



Session Chairperson
Ryobi Limited Hiroshi Matsuda

JD24-19

Development of compression die-casting process using die clamping force

TOYO MACHINERY & METAL.CO.JP.,LTD ● Tomohiro Kitagawa,
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Die-cast products have so far dealt with blow hole countermeasures and shrinkage porosity countermeasures separately for porosity defects. It seems that there are many. This is because these two types of porosity require a completely different approach to coping with them.

This time, we have developed a new "super die casting method" as a new method that can deal with such a situation with one method. Specifically, by casting by combining the PF die casting method and the runner pressurization method, the amount of gas in the product can be reduced and the product density can be improved, and we report this as a construction method that makes it relatively easy to produce high-quality die-cast products.

JD24-20

Characteristic investigation of burr suppression and its countermeasures

SHIBAURA MACHINE CO., LTD. ● Shugo Mastuzawa, Satoru Aida,
Yuto Hayashi, Koei Nakata

In recent years, with the increase in the size and the decrease in thickness of die casting products, injection has been increasing in its speed. This enables short time filling, which is known that improves product quality from the viewpoint of fine diffusion of molten metal and preventing lowering of molten metal temperature. However, increase of injection speed increases surge pressure hence necessary to consider burr blowing, which not only inhibits safety but also deteriorates product quality.

Therefore, this study investigates and reports the mechanism of burr blowing and its countermeasures.

JD24-21

Development of high cycle die casting machine and casting technology

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Naoki Ishibashi

With the rapid shift to EVs, die casting needs are changing to EV parts, which cases for inverters, converters, E-axles, batteries, etc. and Giga-casting, that integrally molds chassis components. In addition, new entrants from other industries are continuing to enter the market, leading to intensifying competition and falling prices in the EV parts market. To survive the competition under such market conditions, it is important to generate continuous profits in die casting production by reducing the unit price of the product. In actual casting using the 850t high cycle die casting machine we developed, we achieved a high cycle time of 22.5s in a four-sided slide mold that imitates a converter case. In this report, we will report on the means to achieve high cycles in the machine itself, auxiliary equipment, and casting process, as well as the results of comparison with conventional machines.



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SHIBAURA MACHINE.CO., LTD. Yuto Hayashi

JD24-22

Integrated casting method using a dual-chamber furnace with embedded pumping mechanism.

Tounetsu Co., Ltd. ● Jyouji Yokoyama, Tsukasa Shimoto,
Dr.Dassanayake Muditha

In aluminum casting process, usually, molten aluminum is transported to the casting equipment by means of a ladle. However, there are two main problems which are the maximum amount that can be transported is below 100Kg and the amount is uncertain. In addition, the temperature of the molten aluminum drops because of time consuming for transportation and weighing process of molten aluminum to ensure high accuracy.

Molten aluminum pumping devices are used as an alternative to ladles. But these devices are unstable in terms of the accuracy of amount of pumping molten aluminum, and difficult to make them larger to cater the need. In the other hand, if the molten aluminum is required to be dispensed with high accuracy, the maintenance costs tend to be high. Furthermore, life span is shorter.

Therefore, to overcome all the above discussed problems, a new pumping method using a dual-chamber furnace with embedded pumping mechanism is introduced.

JD24-23

Basic research to improve Mechanical Properties of Aluminum Die Castings

NIHON KOHNETSU INDUSTRIAL CO., LTD.

● Ryo Isogai, Kiyoshi Okada,
Kazuki Watanabe
Dr. Mayuki Morinaka

MRDC Ltd.

Aluminum die casting has characteristics of its lightness and high productivity, therefore it can be adopted and expanded in the field of especially automotive parts. Nowadays, considering the environmental considerations, the further adoption is considered. ADC 12 die casting is nearly reaching to the upper limit. High mechanical properties are demanded. i.e "Large size, Thin wall and Complex shape". Considering the aluminum parts with high mechanical properties, we adopt the casting method by use of highly ductile materials with expanded materials or virgin ingots, however, it is not common.

Within a realm of luxury/sports cars ONLY.

If we adopt the die casting method by use of the secondary alloy and the mechanical properties demand can be satisfied, the usage application may be greatly expanded.

We researched on the mechanical properties depending on the cleanness of various molten alloys. Let us share our report and results.



Session Chairperson
NanoCast Masao Kikuchi

JD24-24

Proposal of next generation heat exchange system by Solid Phase Diffusion Bonding of ADC12 Die Castings

Suwa University of Science MOLE'S ACT Inc.
MOLE'S ACT Inc.

● Mirai Tsuchiya
Toshiaki Kitazawa,
Hiroshi Makibuchi

The main heat exchanger, the cooling fin, has a complex 3D

shape, high weight and volume, and low heat exchange directivity. However, the thousands of semiconductors in EVs release a large amount of heat, so a system with high heat exchange efficiency is essential. In addition, high productivity is required for automotive parts, so production involving the processing of elongated materials is not suitable from the standpoints of cost and time efficiency. Therefore, a heat sink with a 3D cooling circuit was developed by solid-phase diffusion bonding of ADC12 die-castings, which had been considered impossible. The heat exchange system with high yield and high thermal controllability can be constructed by using the diffusion bonding technique compared with the external heat dissipation type heat sinks with complicated fin geometries. In this presentation, we report on the verification of this next-generation heat exchange system.

