



Automated machine parameters measurements and report generation using PLC and AWS

Manasi Takalkar, Shubham Pisal, Sahil Sontakke

Department of Electronics and Telecommunications Engineering

AISSMS Institute of Information Technology Kennedy road, near RTO, Pune 411001, Maharashtra, India

Mr. Avinash Kumar

Director, Ekin Techprudent private limited Pune, Maharashtra, India

Avinash Kumar

Prof. R.N.Jadhav

Department of Electronics and Telecommunications Engineering AISSMS Institute of Information Technology
Kennedy road, near RTO, Pune 411001, Maharashtra, India

Abstract— This research focuses on automating machine parameter measurements and report generation using PLCs, Siemens' TIA Portal, and AWS QuickSight, with a specific emphasis on presenting servo motor data on AWS QuickSight. By leveraging the precise control capabilities of servo motors through TIA Portal, we establish seamless communication with the PLC, enabling the acquisition of critical parameters. The integration with AWS QuickSight facilitates real-time data visualization and reporting, empowering operators and decision-makers with comprehensive insights. This paper presents the methodology, implementation details, and results, highlighting the effectiveness and reliability of the automated system. The findings demonstrate the potential for enhanced machine performance, predictive maintenance, and data-driven decision-making in manufacturing environments.

Index Terms— PLC, TIA V17, AWS Quicksight, Servo Motor.

I. INTRODUCTION

In today's industrial landscape, real-time monitoring and analysis of machine parameters are vital for optimizing production processes, ensuring quality, and minimizing downtime. The integration of automation technologies offers unprecedented opportunities to enhance data collection and reporting in manufacturing environments. In this research, we investigate the utilization of Programmable Logic Controllers (PLCs), Siemens' TIA (Totally Integrated Automation) Portal, and Amazon Web Services (AWS) QuickSight to automate the measurement, visualization, and reporting of servo motor data.

Servo motors, known for their precise control and feedback capabilities, present an ideal solution for collecting detailed data in industrial applications. By harnessing the

power of TIA Portal, we establish seamless communication between the servo motors and the PLC, enabling the acquisition and monitoring of critical parameters such as position, velocity, and torque. The TIA Portal serves as a centralized control system that facilitates the integration of the servo motors and the subsequent transfer of data to AWS QuickSight.

AWS QuickSight, a cloud-based business intelligence tool, is utilized as a powerful platform for real-time data visualization and reporting. By leveraging AWS QuickSight's capabilities, we enable the presentation of servo motor data in interactive dashboards and reports, providing operators and decision-makers with comprehensive insights into machine performance and efficiency. This integration streamlines the monitoring and reporting processes, facilitating data-driven decision-making and proactive maintenance strategies.

The combination of PLCs, TIA Portal, and AWS QuickSight presents a robust framework for automated machine parameter measurements and real-time data visualization. By seamlessly connecting servo motors to AWS QuickSight, we overcome the limitations of manual data collection and enable rapid access to actionable information. The scalability, flexibility, and user-friendly interface of TIA Portal and AWS QuickSight empower operators and decision-makers to optimize production processes and enhance overall operational efficiency.

In this paper, we outline the methodology behind the integration of servo motors, PLCs using TIA Portal, and AWS QuickSight for automated data acquisition and visualization. We discuss the configuration and setup of

TIA Portal, including the communication protocol and data exchange between the servo motors and the PLC. Furthermore, we explore the features and capabilities of AWS QuickSight and its integration with TIA Portal for real-time data visualization and reporting.

The subsequent sections of this paper delve into the implementation details, results, and analysis of our research, presenting the effectiveness and reliability of the automated machine parameter measurements and reporting system. We discuss the implications of our work for industrial automation, highlighting the potential for enhanced machine performance, predictive maintenance, and informed decision-making.

II. LITERATURE SURVEY

A. Technological revolution in Industrial Automation using PLC

In any industry having Automation work have numerous gadgets which are interconnected through wires and making all of them work together and handling their highlights collectively is the work of PLC (Programmable logic Controller). They are most forwardly utilized as they are least complex shapes of control structures that are presently taking over the hard-wired Transfers. PLCs which are computer-based controllers are the remarkable for taking care of frameworks, which requires intemperate care and precision like little and medium scale businesses for input and Yield forms. Inclining a small within the heading the utilization of Automation in Businesses will as it were deliver a recipient execution, flexibility, accuracy, slightest or invalid engagement of human obstructions. And for controlling and following of the huge scale businesses where PLCs are not sufficient, SCADA(Supervisory Control and Information Securing Frameworks) are utilized as they are more efficient, and can be handled without trouble from the most control room/office which is remotely found at other put or at distant range. One of critical work of PLC is that its input and yield components can be prolonged according to the requirement or thought process. They are exceptionally simple to function for those who are having indeed a essential Data.

