Neutron Diffraction Residual Stress Measurements of Weldments for Shipbuilding Application

C. Shen[a], A.M. Paradowska[b], N. Larkin[a], H. Li[a], Z. Pan[a], M. Law[b]

[a] University of Wollongong, New South Wales, Australia

[b] Australian Nuclear Science and Technology Organisation (ANSTO), New South Wales 2234, Australia

Pulsed tandem gas metal arc welding (PT-GMAW) has been identified as a welding process potentially capable of increasing productivity and minimising distortion in ship-building. For this study, the PT-GMAW process was used in pulse-pulse mode to butt-weld DH36 steel in order to determine its suitability as a replacement for standard gas-metal-arc welding and submerged-arc welding in naval shipbuilding. Weld residual stresses often lead to increased distortion, and reduction of fatigue life.

Quantitative 3D nondestructive neutron diffraction measurements are vital to fully understand the complexity of this welding procedure and their influence on the weld integrity.

This paper presents preliminary study of mechanical properties and residual stresses of the welds and their influence on the distortion and fatigue performance. Residual stress measurements were conducted by neutron diffraction at the OPAL reactor on the strain scanner KOWARI (figure 1). The challenges of the project will be discussed and future planes will be presented.

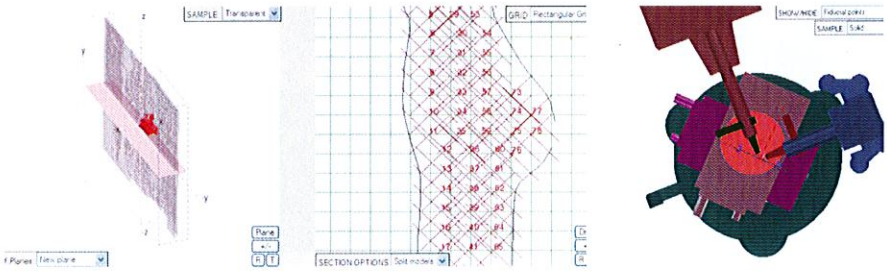

Figure 1. Weldment 1 a) overview of the sample and the measurements location and b) overview of the sample on the Kowari strain scanner in the virtual software SSCANSS.