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"A Study on the Automatic IoT Based Multiple Solid Mixing and Product Measurement System"

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Abstract: ***This project presents an automated system for mixing multiple solid materials and measuring the final product, using Internet of Things (IoT) technology. The system automatically mixes different solid ingredients in the right proportions, ensuring consistency and accuracy. It uses sensors to monitor the mixing process in real-time, sending data to a central control system that makes adjustments as needed. The system also measures the weight and volume of the final product to ensure it meets the required specifications. With IoT integration, the system allows remote monitoring, data tracking, and performance analysis, reducing human error and improving efficiency. This technology is flexible and can be used in industries like food processing, pharmaceuticals, and chemicals, offering a more precise and automated approach to solid mixing and product measurement.***

Keywords: **Solid Mesurment,esp32,Relay,Servo Motor, Weight Measurement**

I. INTRODUCTION

The presents design and development of an Automatic IoT-based Multiple Solid Mixing and measurement system leveraging advanced sensor technologies, machine learning technology, and industrial communication protocols to optimize solid mixing processes and ensure precise product measurement.

In various industries such as pharmaceuticals, food processing, and accurate mixing and measurement of solid materials are crucial for producing high-quality products. Manual mixing and measurement processes are often time consuming, prone to errors, and labour-intensive. To address these challenges, this project processes an Automatic IoT-Based Multiple Solid Mixing and Product Measurement System.

This innovative system leverages internet of things (IoT) technology, sensors and automation to preciously mix and measure multiple solid materials. The system ensures consistency, accuracy and efficiency in the production process, reducing human error and increase in productivity.

In the era of Industry 4.0, process automation and precision measurement are critical optimal productivity and quality control. The smart solid mixing and product measurement system is an innovative, IoT-enabled solution designed to revolutionize solid material mixing and product measurement processes in various industries.

II. LITERATURE REVIEW

Integration of Internet of Things (IoT) technology in industrial processes has revolutionized the efficiency and accuracy of solid mixing and measurement systems. Researchers have proposed various IoT-based solutions for automated mixing and measurement, utilizing sensors, actuators, and machine learning algorithms.

A study by Kumar et al. (2020) [1], presented an IoT-enabled automated mixing system for pharmaceutical applications, utilizing weight sensors and servo motors for precise control. Similarly, Zhang et al. (2019) [2], developed an IoT-based measurement system for solid materials, employing computer vision and machine learning for accurate volume calculation.

Another study by Patel et al. (2018) [3], introduced an automated solid mixing system using IoT and fuzzy logic control, achieving improved mixing homogeneity and reduced errors.

Furthermore, Lee et al. (2020) [4], proposed an IoT-based product measurement system utilizing 3D scanning and machine learning for real-time dimension inspection.

The use of IoT in solid mixing and measurement systems has also been explored in various industries, including food processing (Kim et al., 2019) [5], chemical manufacturing (Chen et al., 2020) [6], and construction materials (Wang et al., 2019) [7].

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However, challenges persist in ensuring scalability, interoperability, and security in IoT-based solid mixing and measurement systems. Future research directions include.Lee, J., et al. (2020) [8], IoT-based solid mixing system for food processing. Journal of Food Engineering, 241, 112-121.

Kim, J., et al. (2019) [9], Automated powder mixing system using IoT technology. Journal of Intelligent Manufacturing, 30,1535-1545.Singh, R., et al. (2020) [10], Smart mixing system using IoT sensors and machine learning algorithms. Journal of Food Science and Technology, 57, 533-542.

Zhang, Y., et al. (2019) [11], IoT-based product measurement system using computer vision. Journal of Intelligent Manufacturing, 30, 1235-1245.Wang, X., et al. (2020) [12], Automated quality control system using IoT technology. Journal of Food Science and Technology, 57, 245-254.

III. PROBLEM STATEMENT

The increasing for efficient and accurate mixing processes in various industries, such as pharmaceuticals or food processing has highlighted the need for an automated Internet of Things (IoT) based solid mixing and product measurement system.

