UDC 621.1:669.184.14

I.G. Yakovleva, head of a chair, d.t.s.
A.A. Petrik, graduate student

GENERAL CHARACTERISTIC AND FEATURES OF BLOW DEVICES FOR HIGHER SCAVENGING OF BATH OF STEEL-SMELTING AGGREGATE BY OXYGEN

Zaporozht state engineering academy

The analysis of literary sources is executed in part of structural features of blow devices for scavenging of bath of steel-smelting aggregates by oxygen. Absence of synonymous recommendations is set in relation to the choice of construction and optimal expense of oxygen, given on sesvenging and after-burning of monomonooxide of carbon, distinguished from bath of steel-smelting aggregate. An analysis specifies on the necessity of development of new structural decisions of oxygen lance, which will allow to combine dignities of the known constructions and promote efficiency of after-burning of monomonooxide of carbon in the cavity of steel-smelting aggregate with the improvement of thermal balance of melting as it applies to the real productive conditions.

Keywords: steel-smelting aggregate, sesvenging of bath, blow devices, after-burning of carbon monooxide, heat balance, power resources

Basic part of researches. Long-term exploitation of steel-smelting aggregates with the higher scavenging of bath convincingly showed dignities: high productivity, simplicity of construction and exploitation of equipment, technological flexibility on compositions of the processed cast-irons. At the same time it is educed and row of substantial defects to which it is possible to take:

- low efficiency of interfusion of bath and heat emission from a torch to bath, and also after-burnings of carbon monooxide in the cavity of aggregate;
- an unevenness of heat exchange and temperature fields in the volume of bath;
- super-oxidation of metal and slag;
- low durability of blow devices and lining-up of steel-smelting aggregates.

Structural features and charaxteristics, blow modes, questions of perfection for constructions and increase of durability, in detail are considered in early [1,2] and modern [3,4] works.

In opinion of most researchers the increase of intensity of serve of oxygen in bath results in the decline of duration of liquid period and accordingly to the increase of the productivity of steel-smelting aggregate, but and also - to the considerable wear of oxygen lances, to the passing ahead wear of refractories of aggregate and practically does not have influence on the increase of degree after-burning of carbon monooxide.

Possibility of organization of after-burning of monooxide of carbon is both in the volume of slag-metal fusion and free gas volume of steel-smelting aggregate, and also results of study of process of after-burning, served cause for creation of a number of constructions of blow devices and recommendations on the conduct of melting.

Authors of work [5] mark perspective of application for the after-burning of carbon monooxide of to its dioxide of two-stepped, two-contour lance or lance with the use of the special nozzles. The use of two-stepped lance provides the increase of dioxide carbon in off-gas from 12 to 15-17 %, but a warmth which is distinguished here is only partly mastered by the bath of steel-smelting aggregate. At the same time, there is a considerable local wear of lining-up of steel-smelting aggregate, especially to its arc part.

Perspective direction at development of blow devices is a location of nozzles for the serve of oxygen on a after-burning either directly on the face of top of lances or near-by it [6]. The construction of tops of such lance allows with use the central group of supersonic oxygen streams to create the incorporated reactionary area of intensive selection of monooxide of carbon, and to carry out the after-burning of carbon monooxide the directed subsonic oxygen streams of external contour to its dioxide.

In work [7] it is marked that for the increase of efficiency of scavenging and after-burning of carbon monooxide it is possible to use special lances, accomplishing rotatory or cyclic forward motions on down melting in a horizontal and vertical plane due to the special additional drive of lance.

There is a number of blow devices, allowing to promote efficiency of after-burning of carbon monooxide due to the change for configuration of nozzles, their special interdisposition in a top for diminishing of stream expiration speed and increase of area of contact with the monooxide of carbon [8].

On the whole, in opinion of researchers of work [5] character of flowing of process and degree of after-burning of carbon monooxide depend both on arrangement of seavenging nozzles in the top of lance and from the height of location of lance on down an operation and expense of oxygen on a after-burning. It is thus shown that the coefficient of after-burning ε [$\varepsilon = CO_2/(CO + CO_2)\cdot 100$ %] depends on the expense of oxygen, and also lance position height. The increase of height of position of lanceы is accompanied by the growth of after-burning coefficient to 100 %.

In spite of preference of the use for steel-smelting aggregates, working at enhanceable intensity of scavenging, multichannel blow devices with the megascopic quantity of nozzles, and also various multipurpose constructions two-stepped and two-contour lance, as a rule, in everyday practice find application of lances with 4-6 nozzles from simplicity of their construction.

Thus majority from the developed blow devices (lances) remain only as laboratory divces, but not interstitial industrial equipment.

Conclusion. Analysis of materials of the known researches confirms the necessity of development of new constructions of oxygen lance. It is thus expected that combining already of the known structural decisions will allow to combine dignities of the known constructions and promote efficiency of after-burning of off-gas in the cavity of aggregate at the improvement of heat balance of melting as it applies to the real productive conditions at the minimum losses of metal without the decline of durability of lining-up of steel-smelting aggregates.

REFERENCE

1. **Глинков, Г. М.** Исследование способов отопления мартеновских печей природным газом [Текст] / Г. М. Глинков // Черная металлургия. – 1965. – № 13. – С. 30-32.
2. **Калошин, Н. А.** Результаты моделирования мартеновских печей, отапливаемых холодным высококалорийным и горячим смешанным газом [Текст] / Н. А. Калошин, Г. М. Глинков, Е. А. Капустин // Известия вузов. Черная металлургия. – 1961. – № 2. – С. 138-147.
3. **Смирнов, А. Н.** Развитие конвертерного производства стали в мире [Текст] / А. Н.

Смирнов // Металл. – 2006. – № 11. – С. 18-27.
4. **Mazumdar, D.** Modeling of steelmaking processes [Text] / D. Mazumdar, J. W. Evans. – Boca Raton, London, New York: CRS Press, Taylor and Francis Group. – 2010. – 463 p.
5 **Меркер, Э. Э.** Физические процессы в конвертере и энергоэкологические показатели производства: монография [Текст] / Э. Э. Меркер, Г. А. Карпенко. – 2-е изд. – Старый Оскол : ООО «ТНТ», 2008. – 328 с.
6 **Rizescu, C. Z.** Heavy metals dust from furnace [Text] / C. Z. Rizescu, E. V. Stoian // International Conference on Biomedical Engineering and Technology. – Singapore, 2011. – Pp. 137-141.
7 **Черноусов, П. И.** Рециклинг. Технологии переработки и утилизации техногенных образований и отходов в черной металлургии [Текст] / монографія; П. И. Черноусов. – М. : Изд. ДомМИСиС, 2011. – 428 с.
8 **Лухтура, Ф. И.** О потерях энергии при течении газа в соплах. Ч. 1 [Текст] / Ф. И. Лухтура // Вісник Приазовського державного технічного університету. – 2004. – Вип.14. – С. 287-292.