KAWASAKI STEEL TECHNICAL REPORT
No.11 (March 1985)

Remodeling of LD Converters into K-BOP - with Emphasis on Design and Construction

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Synopsis :
In Mizushima Works, all three LD converters of No.2 BOF shop were remodeled into K-BOP (combined blowing processes) by March 1984, and have continuously been operating satisfactorily. Way of design and execution in bulk for remodeling LD into K-BOP was successfully established through this reconstruction by organizing self-executing formation, for instance, the dynamic analysis of the vessel, arrangement of environmental equipment and decision of specifications of incidental facilities which include piping, stand-by equipment and bottom maintenance equipment. To remodel the vessel, dynamic analysis was done by heat and stress analysis using FEM. The reconstruction was executed during two times of relining for each converter, without incurring any operation disturbance. Although vessel vibration was expected, it was fully solved by improvement in operation and design of tuyere arrangement. Three K-BOP's have been maintaining high productivity and economy in steel making.

The body can be viewed from the next page.

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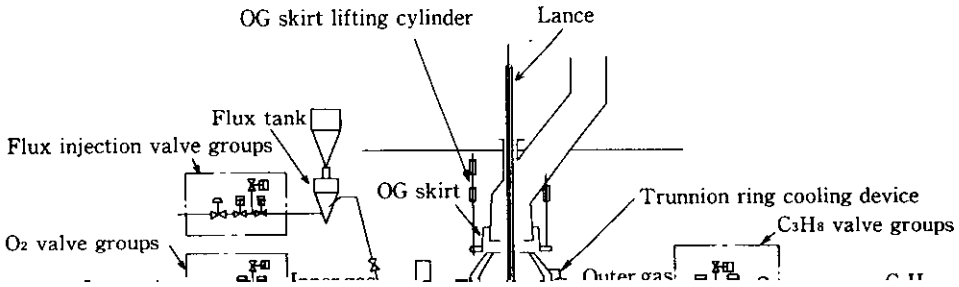

OG skirt lifting cylinder
Lance
Flux tank
Flux injection valve groups
OG skirt
Trunnion ring cooling device
C3H8 valve groups
O2 valve groups

Table 2 Shell cutting line

furnace. Although this is two dimensional, the analysis

Time	10 min	15 min	20 min	5 min	Total 50 min
Condition	Empty	H.M.+Scrap	Blowing	Tapping	

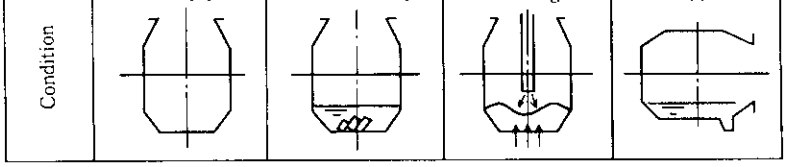
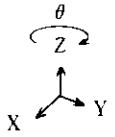


Fig. 5 Simulation pattern of operation

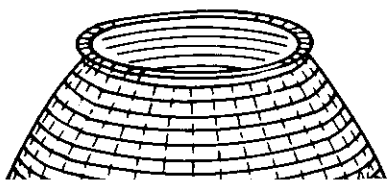
continued until shell temperature reaches close to steady situation under the initial temperature 350°C for refractory and 50°C for shell. Consequently, the calculation was stopped at 450 min after operation-start, that is

