MODIFICATION OF EXISTING YAM POUNDING MACHINE

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DEPARTMENT OF MECHANICAL ENGINEERING HND II
FULL TIME

PROJECT TOPIC:
MODIFICATION OF AN EXISTING YAM POUNDING MANCHINE
BY

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CHAPTER 1: INTRODUCTION

1.1 Background of the Study :

Yam is a staple food in many African countries, especially in Nigeria where pounded yam is a delicacy. Traditional methods of yam pounding using mortar and pestle are physically demanding, time-consuming, and prone to contamination. To reduce human effort and improve hygiene, yam pounding machines were developed. However, existing designs often fall short in terms of energy efficiency, ease of cleaning, noise control, and output texture. This project focuses on modifying an existing yam pounding machine to overcome these limitations and improve performance.

1.2 Problem Statement:

Despite the adoption of mechanized pounding machines, many users report the following issues: Non-uniform yam texture with lumps. Difficulty cleaning non-detachable bowls. Excessive power consumption. Overheating of motor during continuous use. High noise and vibration levels. This project seeks to address these challenges through design modification.

1.3 Aim and Objectives

Aim: To improve an existing yam pounding machine for better performance and user satisfaction.

Objectives:

Modify the pounding mechanism for better yam consistency.
Introduce a detachable basin for easier cleaning.
Use an energy-efficient motor.
Reduce noise and vibration.
Compare performance of modified and original machines.

1.4 Significance of the Study :

The study enhances user experience, hygiene, and machine reliability. It contributes to local food processing technology and supports small-scale enterprises.

1.5 Scope of the Study :

This project involves the redesign, fabrication, and testing of components including the pounding rod, basin, frame, and motor setup. Performance will be evaluated based on pounding time, texture quality, and noise level.

CHAPTER 2: LITERATURE REVIEW

2.2 GAPS IDENTIFIED

LACK OF MODULAR DESIGNS FOR EASE OF MAINTENANCE.

FEW INCORPORATE NOISE REDUCTION OR ERGONOMIC FEATURES.

ENERGY EFFICIENCY IS NOT PRIORITIZED.

2.3 JUSTIFICATION FOR MODIFICATION

THE MODIFICATIONS ENSURE BETTER PERFORMANCE, USABILITY, AND COST-EFFECTIVENESS, MAKING THE MACHINE MORE SUITABLE FOR DOMESTIC AND SMALL COMMERCIAL USE.

Authors	Contribution	Limitations	Addressed in Current Work
Adebayo & Ogunjimi (2017)	Basic yam pounding machine.	Poor hygiene, fixed basin.	Introduced detachable basin.
Bamidele & Oladipo (2018)	Semi-automated system.	Moderate performance.	Enhanced mechanism for consistency.
Oloruntoba & Akinola (2019)	Focus on efficiency.	High cost, complex design.	Simplified design with local materials.
Ajayi & Salami (2020)	Hydraulic design.	Maintenance intensive.	Uses mechanical system for reliability.

CHAPTER 3: MATERIALS AND METHODS

3.1 MATERIALS USED

1. STAINLESS STEEL (DETACHABLE BASIN)
2. MILD STEEL (MACHINE FRAME)
3. ENERGY-EFFICIENT ELECTRIC MOTOR (1.5HP)
4. RUBBER DAMPERS (VIBRATION ABSORPTION)
5. THERMOPLASTIC COVER (NOISE INSULATION)
6. CONTROL PANEL (SWITCHES, INDICATORS)
7. BELTS, PULLEYS, POUNDING RODS

MODIFICATION PROCEDURE:

1. ASSESSMENT: IDENTIFY FLAWS IN THE EXISTING DESIGN.
2. REDESIGN: USE CAD TO REDESIGN THE POUNDING SYSTEM AND FRAME.
3. FABRICATION: WELD NEW FRAME SUPPORTS. INSTALL DETACHABLE BASIN WITH CLAMPS. REPLACE MOTOR AND ALIGN PULLEYS.
4. ASSEMBLY: CONNECT CONTROL SYSTEM, POUNDING MECHANISM, AND ELECTRICAL COMPONENTS.
5. TESTING: COMPARE OLD AND NEW MACHINE USING YAM SAMPLES.

3.3 TESTING PROCEDURE RECORD POUNDING TIME, TEXTURE OUTPUT, NOISE LEVEL, AND POWER USAGE. PERFORM REPEAT TESTS FOR ACCURACY.

Design Calculations

Motor Power Calculation: Where T = required torque, ω = angular velocity.

Frame Load Analysis:
Load per leg = (Total machine weight) ÷ 4
Allowable stress calculated using a safety factor of 1.5.

Pounding Frequency: Optimized at 2.5 cycles/sec using motor speed and pulley ratio.

Working Drawings
2D front, top, and side views.
3D model of the machine with an exploded view.