KAWASAKI STEEL TECHNICAL REPORT No. 4 December 1981

Recent Progress in Techniques of Manufacturing Small Diameter Electric-Resistance Weld Tubes*

Shuzo WATANABE** **Norihiko KANO**** **Yutaka HIRANO****
Fumiaki ODE** **Eiichi YOKOYAMA*****

To meet an ever-increasing demand for higher-grade small diameter electric-resistance weld (ERW) tubes, such as oil country tubular goods (OCTG), mechanical tubing and boiler tubes, remarkable technical developments have been achieved in the manufacture of these products. This report deals with some of the achievements made in this field by Kawasaki Steel Corporation.

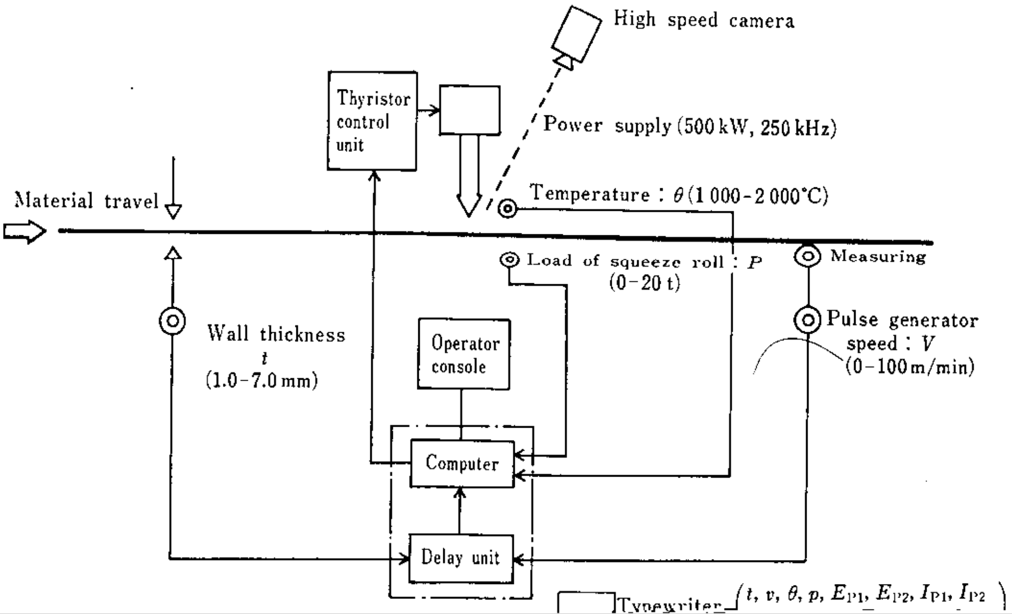
Remarkable progress in techniques of manufacturing small diameter ERW tubes in recent years has considerably increased the weld integrity of the tubes. As the result, small diameter ERW tubes are now

material advanced pipe-making techniques and a

deals with the following major techniques developed to manufacture high-grade small diameter tubes:

1) Automatic heat control technique
2) ERW OCTG manufacturing technique


2"mill
100



E_P : Plate voltage, I_P : Plate current
I_g : Grid current

Fig. 2 Automatic heat input control system in 2"ERW mill

longitudinal variation of sheet coil thickness and the

$$\Delta E = \Big(A\cdot\frac{t-t_s}{} + B\cdot\frac{v-v_s}{}$$

equation:

$$+ C\cdot\frac{p-p_s}{} + D\cdot\frac{\theta-\theta_s}{}\Big) E \quad (2)$$

Now, since there is a correlation between the upset

	Size (mm) and grade	Amount of

Table 2 API specifications

Grade	Type	Chemical compositian(%)	Heat	Yield strength	Tensile strength	Elongation	Flattening tests	Hardness