JD24-25

Development of die-casting technology that can be joined to steel plates by spot welding (SWAD)

Ahresty Corporation ● Atsushi Tateishi, Isao Akuzawa,
Yoshiteru Kondo,
Ph.D.(Eng.) Shunzo Aoyama, Nobuyuki Sakai

Environmental issues are increasing the need to reduce the weight of automobiles. In addition, the weight of the body is being reduced by multi-material. Currently, die-casting is used by joining to steel plates with SPR, but since spot welding cannot be used at that time, it is necessary to assemble it on steel plates with sub-lines, which requires additional investment and factory space. Therefore, we developed a technology that can join steel plates directly to die casting by spot welding. For spot welding, we considered inserting joint piece in die casting. By developing a joint piece, developing a process for inserting in a die casting, and investigating spot welding conditions with a steel plate, we were able to develop a die casting technology that can be joined by spot welding instead of SPR.

JD24-26

Innovation in the use of sensors for the realization of the smart factory

TOYOTA MOTOR CORPORATION ● Tomohiro Koyama

In an era of once-in-a-century transformation, an era in which there is no right answer, we are working on innovation toward smart factories with the aim of transforming conventional processes.

In the Ministry of Economy, Trade and Industry's Smart Factory Roadmap, there are three levels of smartness: (1) data collection and accumulation, (2) data-based analysis and prediction, and (3) data-based control and optimization. As one of the means to achieve this, we believe that the method of collecting measurement data is particularly important in the collection and accumulation of data described in (1) above, because it is not possible to correlate with measurement data that has a low correlation with quality or defects even if it is analyzed. Therefore, it is necessary to use a sensor with a high correlation to the phenomenon. We will introduce an initiative that uses sensors that can see the phenomenon we want to see.



Session Chairperson
AISIN Corp. Hideaki Kobayashi

JD24-27

Verification of Quality Improvement Effect Mechanism of Partial Solid Die Casting by Full Model Simulation Including Injection Parts

R&S Cast Solutions
KYUSHU YANAGAWA SEIKI CO., LTD.

● Eitaro Koya
Atsushi Kawauchi

The semi-solid die casting method is one of the methods to improve the quality of die casting process. The issues of the semi-solid die casting method are the cost increase due to the slurry manufacturing process and the difficulty in applying to ADC12, an eutectic alloy with a narrow solidification range. The Partial Solid Die Casting (PSDC) method has been proposed to overcome these issues and to significantly reduce energy consumption in the manufacturing stage. PSDC promotes solidification nucleation by controlling the solid phase ratio in the sleeve to around 0.05 by using casting conditions and mold design and aims to improve the quality of thick-walled parts. In this paper will verify whether it is possible to generate a stable solid-liquid coexisting molten metal state in the sleeve by numerical analysis using a full-model simulation including the ladle feeding and injection mechanism.

JD24-28

Implementation of pressurized runner squeeze pin system and PF methods for a void-less, high strength casting and technical initiatives for mass production

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Yuuta Shimizu, Takashi Sakai,
Takayuki Hirano

Direct21 Corporation
Norihiro Iwamoto, Osamu Nagasawa,
Isao Kuboki, Shigeaki Saitou,
Masao Kikuchi

The most frequently occurring defects in a die casting process are porosities. It can be majorly classified into gas entrapment and shrinkage porosity. These porosities have a huge impact on the mechanical properties of the casted product and is one of the significant reasons for the loss of its strength. The target was to solve the problem of two different porosities that are caused by different factors with one solution. The goal was to integrate PF (Pore Free) die casting and pressurized runner squeeze pins into the traditional high speed die casting process to achieve excellent internal quality and mechanical strength and further achieve process stability during mass production. This experiment was evaluated based on dedicated casting plans, casting parameters, oxygen supply conditions and pressurized runner squeeze pin parameters. The results, effects and future prospects are discussed in this technical paper.

Development of Manufacturing and Material Technologies for High-Impact Resistance Aluminum Die-Casting Products

Ryobi Limited ● Mamoru Murakami, Shigetake Kami,
Ph.D.Akihito Hasuno, Yusuke Yoshida, Keisei Inoue

In recent years, the shift from iron to aluminum for material substitution has gained renewed attention due to demands for reducing environmental impacts and controlling vehicle weight amid the transition from internal combustion engines to electric vehicles. This development aims to extend the application range of die casting to structural members, focusing on manufacturing and material technology advancements to enhance ductility and impact resistance. Although it is well-known that T7 heat treatment enhances the ductility and impact resistance of die-cast materials, challenges such as high costs and increased CO₂ emissions remain. This paper explores not only material development but also cost-effective and lower CO₂ emission heat treatment technologies and non-heat-treated solutions as alternatives to T7. By incorporating various innovations in design, testing, evaluation, and manufacturing techniques, we have realized the die casting of products with superior impact resistance. This report outlines the overview of our findings.



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