

Sinyakov R. ⁽¹⁾, head of department, c.t.s.

Kharchenko A. ⁽²⁾, associate professor, c.t.s.

.STUDY OF FEATURES OF STEEL DEPHOSPHORIZATION IN OXYGEN CONVERTER WITH THE USE OF PROGRAMMATIC COMPLEX «DESIGNINGMELT»

⁽²⁾ *Technological company «Mines of Tsines», Peking (CPR)*

⁽¹⁾ *Zaporozhe state engineering academy*

The use of technology with the intermediate flushing of slag at blowing out and complete its abandonment after the scarification of fettling can be effective only at correct determination of oxygen blowing out moment stopping, that possibly at presence of adequate model of technological process. The presented approach allows to reduce an expense of lime on 10.7 kg/t, dolomite on 1.1 kg/t, oxygen on 2.0 m³/t, common quantity of slag on 15.0 kg/t, eventual content of phosphorus in 1.5-2.0 times as compared to base technology.

Keywords: oxygen converter, phosphorus, oxygen blowing-off, smelting technology, modeling

Introduction. Importance of creation of effective technology of moving away of phosphorus is conditioned by the necessity of decline of its content in a metal at the end of melting at the concentrations of carbon higher 0.1 %.

Factors, influencing on the conduct of phosphorus in a metal and on its eventual content in steel is well enough studied [1,2]. However reliable and predictable moving away of phosphorus to the real moment possibly only at the use of steel smelting technology in two converters: at first in one converter there is execute a dephosphorization and moving away silicon of metal, after in other there are conduct decarbonating and heating or at smelting became with subzero content of carbon and moderate temperature of metal on producing from a converter.

As authors of work [3] mark perspective is a technological process with the intermediate flushing of slag on motion blowing out of metal by oxygen in a converter and complete abandonment him for the next melting.

Raising of research task. The problem to investigate influence of different factors on a conduct and eventual content of phosphorus in a metal is set, and also there are to execute the estimation of technology with the intermediate flushing of slag from the point of view of dephosphorization and to define the optimal parameters of technology.

Methods, used for realization of research. In work an imitation modeling is used with the use of programmatic complex «DesigningMelt» [4]. Based on the thermodynamics model of the condensed phase, material and thermal balances, and also taking into account kinetics of processes and hydrodynamics of bath, a complex «DesigningMelt» allows to expect enormous quantity of parameters of smelting and steel out-of-furnace treatment.

Research results. Study of conduct of phosphorus and technology of its moving away was executed in the conditions of converter workshop of plant «ROCK-CHECK» (CPR, Tyan'zin'). In the offered system of automatized design a process is

begun with the preliminary task of duration of technological process and step planning (modeling and visualizations). A steel-smelting aggregate in which it is assumed to conduct the planned technological process of smelting or treatment steel gets out then. Descriptions of steel-smelting aggregate are assigned: Then there are choose equipment which is equip a steel-smelting aggregate and set limit on office hours, input of materials and power carriers. Completion of procedure is a structural synthesis of technological process: the technological periods of process get out; their sequence is set; and also preliminary duration of every technological period of melting. As a result get a virtual steel-smelting aggregate and technological process of smelting steel, corresponding to the real analogue. On a next step there is executed verification of project decision: for every period end criterions are set (on a temperature, at times, on the expense of material or on expense power carrier). The eventual parameters of technological process and initial conditions are assigned: chemical composition of metal and slag; temperature of the system; the initial masses of phases; state of fettling. Additional limits are set on the use of materials and equipment: presence on storage or limit on melting; at presence of a few devices is a general expense on all devices; minimum and maximal to intensity of expense of materials and power carriers. Fact data about real technological smelting steel process in an oxygen converter are entered.

The results of parametrical synthesis it is been: calculation of chemical composition of metal, slag and gas on motion a process; calculation of the masses of metal, slag and gas on motion a process; calculation of temperature of the system, calculation of middle temperature taking into account an unmolten charge and temperature of fettling; calculation of kinetics of co-operation of phases; calculation of material and thermal balance.

Results of industrial studies of phosphorus conduct in a metal in an initial period of blowing out, executed in a 150-ton converter in the conditions of converter workshop of plant «ROCKCHECK», well comports with calculation data.

Thus, on motion the oxygen blowing out of metal there is an optimal moment for implementation of operation of intermediate slag flushing. Obviously, deviation from titts time is reduced efficiency of the examined process. Taking into account changeability of basic data from melting to melting, determination of optimal moment of stop of blowing out becomes is awkward task.

In titts case it is necessary to use the adequate model of technological process, allowing on motion melting to forecast chemical composition, mass and temperature of metal, slag and gas. On the basis of the got results of calculation necessary to determine an optimal breakpoint of blow-off.

One of conditions of process efficiency is subzero charges of materials on melting and respectively acceptable quantity of appearing slag. It is therefore necessary to get no less than a 40-50 % slag, that allows to get eventual phosphorus at the level 0.012-0.014 %. Got results, reflecting rational mass of remote slag, are not taken into account by requirements on the branded content of phosphorus in the prepared steel.

Conclusions. As results study, optimal time, corresponding to a minimum of phosphorus content showed in a metal at the beginning of blowing out by oxygen de-

depends on many factors. In this case it is necessary to use the adequate model of technological process, allowing on motion melting to forecast chemical composition, mass and temperature of metal, slag and gas.

An imitation modeling showed that getting is necessary from 40 to 60 % of initial slag, and quantity of cycles of melting conducted in obedience to the investigated technology, must not exceed 4-5 depending on initial content of phosphorus in cast-iron and its eventual content on producing of metal from a converter.

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