A-B MIX NUTRIENT MIXING SYSTEM FOR DRIP IRRIGATION IN A GREENHOUSE BASED ON PLC

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ABSTRACT

Crop cultivation in greenhouses requires efficient irrigation and precise nutrient management to support optimal plant growth. This study develops an automated A-B Mix nutrient mixing system based on the Siemens S7-1200 Programmable Logic Controller (PLC) to support precision drip irrigation. The system integrates a Total Dissolved Solids (TDS) sensor for real-time monitoring of nutrient concentration, three pumps (for nutrients A, B, and mixing), and a PCbased Human Machine Interface (HMI) for setpoint configuration. A Research and Development (R&D) method was applied through stages of problem identification, literature review, system assembly, installation, and performance testing. The automated process enables accurate mixing and distribution of nutrient solutions. Testing results show that the system produces nutrient concentrations close to the target setpoint. The Mean Absolute Error (MAE) was 35.5 ppm and the Mean Absolute Percentage Error (MAPE) was 6.18%, indicating a high level of accuracy and reliability (MAPE < 10%). This system improves nutrient distribution efficiency, optimizes water and nutrient usage, and supports more uniform plant growth in greenhouses through automated irrigation and fertigation, making it a practical solution for sustainable greenhouse automation.

Keywords: Greenhouse, Drip Irrigation, Siemens S7-1200 PLC, TDS Sensor