## UNIVERSITI TEKNOLOGI MARA

# EFFECT OF THE CARBURIZING PASTE CONCENTRATION ON THE CASE DEPTH OF CARBURIZED LOW CARBON STEEL

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#### **AUTHOR'S DECLARATION**

I declare that the work in this dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This dissertation has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

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#### ABSTRACT

Pack carburizing is a thermo-chemical treatment used to increase the mechanical properties of steels. It is an easy, low cost and safe compare to gas and fluid carburizing. However, this process requires additional temperature and soaking time because of limitation of carbon diffusion. Research conducted by introducing paste compound to replace conventional powder for better carbon atom diffusion. Research focused on optimization parameters of paste concentration, temperature and time. The correlation between carbon dispersion towards mechanical properties were analyzed. Samples of low carbon steel were used. Samples were carburized with powder and variable concentration of paste compound. Carburizing parameters of 700°C-1000°C and 7-9 hours were set to explore their effects towards compound performance. A series of experiments were conducted to test the microhardness, optical microscopic, scanning electron microscopic, spectrometer analysis, x-ray diffraction, wear resistance, corrosion and tensile. Results showed that carburizing paste 1:1 compound has provided greater performance for pack carburizing compared to powder compound. Paste 1:1 compound at temperature of 1000°C for 9 hours has produced case depth 14.5 % higher than conventional powder carburizing. Tensile strength and wear resistance were 6.8 % and 99.6% higher compares to powder. Paste compound has potential to replace powder for pack carburizing because of it greater case depth and higher wear resistance. The correlation between carbon diffusion toward the mechanical behavior is optimized by using paste 1:1 compound. This research has suggested a thermo-chemical treatment, which was easy and safe for the environment with better carbon diffusion. It also increases the lifespan of low carbon steels compared to conventional pack carburizing.

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