Material characterization of tribological effects in HSS hacksaw blade
Nor Amirah binti Mohd Amran, Mohd Sayuti, Rusdi bin Abd Rashid, Waleed Alghani, Nur Aqilah binti Derahman

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ABSTRACT

Purpose - This research presents a direct repurposing activity of consumed high-speed steel (HSS) hacksaw blade into fine-looking handmade knives in order to increase the awareness about sustainability by evaluating the relationship between the quality of material alloys and heat treatment as well as cultural aspects such as the treatment on the HSS hacksaw blade will affect the material hardness.

Design/methodology/approach - The quality of HSS hacksaw blade samples was analyzed by using SEM/EDX through the identification of material element's properties. Besides, finite element structural analysis by using SolidWorks Simulation to evaluate the material performance by determining the Von Mises stress in order to find the factor of safety of the knife designs. Then, the effect of tribology implementation towards mechanical properties of the handmade knives was determined by using a Rockwell C hardness test.

Findings - It is found that the material composition of carbon plays a vital role in increasing and improve the hardness and wear resistance of the HSS hacksaw blade. The Von Mises stress obtained is lower than the yield strength of 3250 MPa by 71.44 % with the safety factor of 3.58 means the design will not be subjected to failure. The mechanical properties of the HSS hacksaw blade such as hardness were determined averagely by 5 % of hardness increase.

Originality/value - It has been validated that the tribological effect towards the material characteristic leads to hardness changes which contributed to the enhancement of tool life of the HSS hacksaw blade thus produce better quality knives.

Keywords: High-speed steel, Hardness, Tribology and Heat treatment