

## ABSTRAK

### RANCANG BANGUN DAN ANALISIS HASIL MESIN PENYANGRAI BIJI KOPI KAPASITAS 3 KG

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Masih banyak produsen kopi skala kecil hingga menengah yang menggunakan metode penyangraian tradisional, yang seringkali menghasilkan kualitas biji kopi yang tidak konsisten akibat ketidakstabilan suhu dan waktu. Penelitian ini bertujuan untuk merancang dan menganalisis mesin penyangrai biji kopi kapasitas 3 kg dengan sistem semi otomatis, serta mengevaluasi pengaruh suhu, waktu, dan kecepatan putaran tabung terhadap kualitas hasil sangrai, khususnya kadar air dan warna biji kopi. Metode yang digunakan adalah penelitian dan pengembangan (*Research and Development*) yang mencakup proses perancangan, pembuatan, dan pengujian prototipe mesin. Pengujian dilakukan sebanyak 54 kali dengan kombinasi variasi suhu (200°C, 220°C, 240°C), waktu (10, 15, 20 menit), dan kecepatan putaran tabung (40 rpm dan 60 rpm). Data dikumpulkan melalui pengukuran kadar air biji kopi sebelum dan sesudah proses penyangraian, serta pengamatan terhadap warna hasil sangrai. Analisis data dilakukan secara deskriptif dan statistik untuk menentukan kombinasi yang paling optimal. Hasil penelitian menunjukkan bahwa suhu, waktu, dan kecepatan putaran tabung memiliki pengaruh signifikan terhadap hasil penyangraian. Kombinasi paling optimal diperoleh pada suhu 240°C, waktu 20 menit, dan kecepatan putaran 60 rpm, yang menghasilkan pengurangan kadar air sebesar 11,73% dan warna sangrai dark roast yang merata. Temuan ini membuktikan bahwa penggunaan mesin semi otomatis dapat meningkatkan efisiensi dan konsistensi kuat. Penelitian selanjutnya sebaiknya difokuskan pada evaluasi mutu organoleptik kopi hasil sangrai, seperti aroma, rasa, dan tekstur, berdasarkan variasi suhu, waktu, dan kecepatan putaran tabung. Selain itu, perlu dilakukan kajian terhadap konsumsi energi. Penelitian terkait pengembangan kapasitas mesin untuk skala produksi lebih besar dan integrasi sistem pendingin otomatis juga penting untuk meningkatkan aplikabilitas mesin dalam industri, serta studi implementasi dan kelayakan ekonomi untuk mendukung penggunaan oleh pelaku usaha kopi.

**Kata Kunci:** Mesin penyangrai kopi, semi otomatis, kadar air, suhu penyangraian, warna sangrai

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(2025: xiii + 41 Pages, 14 Pictures, 9 Tables, 4 Appendix)**

*Many small to medium scale coffee producers still use traditional roasting methods, which often result in inconsistent coffee bean quality due to temperature and time instability. This study aims to design and analyse a 3 kg coffee bean roasting machine with a semi-automatic system, as well as evaluate the effect of temperature, time, and tube rotation speed on the quality of roasted results, especially the moisture content and colour of coffee beans. The method used is research and development, which includes the process of designing, manufacturing, and testing the machine prototype. The test was conducted 54 times with a combination of temperature variations (200°C, 220°C, 240°C), time (10, 15, 20 minutes), and tube rotation speed (40 rpm and 60 rpm). Data were collected by measuring the moisture content of coffee beans before and after the roasting process, as well as observing the colour of the roasted results. Data were analysed descriptively and statistically to determine the most optimal combination. The results showed that temperature, time, and tube rotation speed had a significant influence on roasting results. The most optimal combination was obtained at a temperature of 240°C, time of 20 minutes, and rotation speed of 60 rpm, which resulted in a reduction in moisture content of 11.73% and an even dark roast colour. This finding proves that the use of semi-automatic machines can improve efficiency and strong consistency. Future research should focus on evaluating the organoleptic quality of roasted coffee, such as aroma, flavour, and texture, based on variations in temperature, time, and tube rotation speed. In addition, it is necessary to conduct studies on energy consumption, research related to the development of machine capacity for a larger production scale and the integration of an automatic cooling system are also important to increase the applicability of the machine in the industry, as well as implementation and economic feasibility studies to support the use by coffee businesses.*

**Keywords:** *Coffee roasting machine, semi automatic, moisture content, roasting temperature, roasting colour*