

HEAT AND MASS TRANSFERS - IN A COMBINED BLOWING CONVERTER

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1. INTRODUCTION

Considering possible future uncertainties involving main raw materials availability and price fluctuation in scrap and the development of hot metal pretreatment, a need is felt in the steel industry to improve heat compensation techniques. The purpose of this paper is to present an attempt to analyze the phenomena involved in post combustion generation and heat transfer in the converter based on trials on the 6 t pilot converter at IRSID in Maizières-lès-Metz.

2. EXPERIMENTAL CONDITIONS

Post combustion trials were made on a 6 t LBE converter with pretreated hot metal (% Si < 0,050) and a very low amount of slag (10 kg/t). The oxygen specific flowrate varied from 1 m³/min.t to 3 m³/min.t with a one hole lance. The off gas volume and analysis were constantly measured during each heat to evaluate the post combustion ratio. Furthermore a gas sampling lance was installed in order to analyze the gas composition at various places of the converter.

3. EXPERIMENTAL RESULTS

Most of the trials were carried out with an oxygen flowrate of 1 m³/min.t.

According to figure 1, the oxygen jet can be considered as a "burner" conveying pure oxygen in a CO rich atmosphere. The efficiency of the burner seems to be proportional to the lance height. Very high post combustion ratio of eg 90 % were obtained in this range of specific oxygen flowrate.

As shown in figure 2, the addition of iron ore leads to higher post combustion ratios. The main reasons of this phenomena could be :

- an increase of the Fe₂O₃ content of the slag
- a different CO flowrate production in the converter
- a decrease of the bath temperature.

According to figure 3, the post combustion ratio decreases when the bath temperature or the carbon content of the hot metal increases. Some laboratory experiments have already shown that the kinetics of reduction of Fe₂O₃ by molten iron containing C bath¹⁾ is improved when the bath temperatures increases which may be an explanation for this observation on a pilot plant test.

4. CONCLUSIONS

As a result of the tests performed on IRSID 6 t pilot converter, it was found that three phenomena were determinative in the generation of post combustion in a combined blowing converter :

- the entrainment of the CO gas by the oxygen jet,
- the role of the oxygen jet as a burner relating to the above
- the gas-slag-metal reactions near the bath surface.

1) S.SATO & al. Trans ISIJ, 1985, 25, p. B 335

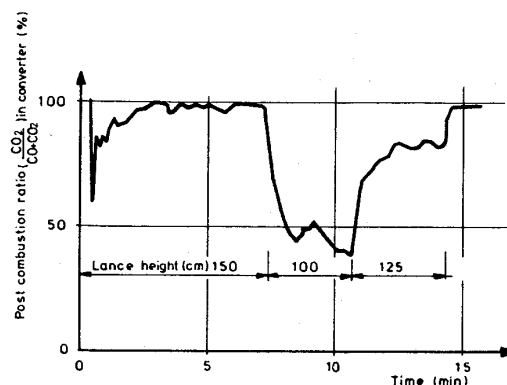


Figure 1 - Influence of lance height

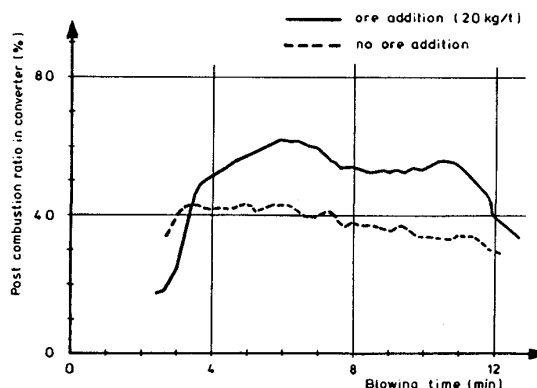


Figure 2 - Influence of iron ore addition

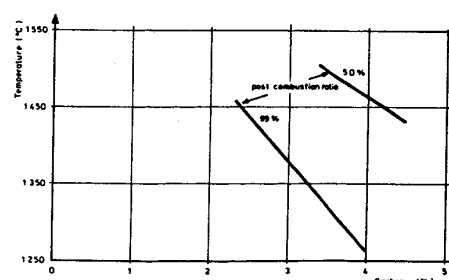


Figure 3 - Influence of refining path