Title Of The Paper: Advantages of Green Sand Molding Process Using Aeration Technology

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Abstract: World casting production in 2012 exceeded 100 million tons. Over 80 % of production was iron castings and made with sand molds. Green sand molding technology plays an important role in the iron casting production. Demands for near-net-shape iron castings become much stronger in order to save resource and energy consumption. In order to make a high quality mold to satisfy such demands, it is critical to choose the most optimum green sand molding process which achieves making uniformly dense molds with lower energy consumption.

Recently, a molding process using low air pressure “Aeration” sand filling, which can make the uniformly dense molds with lower energy consumption, is becoming popular worldwide. This molding process consists of the following two steps.

1) Aeration sand filling: Green sand under aeration fills the flask smoothly and gently. Accordingly, the bridge-forming phenomenon which often happens at some regions inside the mold with complicated pattern geometry and at the entrance of a deep pocket is minimized.

2) High pressure squeezing: Sand molds are finally compacted by high pressure squeeze. The segment squeeze head is preset to contour the pattern geometry for flask tight molding machine. Accordingly, the mold back is formed flat after squeezing.

In actual casting production, it has been proven that the aeration technology provides several advantages such as excellent sand filling, high strength and uniformly dense mold, superior energy saving, low noise level, less pattern wear, etc.

In this paper, the green sand molding process was studied with experiments and numerical simulation. A mathematical model of aeration sand filling based on two-phase flow continuous model was applied to actual production scale mold. Successively, a finite element method was applied for squeezing. It was clarified that the aerated sand flows smoothly by using a high speed video camera and developed sand detecting sensors. Furthermore, it had been found that aeration sand filling can make a lower friable and stronger mold which was evaluated with AFS (American Foundry Society) friability test and modified cone-jolt test. This study provides some valuable information for green sand molding process.

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