

# Pengaruh proses pengelasan tig dengan metode perbaikan tiga kali terhadap perubahan struktur mikro dan ketahanan korosi sumuran pada material super duplex stainless steel uns 32760 = Effect of repeated tig welding cycles on microstructure evolution and pitting corrosion behavior of super duplex stainless steel uns 32760

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## Abstrak

Super Duplex Stainless Steel (SDSS) adalah material yang dibentuk oleh kombinasi unik fasa ferit (alfa) dan austenit (gamma) yang idealnya memiliki jumlah fraksi volum yang sama besar yang menawarkan kombinasi yang menarik dari sifat mekanik dan ketahanan korosi. Pengelasan TIG atau GTAW adalah jenis pengelasan yang paling umum digunakan dalam material DSS dan SDSS di berbagai industri. Pemanasan cepat dan siklus pendinginan yang terjadi dalam proses pengelasan dapat mengganggu keseimbangan fasa alfa / gamma.

Banyak penelitian telah dilakukan terkait dengan perubahan struktur mikro akibat adanya proses pengelasan dalam material SDSS yang berdampak pada sifat mekanik dan ketahanan korosi. Namun, studi dan referensi terkait dampak pengelasan berulang pada material SDSS masih sangat jarang. Padahal dalam praktiknya, karena sulitnya mendapatkan kualitas hasil lasan yang baik pada material SDSS, perbaikan pengelasan sering dilakukan.

Dalam penelitian ini, spesimen dievaluasi untuk mensimulasikan siklus pengelasan berulang yang terdiri dari lasan asli (OW), Perbaikan- 1 (R1), Perbaikan- 2 (R2) dan Perbaikan- 3 (R3). Perubahan struktur mikro diamati melalui mikroskop elektron optik, fasa intermetalik diperiksa dengan SEM- EDS. Sementara itu, ketahanan korosi sumuran diselidiki dengan menggunakan uji korosi gravimetri, uji polarisasi potensio-dinamik dan uji potensio- statik suhu sumuran kritis (CPT).

Hasil penelitian menunjukkan bahwa endapan nitrida, karbida dan oksida mulai muncul di area terpapar panas (HAZ) pada spesimen R- 2 dan R-m3. Berdasarkan uji korosi gravimetri, uji polarisasi potensio-dinamik dan uji potensio- statik CPT menunjukkan bahwa ketahanan korosi sumuran menurun dengan meningkatnya jumlah pengulangan atau proses perbaikan pengelasan. Penurunan ketahanan korosi secara signifikan mulai terjadi pada spesimen R- 2.

.....Super Duplex Stainless Steel (SDSS) is a material that is formed by a unique combination of ferrite and austenite microstructure that ideally has the same large volume fraction that offers an interesting combination of mechanical properties and corrosion resistance. TIG Welding or GTAW is the most common type of welding used in DSS and SDSS materials in various industries. Rapid heating and cooling cycles in the welding process can interfere with the alfa / gamma phase balance.

Many studies have been carried out related to changes in microstructure due to the welding process in SDSS materials which have an impact on mechanical properties and corrosion resistance. However, the studies and references in repeated welding cycles of SDSS materials are infrequently. In fact, because of the difficulty in obtaining quality welds of SDSS material, repaired welding is often carried out.

In this study, the specimens were evaluated to simulate repeated welding cycles consist of the original weld (OW), Repair- 1 (R1), Repair- 2 (R2) and Repair- 3 (R3). The microstructural evolutions were observed

through optical electron microscope, intermetallic phases were examined by SEM EDS. Meanwhile, pitting corrosion resistance were investigated by means of gravimetric corrosion test, electrochemical potentiodynamic polarization and potentiostatic critical pitting temperature (CPT). The result show that the nitride, carbides and oxide precipitates starts appear in R- 2 and R- 3 welding cycles heat- affected zone. Based on gravimetric corrosion test, potentiodynamic polarization test and CPT test show that the pitting corrosion resistance decreased significantly in repair 2 and repair 3 specimens. The more repetitions in the welding process will reduce pitting corrosion resistance. The significant reduction of corrosion resistance started in R-2 specimens.