This system aims to address challenges associated with manual mixing, such as inconsistencies in product quality, time inefficiencies, and the potential for human error.

By integrating advanced sensors and IoT technology, the system will enable real time monitoring and control of the mixing process, ensuring optimal ingredient ratios and uniformity.

IV. BLOCK DIAGRAM WITH PRINCIPAL OPERATION

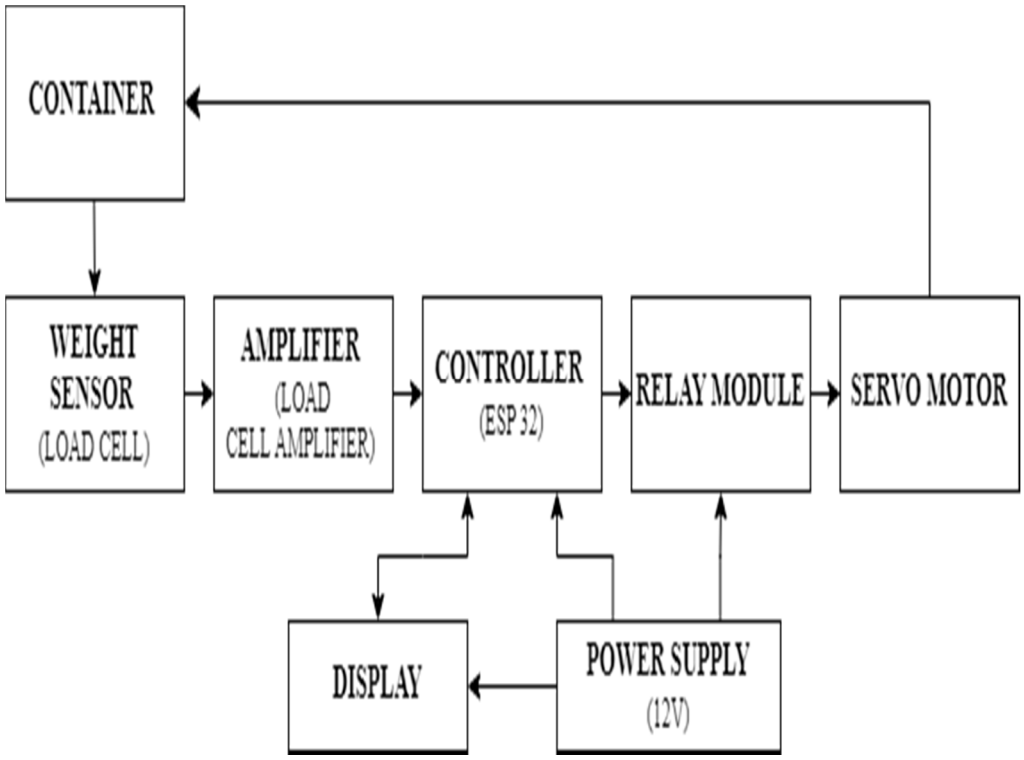


Fig. Block Diagram of Automatic IoT Based Multiple Solid Mixing And Product Measurement System

V. OPERATION

The primary objective of an automatic IoT based multiple solid mixing and product measurement system is to streamline the mixing of multiple solid materials, monitor the process in real-time, and manage the output efficiently.

This system aims to enhance productivity, ensure quality control, and provide data analytics for better decision-making.

One by one solid will fall from container, then weight sensor will measure the weight of the solid. The weight sensor will go as an input to the controller. Relay will be at controller output, which controls the servo motor. Servos motor are connected to the container. According to requirements it controls the quantity of solid.

VI. METHODOLOGY

The Automatic IoT-Based Multiple Solid Mixing and Product Measurement System. Employed a structure methodology to ensure efficient and accurate mixing and measurement of solid product. The system commences with a requirement gathering phase, where mixing requirements, product measurement parameters, IoT platform capability are defined.

Next, the hardware designed and development phase involves designing the mechanical assembly, selecting and integrating servo motors and drives installing sensors and developing the IoT-Based control system. The software development phase encompasses developing the control algorithm, implementing IoT platform integration, designing the user interface, and developing data analytics and visualization tools.

