KAWASAKI STEEL TECHNICAL REPORT
No.2 (March 1981)

Manufacture of Forgings for Nuclear Pressure Vessel

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Manufacture of Forgings for Nuclear Pressure Vessel*

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Experimental manufacture has been performed of a top head flange and a monoblock bottom head dome for the BWR 800-MWe class nuclear pressure vessel. The top head flange was forged from a 165 t ingot made from a two-heat-mixture of BOF-LRF and BOF-EF-LRF melts. The bottom head dome was forged from a 115 t ingot by the BOF- [redacted]

Table 1. Required properties for JIS SFVV3 steel

[redacted]

[redacted]

[redacted]

	C	Si	Mn	P	S	Ni	Cr	Mo	Al	N	H
Aimed value	0.20 ~0.22	0.15 ~0.30	1.40 ~1.50	Max 0.008	Max 0.003	0.70 ~0.80	0.10 ~0.14	0.50 ~0.54	0.010 ~0.020	0.0080 ~0.0100	Max 1.5(ppm)

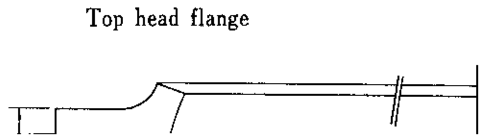
[redacted]

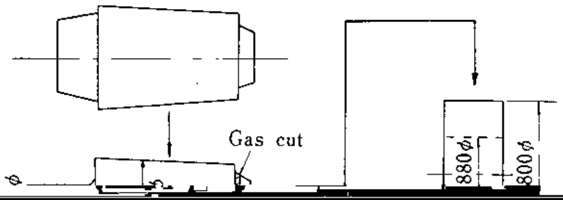
[redacted]

[redacted]

[redacted]

time of forming necessary for the maximum screw-down force of 3 000 t used in this method by the 6 000 t press is 1 000°C to 1 150°C. Further, in the flexural forming process, there are problems of plate-




Gas cut
880φ
800φ

ation of scaling, because forming at each stage was completed in a short period.

3.5 Heat Treatment

and heat treatment has been conducted uniformly.

3.6 Inspection at Completion

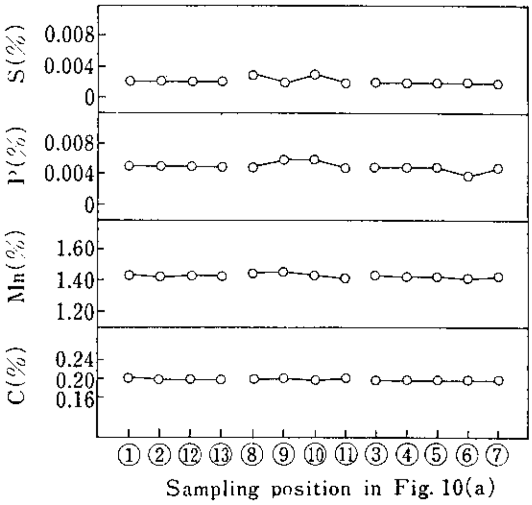


Fig. 11 Distribution of chemical composition in top

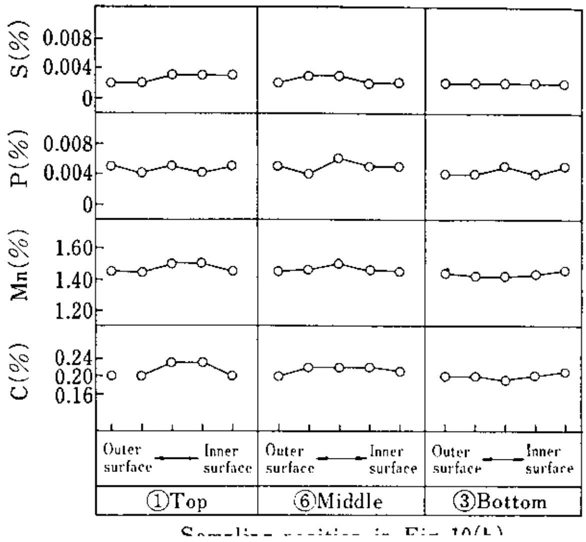
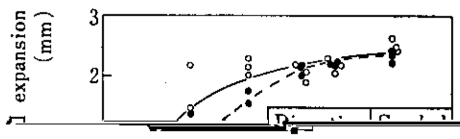


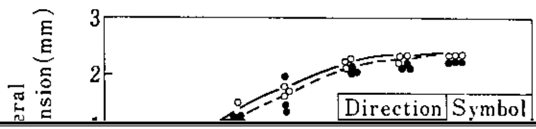
Fig. 12 Through-thickness distribution of chemical composition in bottom head dome

and macro- and microstructures. An example of cleanliness of the top head flange measured according to JIS G 0555 is shown in **Table 4**. Non-metallic inclusions are very rare and only A type inclusions are observed here and there. Austenite grain sizes

ing position. Austenite grain sizes and microstructures at typical sampling positions are shown in **Photos. 2** and 3, respectively. The sulphur print test was con-

much as about 400 mm, the mass effect was observed, but the circumferential distribution of impact strength was uniform, and the bottom head dome also had uniform circumferential distribution of impact properties, thus indicating that both the products had


expansion
(mm)
3
2


(mm)
3
2
Direction
Symbol

70

[illegible]

consideration in the form of temperature variation in deformation resistance and in the friction factor. **Fig. 23** shows the relationship between forming load

former's constituents P_1, P_2, and P_3. The peak point of P is caused by drawing-deformation load P_1, and the maximum value at the forming completion point

6 Conclusion

The top head flange and bottom head dome for

and their property verification tests conducted. The bottom head dome was given flexural forming with