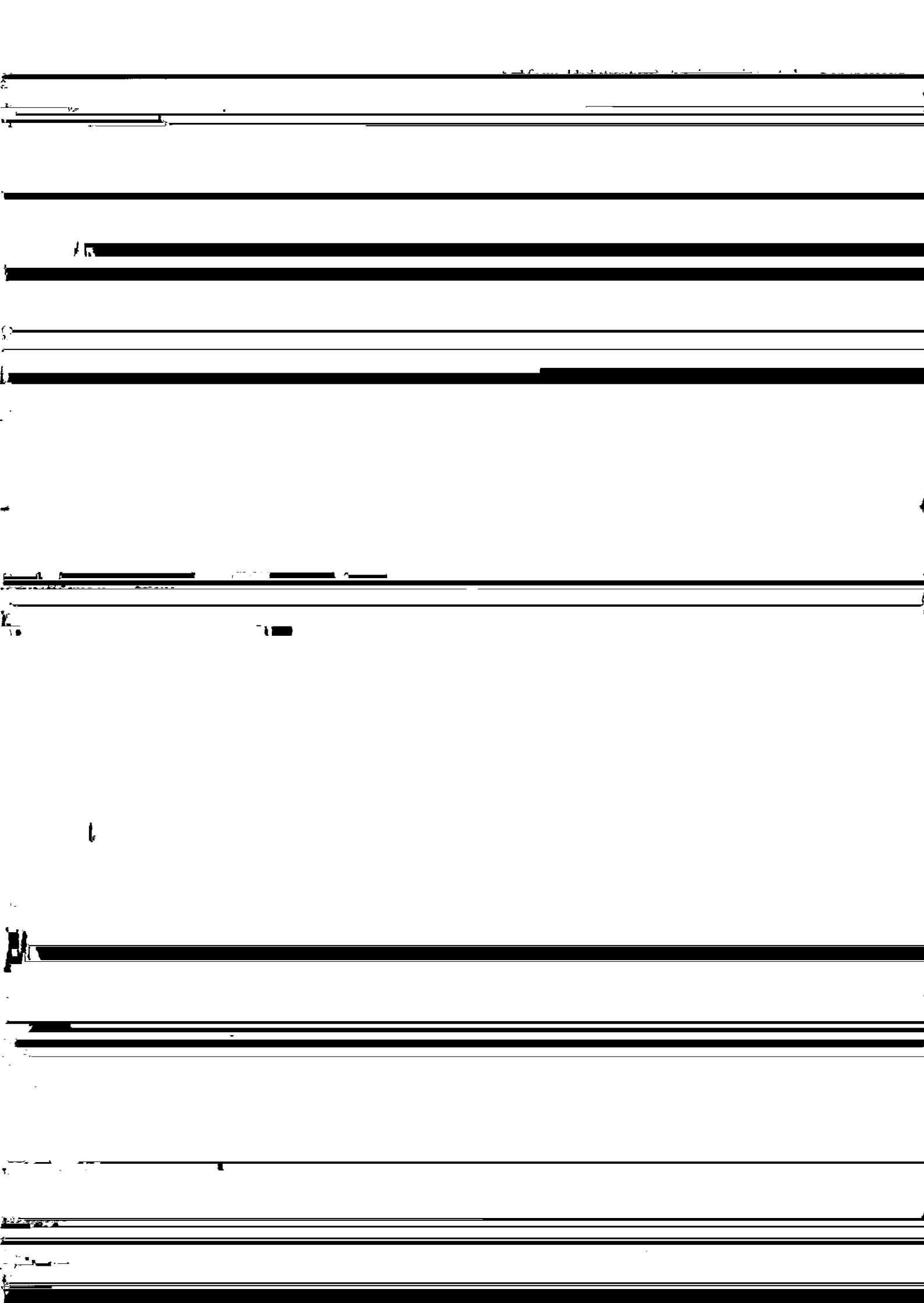


negligible.

4.2.2 Temperature distribution

Figure 6 shows temperature distribution on shell surface at cross section C and E (Fig. 3) at 450 minutes





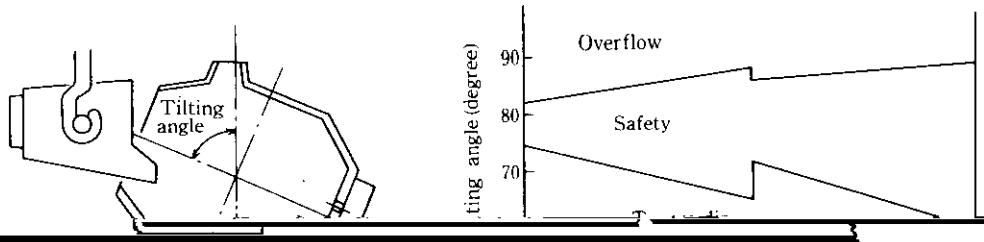


Fig. 10 Change of bath level at charging

γ: specific gravity (kg/m^3)
p: gas pressure (kg/cm^2, gauge)
t: gas temperature (°C)
v: gas speed (m/s)
K: factor decided by the ratio of flux and gas

Consequently, the feeding rate of flux and oxygen and the responsiveness of control have no problems

by torque-tilting angle relation in Sec. 4.3, although it can be calculated by torque curve of rotating and by

draulic motor. The driving method of the accumulator was designed to be of single-driving from the consideration of reliability.

6.2.2 OG skirt stand-by lift-up facility

The vessel can not tilt in sequence if OG skirt fails

	Step 1	Step 2	Step 3
	Bottom shell cutting	Flange welding	Latching device