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Compacting of Greensand Control Equipment

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Sand control equipment in conventional greensand molding lines requires much space and investment. With the aim of putting into practical use compact sand control equipment that ensures stable sand properties, a method for stabilizing sand properties while improving casting quality was devised. In the method, collected sand was processed after separating into thermally deteriorated and undeteriorated sand. Since undeteriorated sand could be processed more simply, the amount of sand to be processed was reduced, and thus the newly developed sand control equipment achieved 20% space reduction for sand processing as compared with conventional equipment.

Keywords: *greensand control equipment, compacting , separation and collection process.*

1. Introduction

In conventional greensand molding lines, sand control equipment requires much space and investment, making it difficult to develop compact greensand molding lines. Therefore, we have developed a sand control method that ensures stable sand properties even in compact equipment.

2. Concept of compacting greensand control equipment

Conventional sand control equipment necessitates much space for recycling all collected greensand and processing a larger amount of greensand than that required for molding. To achieve equipment compacting, we considered reducing the processing amount, focusing on the state of greensand mold after pouring molten metal, as shown in Fig. 1. We anticipated that it is possible to reduce processing amount by normally processing only sand that contains a reduced amount of activated clay as a result of bentonite degradation due to heat of molten metal around the casting (hereinafter referred to as "deteriorated sand"), and by performing simple agitation for moisture adjustment of recycling sand that contains no bentonite degraded by heat in the outer layer (hereinafter referred to as "undeteriorated sand"). To this end, we developed a method for separating a mold after pouring molten metal into deteriorated and undeteriorated sand at the water condensed layer where mold strength is lowered.

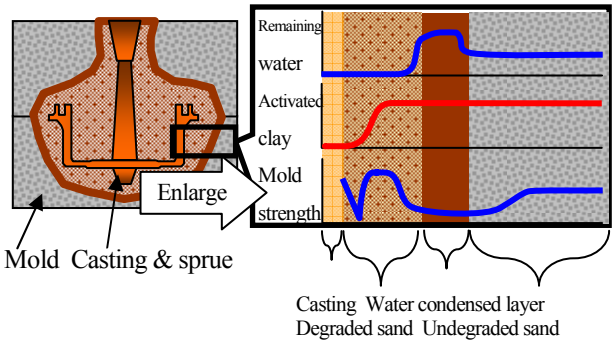

Fig. 1 Mold cross-section after pouring molten metal and properties of sand

3. Basic research

We investigated the possibility of separating sand by means of the water condensed layer, by examining changes in sand temperature and the degree of bentonite degradation due to heat of molten metal from the casting to the mold surface. Almost no changes in the activated clay content were noted in undeteriorated sand at 100 °C or higher temperatures where the condensed water layer was formed, whereas marked depletion of activated clay content was observed in deteriorated sand, as shown in Fig. 1. The properties of deteriorated and undeteriorated sand separated by the water condensed layer were hardly affected by differences in the type of casting, the sand-metal ratio, or the ratio of deteriorated to undeteriorated sand. These findings demonstrated that the separation into deteriorated and undeteriorated sand might have suppressed changes in sand properties even if they were separately processed in constant amounts, in contrast to conventional sand processing methods, where sand is processed in the same manner despite differences in the degree of thermal deterioration of sand found in different parts of the mold due to changes in the sand-metal ratio, causing variation in the properties of the sand.

Then, we developed a method for separating a mold after pouring molten metal into deteriorated and

undeteriorated sand by means of the water condensed layer. The method facilitated the separation of a horizontal splitting mold by making vertical cuts at the center of its four horizontal sides to split it. We applied this method to various actual products to separate deteriorated and undeteriorated sand and examined the proportion of deteriorated and undeteriorated sand to estimate the capability of greensand processing based on proportions where the amount of deteriorated sand is larger.

Finally, we fabricated compact greensand control equipment based on the above results, and evaluated it in a mass-production environment.

4. Results of using the greensand control equipment

The newly developed compact greensand control equipment was used in a molding line for mass production. The process of separating and collecting deteriorated and undeteriorated greensand was introduced in the shake-out process. As a result, a 20% reduction in space and a 10% reduction in investment cost were achieved, as shown in Fig. 2 and Fig. 3, respectively.

In addition, as shown in Fig. 4, compared with the conventional method, sand properties were greatly stabilized by processing stable deteriorated and undeteriorated sand separately through the separation and collection process.

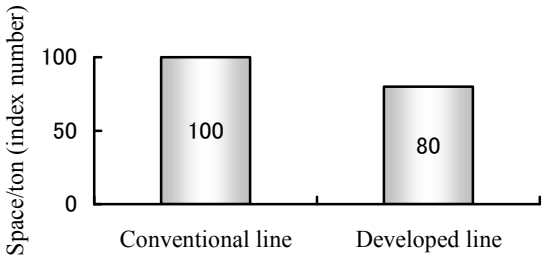

Fig. 2 Comparison of space per ton of sand processed

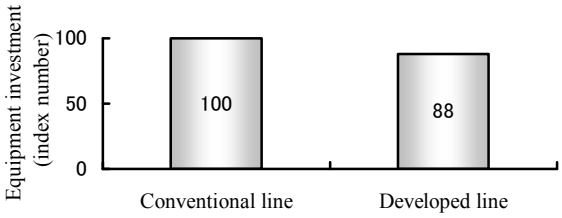

Fig. 3 Comparison of greensand control equipment costs

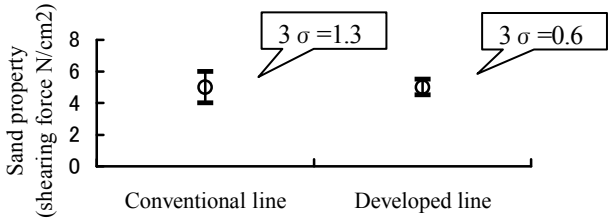

Fig. 4 Comparison of variation in sand properties