

## **Abstract**

This project focuses on the comprehensive design, development, and implementation of an automated labneh filling and packaging machine, specifically tailored to meet the operational needs of small to medium-scale dairy producers. The machine has been engineered to ensure high efficiency, hygiene, and precision in the process of dispensing viscous dairy products like labneh into various container sizes.

The system comprises several integrated subsystems: a stainless-steel mixing hopper equipped with an internal agitator motor to maintain uniform product consistency; a screw pump mechanism driven by a calibrated motor to ensure accurate volumetric filling; and a servo-actuated nozzle valve that precisely controls the start and stop of product flow to prevent dripping and ensure clean filling. Additionally, the system is designed for easy cleaning (CIP - Clean-in-Place), using food-grade materials and sanitary connections to comply with food safety standards.

Through a combination of mechanical, electrical, and control engineering principles, the machine provides programmable fill volumes, speed control, and sensor-based feedback to optimize the filling process. It reduces manual labor, minimizes product waste, and enhances production throughput.

The development process included mechanical simulations, flow rate calculations, motor torque estimations, and prototype testing to refine the accuracy and reliability of the system. Results demonstrated the machine's capability to fill labneh with high repeatability and minimal deviation, making it suitable for commercial applications.

This project represents a significant step forward in localized dairy automation, providing a cost-effective and customizable solution for producers seeking to improve product quality and operational efficiency.