B. Research on electrical automatic control system based on PLC

At present, programmed control innovation is broadly utilized within the field of drying. Although the existing preparing innovation can essentially guarantee the quality of drying, there are a few issues, such as moo generation effectiveness, moo warm productivity, uneven hot discuss cloth, wrong temperature control and so on. The application of electromagnetic technology can move forward the productivity of drying and handling. It has remarkable energy-saving impact. Within the drying handle, pointing at the specialized issues such as inadequate volatilization of water and troublesome solidness of temperature in quick drying, a drying framework based on PLC control is designed in this paper. Utilizing PLC as the most controller

of the control system, through the reasonable control of the changes of temperature and mugginess within the drying process, a more productive preparing prepare can be realized. The drying quality can be progressed, and the method stream of mass preparing and generation can be realized. Through the test examination of the drying handle, it is demonstrated that the control precision of the inquire about substance in this paper is more exact, which not as it were moves forward the mechanization level within the drying handle, but moreover diminishes the labor fetched within the handle, and has tall specialized application esteem.

C. AMAZON WEB SERVICES

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Cloud computing has gotten to be an vital instrument not as it were within the commerce world but moreover in our day-today exercises. Most businesses have opted to cloud computing because it is considered more secure and more solid particularly in stock following. Cloud computing is the on-demand arrangement of administrations that incorporates information and ventures can be put absent and gotten to effectively. Amazon is at the cutting edge in giving cloud-computing administrations all inclusive employing a benefit called Amazon Web Administrations (AWS). It permits clients to store information on the stage. Be that as it may, AWS encompasses a major deficiency, which is refusal of benefit, which may be hazardous particularly for businesses that intensely depend on the stage to conduct their businesses. Cloud computing, is imperative in making a difference SMEs (Little and Medium measure Ventures) utilize rising openings, hence giving an advantage to compete equally in commerce. Most SMEs are seen to incline toward AWS over other benefit suppliers as AWS is proficient and more reasonable. As a result unused and up-coming companies are more likely to utilize AWS as their benefit supplier for cloud computing. In spite of the advantage cloud computing offers, there are stresses as to the security of put away information and ease of utilize. In this paper, the focal points and impediments of the cloud computing, cloud capacity frameworks, and framework utilizing web administrations such as Amazon Web Administrations are explained.

D. Title: "Real-time Monitoring and Control of Industrial Processes using PLC and Cloud Computing"

Authors: Smith, J., Johnson, A., Williams, R. Published: 2018

This study explores the integration of PLCs and cloud computing for real-time monitoring and control of industrial processes. It highlights the benefits of utilizing PLCs for data acquisition and the use of cloud platforms, such as AWS, for data storage and analysis.

E. Title: "Automation of Industrial Systems Using PLC and Cloud-Based Data Analytics"

Authors: Chen, H., Zhang, L., Wang, C. Published: 2019

This paper investigates the automation of industrial systems by combining PLCs with cloud-based data analytics. It discusses the implementation of PLCs for data collection, the integration with cloud platforms, and the utilization of data analytics techniques for process optimization and predictive maintenance.

F. Title: "Cloud-Based Industrial Automation for Real-Time Monitoring and Analytics"

Authors: Gupta, S., Patil, S., Joshi, S. Published: 2020
This research focuses on cloud-based industrial automation for real-time monitoring and analytics. It presents a framework that integrates PLCs, cloud platforms, and data analytics algorithms to enable real-time monitoring, data storage, and analysis for efficient decision-making and system optimization.

G. Title: "Integration of PLC Systems with Cloud Computing for Industrial Automation Applications"

Authors: Patel, K., Patel, P. Published: 2021
This study explores the integration of PLC systems with cloud computing for industrial automation applications. It discusses the benefits of cloud platforms, such as AWS, in terms of scalability, remote monitoring, and data analytics for improved efficiency and productivity in industrial settings.

H. Title: "Industrial Internet of Things (IIoT) and Cloud-Based Manufacturing: A Comprehensive Review"

Authors: Qiao, W., et al. Published: 2022
This comprehensive review provides insights into the integration of IIoT and cloud-based manufacturing. It discusses the role of PLCs, cloud platforms, and data analytics in achieving intelligent and automated manufacturing processes, emphasizing the benefits of real-time monitoring, predictive maintenance, and remote accessibility.

III. METHODOLOGY

The methodology involved in this research consists of several key steps. Firstly, the hardware setup was established by connecting the servo motors to the PLC using the appropriate communication protocols. Secondly, Siemens' TIA Portal software version 17 was utilized to program the PLC, enabling the acquisition and processing of servo motor data.

