

KAWASAKI STEEL TECHNICAL REPORT

No.14 (March 1986)

Special Issue on Stainless Steels

Manufacturing and Characteristics of 13 Cr Stainless Steel Tubing

Takao Kawate, Tadao Katagiri, Toshikazu Masuda, Isao Takada, Takao Kurisu, Hiroshi Otsubo

Synopsis :

The 13 Cr stainless steel tubing has been manufactured by rolling in the Mannesmann mandrel mill, upsetting and heat treatment in Chiba Works. The billet has been made by continuous casting and rolling at the billet mill. Sulfur content of the billet is lowered to less than 0.002% to improve hot workability. High piercing efficiency of the billet is required for decreasing defects on the outer and inner surfaces of the tube. The groove design of the mandrel mill roll is improved to prevent sticking between mandrel bar and tube. In order to succeed in upsetting, lubrication between tube and upsetting tools is necessary. The 13 Cr stainless steel tubing manufactured by the processes described above has dimensional accuracy similar to that for carbon steels and has mechanical properties satisfying the specification of API L80 Grade. Besides, the tubing exhibits corrosion resistance to CO₂ and brine environment and is useful for oil and gas wells containing CO₂ and brine.

(c)JFE Steel Corporation, 2003

The body can be viewed from the next page.

Manufacturing and Characteristics of 13 Cr Stainless Steel Tubing*



Synopsis:

The 13 Cr stainless steel tubing has been manufactured by rolling in the Mannesmann mandrel mill, upsetting and heat treatment in Chita Works. The billet has been made by continuous casting and rolling at the billet mill. Sulfur content of the billet is lowered to less than 0.002% to improve hot workability. High piercing efficiency of the

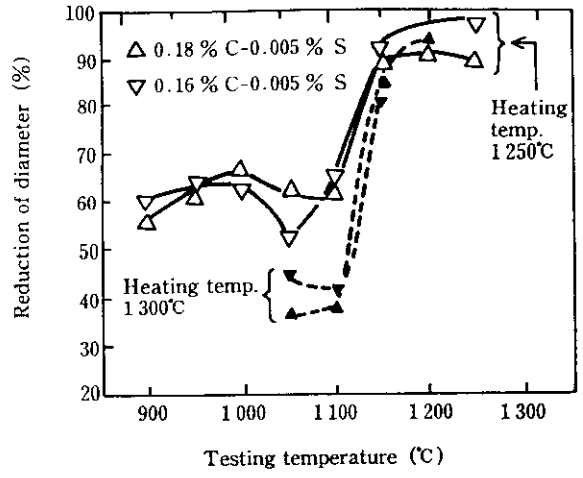
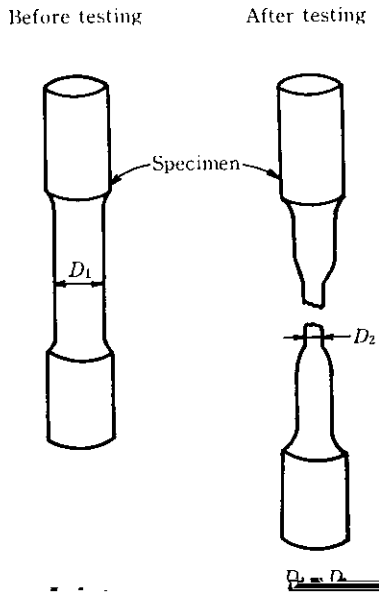


Fig. 3 Effect of heating temperature on hot workability of 13 Cr stainless steel

(F)

4 Actual Tube Manufacturing Techniques

stainless steel compared with those of carbon steels. As was discussed previously, sulfur content has been noticeably lowered to improve hot workability. The problem of high resistance to deformation, however, has still been left unsolved. The problems involved in rolling and their countermeasures will be discussed here based on the findings obtained from actual operation.