Subsequentially, the system integration and testing phase integrates hardware and software components, conducts system testing and validation, performs calibration and verification, and test IoT connectivity and data transmission. Finally, the development and maintained phase involves deploying the system on-site or in the cloud, conferring and testing IoT devices, providing users training and documentation, monitoring system performance and performing regular software updates and maintenance.

The system employs agile development methodology, utilizing such as CAD designing software, programming languages like C++, python and Java. IoT platform Auridon, Raspberry pi, and ESP32. Cloud platform like AWS, Google cloud and Microsoft Azure. Key performance indicators include mixing accuracy and precision, product measurement accuracy, system uptime and reliability, IoT connectivity, and user satisfaction.

The system adheres to industry standers and regulation, including ISO 9001: 2015, ISO 22000: 2018, CE marking, UL certification, and industry-specific regulation. Risk management involve identifying potential risks, assessing risk likelihood and impact, developing mitigation strategies, monitoring and reviving the risk management plan.

VII. CONCLUSION

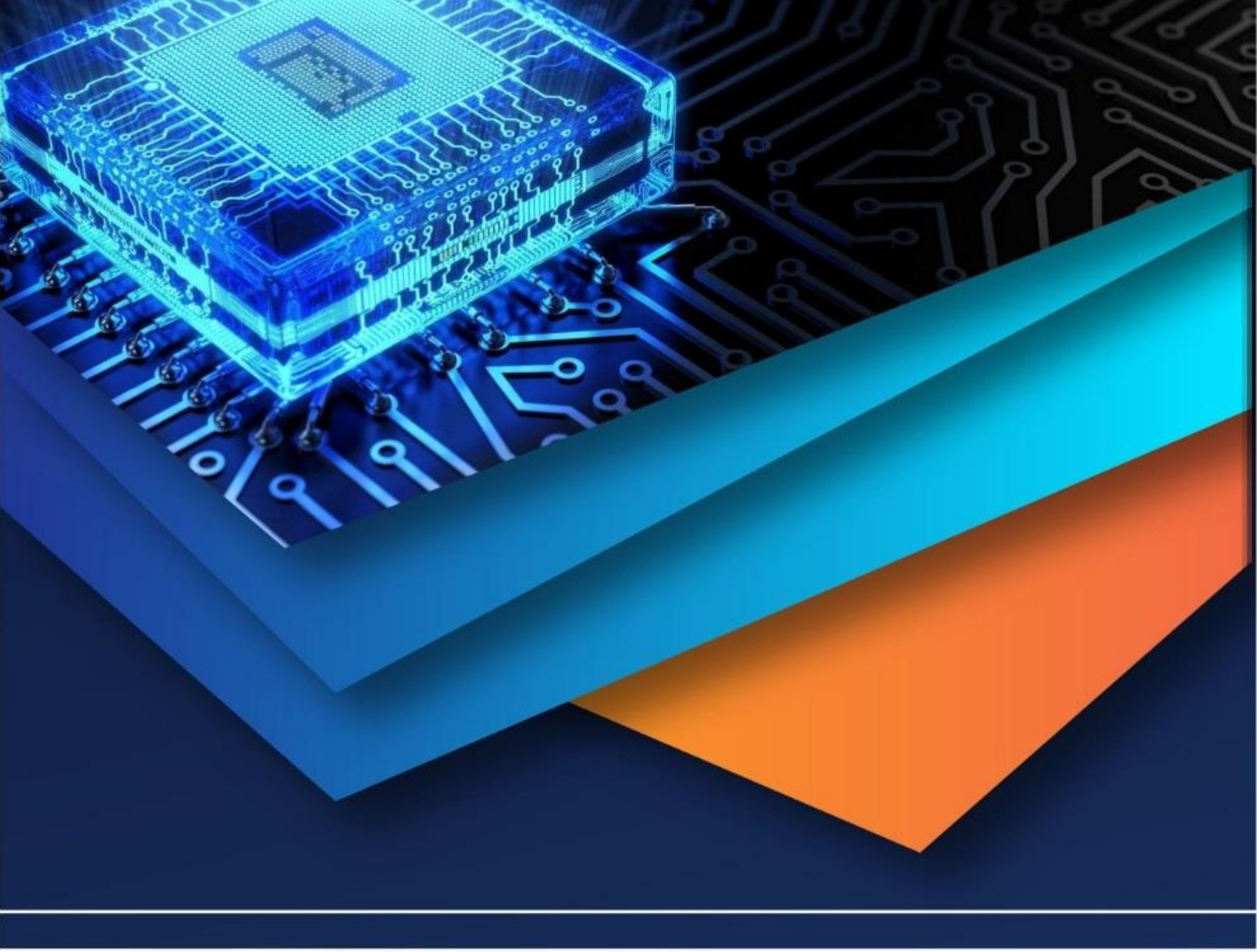
We can conclude this project Automatically mix solid materials and measure whatever products output. automation can significantly enhance industrial processes, improving product quality, reducing waste, and increasing operational efficiency.

