

ANALYSIS OF EFFICIENCY AND EFFECTIVENESS OF AN AUTOMATED TOBACCO LEAF CHOPPING AND ARRANGING MACHINE SYSTEM

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ABSTRACT

Conventional tobacco leaf chopping and arranging processes remain highly dependent on manual labor, leading to low efficiency and high operational costs. This research aims to design and analyze an automated tobacco leaf chopping machine integrated with a lead screw-based arranging system controlled by a Programmable Logic Controller (PLC). The research method involved functional testing with mass variations (100g, 200g, 300g, and 400g) to evaluate time efficiency, electrical performance, and the success rate of leaf distribution onto curing frames (rigen). The results demonstrate that the automated system achieves a maximum working capacity of 25.00 grams/second at a 400g load. This automation implementation provides an 80% increase in labor efficiency, successfully reducing the required manpower from 15 workers in the conventional method to only 3 operators. The effectiveness analysis shows a peak success rate of 79% at a 100g load. Technical modifications, such as the implementation of a static pressure system (springless), proximity sensor repositioning, and the addition of a servo-motor-based stopper, significantly improved system stability and distribution accuracy. Despite a minor bottleneck constraint in the conveyor system during medium-weight processing, the machine effectively enhances operational efficiency and output quality compared to manual methods.

Keywords: Automation, Tobacco Chopper, Efficiency, Effectiveness, Arranging System, PLC.