casting Technology

Yue Chunhua

Deputy Chief Engineer, Precision Forming/Research Professor

Beijing Xinghang Mechanical and Electrical Equipment Co., Ltd.

High performance, lightweight, high temperature resistance, high precision and green manufacturing are important development directions for future aerospace equipment. Requirements for the integration of materials, structures and processes are getting increasingly higher while the service environment of components is becoming increasingly complex, which puts forward new demands for titanium alloy casting technology. It is necessary to explore the optimization of structure, the simplification of connection forms, and the integration of structure and function technologies. It is also important to develop green and environmentally friendly multi-functional casting processes and to explore the balance and optimization technology of new alloy systems and casting formability, etc., so as to achieve a shape and property coordinated control of products and meet the new demands of aerospace equipment.

16. Research Progress in Casting High-Temperature Titanium-Based Alloys: Materials and Processes

Kou Hongchao

Professor

Northwestern Polytechnical University

The highly integrated structural design of next-generation aerospace vehicles and their propulsion systems poses new challenges for lightweight, high-temperature resistant materials and near-net-shaping technology. Precision casting is the most economical and effective process for fabricating complex internal cavity structures. This report presents recent research advances in composition optimization of high temperature Ti alloys and TiAl alloys, their casting process performances and mechanical properties, and the precision casting technologies and equipment. Additionally, it provides an outlook on their engineering applications.

17. Precision Casting Technology of Titanium Alloy Intermediate Cases for Aero Engines

Qie Xiwang

Research Professor

Baimtec Material Co., Ltd.

Intermediate casing, in between the LPC and HPC, is a critical component in an aero engine. The engine connects to the aircraft via the intermediate casing which serves as the assembly foundation and shares the same service life as the engine. Titanium alloys,

widely used in aero engines and aircrafts due to its low density, high specific strength and corrosion resistance properties, can be utilized together with investment casting technology for the development of intermediate casings with complex structures. The structural complexity and high quality requirements of intermediate casings and the high reactivity of titanium alloys pose significant challenges to the investment casting and quality control of Ti alloy intermediate casings. This report focuses on the integral forming, quality control, and inspection techniques of intermediate casings. Additionally, in light of the requirements for the next generation of aero engines, a brief overview of the future development direction for intermediate casings is provided.

18.Rapid Manufacturing of Complex Titanium Alloy Components for Aircraft Engines Based on 3D Printing

Lu Zhongliang

Professor

Xi'an JiaoTong University

Titanium alloy is a key structural material for high-performance aircraft engines, and titanium alloy closed impellers are important hot end components. Investment casting is the mainstream manufacturing technology, but there are problems such as long development cycle, slow response, and difficult precision control. Therefore, a rapid manufacturing technology for complex hot end components of titanium alloy based on hotopolymerization 3D printing has been studied, which solves the problem of rapid manufacturing of complex thin-walled hollow structures, reduces development costs, and achieves precision control of complex hot end components. This provides a new idea for the rapid and low-cost manufacturing of complex hot end components of titanium alloy.

19.Effect of Heat Treatment on Microstructure and Properties of Cast TC4-4.34Cu

Titanium Alloy

Shi Kun

Research fellow

China Academy of Machinery Shenyang Research Institute of Foundry Co., Ltd. The TC4-4.34Cu Ti alloy was prepared by water-cooled copper crucible vacuum suspension melting technology, followed by hot isostatic pressing (HIP) at 920°C and heat treatments at 720°C (three-phase) and 800°C (two-phase). Results showed the matrix consisting of α-phase, β-phase and Ti2Cu phase. The 720°C treatment optimized mechanical properties by uniformly dispersing equiaxed α-phase in β-Ti matrix and enhancing Ti2Cu precipitation. In contrast, 800°C treatment induced a phase transformation of α + Ti2Cu to β, leading to the redissolution of Ti2Cu and coarsening of the β-phase, which increased strength but reduced plasticity. Antibacterial and corrosion resistance tests revealed that compared to TC4 alloy, the TC4-4.34Cu alloy

exhibited excellent antibacterial properties due to the sustained release of Cu2+ ions, which effectively inhibited bacterial membrane growth in P.aeruginosa solution. The antibacterial rate of the TC4-4.34Cu alloy after heat treatment at 720°C reached 83%. Additionally, the improved impedance value of the TC4-4.34Cu alloy enhanced its corrosion resistance.

