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Moulding sand recycling and reuse in small foundries

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Abstract

A number of small foundries do not reuse their sand while some reuse it. In this paper we explore how the EffSAfound a German project in collaboration with the Metal Casting Technology Station (MCTS) at the University of Johannesburg reused spent foundry sand in a small foundry. We look at economics of reuse and quality of the reusable sand. Currently there are a number of small foundries with no sand reuse options. The following properties of the reusable sand were looked at as part of the collaboration with the German project. The two important properties looked at are strength and loss on ignition. All the test procedures related to sand reuse were conducted according to the American Foundry Society moulding and core making test procedures. Our research indicates that a number of small foundries have not explored the qualities of spent foundry sand which could have been reused in the foundry. As part of the EffSAfound project we tested the quality of sand in particular to ensure reusability. We also looked at potential cost savings in the foundry. The major challenge remains the cost of investment required to install reclamation units in small foundries.

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Keywords: Sand reclamation; sand recylcing and reuse, sand reuse in South African foundries

1. Introduction

Reclamation is becoming a necessity in foundry operations. Foundrymen cannot afford to continue paying money to buy and for freight to the foundry and thereafter pay for freight and disposal costs [1]. Casting production done in sand moulds is considered as 80 % of the world casting production [2]. There are three methods for the recovery of foundry sands for core operations: dry mechanical reclamation, wet mechanical reclamation and thermal reclamation

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[3]. In [4] authors explain in-house reuse and reclamation of used foundry sands with sodium silicate binder - an inorganic binder. In this study we used an organic binder namely Alkaline Urethane from one of the small local foundries. EffSAfound [5] project was initiated mainly to improve material efficiency in foundries. In this paper we look at the reusability and quality of the spent foundry sand after mechanical reclamation. High purity silica sand is a valuable mineral resource used in foundries. In order to conserve the natural resource and improve efficiencies. There is a need to encourage reuse in the foundry and other industrial sectors before disposal of the spent foundry sand to Landfill site. Foundries can recycle and reuse sand many times and chemically bonded sands are used in particular both in core making where high strengths are necessary to withstand the heat of molten metal, and in mould making [6]. In this paper we focus on reclamation of hot box sand from a small core making operation. The reclamation process involves treatment of sand and then reusing it for core production [7].

2. Objectives

The main objective is to explore how MCTS in collaboration with the small foundry recycle and reuse spent foundry sand.

The sub-objectives are:

- To determine the loss on ignition values from chemically bonded sand
- To determine the strength with variation in reclamation cycles.
- To reuse the reclaimed sand in core production.

3. Materials and methods

The process that was followed for checking sand reusability is given in Figure 1.

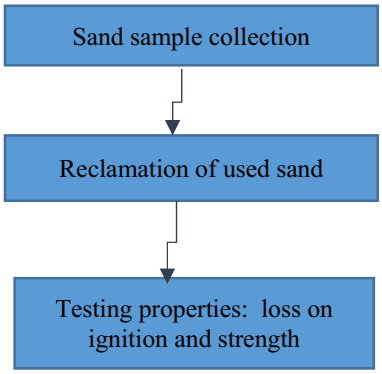

Figure 1: Process for checking sand reusability

In Figure 1 we explain the process for checking sand reusability. We used the dry mechanical reclamation process initially. We collected the sample that had been used once for core making in the foundry. The next step is reused sand reclamation followed by testing the properties for instance, the strength and loss on ignition using various test procedures.

Standards and test conditions: Representative samples of the reclaimed sand were collected during the reclamation process. The sand was stored in sealed plastic buckets. The sand was then tested over a 48-hour period. A representative sample of the sand to be tested was selected from the collected samples. The oven (power) was turned on and the temperature allowed to stabilize at the desired set point of 260 ^{0}C. The curing time was selected to be 8 minutes The transverse specimen was selected and coated with release agent. The pattern was then filled with the

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