



## Session Chairperson

Institute of Technologists Dr. Naomi Nishi

JD22-19

## Development and practical examples of "New die casting method" that solves blow holes and shrinkage porosities at the same time.

PROGRESS Corp.  
Direct21 Corporation● Antoku Ryo, Nishimura Hiroshi  
Iwamoto Norihiro, Nagasawa Osamu,  
Norikane Satoshi, Taniguchi Keiji

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.

JD22-20

## Development of electro-hydraulic actuator for die casting dies

NAMBU CO., LTD.

● Tsutomu Yagi

Actuators used for a sliding of aluminum die-casting dies are required to have high thrust, cycle time, and impact resistance when pulled out. We report the development of an electro-hydraulic actuator that satisfies this requirement and ensures overwhelming energy saving. This electro-hydraulic actuator drives a hydraulic pump that can rotate in both directions with a servomotor. Energy saving is realized by driving the servo motor and using power only when the actuator is operating. In addition to this system, a mechanism generating large thrust is combined with a hydraulic mechanism that can increase speed in a complex manner to improve the function. In this development, we will introduce not only the basic function as an actuator, but also the possibility of preventive maintenance and the possibility of improving the productivity of equipment by the information acquired from various sensors.

JD22-21

## Verification of production method for environmentally conscious die casting technology

SHIBAURA MACHINE Co., Ltd.

● Satoshi Tomioka, Satoru Aida,  
Toshiaki Toyoshima

What people nowadays demand in die casting are weight reduction of automobiles, environmental impact reduction

activities in manufacturing process, and competitiveness in pricing.

Further, shortening the cycle time will become increasingly more important, because people expect reduction of power consumption and increase of production efficiency.

As an example, changing a part of die casting machine driving unit, from conventional hydraulic unit to full-electric, or to hybrid system of hydraulic and electric, can possibly bring faster cycle and better energy saving.

Hereunder reports the effectiveness by research of the quality comparison between the method including environmental impact reduction and the conventional method.

JD22-22

## Development of Runner Squeeze

RYOBI Limited

● Yasuyuki Mizukusa, Tsutomu Ueda,  
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Masahiro Nakata  
Osamu NagasawaTrust Limited  
Direct 21 Corporation

Runner Squeeze is a casting method in which the runner is immediately blocked with a squeeze pin after filling with ordinary die casting injection. Then, the molten metal is supplied with the same squeeze pin molten metal forging. The final casting pressure of the squeeze pin can be as high as 300MPa. As a result, a significant improvement in internal quality was obtained. In addition, we introduce cases where yield improvement and high cycle have become possible by slimming runners. In addition, topics of development history and knowledge that could be confirmed for the first time by the runner squeeze method are described. Finally, technical issues and future prospect of the runner squeeze method will be introduced.



## Session Chairperson

SHIBAURA MACHINE CO., LTD. Masaki Koiwa

JD22-23

## Development of Laser Heat Treatment Technology for SPR Joining of Aluminium Alloy Die Casting to Reduce CO<sub>2</sub> to 1/10

Ahresty Corporation

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Dr. Masakazu Kobayashi

Toyoashi University of Technology

Reducing CO<sub>2</sub> emissions from automobiles in Life Cycle is an urgent task to achieve carbon neutrality by 2050. To reduce the weight of automobiles, aluminium alloy die casting is used as part of the body structure. SPR is mainly used for fastening steel plates with die casting, and die casting is subjected to T7 treatment to obtain ductility to withstand deformation during rivet joining. The problem of heat treatment process is to generate blister and deformation in die casting and to generate large amount of CO<sub>2</sub>. Therefore, we developed a technology to heat treatment only a local part of SPR fastening part of die casting in a short time by laser. As a result, the blisters and deformation generated in heat treatment process have been eliminated, heat treatment equipment has been made compact, and CO<sub>2</sub> emissions in the process have been reduced to about 1/10 of those in the existing process.

