

# SAND-SLINGER METHOD OF LINING STEEL-CASTING LADLES

Abstracted by I. A. Gryaznova\*

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The lining of the 210-ton steel-casting ladles of the converter division of the Salzgitter Plant of the concern Stahlwerke Peine-Salzgitter (West Germany) is produced by a sand-slinger method on special equipment. Three ladles are set up together over a pit. The ramming material is loamy sand. The prepared material is placed into a hopper from where it is fed to the sand-slinger head. The rotation of the head around the ladle axis can be regulated to a maximum of 20 rpm; the conical shape of the lining is produced by slewing the arm of the sand-slinger. Peak sand consumption is 55 m<sup>3</sup>/h.

The permanent lining of the ladle is constructed of chamotte brick to a thickness of 40 in the wall and 65 mm in the bottom. The thickness of the sand-slinger rammed lining is 218 mm at the bottom and 184 mm at the top edge of the lining. After the fitting of two porous bricks for the blow with inert gas and of the brick for the pouring nozzle the 210-mm-thick working lining of the bottom is constructed of V-2 brick placed on end.

The full sand-slinging cycle consist of the following operations: setting up the sectioned template and adjusting its position, the sand-slinging operation, and the removal of the template with a crane. Complete renewal of the lining by sand-slinging requires 39 h which includes handling the material, adjustments, cooling, removal of the worn lining, laying the bottom bricks, and ramming and drying the wall lining. The sand-slinging operation requires 20 min. Drying accounts for 60 % of the total time.

The durability of the sand-slinger produced lining may equal 33 pourings depending on the conditions of operation, the chemical and mineral composition and grain size distribution of the mix, the quality of the sand-slinger process, and the method of drying.

A sintered layer should form quickly on the surface of the sand-slinger lining during the first pouring. The strength of the wall depends on the coarseness of the sand, the proportion of plastic component in the sand, and to a significant degree on the moisture content of the mix. The density of the wall lining depends primarily on the properties of the mix, the rate of the sand feed, and the speed of rotation of the sand-slinger head.

The chemical composition of the mix used for the sand-slinger lining of the ladles is approximately as follows: 86% SiO<sub>2</sub>, 6.5% Al<sub>2</sub>O<sub>3</sub>, 2% Fe<sub>2</sub>O<sub>3</sub>, 0.1% CaO, 0.3% MgO, 0.05% Na<sub>2</sub>O, 0.2% K<sub>2</sub>O, and 3% other admixtures.

The moisture content of the mix is 8-9% during the lining process, and the refractoriness 1650°C. The grain size distribution is as follows: 1% fraction 3-2 mm, 1% 2-1 mm, 2% 1-0.5 mm, 12% 0.5-0.3 mm, 14% 0.3-0.2 mm, 40% 0.2-0.1 mm, 19% 0.1-0.06 mm, and 11% finer than 0.06 mm.

The sand-slinger method gives a much more durable lining produced in a shorter time with less labor and at lower cost.

\*W. Cherubim and W. Resch, Stahl und Eisen, 95, No. 13, 582-592 (1975).

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