ABSTRAK

Material *sprocket* seperti baja SCM 415 memiliki kandungan karbon rendah membuat kekerasan dan ketahanan aus material ini terbatas. Untuk meningkatkan sifat mekanisnya, penelitian ini menerapkan proses karburasi pada temperatur 900°C selama 60 menit serta menggunakan gas *acetylene* sebagai sumber karbon. Setelah proses karburasi sampel diberikan variasi siklus termal dilakukan meliputi *annealing* (*furnace cooling*), *quenching* dalam oli SAE 5W/30, dan kombinasi *quenching-tempering* pada temperatur 230°C selama 30 menit. Karakterisasi dilakukan menggunakan SEM-EDX *mapping* dan mikroskop optik untuk analisis distribusi elemen, ketebalan lapisan difusi, dan mikrostruktur. Pengujian keausan dilakukan dengan metode Ogoshi untuk mengetahui nilai keausan material. Hasil penelitian menunjukkan bahwa karburasi meningkatkan distribusi karbon pada permukaan material dan hasil analisa masing-masing sampel menunjukan 90,099µm untuk sampel *quenching*, 43,124µm untuk sampel tempering dan 43,732µm untuk sampel *annealing*. Kombinasi *quenching* dan *tempering* menunjukkan anomali dimana keausan 31% lebih rendah dibandingkan perlakuan *quenching* dimungkinkan karena perlakuan *tempering* menyebabkan kekerasan sampel menurun yang terkonfirmasi melalui pengujian kekerasan yaitu 82,19 HRA untuk sampel *quenching* dan 79,46 HRA untuk *quenching* dan *tempering*. Sehingga dari analisa distribusi elemen dan keausan yang dilakukan dapat disimpulkan bahwa perlakuan karburisasi diikuti perlakuan *quenching* dan *tempering* adalah perlakuan yang paling optimal untuk mendapatkan distribusi carbon dan keausan.

Kata kunci: SCM415, karburasi, siklus termal, mikrostruktur, ketahanan aus

ABSTRACT

Sprocket materials like SCM 415 steel have low carbon content, resulting in limited hardness and wear resistance. This research aims to enhance the mechanical properties of the material by applying a carburizing process at a temperature of 900°C for 60 minutes, utilizing acetylene gas as the carbon source. Following the carburizing treatment, the samples underwent several thermal cycles, which included annealing (with furnace cooling), quenching in SAE 5W/30 oil, and a combination of quenching and tempering at 230°C for 30 minutes. Characterization was conducted using SEM-EDX mapping and optical microscopy to analyze elemental distribution, diffusion layer thickness, and microstructure. Wear testing was performed using the Ogoshi method to evaluate the material's wear value. The results indicated that carburizing enhanced the carbon distribution on the material's surface. The analysis of each sample showed the following wear values: 90.099 µm for the quenching sample, 43.124 µm for the tempering sample, and 43.732 µm for the annealing sample. The combination of quenching and tempering demonstrates an interesting anomaly where wear is reduced by 31% compared to the quenching treatment alone. This reduction occurs because the tempering treatment results in a decrease in hardness, as confirmed by hardness testing. Specifically, the hardness for the quenching sample measures 82.19 HRA, while the hardness for the sample that underwent both quenching and tempering is 79.46 HRA. Based on the analysis of element distribution and wear, we can conclude that carburization treatment followed by quenching and tempering is the most effective method for achieving optimal carbon distribution and wear resistance.

Keywords: *SCM 415, carburizing, thermal cycling, microstructure, wear resistance*