4.2.1 Rolling load

The hot deformation resistance of 13 Cr stainless steel, being 1.5 times that of carbon steel, bring about larger rolling reaction force at various mills. The rolling reaction of 13 Cr stainless steel at each mill is shown in Fig. 8 by comparing with that of carbon steels containing 0.25% C. When rolling thin-walled tubes, not only the rolling load of the mandrel mill increases, but also

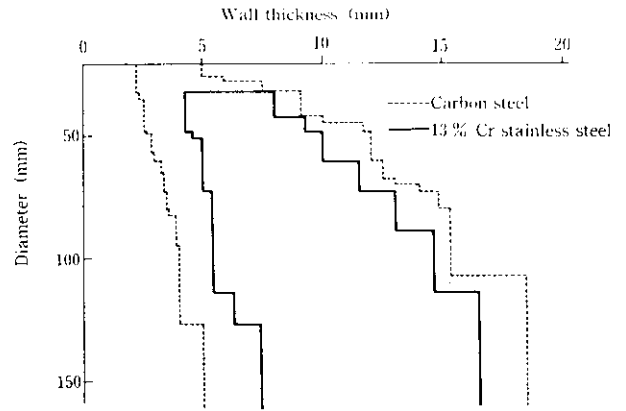


Fig. 9 Available size

tubes manufactured on the mandrel mill

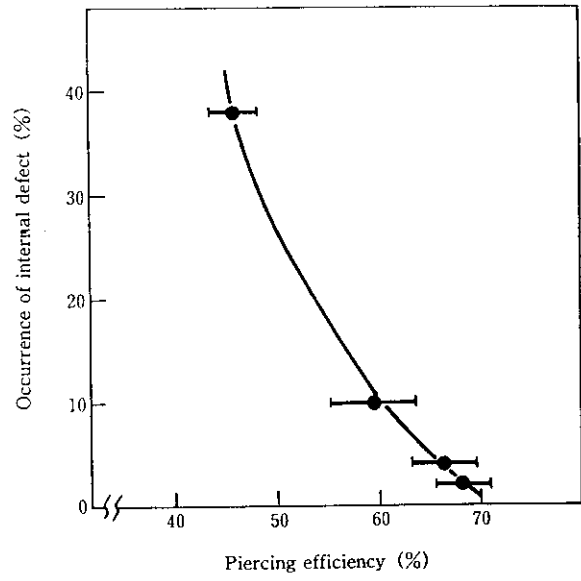
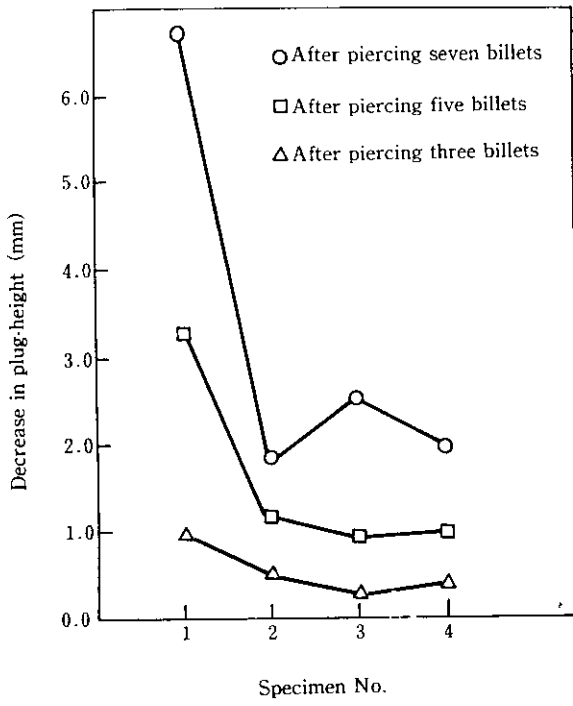
