IN-MOULD INOCULATION OF CAST IRON
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6 Claims

ABSTRACT OF THE DISCLOSURE

In casting molten iron, a block of additive composition is placed in the mould prior to pouring. The additive is ferrosilicon dispersed in a wax or wax-like substance such as stearic acid.

This invention relates to the production of cast iron. It is well known that in order to obtain cast iron in the so-called “gray” condition, rather than the “white or bloom” condition it is necessary to increase the incidence of crystallisation nuclei and this can be achieved by adding to the iron, usually while it is contained in a ladle, a so-called “inoculant.” The most commonly used inoculant is ferrosilicon but others are known and may be successfully employed.

The measure of success achieved by the inoculant may be determined by the so-called “flanged plate” method of the British Cast Iron Research Association. In this method a plate of the iron is cast in the general shape illustrated in plan in the accompanying drawing. Referring to this drawing the plate has a central portion A which is 6 inches square and half an inch thick. This central portion has extensions B, C and D three sides respectively \( \frac{3}{16}, \frac{1}{8} \) and \( \frac{3}{4} \) inch thick. These extensions each extend 2 inches beyond the margins of the central portion A, and have inclined edges so that the length of the outer margin of each is 5 inches. When the casting is complete the extensions are cut away along the line X—X and are fractured centrally (in a plane at right angles to the body of the plate) as shown at F on extension D, and visually inspected. The distance to which the white iron extends along the sample (measured from the outer edge of the flange as indicated at H1) is defined as the chill height. If for a sample which has not been treated with an inoculant this value is \( H_1 \) and for a sample which has been treated with inoculant is \( H_2 \), then the chill reduction is determined as

\[
\frac{H_1 - H_2}{H_1} \times 100
\]

as a percentage value.

It is an object of the present invention to provide a method whereby an improvement in the chill reduction obtained may be achieved.

According to the present invention, in the production of cast iron by pouring iron into a mould, there is placed in the mould prior to pouring a body comprising an inoculant for cast iron dispersed in a medium of wax or wax-like substance.

Suitable waxes are any of the well known natural waxes such as beeswax, carnauba wax or montan wax, or paraffin wax or a substance having the physical characteristics of a wax such as a fatty acid or fatty alcohol or fatty acid ester, e.g. stearic acid or stearic acid alkyl esters. It is important to employ a wax which is destroyed by the molten iron to leave no undesirable residue.

The inoculant is preferably ferrosilicon (the commercial grade of which contains small quantities of aluminium and calcium as impurities) and the composition may conveniently contain 30 to 80% by weight of ferrosilicon. However it is found preferable to employ compositions in which the waxy constituent constitutes at most to 35% of the composition since higher proportions of the waxy constituent appear to lead to no further improvement in results. The composition of inoculant and waxy substance is preferably set up as tablets of standard weight so that an appropriate number of tablets may be scattered in the mould according to the weight of iron to be treated. Generally the quantity should be at the rate of 25 to 50 ounces (calculated as ferrosilicon) per ton of molten iron under treatment if no pre-inoculation of the iron in the ladle has been carried out, but less may be applied if it is used in conjunction with pre-inoculation techniques, i.e. normal inoculation in the ladle.

It has been found desirable, though not essential, to include in the composition a substance which is converted to a gas under the heat of the molten metal since this aids in disintegrating the inoculant composition and is especially useful where the composition is used in tablet form. A particularly useful additive for this purpose is hexachlorethane since it decomposes to gaseous products leaving no solid residue. A proportion of 2 to 10% by weight of the composition is very suitable.

The following examples will serve to illustrate the invention and demonstrate the advantages obtained:

EXAMPLE I

Two thirteen pound weight plates of iron are cast in molten iron in the form shown in the accompanying drawing. In one case (a) there is added to the mould, before pouring the molten iron, \( \frac{1}{4} \) ounce of ferrosilicon powder. In the other case (b) the same amount of ferrosilicon is added to the mould but in the form of a tablet consisting of 1:1 ratio by weight mixture of ferrosilicon and stearic acid. Casting of the molten metal is effected at 1385° C.

The tests were repeated and the chill reduction values were determined, and were as follows: (a) 45—55%, (b) 70—96%.

EXAMPLE II

The procedure of Example I was followed but using three comparative cast plates as follows:

(i) containing no inoculant
(ii) containing \( \frac{1}{4} \) oz. of ferrosilicon powder
(iii) containing \( \frac{3}{4} \) oz. of a composition (in tablet form) comprising, by weight,

<table>
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<tr>
<th>Percent</th>
<th>Ferrosilicon (Po 44 BSS Mesh)—(75—80% Si)</th>
<th>65</th>
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<tbody>
<tr>
<td>Stearic acid</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Hexachlorethane</td>
<td>5</td>
<td></td>
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The iron cast to form the plates contained 2.80% total carbon, 1.66% silicon and 0.05% phosphorus.

Compared with the uninoculated casting (i) taken as zero, the chill reduction value was 47% in casting (ii) and 75% in casting (iii).

The method of the invention thus achieved a substantially greater chill reduction value as compared with the conventional use of the inoculant.

I claim as my invention:

1. In a process of casting iron by pouring into a mould, the step of placing in the mould, prior to pouring the molten metal, in inoculant quantities, a coherent block of a mould additive which consists substantially of ferrosilicon dispersed in a material having the physical characteristics of a wax, the ferrosilicon consisting from 30 to about 80% by weight of the additive.

2. The process of claim 1 wherein said material is selected from the class consisting of beeswax, carnauba wax, montan wax, paraffin wax, stearic acid and stearic acid alkyl esters.
3. The process of claim 1 wherein the mould additive includes a substance which is converted to gaseous forms under the heat of the molten metal.

4. The process of claim 3 wherein said substance is hexachlorethane.

5. The process of claim 1 wherein the said material constitutes up to 35% by weights of the additive.

6. The process of claim 1 wherein about 25 to 50 ounces of said mould additive per ton of molten iron is added.

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