Session Chairperson
Syunzo Aoyama (Ahresty Corporation)

JD26-01

Development and Outlook of Machine-Learning-Based Anomaly Detection Framework for Die-Casting Processes

UBE MACHINERY CORPORATION, LTD. ● Wataru KUBOTA
Yoshinori OKAZAKI, Kiyotaka TANNOU
Tsukasa YUASA, Shin GOUBARA
Atsuya TAJIMA

Die-casting processes are monitored using high resolution waveform data that have traditionally required skilled engineers to check visually during production. This study presents a machine learning based framework that models signal characteristics under normal operating conditions and produces anomaly scores for each production cycle. To address process dependent waveform behaviors, preprocessing informed by domain expertise was incorporated, contributing to improved detection performance. By enabling cycle level anomaly identification, the approach provides timely indications of deviations that were difficult to detect without manual review. The resulting anomaly information offers potential for supporting data driven process analysis and for integration into traceability systems.

JD26-02

Approaches to Low-Pressure Casting for Die-Casting Machine Downsizing

SHIBAURA MACHINE CO.,LTD ● Shugo Matsuzawa
Satoru Aida, Yuto Hayashi
Koei Nakata, Otaro Yamagiwa

In recent years, with the trend toward larger die-castings, gigacasting and joining technologies have attracted attention. On the other hand, interest in downsizing die-casting machines has also been increasing. In the context of die casting, downsizing refers to reducing the casting pressure compared to conventional levels relative to the product size, thereby reducing the machine size. This is expected to offer benefits such as lower equipment costs, reduced power consumption, and improved productivity.
However, downsizing also presents several challenges. For example, compared to conventional machine sizes, a decrease in clamping force can make flash formation more likely, and a reduction in casting pressure raises concerns about deterioration of internal quality. In this paper, countermeasure technologies for these challenges are defined as “low-pressure casting technologies,” and their details are reported.

JD26-03

Technology Development Toward Mass Production of a Compression Die-Casting Process Using Die Clamping Force

TOYO INNOVEX Co.,Ltd. ● Tomohiro Kitagawa
Aiki Hamada, Takashi Ijiri
Kouki Shibata

The compression die-casting method using clamping force is a casting process that can obtain a feeding effect even after gate closure. When the casting pressure is increased stepwise by multi-stage intensification control immediately after molten metal filling, the tie bars extend and the die opens slightly. After gate closure, pressure is generated inside the molten metal by the force of the extended tie bars trying to contract (clamping force), and this pressure makes it possible to improve the internal quality of the cast product. At the previous die-casting conference (held in 2024), we reported on the development history and operating principle of this technology. In this paper, we describe the knowledge obtained through technological development aimed at solving issues in mass production based on specific case studies, and report on the technical challenges and future potential of this casting method.

Session Chairperson
Hideaki Kobayashi (AISIN Corp.)

JD26-04

Optimization of material properties and cooling channel inner surface properties of maraging steel additive-manufactured aluminum die casting mold

HIBINO INDUSTRY Co., Ltd. ● Masahiro Sugiyama, ● Mitsuhiro Karaki
Shinsuke Kitagawa, Makoto Kato
Dr. Eng. Hiroaki Iwahori, Technical Advisor
MAEDA SHELL SERVICE Co., Ltd. Kiyoshi Utsumi, Isao Takahashi
Aichi Center for Industry and Science Technology
Dr. Eng. Junji Umeda, Dr. Eng. Masaki Kato

Maraging steel, with its high strength and toughness, exhibits excellent laser melting and layering properties. However, its impact values are low, posing a risk of inducing cracks in molds. This report investigates the age-hardening characteristics and mechanical properties of layered maraging steel components and fabricated a die-casting mold with a hardness level deemed effective. Furthermore, by varying the inner surface roughness of the cooling channels through fluid abrasive polishing and applying Ni-P plating to prevent corrosion on the inner surfaces, aluminum die casting was performed. This revealed the optimal inner surface condition of the cooling channels for preventing mold cracking and corrosion.

JD26-05

Development and characterization of semi-solidified forging method (FS method) using recycled aluminum alloys

Ahresty Corporation

● Hiroto Kurita, Kiyomi Sakai
Katsuhiro Ode, Tomohide Sakaguchi
Shogo Narita, Tetsuji Konishi
Yoshinori Shibasaki

In recent years, automotive parts are required to have high thermal conductivity and high strength, and the importance of using recycled materials from the perspective of LCA is increasing. In this study, we developed a semi-solidifying forging method (FS method) that achieves both die-casting-like dimensional accuracy and high productivity for recycled materials of 6000 series and 7000 series aluminum alloys. In anticipation of mass production application, the characteristics of 6000 series alloys derived from market scrap were verified, and the main causes were extracted by quantitatively evaluating the inter-site variability caused by the structural heterogeneity peculiar to semi-solidification. In addition, the reduction of segregation was confirmed by introducing a new control factor, and the possibility of applying the FS method to mass production was shown as a guideline for optimizing molding conditions and for mass production.

JD26-06

Technical Development Initiatives to Expand Aluminum Die Casting Applications for Body and Electrified Components

RYOBI Ltd.

● Iori Koga, Daisuke Tao
Shin Hirabayashi

Achieving carbon neutrality urgently requires production innovation driven by vehicle lightweighting and component integration for BEVs and PHEVs. This paper reports on the latest developments in large-scale integrated die-casting (Gigacasting) for high-quality thin-wall casting, as well as joining technologies such as Laser Beam Welding (LBW) and Friction Stir Welding (FSW), to enable the application of aluminum die-casting to vehicle structural and electrified components. The evolution of these manufacturing technologies is expected to expand the application of aluminum die-casting beyond the automotive sector to various other industries.