20. Data-Driven Prediction of Deformation and Process Optimization for Complex Titanium Alloy Castings

Ji Xiaoyuan

Assistant Dean of School of Materials Science/

Professor

Huazhong University of Science and Technology

This study addresses phase-change shrinkage on the dimensional deformation of TC4 investment casting via a hybrid method integrating thermomechanical simulation and data-driven modeling. A process-deformation model combining simulations and production data employs multilayer perceptrons to map nonlinear relationships, and introduces thermomechanical constraints to form a hybrid modeling framework. Multi-objective particle swarm optimization (MOPSO) globally adjusts pouring temperatures to minimize critical dimension deviations. Results show 90% deformation prediction accuracy (10% higher than pure data-driven models), with optimized parameters reducing deviations to <1.82 mm. The dual physics-data strategy establishes an innovative paradigm for aero-engine precision casting, balancing model fidelity and manufacturability.

21. Study on Technology of Semi-Continuous Induction Melting Titanium Alloy Ingot

Li Weidong

Vice Director/ Senior Engineer

Luoyang Ship Material Research Institute

This research presents a semi-continuous induction smelting method for Ti alloy ingots. A ϕ280mm cold crucible was used to smelt TA17 alloy under different powers (450KW, 550KW, 650KW, 750KW, 800KW). Results indicate the alloy ingot failed to melt at 450KW and 550KW, but melted at 650KW, 750KW and 800KW. The TA17 alloy smelting efficiency of ϕ280mm cold crucible at 650KW, 750KW, 800KW) was calculated. According to the calculation results, the smelting process scheme was formulated and the corresponding experiments conducted. Results indicate that at a specific smelting power, the alloy will not be smelted if adding too much alloy material per unit time. On the contrary, the temperature of the cooling circulating water will rise rapidly when the alloy material is fed too little per unit time, potentially damaging the cold crucible. When the smelting power was 750KW and the feeding weight was 4Kg/min, the cooling

circulation water temperature was kept lower than 50°C, the semi-continuous induction smelting of TA17 Ti alloy ingot was effectively realized, and the utilization rate of energy is about 8.3%.

22. Development and Industrialization of New Materials for Integrated Die-Casting Molds in New Energy Vehicles

Yu Yang

Chief Scientist/ Professor

Tiangong International Company Limited

(1) Large-Module Die-Casting Mold Materials: Tiangong International has deployed 20-ton ESR and 7,500-ton forging systems, enabling mass production of 10-15 ton large-module forged mold materials. Its TGE23 die steel became China's first NADCA-certified mold material in 2024. (2) Recently, die-casting mold inserts featuring conformal cooling channels produced via additive manufacturing (AM) have been increasingly adopted. This article reviews China's latest AM material innovations. (3) Tiangong International has pioneered near-net-shape die-casting inserts with internally embedded cooling channels manufactured through hot isostatic pressing (HIP), complementing AM removable insert solutions—a breakthrough in China. (4) High-end laser cladding shows promise for surface treatment and repair of die-casting inserts.

23. Preparation and Performance Study of Low-Cost and High-Performance Graphite Casting Materials

Wu Haihua

Executive Dean/ Professor

China Three Gorges University (CTGU)

Develop a low-cost rapid preparation method for graphite casting materials based on engineering needs. Using the principle of additive manufacturing technology, low-cost artificial graphite powder is used as the main raw material to produce graphite casting materials without graphitization, saving energy consumption costs. By introducing carbonaceous reinforcing phases, the performance of graphite casting material matrix is improved. Efficient impregnation strategy is adopted to improve impregnation effect. A cost-effective high-performance graphite casting method replaces traditional processes, and its promotion to practical industrial production provides a new method for short process and low-cost manufacturing of various high-end graphite functional structural components, such as graphite molds, graphite crucibles, graphite tubes, etc.

24. Development of Die Steels for Laser Cladding and Their Applications in Die Repair

Wan Jie

Associate Professor

Northwestern Polytechnical University

The mold is an important carrier for the manufacturing of various parts and is known as the "mother of industry", but it will accumulate damage and eventually fail during its service. Compared with traditional repair methods such as surfacing welding and spraying, laser cladding additive manufacturing technology can achieve high-quality and high-precision repair of failed molds, thereby significantly improving the service life of molds and reducing production costs. This report focuses on the development of special die steel for laser cladding and its application in the field of mold repair, sorts out the failure modes of molds in detail, deeply analyzes the advantages of laser cladding technology, shares the research progress of the team in special die steels for laser cladding, and introduces the application of new special die steels for laser cladding in the field of mold repair through specific cases.

