

INTISARI

Friction stir welding (FSW) merupakan proses pengelasan yang inovatif dikenal sebagai proses pengelasan kondisi padat (*solid state*). Proses pengelasan FSW ini tidak membutuhkan logam pengisi *filler*, sehingga komposisi hasil pengelasan yang didapatkan umumnya sama dengan komposisi logam induk, kecuali pengelasan pada logam yang berbeda. Penelitian ini bertujuan untuk mempelajari pengaruh perlakuan *preheating*, *Dynamically Controlled – Low Stress No Distortion* (DC-LSND), dan kombinasi perlakuan DC-LSND + *preheating* terhadap distorsi, sifat mekanis, dan sifat fatik sambungan las FSW.

Bahan yang digunakan untuk pengelasan FSW adalah aluminium paduan seri AA5083-H116 dengan tebal 3 mm. Proses pengelasan dilakukan dengan variasi perlakuan *preheating* pada temperatur 200° C, DC-LSND, DC-LSND + *preheating* dan tanpa perlakuan. Kemudian pengujian dan pengamatan yang dilakukan meliputi data termal pengelasan, pengukuran distorsi, struktur mikro dan makro, pengukuran nilai kekerasan mikro Vickers, kekuatan tarik, dan perambatan retak fatik.

Hasil penelitian menunjukkan bahwa perlakuan DC-LSND + *preheating* menunjukkan distorsi las yang lebih kecil dibandingkan perlakuan lain. Hasil kekuatan tarik paling tinggi terdapat pada perlakuan DC-LSND. Perlakuan DC-LSND + *preheating* menunjukkan nilai kekerasan paling tinggi. Perlakuan DC-LSND + *preheating* juga terbukti menunjukkan laju perambatan retak fatik yang lebih rendah sehingga memiliki ketahanan fatik yang paling baik dibandingkan tanpa perlakuan.

Kata Kunci : *friction stir welding* (FSW), *preheating*, DC-LSND, laju perambatan retak fatik, AA5083-H116

ABSTRACT

Friction stir welding (FSW) is an innovative welding process known as a solid state welding process. This FSW welding process does not require filler material, so the final welding composition obtained is generally the same as the base metal composition, except when welding is carried out on two different metals. The aim of this study is to observe the effect of preheating treatment, Dynamically Controlled - Low Stress No Distortion (DC-LSND), and the combination of DC-LSND + preheating treatment on distortion, mechanical properties, and fatigue properties of FSW welded joints.

The material used for FSW welding was aluminum alloy AA5083-H116 series with a thickness of 3 mm. The welding process was carried out with various preheating treatments at 200°C, DC-LSND, DC-LSND + preheating and without treatment. Then the tests and observations which were conducted include thermal welding data, measurement of distortion, micro and macro structure, measurement of Vickers micro hardness values, tensile strength, and fatigue crack propagation.

The results showed that the DC-LSND + preheating treatment showed smaller weld distortion compared to other treatments. The result with highest tensile strength were found in the DC-LSND treatment. The DC-LSND + preheating treatment showed the highest hardness value. The DC-LSND + preheating treatment also showed a lower fatigue crack propagation rate so that it has the best fatigue resistance compared to the specimen without treatment.

Keywords: friction stir welding (FSW), Preheating, DC-LSND, fatigue crack propagation rate