(687) SSCC behavior related with HIC in line pipe steel plate

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1. Introduction

In the case of wet sour service condition in linepipes, there are two problems due to corrosion and high service pressure [1]. One is sulfide stress corrosion cracking (SSCC) and the other is hydrogen induced cracking (HIC). Though HIC occurence in wet sour environment can be prevented by some metallurgical measures, HIC generation and propagation can be accelerated by external applied stress even in the case of steels delete having good resistance to HIC. In this study role of HIC occurence on the propagation of SSCC is investigated in linepipe steels.

2.Experimental Method

Commercial line pipe steels for sour gas service were used in experiment. The chemical compositions are listed in table 1. SSCC test was carried out in accordance with the NACE standard TM01-77. Cross section of SSCC specimen was examined by optical microscope after the SSCC test.

Table 1. Chemical compositions of line pipe steels

C	Si	Mn	P	S	Sol. Al	Nb,V,Ni,Ca added
0.12	0.28	1.12	0.016	0.003	0.024	

3. Results and discussion

1) σ_{cr}/σ_y values are 86% in QT steel and 75% in CR steel.

2) Fig. 1 shows typical SSCC related with HIC in QT steel. In this experiment,even though the direction of applied stress is parallel to rolling direction HIC generation is rapidly increased with external applied stress. Also stress assisted HIC is propagated to the perpendicular direction of applied stress. From this point,occurence of stress assisted HIC is very important even in steels delete having good resistance to HIC in stress free immersion test.

3) From Fig.2 it can be said that C_k (critical concentration) Value of QT plate is higher than C_k value of CR plate.

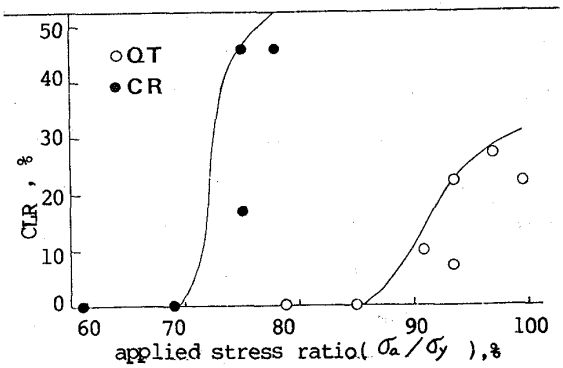

Fig.2. The occurence of HIC with applied stress in SSCC test

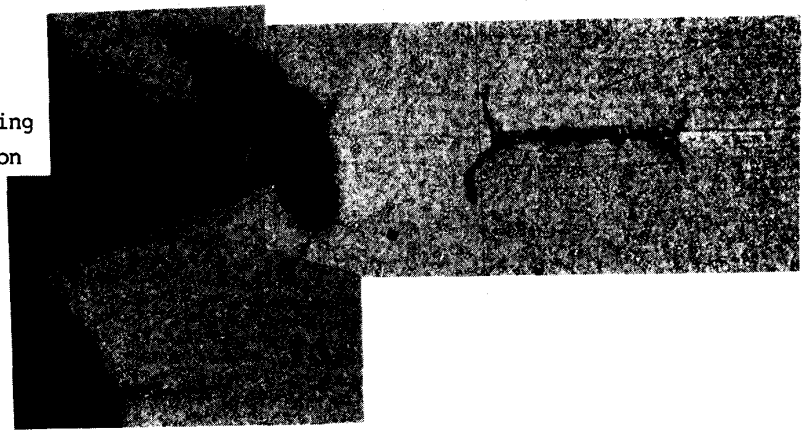

Fig.1. Cross section of fractured specimen of SSCC test
.Stress 51.3kg/mm^2 [93% Y.S.]
.fractured after 58 hours
.100X (×⅔)

4.Reference

1) T.Taira etal : Corrosion V37 No.1. (1981) 5-