

# Direct Observation and Simulation for of Ladle Pouring and Plunger Advancing behaviours in Die Casting Process

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## ABSTRACT

The ladle pouring and plunger advancing processes are parts of the die casting which has advantages of high speed, good quality and mass production. The molten metal is quickly poured into the sleeve by tilting the ladle, and immediately injected into the die cavity with high speed and high pressure by advancing the plunger. Since the entrapment of air and the generation of solidified layer in the ladle pouring may cause the defects of cast products, it is necessary to simulate the ladle pouring behavior.

In the present study, the pouring experiment into the sleeve using die casting aluminum alloy JIS-ADC12 are carried out to observe the flow behavior by tilting the ladle. Further the molten aluminum alloy is injected to the cavity from the sleeve by advancing the injection plunger. Dynamics of the molten aluminum alloy is influenced by the oxide film [1][2]. The flow behaviors in ladle pouring and plunger advancing of molten aluminum alloy are simulated using "COLMINA CAE", which is the casting analysis software by particle method SPH [3]. The experiments and simulation are executed varying with the shot time lag, which is the interval from finish of ladle pouring to start the plunger advancing, and plunger speeds. Wave behavior obtained by simulation is almost agreed with the actual phenomena. Flow and heat transfer simulation using SPH method with a function of the oxide film is effective method that ladle pouring and plunger advancing of molten aluminum alloy with free surface flow can be simulated accurately.

**Keywords:** Ladle pouring, Wave behavior, Molten metal, Aluminum alloy, Solidification

## REFERENCES

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