

ABSTRAK

Perkembangan dunia industri di Indonesia semakin hari semakin berkembang pesat terutama industri manufaktur. Salah satu baja yang digunakan dalam kegiatan industri adalah baja AISI 4340 dengan kandungan karbon 0,3-0,85 % wt. Baja karbon dituntut buat memperbaiki sifat-sifatnya seperti ketangguhan, keuletan, kekerasan bagian atas serta ketahanan terhadap gesekan. pada umumnya untuk memperoleh sifat-sifat tadi maka perlu dilakukan proses perlakuan panas (*heat treatment*) untuk meningkatkan kekerasan pada logam tersebut. salah satu metode yang bisa diterapkan ialah melalui *pack carburizing*. Hasil dari *pack carburizing* tersebut harus dilakukan beberapa pengujian, seperti uji tarik, uji kekerasan dan uji impak untuk mengetahui seberapa kuat spesimen tersebut menahan beban yang akan diberikan.

Dalam penelitian ini menggunakan 3 variasi perbandingan *energizer* $\text{BaCO}_3 : \text{Na}_2\text{CO}_3$ yaitu 40:60 (w/w)%, 50:50 (w/w)%, 60:40 (w/w)%. Dimensi spesimen uji tarik sesuai dengan standart ASTM E-8 tipe 13a, uji impak sesuai dengan standart ASTM E-23, uji kekerasan sesuai dengan standart ASTM E-18, dan uji Struktur Mikro sesuai dengan standart E-3. Sampel diberikan kode seperti kode spesimen A untuk komposisi 40:60 (w/w)%, kode spesimen B untuk komposisi 50:50 (w/w)% dan kode spesimen C untuk komposisi 60:40 (w/w)%.

Berdasarkan hasil pengujian tarik menunjukkan bahwa spesimen C memiliki nilai *ultimate tensile strength* yang lebih rendah dibandingkan dengan spesimen lainnya, yaitu $333,43 \pm 30,22$ MPa. Berdasarkan hasil pengujian *impact* yang telah dilakukan dapat diketahui bahwa nilai *energi impact terendah* terdapat pada spesimen C yaitu sebesar $4,32 \pm 0$ joule dan nilai energi *impact* terbesar terdapat pada spesimen tanpa perlakuan yaitu sebesar $15,80 \pm 0$ joule. Hasil pengujian kekerasan pada spesimen menunjukkan bahwa spesimen C memiliki kekerasan yang tertinggi dibandingkan dengan kekerasan spesimen lainnya yaitu sebesar 80,70 HRC sedangkan spesimen tanpa perlakuan sebesar 56,90 HRC. Pada pengujian struktur mikro terjadi pertambahan fasa setelah dilakukan perlakuan yaitu terbentuknya fasa martensit.

Kata kunci: *Pack Carburizing, Kekuatan Tarik, Kekerasan, Impak, Struktur Mikro*

ABSTRACT

The development of the industrial world in Indonesia is growing rapidly, especially the manufacturing industry. One of the steels used in industrial activities is AISI 4340 steel with a carbon content of 0.3-0.85% wt. Carbon steel is required to improve its properties such as toughness, ductility, upper hardness and resistance to friction. In general, to obtain these properties, it is necessary to carry out a heat treatment process to increase the hardness of the metal. One method that can be applied is through pack carburizing. The results of the carburizing pack must be carried out several tests, such as tensile tests, hardness tests and impact tests to find out how strong the specimen is to withstand the given load.

In this study, 3 variations of the ratio energizer of BaCO_3 : Na_2CO_3 were used, namely 40:60 (w/w)%, 50:50 (w/w)%, 60:40 (w/w)%. The dimensions of the tensile test specimen are in accordance with the ASTM E-8 type 13a standard, the impact test is in accordance with the ASTM E-23 standard, the hardness test is in accordance with the ASTM E-18 standard, and the Microstructure test is in accordance with the E-3 standard. Samples were given codes such as specimen A code for composition 40:60 (w/w)%, specimen B code for composition 50:50 (w/w)% and specimen C code for composition 60:40 (w/w)%.

Based on the results of the tensile test, it was shown that specimen C had a lower ultimate tensile strength value than the other specimens, which was 333.43 ± 30.22 MPa. Based on the results of the impact testing that has been carried out, it can be seen that the lowest impact energy value is found in specimen C, which is 4.32 ± 0 joules and the highest impact energy value is found in specimens without treatment, which is 15.80 ± 0 joules. The results of the hardness test on the specimen showed that specimen C had the highest hardness compared to the hardness of other specimens, which was 80.70 HRC while the untreated specimen was 56.90 HRC. In the microstructure test, there was an increase in the phase after the treatment, namely the formation of the martensite phase.

Keywords: *Pack Carburizing, Tensile strenght, Hardness, Impact, Microstructure*