3-AXIS CNC CONTROL SYSTEM FOR MEASURING THE MOISTURE CONTENT OF RAW MATERIALS FOR ANIMAL FEED BASED ON A MICROCONTROLLER

Nuzula Afianah, S.Kom, M.Cs. *As a Thesis Supervisor*

MUHAMMAD MUHTADI

Mechatronics Engineering Technology Study Program

Enginering Department

muhammadmuhtadi120304@gmail.com

ABSTRACT

This study aims to design and develop a 3-AXIS CNC control system based on the Arduino ATmega2560 microcontroller for automatic moisture content measurement of animal feed raw materials at multiple measurement points. The system was developed to overcome the limitations of conventional measurement methods, which are generally performed at a single point and therefore provide less representative moisture distribution data. The system consists of an Arduino ATmega2560 microcontroller, NEMA23 stepper motors, TB6600 drivers, a Resistive Soil Moisture sensor, and limit switches for the homing system. The research employed a quantitative experimental method consisting of system design, implementation, testing, data analysis, and system evaluation. The tests included homing accuracy, travel time performance, coordinate point accuracy, and sensor measurement accuracy. The results showed that the system achieved a 100% homing success rate. Coordinate accuracy testing at 24 measurement points produced an average error of 0.0907 mm with an average percentage error of 0.0162%. Sensor calibration significantly improved measurement accuracy, as indicated by a reduction in percentage error from 47.77% to 5.59% for wet corn samples and from 53.91% to 4.34% for dry corn samples. Based on these results, the developed system is capable of performing automatic, precise, and more representative moisture content measurements compared to conventional methods.

Keywords: *3-AXIS CNC, Arduino ATmega2560, moisture content, Resistive Soil Moisture, microcontroller.*