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Calciner-Free Green Sand Reclamation by Using Advanced Mechanical Reclamation System

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In most green sand/core sand systems, new sand is usually added as cores, and waste sand is discharged as dust or removed at shotblasts. If their amounts are completely equal, they must be balanced. However, in most cases, amount of entered sand is much larger than lost after shakeouts. This unbalance makes overflowed sand. Unfortunately, overflowed sand has insufficient properties for replacing new sand. Consequently, overflowed sand must be recycled or wasted. Some large foundries reclaim thermally their waste sand as core sand, and other large foundries recycle it for steel making material or cement material. Both methods have various difficulties for small to medium foundries. Therefore, they must waste their overflowed sand for landfill. Moreover, landfill cost is unbelievably more expensive compared to purchase new sand. Authors developed the cutting-edge mechanical reclamation system that is effective for green sand reclamation with eliminating use of calciners. This presentation reports the principle of the system and results of some case studies. The results shows sand reclaimed by this system is usable as alternative to sand reclaimed by thermal system and unused sand. These advantages contribute not only waste reduction but also defect elimination caused by poor quality cores.

Keywords: *Greensand Reclamation, Mechanical, Core Sand, RCS, PUCB*

1. Principles and Mechanism

This reclamation system, *Roller Squeezing Type Mechanical Reclaimer*, consists of a pair of ceramic rollers and a rotating drum. Combination of attrition and squeeze works on removal of oolitics and fines effectively. At first, this system had developed for *tough chemically bonded sand processes* such as Phenol Nobake or Sodium Silicate processes [1-3]. However, after numerous experiments, authors established the mechanical green sand reclamation system without calciners.

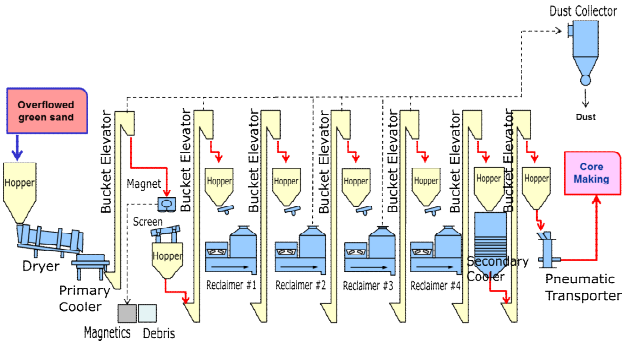

Fig. 1 Schematic Diagram of a Standard Plant

Fig. 1 shows the schematic diagram of standard reclamation system for overflowed green sand.

2. Case Studies

2.1 Reclamation for Resin Coated Sand (RCS)

RCS, used for shell cores, is one of the most popular applications of green sand reclamation in Japan. Authors conducted one comparison test between *Roller Squeezing Type Mechanical Reclaimer* and conventional reclaimer for a customer. Conventional method is to combust the sand by a calciner and then to scrub it by a numerous passes of attrition type reclaimers. On the other hand, developed system possesses four or six cell *Roller Squeezing Type Mechanical Reclaimers*. Test conditions are shown in Table 1, and test result for transverse strength is shown in Fig.2, and that for SiO_2 purity is shown in Fig. 3.

Table 1. Test Conditions from Green Sand to RCS

Throughput	Motor Power	Pass
4.0 MTPH	30kW/Pass (1st to 4th) 22kW/Pass (5th, 6th)	6 Passes

Fig. 2 and Fig. 3 clearly show that R*oller Squeezing Type Mechanical Reclaimer* achieves superior transverse strength and SiO_2 purity compared to conventional method using a calciner.

These results mean *Roller Squeezing Type Mechanical Reclaimer* enables to remove adhered Oolitics as well as fines more efficiently than

conventional method. Oolitics is very hard to remove and enables to be burnt by combustion. Consequently, combination of attrition and squeezing shows much more effective performance compared to conventional method.

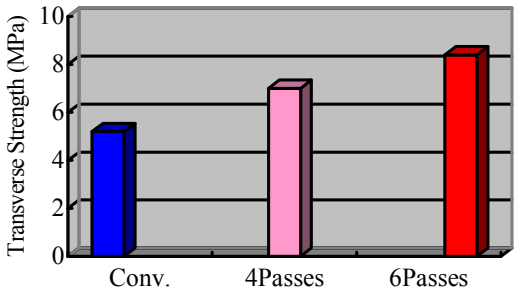

Fig. 2 Transverse Strength Comparison

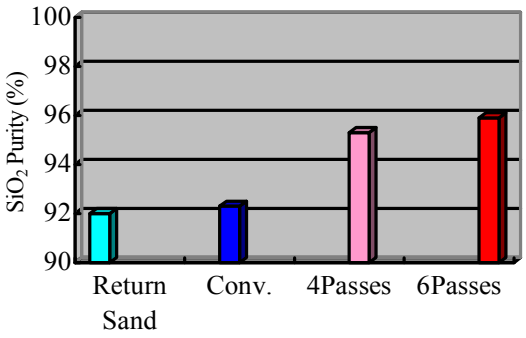

Fig. 3 SiO_2 Purity Comparison

2.2 Reclamation to Phenol Urethane Cold Box (PUCB) Sand

PUCB is popular core molding process for green sand mold all over the world. Authors conducted another reclamation test from waste green sand, core sand, and sand discharged from the shotblast mixture to PUCB cores for a customer. Test conditions are shown in Table 2, and Fig. 4 shows the transverse strength comparison between unused sand and reclaimed sand.

Table 2 Test conditions from Mold Sand Mixture to PUCB

Throughput	Motor Power	Pass
5.0 MTPH	30kW/Pass	4Passes
Sand Mixture		
Overflowed sand	Core Sand	Sand from Shotblast
50%	30%	20%

From the result shown in Fig. 4, *Roller Squeezing Type Mechanical Reclaimer* achieves superior values at 4 Passes in each condition compared to unused sand.

This result means that *Roller Squeezing Type Mechanical Reclaimer* does not removes oolitics and fines but also polish sand grainsurface and improves its shape to rounded.

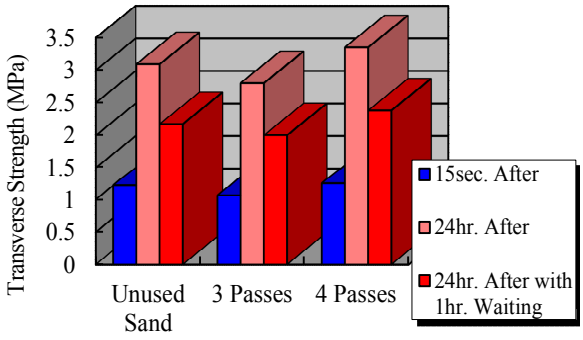

Fig. 4 Transverse Strength Comparison

3. Conclusions

Authors conducted numerous tests from green sand or sand mixture contains much green sand to core sand or mold sand. From the results mentioned above, *Roller Squeezing Type Mechanical Reclaimer* enables to eliminate calciners for reclaiming green sand. This system achieves to manufacture superior quality reclaimed sand only by mechanical reclamation.

Case study results clearly show the sand reclaimed by this system superior core strength and SiO_2 purity compared to the sand reclaimed by calciners and unused sand. These results mean sand reclaimed by this system enables to make more quality cores than that reclaimed by calciners. More quality cores must improve casting quality as well by eliminating casting defects caused by poor quality cores.

Authors expect this system to improve casting quality as well as to reduce waste sand.

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