

## The Use of Briquettes in the Converter Process at PJSC “EVRAZ DMZ Petrovskogo”

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The information on the use of different briquettes in the production of steel in the top oxygen blast converters is given.

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### Introduction

During the past 10 years different briquetted materials have been implemented and are constantly being used in the steel production of PJSC “EVRAZ DMZ Petrovskogo”. The most widely used are ferrous briquettes (FB), the implementation results of which are given in [1, 2].

The data [2] refer to 2005, when the average consumption of FB was 10.86 kg/t of steel and they were used as a cooler and replacement of steel scrap part in short supply of the latter. By increasing the specific consumption of steel scrap from 119.65 kg/t of steel in 2005 to 147.71 kg/t of steel in 2010 average consumption of FB decreased to 5.26 kg/t of steel and they tend to serve for additional charging as required estimated amount of steel scrap is not possible to be provided into the converter for organizational reasons. At the same time FB are used for cooling overheated melts and sedimentation of slag during its excessive foaming in the blast. Any features of FB implementation are not established.

### Results and Discussion

One of the most important indicators of the work of oxygen converter shop of the plant is resistant refractory lining of converters, which considering the high cost of the used in the last years magnesia-carbon refractories is necessary to continuously improve. One of the recognized and effective ways of solving this problem is to maintain a sufficient concentration of magnesia in the slag due to its input to the converter with other materials, that contributes to slowing down the

transition of MgO from the lining into slag.

As such materials magnesia briquettes from different manufacturers are used. The content of MgO in briquettes is at the level 69-77%. Their number in the melt is chosen in accordance with the technological instructions for the production of converter steel and depends on the silicon content in cast iron. As a rule briquettes are added by one portion in the first additive along with other non-metallic materials. Their specific consumption ranges from 4.4 to 5.9 kg/t of steel and provides the content of MgO in the final 5-6% slag. The effectiveness of magnesia briquettes can be judged by the following data: the average specific consumption of briquettes in 2005, 4.4 kg/t of steel the average lining strength was 1200 melts whereas in the specific consumption of 5.4 kg/t of steel in 2011 it reached 2410 melts, to some extent, this index was influenced by other factors.

In 2002-2003 the shortage of aluminum for the deoxidation converter steel titanium and aluminum cylinder-shaped briquettes with a diameter of 150 mm, height of 50-105 mm and weight of 3.0 to 6.5 kg were applied. Titanium briquettes consisted of 60% of titanium chips, aluminum- 50% of the aluminum chips and the rest was steel chip. The briquettes were used mainly for additional deoxidation of semikilled steel with adding in the casting ladle, and the specific consumption was 0,13-0,20 kg/t of steel, which provided a reduction of refused material and flaws on the billet of steel 3ПС from 0.16 to 0.1% on steel 5ПС - from 0.36 to 0.21%. At the same time the refused bundle material remained at 0.01-0.02%.

During the same period experiments on the use of briquettes instead of lump ferrochromium for

alloying steel 35X were conducted. The chromium content in briquettes was at least 60%. Briquettes were added to the converter and the casting ladle. In the first case of chromium waste was 70.5%, 5.7% in the second.

In January and February 2009 experimental melting ferrosilicomanganese briquettes for deoxidation semikilled steel grades 3ПЦ and 5ПЦ instead of lump FeSiMn was conducted. Dimensions of briquettes 806 040 mm, with content in them (%) 74.9 Mn; 17.2 Si; 2.24 C and 0.302 P. Specific consumption of briquettes for steel 3ПЦ deoxidation was 10 kg/t and steel 5ПЦ 10.7 kg/m. The coefficient of replacement briquetted material in relation to the lump was 1.05. The quantity of manganese waste briquettes was at the level of his waste from the lump of material: 38.9 vs. 36.9% for steel 3ПЦ and 31.5 vs. 29.0% for steel 5ПЦ.

Melting ferrosilicomanganese briquettes were carried out in order to increase the degree of desulfurization of steel during the blowing and residual content of Mn. Briquettes were added to the converter with the content of less than 0,15% Mn and more than 0,05% S in the cast iron after the intermediate slagging on the 6th minute blast with a flow rate 0.5 tons (about 8.1 kg/t steel). The degree of desulfurization of steel at the same time is increased by 11.8% and the residual content of Mn in the steel at 0.085% against the current production melts conducted under comparable conditions.

## Conclusions

At the oxygen converter shop of PJSC "EVRAZ DMZ Petrovskogo" briquetted materials were and are used for various technological purposes. In the future, new materials may be used upon receipt of proposals from manufacturers.

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## Использование брикетов в конвертерном производстве ПАО «ЕВРАЗ–ДМЗ им. Петровского»

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Приведены сведения об использовании различных брикетов при производстве стали в конвертерах верхнего кислородного дутья.