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Metallurgical Characteristics of Combined-blown Converters

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Synopsis :
Kawasaki Steel Corporation has developed two different types of combined-blown processes for basic oxygen steelmaking; (1)inert gas-stirred LD(LD-KG) and (2)oxygen bottom-blown LD with the powdered lime injection (K-BOP). Small amount of bottom flows gas improves stirring intensity of steel bath and suppresses excessive oxidation of steel bath; hence LD-KG results in higher yields of iron and manganese than those of LD. K-BOP has shown much more advantages than other types of combined-blown processes, particularly in the removal of phosphorous and sulfur by the enhanced reaction with injected powdered lime.

The body can be viewed from the next page.

[illegible]

Combined-blown Converters*

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[illegible]

[illegible]

Kawasaki Steel Corporation has developed two different types of combined-blown processes for basic oxygen steelmaking; ① inert gas-stirred LD (LD-KG) and ② oxygen [illegible]

Q_A is the amount of top-blown oxygen). The amount, Q_A has been selected on the conditions that the total

executed in various steel-works are classified into the following three types:

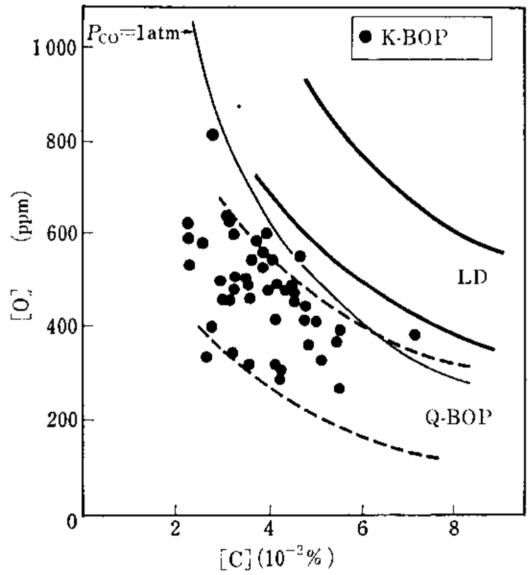

Fig. 3 Relation between [C] and [O] at blow end

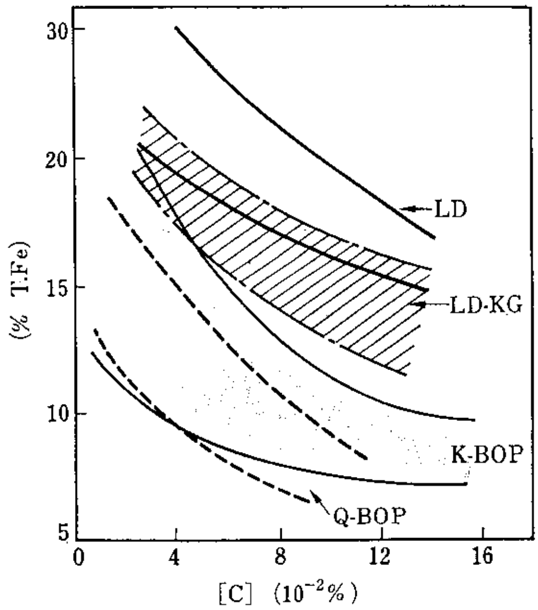

Fig. 4 Relation between (T. Fe) and [C] at blow end

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more intense the bath stirring, the lower (T.Fe) in

[redacted]

alloy by about 1 kg/t. Moreover, at the time of prod- [illegible]

ucing low-carbon steel, low-cost high-carbon ferro- [illegible]

manganese alloy can be used, instead of the expensive
low-carbon ferro-manganese alloy. The reason for the [illegible]

There is no appreciable difference in the [illegible]

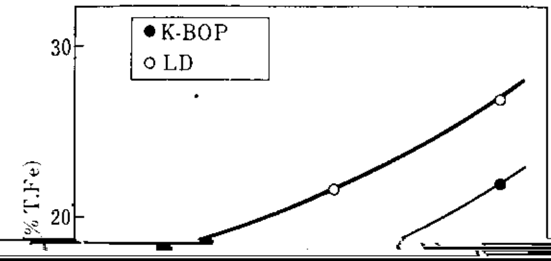
between LD-KG and LD; thus the contributi[illegible]

powdered lime injection seems significant in the K-
BOP and Q-BOP in additi[illegible]

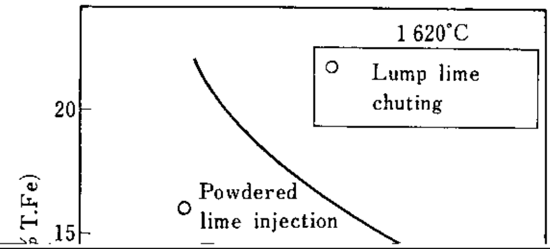
slag and metal in the K-BOP is within 10°C and is smaller than that of 20 to 40°C in the LD. In the examples of other steel works, it is reported that the temperature difference was reduced from 40–70°C to 20–30°C in the STB process[12] and from 10–30°C to

3.1.3 Gas contents in metal bath

Fig. 10 shows the relation between blow-end [C] and [N]. In the K-BOP, [N] is lower than in the LD and is close to that in Q-BOP, thereby proving an

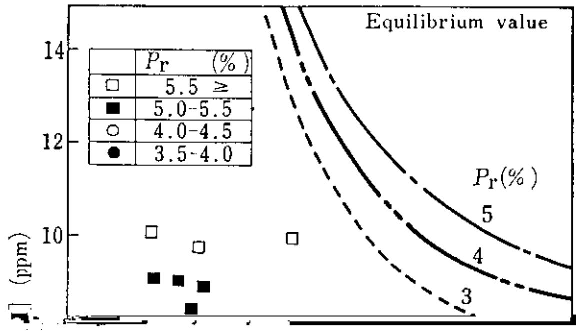


K-BOP
LD
30
20
% T.Fe)



1 620°C
Lump lime chuting
Powdered lime injection
20
15
T.Fe)

[redacted]



Eventually, the following eq. **(11)** is obtained:

$$\frac{d[\%H]}{89.3Q_{O_2}\cdot\eta_{O_2}\cdot dt} = -\frac{0.2\eta[\%H]^2}{\{K_H^2\cdot P_0-\eta[\%H]^2\}W} \quad \cdots\cdot(11)$$

By using eq. **(11)**, hydrogen contents during blowing has been estimated at propane ratios of 4%, 5%, and 6% taking into consideration the oxygen efficiency

Table 2 Metallurgical advantages of K-BOP and LD-KG [illegible]

	LD-KG	K-BOP
Steel yield (%)	+0.15	+1.0
[illegible]	[illegible]	[illegible]
Aluminum addition (kg/t)	−0.05	−0.2