Proceedings of the Eighteenth (2008) International Offshore and Polar Engineering Conference
Vancouver, BC, Canada, July 6-11, 2008

ISBN 978-1-880653-70-8 (Set); ISBN 1-880653-68-0 (Set)

New UST Inspection Procedure for Heavy Wall SAW Pipe

M. Nagase, Y. Hirose, T. Horikiri,
Kashima Steel Works, Sumitomo Metal Industries, Ltd.
Kashima City, Ibaraki, Japan

M. Yamano
Corporate Research Laboratories, Sumitomo Metal Industries, Ltd.
Amagasaki City, Hyougo, Japan

ABSTRACT

High strength and heavy wall thickness steel pipes have been developed for deep-water application. The UOE pipes have been improved and successfully developed for application. Meanwhile, the requirements of ultrasonic testing to the center of the weld cross section for longitudinal submerged arc weld (SAW) seam of UOE pipe are not clearly specified in the international standards such as API, DNV, ISO specification etc.. There are several cases that special inspection methods are specified in the pipeline projects specification with many kinds and various directions of the reference standard reflector in the weld area. Depend on the reference standard reflector; it is necessary to process the defects for long time and with expensive technique. Furthermore there is a case to use the tandem probe technique in order to detect the center flaws as the requirement of the inspection method. In that case, it is necessary to set up the probes for long time and to trace more correctly to the conventional technique at decided position.

The authors have developed and applied the new inspection technique with an applicable ultrasonic phased array probe for longitudinal SAW seam in the UOE pipe mill. This technique could be useful for solving the above matters.

This paper discusses the new UST inspection procedure to detect the defects which presents at center of the weld bead with high sensitivity and excellent detect ability. Firstly, it is suggested to use direct scanning technique instead of reflecting technique and tandem probe technique comparing to the through drilled hole, side drilled hole, and flat-bottom hole. The direct scanning technique has good sensitivity to another methods. Furthermore it is introduced and suggested to use new reference reflector, which has easy processing to set the artificial defect and repeatability.

KEY WORDS: UOE; SAW; UST (Ultrasonic Testing); phased array; probe; reference block; reference flaw.

INTRODUCTION

High strength and heavy wall thickness steel pipes have been developed for high-pressure gas transmission system as well as for deep-water application. The UOE pipes, which are essential to produce high strength such as X70 grade or higher, have been improved and successfully developed for application.

Meanwhile, It seems that the requirements of ultrasonic testing to the center of the weld cross-section for longitudinal submerged arc weld (SAW) seam of UOE pipe have become severe for inspection. But it is not clearly specified in the international standards such as API, DNV, ISO specifications etc. The international standards requirements include probe setting and signal evaluation, which increase the number of probes to detect the many reference flaws, depending on the material wall thickness as well as detecting various kinds of shape and direction of defects in the weld area, especially to the offshore heavy wall steel line pipe usage.

There are several cases that special inspection techniques are specified in the pipeline projects specification. That is the application for tandem scanning technique and to use the special reference reflector such as side drilled hole and/or transverse flat bottom drilled hole.

The conventional tandem scanning technique is generally applied in the pipeline field, which is girth weld inspection, in order to meet specified requirements and to assure the quality of the weld area. But as there is some difficulty to apply for the longitudinal weld seam of the pipe the authors have developed and applied the new inspection technique with an applicable ultrasonic phased array probe for longitudinal SAW seam. This latest technique is now being applied in the large SAW pipe inspection.

Secondarily, we have also created and applied the new reference reflector, which is used for calibration or assessment of flaw detection sensitivity because there is the special reference reflector used for the girth weld inspection which is difficult to process the artificial defects in the weld of the UOE pipe and is necessary to cut off the reference block from pipe before making the reference reflector and to join the reference block to the calibration pipe.

This document presents the new ultrasonic inspection technique for the mid wall scanning in order to detect the flaw that the face is positioned at vertical to the surface in the weld for the SAW heavy wall pipe. It also presents the new reference reflector and processing