

**DESIGN, FABRICATION AND PERFORMANCE EVALUATION OF USED
OIL-POWERED STOVE WITH QUICK START IGNITION SYSTEM**

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**BACHELOR OF SCIENCE IN AGRICULTURAL AND BIOSYSTEM
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ACCEPTANCE SHEET

This undergraduate thesis entitled **DESIGN, FABRICATION AND PERFORMANCE EVALUATION OF USED OIL-POWERED STOVE WITH QUICK START IGNITION SYSTEM,** prepared and submitted by **ALRENCE A. BAJUM,** in partial fulfillment of the requirements for the degree of **BACHELOR OF SCIENCE IN AGRICULTURAL AND BIOSYSTEMS ENGINEERING (AB MACHINERY AND POWER ENGINEERING),** is hereby accepted:


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BIOGRAPHICAL SKETCH

Alrence A. Bajum is the eldest son of Luis Bajum and Aurora Abawag. He was born on March 10, 2003 in San Roque, Gapan City, Nueva Ecija. His educational journey began at San Roque Elementary School, where he graduated in 2013, followed by his completion of junior high school at San Roque National High School in 2018. With a thirst for knowledge and a commitment to his academic pursuits, Alrence pursued his senior high school education at ACLC College of Gapan, graduating in 2020. Recognizing his passion for agriculture, Alrence decided to further his studies and enrolled in the Bachelor of Science in Agricultural and Biosystem Engineering program at Central Luzon State University (CLSU). Despite facing financial challenges, Alrence remains steadfast in his determination to succeed, taking on the role of the family breadwinner while pursuing his tertiary education. Through his dedication and perseverance, Alrence strives to make a difference in the field of agricultural engineering and provide a better future for himself and his family.

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ABSTRACT

BAJUM, ALRENCE A., Department of Agricultural and Biosystems Engineering, College of Engineering, Science City of Muñoz, Nueva Ecija, Philippines, **July 2024, DESIGN, FABRICATION AND PERFORMANCE EVALUATION OF USED OIL-POWERED STOVE WITH QUICK START IGNITION SYSTEM**

Adviser: May A. Cabral, M.Sc.

Improper disposal of used engine oil poses significant environmental hazards, contaminating water supplies and contributing to pollution. In the Philippines, 240 million liters of used oil are produced annually, with 95% improperly managed, causing severe ecological impacts. This study was conducted to address these issues by developing a used oil-powered stove with a quick-start ignition system. A used oil-powered stove was design using AutoCAD- a widely used computer-aided design (CAD) software. It has five major components which includes the frame, oil tank, blower, automatic ignition switch and burner. The used oil-powered stove was fabricated using angle bar and round bar, as well as pipe, flat bar, and steel plate. Most of these materials can be found at junk shops and as scrap. The performance of the stove was assessed based on thermal efficiency, firepower, gas emissions, burning rate, and fuel consumption. Results showed that both blower speed and starting condition significantly influenced performance. Hot starts combined with high blower speed resulted in the shortest boiling times (22 minutes) and highest thermal efficiency (19.67%), firepower (6050.67 watts), and burning rate (9.33 g/min). Conversely, cold starts with low blower speed led to the longest boiling times (37 minutes), lowest thermal efficiency (13.33%), firepower (4183.67 watts), and burning rate (6.33 g/min). Emissions from the stove were compliant with local and EU standards, indicating its

environmental and human safety. The cost of the used oil-powered stove was low-cost compared to commercial stoves like LPG. The total annual operating cost for the used oil-powered stove with a quick-start ignition system is 8,781 PhP, whereas for the LPG stove it is 17,236 PhP. The hourly operating cost is 6 PhP for the used oil-powered stove and 11.80 PhP for the LPG stove. The used oil-powered stoves can offer an economical, effective, and green way to cook and heat.

Keywords: used oil-powered stove; major components; performance; emission; cost

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