“Influence The Process of Heat Treatment Quenching and Partitioning to The Fatigue Life of Leaf Spring Steel JIS SUP 9A With Reversed Bending Method”

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Abstract

In the development of transportation technologies, components that have a good quality is needed by society. Because of that the components used in the world of automotive must have good mechanical properties. Leaf spring is one important component of transport equipment such as four-wheeled vehicles. Function of leaf springs is support the weight of static and dynamic to provide comfort to the rider. Conditions such as these demands spring material which has good mechanical properties so that the components of leaf springs has a long shelf life.

This research was conducted at the beginning of material and heat treatment of materials by quenching and partitioning of spring steel JIS SUP 9A. Austenite performed at temperatures 860 °C holding time is 30 minutes and then quench to temperatures of 190 °C with saltbath during partitioning 3 seconds then performed at a temperature of 250 °C holding time is 10 seconds and then quench again with water or an oil medium. After this process the material in fatigue tests with load level 0.8 σu, 0.65 σu and 0.5 σu for quenching and partitioning material while the initial material (non-treat) were made at load 0.8 σu and 0.5 σu. Fatigue test conducted by the method and results of reversed bending fatigue life of fatigue life compared with the results obtained at the beginning of leaf spring steel (non-treat). Fatigue testing machine used in this study were machine fatigue dynamics, Inc. LFE-150 model in the Metallurgy laboratory in Mechanical Engineering ITS.

The results obtained after testing the material in fatigue test reversed bending is the obtainment of S-N curve (the relationship
between stress and material age). At the initial material (non-treat) with a stress level of $0.8\sigma_u$ obtained load is exhausted $996,750$ N/mm$^2$ with fatigue life $19649 \ (2.0 \times 10^4)$ cycle and the stress level of $0.5\sigma_u$ with the burden of fatigue load $622,969$ N/mm$^2$ with fatigue life $524699 \ (5.2 \times 10^5)$ cycle while the stress at the quenching and partitioning material to stress levels $0.8\sigma_u$ with load is $1474,326$ N/mm$^2$ exhausted by fatigue life $13349 \ (1.3 \times 10^4)$ cycle, the stress levels obtained $0.65 \sigma_u$ with load is $1197,89$ N/mm$^2$ with exhausted fatigue life $26549 \ (2.6 \times 10^4)$ cycle and the stress level of $0.5\sigma_u$ load is obtained with the old tired $921,454$ N/mm$^2$ with fatigue life $68249 \ (6.8 \times 10^4)$ cycle, so at this final paper, quenching and partitioning material has a higher load than the initial material (non-treat) but has a lower fatigue life than the early material (non-treat). This is evidenced by the percentage of material that is obtained by quenching and partitioning has a $13.01\%$ fatigue life time of the initial material and has a $4.85\%$ times the percentage of material results quenching and tempering has ever carried out by other studies for comparison.

**Key Words**: Spring steel, Non Treat, Quenching, Partitioning, Tempering, Reversed Bending.