Abridged version

KAWASAKI STEEL TECHNICAL REPORT

No.16 (June 1987)

Ultrasonic Immersion Testing System

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Synopsis :

The immersion type ultrasonic scanning flaw detection system, developed and manufactured by Kawasaki Steel Corp. and Kawatetsu Instruments Co., Ltd., features the use of a high-sensitivity flaw detector, precision six-axis scanning mechanism and sophisticated data processing by microcomputer. For the data processing, the system was started with a conventional two-dimensional map recording of flaws, and has now grown into sophisticated computer graphic processing, including B-scope recording, computation and recording of the flaw ratio to the total area and three-dimensional display of flaws. This paper discusses some examples of its application, including: (1) substitution of a microscope for visual examination in the hydrogen induced cracking test; (2) prediction of susceptibility to disbonding of stainless steel overlay welds; (3) a new approach to detection of non-metallic micro-inclusions in ultra-thin steel strips; and (3) attempts to use this system for testing new composite materials such as honeycomb materials.

The body can be viewed from the next page.

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Synopsis:

The immersion type ultrasonic scanning flaw detection system, developed and manufactured by Kawasaki Steel Corp. and Kawatetsu Instruments Co., Ltd., features the

has become possible by an immersion type ultrasonic scanning flaw detection system, the C-scan system, developed to conduct precision scanning flaw detection of the entire area of a specimen.

This flaw detection method was first adopted by Kawasaki Steel in 1974 when a C-scan system manufac-

Research Laboratories for the purpose of evaluating

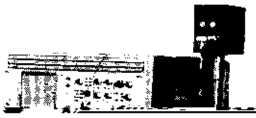
2 Outline of System

2.1 Principle of System

The C-scan system has the following features:

(1) High frequencies can be used because of the small acoustic absorption loss in water.

(2) Acoustic coupling is stable



play on the CRT screen.

2.2 Features and Specifications of System

Table 1 General specifications of KUSS series C-scan system

the device possible with objects of any form. The scanning mechanism, which uses a stepping motor as the

drive source and a rack and pinion mechanism as its

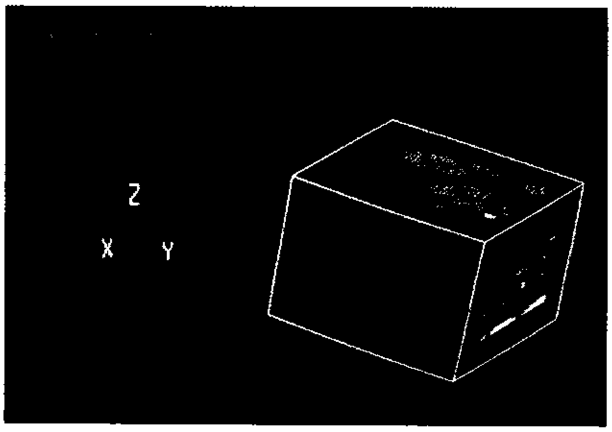


Photo 2 Example of isometric display with two-dimensional top and side views for ready identification of the three dimensional distri-

Table 2 HIC test procedure

Item	Condition
Test solution	Synthetic sea water (ASTM D1141)
Temperature	25±3°C
H_2S concentration	2 300 — 3 500 ppm
pH	5.1 — 5.4
Test period	96 h

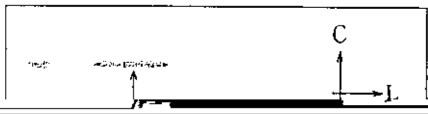
scopic examination and the test itself require much time and labor. Furthermore, there is an uncertainty factor involved because a sampling method is used. In con-

3.2 Application to the Study of Disbonding of Overlay Welds[3,4]

To assure corrosion resistance, austenitic stainless

ferrite content of weld metal (the δ-ferrite content on the austenite-martensite boundary line, A-M line, in the Delong Schaeffer diagram) and that the formation of

Hydrogen exposure	Sensitivity \ Test specimen \ δ-ferrite	0	1.0	1.7	3.0	4.3	5.5	6.3	7.6
		M8-1-11	MM8-2-3Y	FLS-10B-2B	K4B	M8-12-2B	WI-4	K-6	M8-14-2B
	+14 dB								


C
L

steels, and fine nonmetallic inclusions [illegible]