



Thesis Abstract

Development, Evaluation and Optimization of A Microcontroller-Based Mechanical Coffee Roaster for Small-Scale Roasting

by Mojica, Ruel Marges, University of the Philippines Los Baños, April 2009
Major Professor: Dr. Jessie C. Elauria

A microcontroller-based multi-crop mechanical roaster that can be used for small-scale roasting was designed, fabricated and evaluated to establish the optimum combination of the operating parameters involved namely: roasting temperature, time of roasting and initial moisture content of coffee beans.

The selection criteria expressed by coffee farmers were considered in the design of the mechanical roaster. The machine is so simple that it is composed of basic parts such as roasting drum, hopper, auger, heater and insulation. The microcontroller was introduced in the design to maintain and control the temperature setting inside the roasting drum and the time of roasting.

The Response Surface Analysis was used to optimize the operating conditions of the mechanical roaster. The effect of the three factor variables such as temperature, time and initial moisture content were determined. The response variables included final weight, final moisture content, overall cup quality, general acceptability and willingness to buy the product. Initial moisture content of the product was found to have no significant effect on all the response variables except for overall cup quality. Time of roasting significantly affected final weight, final moisture content and overall cup quality. The most important treatment factor, however, was roasting temperature. This factor significantly affected all the response variables except willingness to buy the product.

Superimposing contour plots of the five responses yielded an optimum region that established an optimum point. Maximum responses were obtained at temperature, time and initial moisture content setting of 204⁰C, 19.75 min, and 12.25 %, respectively.

Investment analysis revealed that using the roaster for custom work would be a profitable business with a benefit-cost ratio of 1.65.