25.Solidification Behavior and Microstructure Tailoring of Al-5Cu Alloy by Electron Beam Wire-Feed Additive Manufacturing

Cui Ran

Research Associate

Tsinghua University

Al-5Cu alloy is one of the important structural materials in the aerospace field. However, due to its inherent properties such as wide solidification range, poor weldability, and hydrogen absorption, coarse columnar grains and defects like cracking and porosity are easily formed during additive manufacturing. Therefore, the fabrication of high-quality Al-5Cu alloys has been a long-standing challenge in the field of additive manufacturing. This study successfully fabricated a defect free Al-5Cu alloy with a fully equiaxed grain structure using electron beam wire feed additive manufacturing (EBF3). The mechanism for crack suppression was clarified, and the evolution of grains during solidification was revealed. A universal criterion for grain morphology was proposed, providing a theoretical basis for the precise control of grain structure in additive manufacturing.

26.Several Key Breakthroughs in Binder Jet Metal 3D Printing Technology

Cai Daosheng

Chairman

Wuhan Easymade Technology Co., Ltd.

Starting from the requirements of batch application of binder jetting metal 3D printing technology, this article analyzes key technologies and their impacts on the quality and consistency of the fabricated parts. It also introduces the technical solutions adopted by Easymade, and their influences on improving the strength, surface roughness, polishing effect, and product consistency of the fabricated parts. Additionally, suggestions on the short-term R&D work for entrepreneurs are put forward.

27.Technological Advances of 3D Printing in Casting

Jin Feng

Vice General Manager/Senior Engineer

Guangdong Fenghuazhuoli Technology Co., Ltd.

3D printing technology encompasses various processes that have found extensive applications in the casting industry. For instance, FDM used for producing casting molds, SLA and 3DP employed to create wax-like patterns for investment casting, and SLS and 3DP utilized to fabricate cores for sand casting. With ongoing technological advancements, new progress and breakthroughs have been achieved in the application of various 3D printing processes within the casting sector, while new challenges are also emerging.

3.7.4. Planning for 2026 and expected final outcome

Non-Ferrous Alloys Committee holds the International Forum on Non-Ferrous Alloys and Special Casting Technologies every two years, with the next (9th) forum scheduled for 2027. In 2026, the committee's primary focus will be on organizing this event, including finalizing the venue and theme, inviting speakers, and conducting preliminary promotion.

3.8 Training and Professional Development Working Group

March 2026

3.8.1. Brief description of the objectives of the Working Group

The **Training and Professional Development working group** is aimed to:

- Facilitate collaboration and partnership for the development of training programmes by national foundry bodies that are relevant and current
- Support the national foundry bodies in promoting careers in the castings industry and increase the visibility of the industry.

3.8.2. Leader and participants

The former participants of the last stage of the working group are as follows, these need to be updated under the new chairing;

	Name	Country
Chairing	Dr Pam Murrell FICME until resignation	UK
Secretariat	José Javier González Estévez	Spain
Working member 1	Doug Kurkul	USA
Working member 2	Dr.-Ing Ion-Alexandru Bacanu	Romania
Working member 3	Conny Gustavsson	Sweden
Working member 4	Kimberly Workman	Australia
Working member 5	Sandy Majatladi & Isidore Kilongozi	South Africa
Working member 6	Assoc. Prof. Zdenka Zovko Brodarac, PhD	Croatia
Working member 7	Manini Phokwane Ramagaga	South Africa
Working member 8	Silvano Squaratti	Italy
Working member 9	Tunçağ Cihangir Şen	Turkey
Working member 10	S. Koray Hatipoğlu	Turkey
Working member 11	Dr.Eng. Adel Nofal	Egypt
Working member 12	Mitja Petric	Slovenia

3.8.3. Main activities and outcomes of the Group during 2025

The Group was not able make any substantive progress against its main objectives during 2025 due to resignation of the chairing of the group. A first approach in UK was done to identify a possible candidate to chair this action.

Promotion of careers in the industry

Part of the members of the Working Group took an active role in the promotion of young professionals through the actions under the WFO Young Researchers Conference.

3.8.4. Planning for 2026 and expected final outcome

The process to identify a new chairing of the Working Group will continue in 2026, starting first with the members of the WG and then with the Associations.

A review of the group's objectives is planned to agree some new aims.

The members of the WG will continue promoting young careers through their presence in the actions of the new edition planned for the Young Conference.

4 Final remarks

A yearly report is to be produced and discussed with the WFO Executive for the proper evaluation of the activity of the Working Groups. An executive document is also produced to be shared in the WFO General Assembly Meeting, gathering the proceedings or any kind of additional value-added documentation from the different Working Groups.

The drafting of this report counts with the collaboration and the valuable feedback of the Chairmen of the active WFO Working Groups.

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