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Development of Martensitic Stainless Steel Seamless Pipe for
Linepipe Application

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Synopsis :

Two types of martensitic stainless steel seamless pipes have been developed for linepipe applications. One is 0.01C-11Cr-1.5Ni-0.5Cu-0.01N steel pipe for CO₂ environment, and the other is 0.01C-12Cr-5Ni-2Mo-0.01N steel pipe for CO₂ and slight H₂S environment. Both pipes are suitable for welding without preheating. They give X80 grade strength and good low temperature toughness of welds without PWHT. The former pipe gives better resistance to CO₂ corrosion than the 13Cr martensitic stainless steel for OCTG. The latter pipe gives good SSC resistance in 10% NaCl solution with H₂S partial pressure of 0.002 MPa and pH value of 4.0. These steel pipes have a great economical benefit and are expected to substitute conventional flowline pipes using carbon steel with inhibitor injection or costly corrosion resistant materials, such as, duplex stainless steel.

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... of that... stability can be ... Cu free steel and consequently this material showed a

Table 2. Chemical compositions of base metal and welding wires for orth welding of 11Cr-1.5Ni-0.5Cu steel

Material	pipe							
	C	Si	Mn	Cr	Ni	Cu	Mo	N
11Cr base metal	0.01	0.16	1.13	11.1	1.5	0.48	-	0.01
GTAW filler wire	0.01	0.30	0.38	25.3	9.5	-	4.0	0.27
GMAW wire	0.02	0.33	0.41	25.1	9.6	-	4.0	0.27

(mass%)

Charpy full size specimen
Longitudinal direction

500

GTAW (As welded)

Bond

HAZ

3 Development of 12Cr Steel Pipe for Linepipe in CO₂ Slight H₂S Environments

newly developed material to ensure stable nitriding results. In Table 8, Preheating and PWHT were not performed

Excellent weldability was secured by reducing the C and N contents to 0.01% as with the 11Cr steel pipe discussed above. To compensate for the reduction in hot strength, the tensile strength of the pipe was increased by the addition of 0.02% Nb. The tensile test, side bend test, hardness measurement, Charpy test, and Chemical test of the joints were performed. In any of the welds with these pipes, and excellent weldability was confirmed.

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Welded joint of the 12Cr steel pipe for CO₂ + slight

H₂S environments.

(4) The welded joint of the 11Cr steel pipe for CO₂ environments possesses CO₂ corrosion resistance

References

1) L. van Bodegom, K. van Gelder, and J. A. M. Spanincs: Corro-