ABSTRAK

Baja *hadfield* yang memiliki sifat kekerasan, ketangguhan serta ketahanan aus yang tinggi sangat cocok diaplikasikan pada kondisi beban dinamis, khususnya pada industri yang membutuhkan performa tinggi seperti industri pemrosesan mineral dan tambang (*crusher, lining plates, jaws, hammers*) serta industri energi. Baja *Hadfield* dibuat melalui proses pengecoran yang menghasilkan fase *austenite* dengan keberadaan karbida $(FeMn)_3C$ pada batas butir, sehingga cenderung memicu getas. Pada penelitian ini, karakteristik baja *Hadfield* hasil cor di investigasi lebih lanjut setelah dilakukan proses *heat treatment* dalam dua tahap untuk mengetahui perubahan struktur mikro dan kekerasannya. Pengujian diawali tanpa adanya proses *heat treatment,* kemudian dilanjutkan dengan pemanasan ruang sampai 700 ºC dengan *holding time* 60 menit sampai dengan empat variasi temperatur Austenite, yaitu 1000 ºC, 1100 ºC, 1150 ºC dan 1200 ºC. Masing-masing temperatur Austenite ditahan dengan dua waktu penahanan yaitu selama 30 menit dan 60 menit diikuti dengan *quenching* menggunakan media pendingin air. Setelah proses *heat treatment* dilakukan pengujian metalografi meliputi pengamplasan, polishing dan etsa untuk memberikan gambaran mikro struktur saat dilakukan pengamatan menggunakan mikroskop optik. Serta dilakukan uji kekerasan untuk menganalisis sifat mekaniknya dengan menggunakan metode *Vickers.* Berdasarkan hasil pengujian pada temperatur 1200 ºC dengan waktu penahanan 60 menit diperoleh persentase kandungan karbida pada baja *hadfield* lebih rendah dibandingkan hasil pengujian 1000 ºC, 1100 ºC, 1150 ºC dengan waktu tahan 30 menit maupun 60 menit serta tanpa adanya proses *heat treatment*. Begitu pula dengan kegetasannya, hasil uji kekerasan yang didapatkan nilai terendah adalah waktu tahan 60 menit pada temperatur 1200ºC, yaitu 170,3 HV.

Kata Kunci: Baja hadfield, heat treatment, struktur mikro, sifat mekanik.

EXPERIMENTAL STUDY OF THE EFFECT OF HEAT TREATMENT PROCESS HOLDING TIME VARIATIONS ON MICROSTRUCTURES AND MECHANICAL PROPERTIES IN HADFIELD STEEL

ABSTRACT

Hadfield steel which has high hardness, toughness and wear resistance properties is very suitable to be applied to dynamic load conditions, especially in industries that require high performance such as the mineral processing industry and mines (crushers, lining plates, jaws, hammers) and the energy industry. Hadfield steel is made through a casting process that produces an austenite phase with the presence of carbide (FeMn)3C at the grain boundary, so it tends to trigger shock. In this study, the characterization of hadfield steel cast results was further investigated after a heat treatment process was carried out in two stages to determine changes in microstructures and their hardness. The test began without a heat treatment process, then continued with room heating up to 700 ºC with a holding time of 60 minutes to four variations in austenite temperatures, namely 1000 ºC, 1100 ºC, 1150 ºC and 1200 ºC. Each austenite temperature is held with two holding times, namely for 30 minutes and 60 minutes followed by quenching using water cooling media. After the heat treatment process, metallographic testing is carried out including sanding, polishing and etching to provide a microstructure picture when observed using an optical microscope. As well as a hardness test was carried out to analyze its mechanical properties using the Vickers method. Based on the test results at a temperature of 1200 ºC with a holding time of 60 minutes, the percentage of carbide content in hadfield steel was lower than the test results of 1000 ºC, 1100 ºC, 1150 ºC with a duration of 30 minutes or 60 minutes and without a heat treatment process. Likewise with the shock, the hardness test results obtained the lowest value is a resistance time of 60 minutes at a temperature of 1200 ºC, which is 170.3 HV.

Keywords: *hadfield steel, heat treatment, microstructure, mechanical properties*