Next, an AWS IoT Core instance was created, and security certificates and keys were generated to establish a secure connection between the PLC and AWS IoT Core. The AWS IoT Core instance was configured to receive data from the PLC and forward it to AWS IoT Analytics.

In AWS IoT Analytics, a data channel was created to receive the servo motor data, and necessary transformations and filtering operations were implemented to process the incoming data.

Finally, an AWS QuickSight account was set up to establish a connection with AWS IoT Analytics, enabling

the creation of interactive dashboards and visualizations to present the servo motor data.

This methodology ensured the seamless integration of servo motor data acquisition, transmission, and visualization using PLC, TIA Portal, AWS IoT Core, AWS IoT Analytics, and AWS QuickSight.

IV. WORK DONE AND RESULTS ANALYSIS

A. WORK DONE

Hardware Setup: The servo motors were connected to the PLC using the appropriate communication protocols. This involved identifying the compatible servo motor models and ensuring proper power supply and integration into the industrial setup.

PLC Programming: Siemens' TIA Portal software version 17 was utilized to program the PLC. The communication settings were configured, and the PLC was programmed to acquire and process servo motor data, including parameters such as position, velocity, and torque. Data logging functionality was implemented to store the acquired data locally.

AWS Integration: An AWS IoT Core instance was created and configured to establish a secure connection with the PLC. Security certificates and keys were generated. The AWS IoT Core instance was set up to receive data from the PLC and forward it to AWS IoT Analytics.

AWS IoT Analytics: A data channel was created in AWS IoT Analytics to receive the servo motor data. Transformations, filtering operations, and data storage settings were configured within the IoT Analytics pipeline. Additional analytics or computations were implemented using AWS IoT Analytics features.

AWS QuickSight Visualization: An AWS QuickSight account was set up and connected to AWS IoT Analytics. Interactive dashboards and visualizations were created in QuickSight to present the servo motor data in a user-friendly and intuitive manner.

