Pengaruh Kandungan Nikel Dalam Elektroda Terhadap Sifat Mekanis Dan Mikrostruktur Pengelasan Baja Pelat SM570TMC Dan AH36 Dengan Metode Las FCAW = Effect of Nickel Content in Electrodes on Mechanical Properties and Microstructure Welding of SM570TMC and AH36 Plate Steel with FCAW Welding Method

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Abstrak

Penelitian ini bertujuan untuk mengetahui pengaruh kandungan nikel dalam elektroda terhadap sifat mekanis dan mikrostruktur pengelasan baja pelat SM570TMC dan AH36. Pengelasan material tersebut menggunakan metode Flux Cored Arc Welding (FCAW) dengan kawat las yang memiliki kandungan nikel 0%, 1%, dan 1,5%. Hasil dari pengelasan diteliti dengan pengujian tak rusak (MPT, UT) dan rusak (Hardness Vickers, impact charpy, pengamatan mikrografi (makro, mikro, SEM, EDS, OES)). Pengujian dilakukan pada area base metal (BM), Heat Affected Zone (HAZ) dan Weld Metal (WM). Pengujian impact charpy dilakukan pada temperatur 25⁰C, 0⁰C, dan -20⁰C. Pengujian NDT tidak mempengaruhi kualitas lasan. Hasil pengujian kekerasan pada penambahan 1% nikel material AH36 maksimum sebesar 190 HV dan minimum 163 HV sedangkan untuk material SM570TMC maksimum sebesar 172 HV dan minimum 154 HV. Material AH36 mempunyai nilai ketangguhan impak pada temperatur 0⁰C sebesar 280 J dan pada temperatur-20⁰C sebesar 200 J diarea HAZ. Material SM570TMC nilai ketangguhan impak sebesar 385 J pada temperatur 0⁰C dan 276 J pada temperatur -20⁰C diarea HAZ. Dengan penambahan 1% nikel menunjukkan dalam pengamatan mikro menghasilkan butiran yang lebih halus bila dibandingkan penambahan nikel 0 dan 1,5% sehingga mampu meningkatkan nilai ketangguhannya pada material AH36 dan SM570TMC terutama pada temperatur 0⁰Cdan -20⁰C.

.....This study aims to determine the effect of nickel content in electrodes on the mechanical and microstructure properties of welding steel plates SM570TMC and AH36. Welding of the material uses the method of Flux Cored Arc Welding (FCAW) with welding wire which has a nickel content of 0%, 1%, and 1.5%. The results of welding were examined by non-destructive testing (MPT, UT) and damaged (Vickers Hardness, charpy impact, micrographic observations (macro, micro, SEM, EDS, OES)). Tests were carried out on the base metal area (BM), Heat Affected Zone (HAZ) and Weld Metal (WM). Charpy impact testing is carried out at temperatures of 250C, 00C, and -200C. NDT testing does not affect weld quality. The hardness test results on the addition of 1% nickel AH36 material to a maximum of 190 HV and a minimum of 163 HV while the SM570TMC material is a maximum of 172 HV and a minimum of 154 HV. AH36 material has an impact toughness value at a temperature of 0⁰C of 280 J and at a temperature of -20⁰C of 200 J at HAZ area. Material of SM570TMC impact resistance value was 385 J at temperatures of 0⁰C and 276 J at -20⁰C at HAZ. With the addition of 1% nickel, the micro-observation produced finer grains when compared to the addition of 0 and 1.5% nickel so as to increase the toughness value of AH36 and SM570TMC materials, especially at temperatures of 0⁰C and -20⁰C.