

## INTISARI

*Pin bucket excavator* merupakan komponen penting yang bekerja sebagai penghubung antara *bucket* dan *arm*. Komponen ini menerima beban tekan, beban geser, dan gesekan berulang saat *excavator* beroperasi, sehingga rentan mengalami keausan. Penelitian ini bertujuan untuk mengetahui pengaruh *heat treatment* dengan metode *flame hardening* terhadap sifat fisis dan mekanis *pin bucket excavator original* kapasitas 20 ton.

Penelitian ini menggunakan metode kuantitatif melalui pengujian komposisi kimia, foto makro, struktur mikro, kekerasan *Vickers*, dan keausan *Ogoshi*. Spesimen diberi perlakuan *flame hardening* pada suhu 900°C dengan variasi waktu pemanasan 10 menit, 20 menit, dan 30 menit, kemudian dilakukan *quenching* menggunakan media air. Hasil uji komposisi menunjukkan bahwa material *pin bucket* termasuk baja karbon sedang paduan rendah dengan kandungan Fe sebesar 98,08% dan C sebesar 0,542%. Setelah proses *flame hardening*, struktur makro menunjukkan zona pengerasan yang semakin luas seiring bertambahnya waktu pemanasan. Struktur mikro juga mengalami perubahan dari fasa ferit dan perlit menjadi martensit pada bagian permukaan.

Hasil pengujian menunjukkan bahwa *flame hardening* mampu meningkatkan kekerasan dan ketahanan aus *pin bucket*. Nilai kekerasan awal sebesar 206 HV meningkat hingga 1097 HV pada variasi pemanasan 30 menit. Nilai keausan spesifik juga menurun dari 0,000087072 mm<sup>3</sup>/kg.m menjadi 0,000035788 mm<sup>3</sup>/kg.m. Dengan demikian, *flame hardening* selama 30 menit memberikan hasil paling optimal karena menghasilkan zona pengerasan paling luas, martensit paling dominan, kekerasan tertinggi, dan nilai keausan terendah.

Kata kunci: *Flame hardening*, *pin bucket excavator*, struktur mikro, kekerasan *vickers*, keausan *ogoshi*.

## ABSTRACT

*The excavator bucket pin is an important component that works as a connector between the bucket and the arm. This component receives compressive loads, shear loads, and repeated friction during excavator operation, making it vulnerable to wear. This study aims to determine the effect of heat treatment using the flame hardening method on the physical and mechanical properties of an original bucket pin for a 20-ton excavator.*

*This study used a quantitative method through chemical composition testing, macro photo analysis, microstructure analysis, Vickers hardness testing, and Ogoshi wear testing. The specimens were treated using flame hardening at a temperature of 900°C with heating time variations of 10 minutes, 20 minutes, and 30 minutes, followed by quenching using water as the cooling medium. The chemical composition test showed that the bucket pin material belongs to low-alloy medium carbon steel, with Fe content of 98.08% and C content of 0.542%. After the flame hardening process, the macrostructure showed that the hardened zone became wider as the heating time increased. The microstructure also changed from ferrite and pearlite phases to martensite on the surface layer.*

*The test results showed that flame hardening increased the hardness and wear resistance of the bucket pin. The initial hardness value of 206 HV increased to 1097 HV in the 30-minute heating variation. The specific wear value also decreased from 0.000087072 mm<sup>3</sup>/kg.m to 0.000035788 mm<sup>3</sup>/kg.m. Therefore, flame hardening for 30 minutes produced the most optimal result because it formed the widest hardened zone, the most dominant martensite structure, the highest hardness value, and the lowest wear value.*

*Key words: Flame hardening, excavator bucket pin, microstructure, vickers hardness, ogoshi wear test.*