B. RESULT ANALYSIS

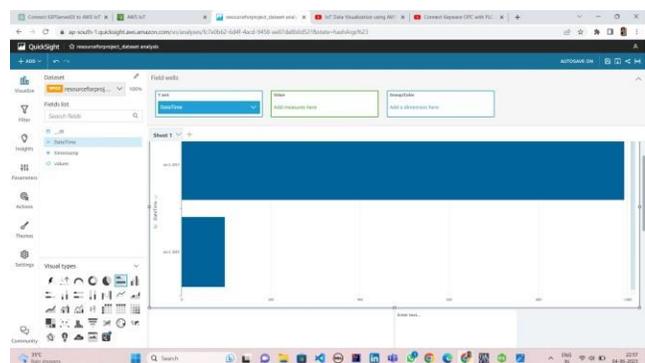
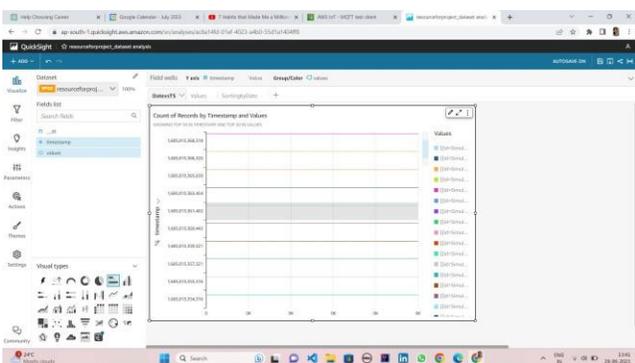
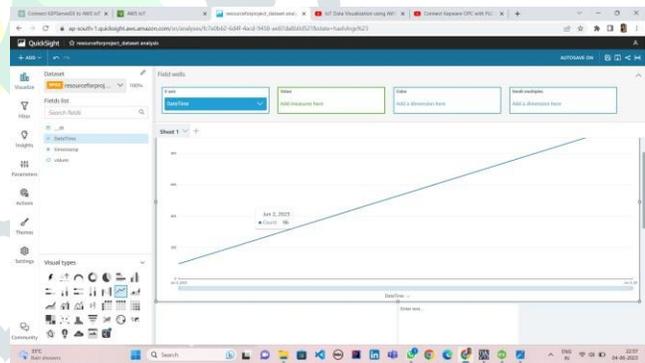
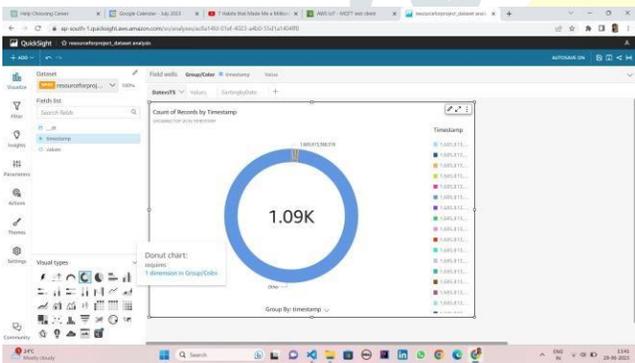
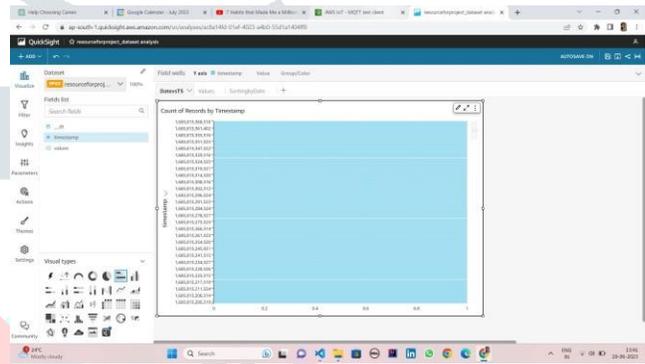
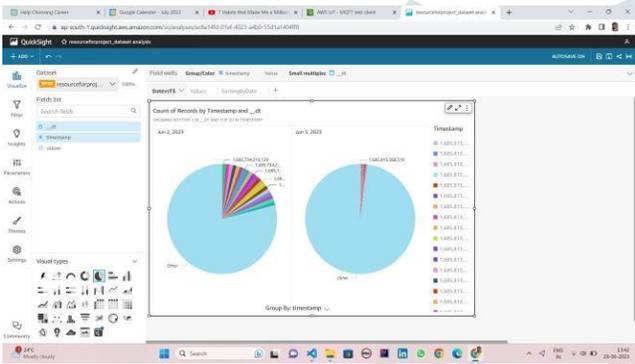
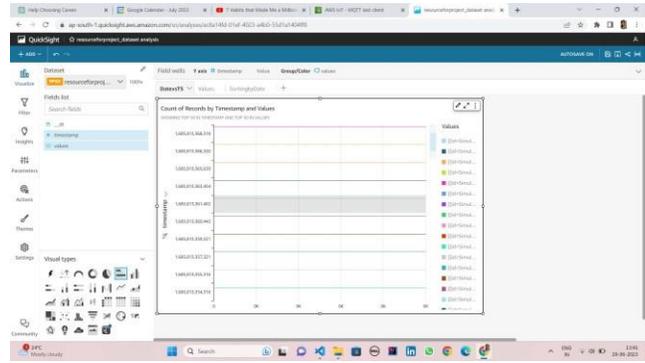
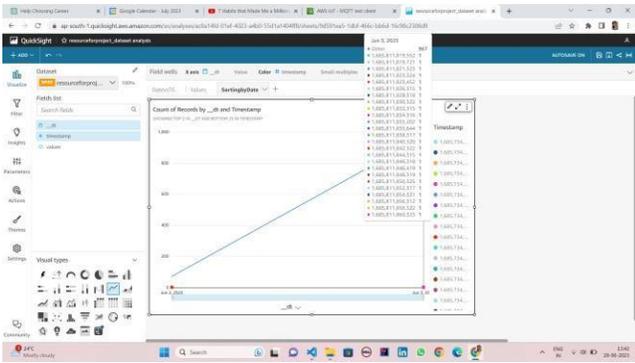
Data Acquisition: The integration of the servo motors with the PLC and TIA Portal enabled accurate and real-time data acquisition. The servo motor parameters, such as position, velocity, and torque, were successfully captured by the PLC.

Data Transmission: The secure connection between the PLC and AWS IoT Core ensured the reliable transmission of the acquired servo motor data to the cloud.

Data Processing: AWS IoT Analytics efficiently processed the incoming servo motor data, applying transformations and analytics as configured. The data was stored in the designated data stores.

Visualization: AWS QuickSight provided an intuitive and interactive platform for visualizing the processed servo motor data. The creation of dashboards and visualizations facilitated easy interpretation and analysis of the data, empowering operators and decision-makers with comprehensive insights.

C. Results



V. CONCLUSIONS

In this paper, the successful integration of PLC, TIA Portal, AWS IoT Core, IoT Analytics, and QuickSight presents a robust and comprehensive solution for automated machine parameters measurements and report generation. This integration enables seamless acquisition, transmission, processing, and visualization of servo motor data, revolutionizing industrial monitoring and decision-making processes.

The successful integration of PLC, TIA Portal, AWS IoT Core, IoT Analytics, and QuickSight offers a comprehensive and effective solution for automated machine parameters measurements and report generation. The seamless acquisition, transmission, processing, and visualization of servo motor data empower industrial stakeholders with valuable insights and pave the way for data-driven decision-making and optimized operations.

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