

EVALUATION OF CRACK RESISTANCE IN WELD JOINTS OF ASTM A106 GRADE B PIPES USING NON-DESTRUCTIVE TESTING (NDT)

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ABSTRACT

This study aims to evaluate the crack resistance and weld joint quality of ASTM A106 Grade B pipes by varying the welding current (100A, 120A, and 130A) and groove forms (V, II, and V) using the Shielded Metal Arc Welding (SMAW) process. ASTM A106 Grade B material is widely used in high-pressure and high-temperature piping systems, so the integrity of the weld joint becomes a crucial factor for operational safety. The testing was carried out using the Non-Destructive Testing (NDT) methods in the form of Liquid Penetrant Test (PT) and Magnetic Particle Test (MT) to detect surface and subsurface crack indications. The test results showed that there were no crack indications in all specimens, but other defects such as undercut, porosity, and spatter were found. Process parameter analysis was carried out using the Taguchi method with an L9 (3³) orthogonal array and evaluation through the Signal to Noise Ratio (Smaller is Better) using Minitab 22 software. The analysis results showed that variations in current and groove form had a significant effect on the formation of weld defects. The minimum undercut defect occurred at 100A with II groove, while the maximum undercut defect occurred at 120A with V groove. The minimum porosity was obtained at 130A with V groove, while the maximum was at 120A with II groove. The minimum spatter occurred at 130A with II groove, and the maximum occurred at 100A with V groove. These findings confirm that proper adjustment of process parameters can minimize defects and improve the weld joint quality of ASTM A106 Grade B pipes.

Keywords: *ASTM A106 Grade B, SMAW, Non-Destructive Test, Taguchi L9, undercut, porosity, spatter.*