RINGKASAN

Ahmad Yasin Yusuf**,** Jurusan Teknik Mesin Fakultas Teknik Universitas Brawijaya, November 2016, Pengaruh Diameter dan Sudut *Chamfer* Terhadap Distribusi Temperatur Metode Pengelasan CDFW Logam Al-6061 Dengan Logam SS-304, dosen pembimbing: Moch. Agus Choiron, Endi Sutikno.

Teknologi CDFW (*continous drive friction welding*) mulai dikembangkan karena prosesnya yang murah, cepat, dan aman. CDFW dilakukan dengan cara memberikan rotasi ke benda kerja pertama dan memberikan tekanan ke benda kerja kedua sehingga menimbulkan gesekan. Gesekan yang terjadi menghasilkan panas yang dapat menyambungkan kedua benda kerja tersebut.

Penelitian ini bertujuan untuk mengetahui pengaruh diameter dan sudut *chamfer* terhadap distribusi temperatur benda kerja yang dihasilkan dari proses pengelasan CDFW. Material yang digunakan pada benda kerja pertama yakni Al-6061 yang memiliki temperatur rekristalisasi sebesar 315,56^{0}C dan temperatur cair sebesar 660°C. Material yang digunakan pada benda kerja kedua yakni SS-304 yang memiliki temperatur rekristalisasi sebesar 537,78^{0}C dan temperatur cair sebesar 1523,889^{0}C. Penelitian ini menggunakan *software* berbasis elemen hingga. *Modelling* diatur dengan cara material Al-6061 dirotasi dengan kecepatan 1200rpm dan material SS-304 ditekan dengan *friction pressure* sebesar 50MPa selama *friction time* 1 detik. Pada material Al-6061 diberikan sudut *chamfer* dengan variasi 0^0, 15^0, dan 30^0 sedangkan variasi diameter benda kerja yakni 1,5 cm, 2 cm, dan 2,5 cm.

Hasil penelitian menunjukkan bahwa semakin kecil sudut *chamfer* dan semakin besar diameter benda kerja menyebabkan distribusi temperatur yang dihasilkan semakin besar yang diakibatkan oleh proses pengelasan CDFW. Temperatur tertinggi dihasilkan oleh variasi diameter 2,5 cm sudut *chamfer* 0^0 yakni 423,64^{0}C. Sedangkan temperatur terendah dihasilkan oleh variasi diameter 1,5 cm sudut *chamfer* 30^0 yakni 152,52^{0}C. Pada prosesnya, material yang digunakan akan menyambung apabila salah satu benda kerja telah mencapai temperatur rekristalisasinya. Penyambungan las CDFW yang baik apabila daerah sambungan las berada di antara temperatur rekristalisasi dan temperatur cair material. Berdasarkan asumsi tersebut, maka variasi diameter diameter 2,5 cm sudut *chamfer* 0^0 memungkinkan memiliki hasil pengelasan yang paling baik, karena telah mencapai temperatur rekristalisasi material Al-6061 dan di bawah temperatur cair material Al-6061.

Kata kunci: *Continous drive friction welding*, diameter benda kerja, sudut *chamfer*, temperatur.

SUMMARY

Ahmad Yasin Yusuf, Department of Mechanical Engineering, Faculty of Engineering, Universitas Brawijaya, in November 2016, Effect of Diameter and Angle of Chamfer Towards Temperature Distribution CDFW Welding Method Al-6061 With SS-304, the advisors: Moch. Agus Choiron, Endi Sutikno.

CDFW (continous drive friction welding) technology has been developed because of its quick process, low cost and safety. CDFW method are giving rotation in to first object and giving pressure in to second object thus make frictions between two objects. The friction produced between two objects creates heat, resulting two objects bonded.

This research purposes are to knowing effect of diameter and angle of chamfer toward object's temperature distribution produced from CDFW process. Material used for first object is Al-6061 which has recrystalisation temperature at 315,56^{0}C and melting temperature at 660^{0}C. Material used for second object is SS-304 which has recrystalisation temperature at 537,78^{0}C and melting temperature at 1523,889^{0}C. This research is using finite element based software. Modelling has been setting that Al-6061 material rotated with rotational speed at 1200rpm, and SS-304 material pressured with friction pressure at 50MPa during friction time which set at 1s. The chamfer applied to material Al-6061 with its angle variations are 0^0, 15^0, and 30^0, while diameter variations are 1,5 cm, 2 cm, and 2,5 cm.

The result of this simulation shows lesser chamfer's angle and bigger object's diameter create higher temperature distributions during CDFW processes. Highest temperature's distribution, which is 423,64^{0}C at the core of collided area, is shown when the model had its object's diameter at 2,5 cm and the chamfer's angle is 0^0. While lowest temperature's distribution, which is 152,52^{0}C at the core of collided area, is shown when the model had ist variation of diameter at 1,5 cm and the angle of chamfer is 30^0. In the process, material will be bonded if one of material reached its recrystalisation temperature. CDFW welding process has good quality when its heat affected zone temperature between recrystalisation temperature and melting temperature of one object. Using this asumption, 2,5 cm is the best option for object's diameter while its chamfer's angle is 0^0 shown by its temperature at the core of collided area is reaching recrystalisation temperature Al-6061 and lower than melting temperature Al-6061, thus is the best condition to get the best welding quality.

Keywords: Continous drive friction welding, object's diameter, chamfer's angle, temperature distribution.