Pipe size : $5\frac{1}{2}''\phi \times 0.304''t$

Normalizing temperature : [illegible]°C

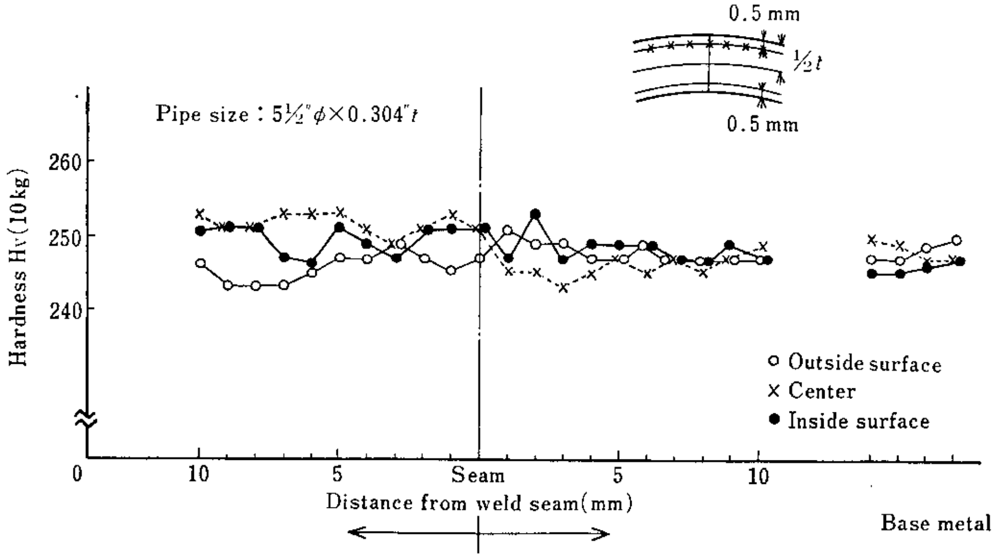


Fig. 8 Hardness distribution of API 5A N-80 across weld

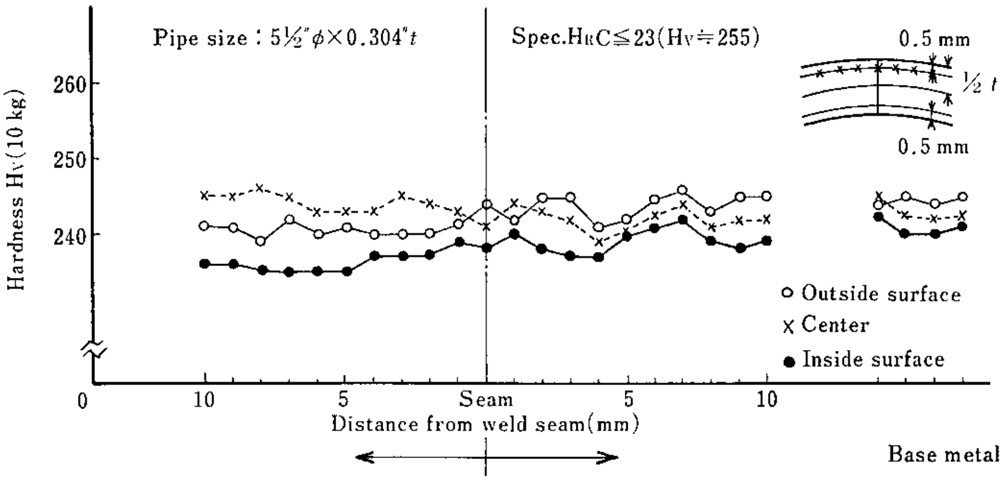


Fig. 9 Hardness distribution of API 5AC L-80 across weld

4.1.1 Weld quality

The API standard stipulates that the flattening test should be performed as one of the methods for evaluating the strength of weld seam portions. In the case of high strength steel pipes such as those of N-80

4.1.2 Collapse strength

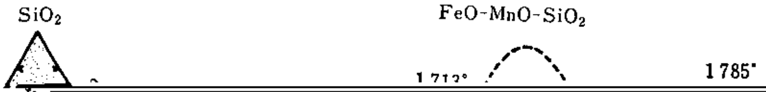
One of the factors which affect the collapse strength value is the dimensional accuracy of pipes, namely the degree of out-of-roundness and eccentricity; in the case of the quenched and tempered pipes


θ

Table 3 Chemical compositions of penetrator in Cr bearing low alloy ERW steel pipes

[illegible]

Table 4 Measured melting temperature of various FeO-MnO-SiO_2-Cr_2O_3 oxides


SiO_2
FeO-MnO-SiO_2
1 713°
1 785°

6 Conclusion

The recent trend toward higher grade of small

References

1) S. Sugimura, K. Okuyama, T. Fukuda and H. Nakasugi