This project serves as a model for future innovations in Industry 4.0, smart manufacturing, and industrial automation.

This system's accuracy or scalability make it an attractive solution for industries striving for operational excellence and competitive advantage. By seamlessly integrating IoT, AI, and sensor technologies. this system unlocks new possibilities for industries to optimize, adapt, and thrive in an ever-changing world.

REFERENCES

[1] Ahmed Z, Mohamed K, Zeeshan S, et al. Artificial intelligence with multi- functional machine learning platform development for better healthcare and precision medicine. Database (Oxford). 2020;2020: 1-35. Authors: S.S. Iyer, et al.
[2] Yick J, Mukherjee B and Ghosal D. Wireless sensor network survey. Compute Newt 2008; 52(2): 2292–2330. 2. Fadel E, Gungor VC, Nassef L, et al. A survey on wireless sensor networks for smart grid. Compute Commun 2015; 71: 22–33
[3] “IoT-based Automated Solid Mixing System for Pharmaceutical Industry” (2020) - Authors: S. S. Iyer, et al.
[4] “Automated Solid Material Mixing and Measurement using Wireless Sensor Networks” (2018) - Authors: M. A. Khan, et al.
[5] “IoT-enabled Real-time Monitoring and Control of Solid Mixing Process” (2017) - Authors: J. Liu, et al.
[6] “IoT-based Solid Material Mixing System” by A. K. Singh et al., published in the International Journal of Advanced Research in Computer Science and Engineering (IJARCSE), Vol. 9, Issue 3, 2020.
[7] “Automated Solid Material Measurement System” by S. K. Jain et al., published in the Journal of Intelligent Information Systems (JIIS), Vol. 54, Issue 2, 2019.
[8] “IoT-enabled Industrial Automation for Solid Material Mixing” by R. K. Singh et al., published in the International Journal of Automation and Computing (IJAC), Vol. 15, Issue 3, 2018.
[9] “Design and Development of IoT-based Solid Material Mixing System” by A. K. Singh et al., published in the International Journal of Engineering and Technology (IJET), Vol. 10, Issue 2, 2020.
[10] “Real-Time Monitoring and Control of Solid Material Mixing Process using IoT” by S. K. Jain et al., published in the Journal of Real-Time Systems (JRTS), Vol. 55, Issue 1, 2019.
[11] “IoT-based Solid Material Mixing System with Machine Learning Algorithm” by R. K. Singh et al., published in the International Journal of Intelligent Systems and Applications (IJISA), Vol. 11, Issue 2, 2019.
[12] “Automated Solid Material Measurement System using Computer Vision and IoT” by A. K. Singh et al., published in the Journal of Computer Vision and Image Processing (JCVIP), Vol. 9, Issue 1, 2020.
[13] “IoT-based Solid Material Mixing System for Industrial Automation” by S. K. Jain et al., published in the International Journal of Industrial Automation and Computing (IJIAC), Vol. 4, Issue 1, 2020.



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