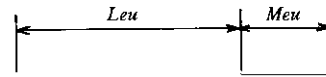
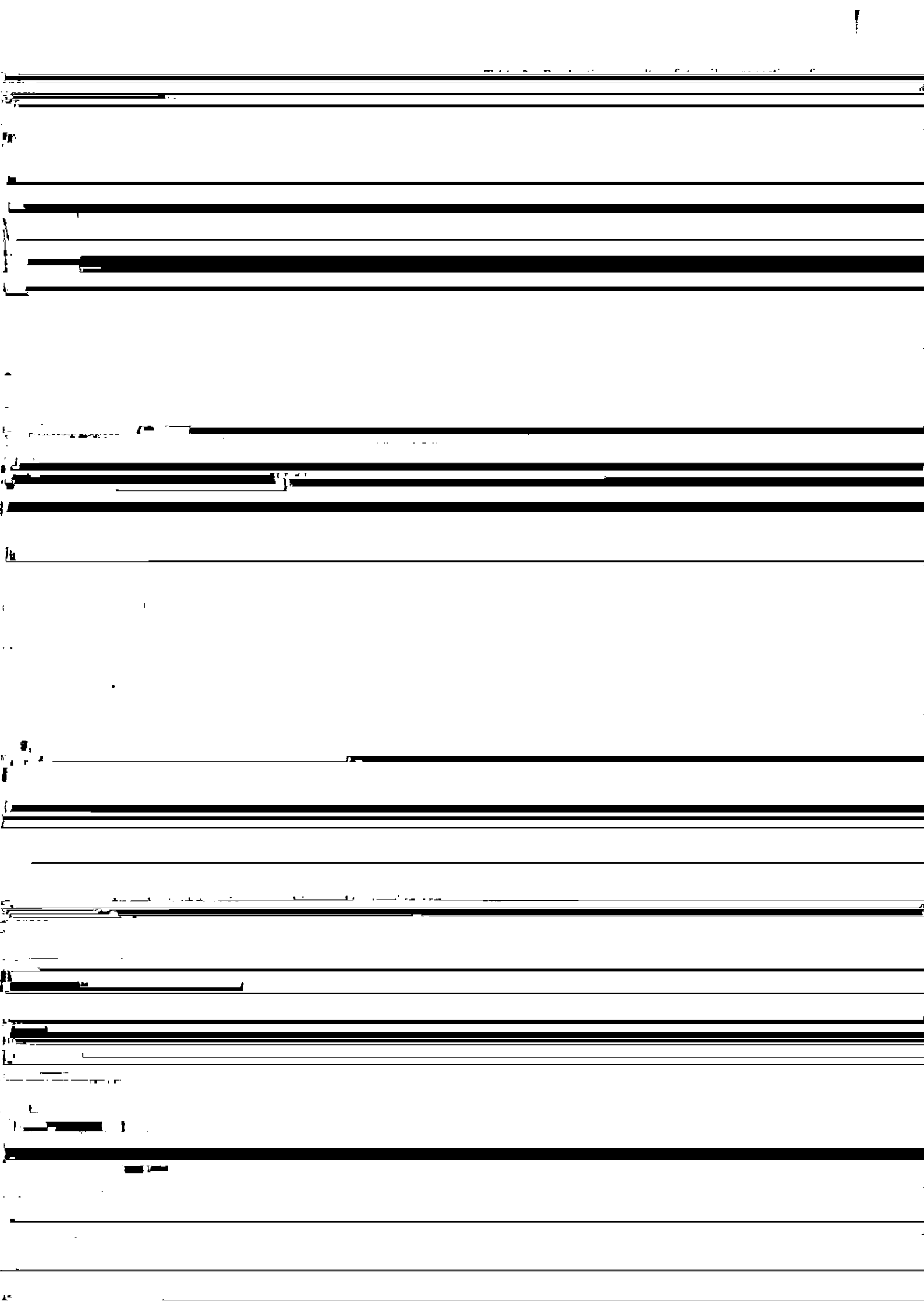


Fig. 11 Effect of piercing efficiency on internal defect



quality:

13, there is a point in the vicinity of a lubricant-applica-



[REDACTED]

1

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

With increasing depth of oil well the content of

lubricant is needed

H_2S increases. This fact makes it important to select materials excellent in resistance to SSC. The influence

(2) Quality Characteristics

(a) The dimensional accuracy acceptable to carbon

of H_2S concentration on the resistance to SSC of 13 Cr

steels can be fully satisfactory.