## Development of aluminum body parts manufacturing technology that requires T7 heat treatment

Ryobi Mirasaka Co.  
Ryobi Limited

● Akifumi Suzuki  
Mamoru Murakami, Yoji Yamada,  
Yusuke Yoshida, Shingo Muramoto

T7 heat treatment, which is known as one of the most effective methods for improving ductility, is a process that involves solution heat treatment at high temperature and quenching. When T7 processing thin-walled aluminum die-cast products, large distortions are likely to occur and variations are likely to occur. Therefore, reduction and stabilization of distortion is the biggest challenge in promoting mass production with T7. We have developed a T7 heat treatment technology that produces stable mechanical properties with little variation even in mass production and is less likely to cause distortion. As a result of making various improvements through CAE and experiments, we were able to achieve the target dimensional accuracy and bondability at the joints required in the assembly process

## Die casting technologies of large body and chassis parts for automobiles

UBE MACHINERY CORPORATION, Ltd.

● Noriyuki Oe, Mamoru Nishi, Hirofumi Onishi,  
Yuuichirou Tsurugi, Yuki Miyamoto, Motoki Tanaka,  
Naoki Ishibashi, Kousei Murakami, Dr. Hiroto Sasaki

Automobile world is proceeding to electric power drive and requiring lightweight solutions, which include body and chassis parts, so called structural components, which used to be composed mainly of welded pressed steel sheets, are now being shifted to aluminum die-casting materials and process, which excels in thin-walled, three-dimensionally complex shapes. And, as a means to achieve both weight reduction and manufacturing cost reduction of those parts, the integration of multiple parts into a super-sized structure is being promoted. In the above parts, which tend to increase not only thin-walled but also flow length, it is necessary to prevent casting defects such as air inclusion and cold-shut as well as to further shorten time for molten metal filling up the die cavity in order to obtain a uniform fine solidified micro-structure. In this paper, details of die casting technologies newly developed to realize the above requirements are presented, and a method for manufacturing high-quality large body and chassis parts is proposed by applying those technologies.



## Effects of high response injection die-casting machines on product quality

TOYO MACHINERY & METAL Co., Ltd.

● Tomohiro Kitagawa,  
Takashi Ijiri,  
Fumitaka Ishibashi,  
Aiki Hamada

These years, automotive parts have been changing for higher performance, EV and HV. Instead of parts for engine-driven vehicles, thin-walled parts for electric vehicles are increasing, which requires high injection speed as melt solidifying time is very short. In addition, immediate intensifying is required upon filling completion, or inside quality is considered to be badly affected. However, the intensification tends to be delayed with the presently available die-casting machines as the higher the injection speed is, the longer their injection mechanism takes in shifting to intensification process.

In this paper, basic experiments have been made regarding the relationship between the shifting time to intensification process and the inside quality. In addition, we devised and verified the effectiveness of an injection system that requires extremely near zero shifting time, causing no delayed intensification.

## Global development of the die-casting technology for the aluminum subframe

Ryobi limited

● Mamoru Murakami, Shinya Akada,  
Tadaaki Shimohigashi,  
Tomohiro Umoto, Shoichi Murakami  
Taishi Tsuwano, Tomoyuki Nishiyama  
Yoshiro Iwata

Ryobi Die Casting (USA), Inc.  
Honda Motor Co., Ltd.

Ryobi and Honda developed new subframe which has been integrated with the conventional die-casting shape and GDC bracket, which is requiring high level of die-casting process. The die-casting process applied the two-cavity with high vacuum condition same as previous model, and Ryobi cascaded this process to global wide. In order to achieve stable production with the same quality level, the material was changed from AISi8Mg alloy, which emphasizes ductility, to AISi10Mg alloy, which emphasizes productivity. The ductility that was disadvantageous due to the material change can be guaranteed by improving the evaluation technology and production development. We will introduce the summary of the way of achievement to cascade this mass production methods to global wide, such a die-casting key elements technology for stabilization process and have developed automated inspection technology.