IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 7.39 ⁜ Vol. 11, Issue 4, April 2022

DOI: 10.17148/IJARCCE.2022.11407

Remote Machine Condition Monitoring

Harsh Merchant[1], Ayan Mulla[2], Umair Sayed[3], Hamza Rangwala[4], Sufiyan Ansari[5]

Abdulaziz Kazi[6]

Department of Information Technology, M.H. Saboo Siddik College Of Engineering, Mumbai, India[1-6]

Abstract: The exponential growth of data generation is difficult to perceive. Every enterprise has a lot of data, some of which they don't even accumulate due to difficulty of data extraction and selecting the most relevant data. Hence, appears the mistake of neglecting useful data amidst other unproductive data. This phenomenon does not depend on the company's ability to compute and communicate, but rather on the ability to provide adequate information, to take good decisions and to compare results with the planned objectives. These can be done through adopting modern approaches to machine condition monitoring. Machine condition monitoring or condition-based monitoring is the process of monitoring machinery conditions while in operation. The data generated by machines provide with real insights into near real-time values of the machine parameters which are helpful for analysis. This paper shows how this methodology has developed, the main features and benefits of Data Extraction and Remote Machine Condition Monitoring. By taking measurements of pressure, temperature, and vibration, we are more likely to identify early malfunctions resulting in costly shutdowns. In turn, it will ensure the long-term and effective operation of entire machine systems.

Keywords: Condition Monitoring, Dashboards, Fault detection, Data extraction.

I. INTRODUCTION

As machines involving PLCs are usually complex and involve a lot of sensor data which helps us in our machine monitoring system on the other hand it is not an easy task extracting such a big amount of data from it. Condition monitoring is significant to lean manufacturing facilities because it reduces downtime, boosts production efficiency, and helps with cost prediction, maintenance needs and timing, as well as more accurate production predictions.

The benefits of condition monitoring are abundant. One major boon of condition monitoring is increasing the durability of equipment. If a specific parameter is continuously out of expected ranges, especially factors that could severely damage a machine or its components, then underlying issues can be assessed and repaired before a downtime event or long-term, costly damage occurs. We will be exploring how condition monitoring provides the above benefits, providing manufacturers with the necessary, real-time machine condition data to make proactive decisions based on the current health of their equipment, even enabling them to introduce automation to the shop floor.

The machinery on the shop floor is not remotely available for accessing of machine data, we use the Ewon module by HMS Networks that attaches itself to the plc through ethernet cable and enables remote connection to the plc. Using Siemens SIMATIC STEP 7 and WinCC V15.1 we read the tag addresses we want to monitor and add those tags to the Kepware's KepServerEX software. Once the connection to the Ewon Module is successful we can connect KepServerEX software to a database in our case Microsoft SQL Server, so that all the data is logged from the plc directly to a database in real time.

After successful extraction of the data, we display that data on our Web Application Dashboard so that the user can see the data remotely anytime. The tags added in the software can be tags that provide data such as temperature of various parts in a machine, Production count, Rejection due to factors, and alarm which helps us in our problem-solving endeavour. The data can be further analysed to predict malfunctions earlier and help reduce downtime. The dashboard uses Chart.js library to display the extracted data in a visualized format and the data is fetched in real time from the Microsoft SQL Server.

The potentials of such an intelligent monitoring system are immense. Remote Accessibility of Sensory, Production, and other real time data can enhance productivity. It is vital for the future of Smart Machine Automation to have internet based remote accessibility and control over the valuable data so that smart decisions can be made in the future. In response to the above critical needs, the objectives of this research are as follows:

- To Develop a methodology for remote machine condition monitoring
- To demonstrate the effectiveness of the developed methodology by applying it to a real industrial case

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 7.39 ⁜ Vol. 11, Issue 4, April 2022

DOI: 10.17148/IJARCCE.2022.11407

II. LITERATURE SURVEY

There are no simple functional implementations of this entire system but there are different types of implementations on smaller segments or areas of the system.

"Extracting Sensing Data from PLCs in Smart Manufacturing Machines" by Bunrong Leang, Sokchomrern Ean, Rock-Won Kim, Su-Young Chi, Kwan-Hee Yoo provides some useful information on filtering and extracting useful data from PLC addresses using the HashSet algorithm.

"Intelligent remote monitoring and diagnosis of manufacturing processes using an integrated approach of neural networks and rough sets" by Tung-Hsu (Tony) Hou, Wang-Lin Liu & Li Lin uses neural network to intelligently diagnose manufacturing malfunctions and monitor machine data.

III. PROPOSED SYSTEM

The purpose of this study is to remotely access the PLC integrated Machine data and thus monitor it using a visualized dashboard. The proposed methodology can be applied to any siemens plc machinery to extract the data and view it remotely. Our Research proposes that using some easily available software's we can extract plc data for remote condition monitoring.

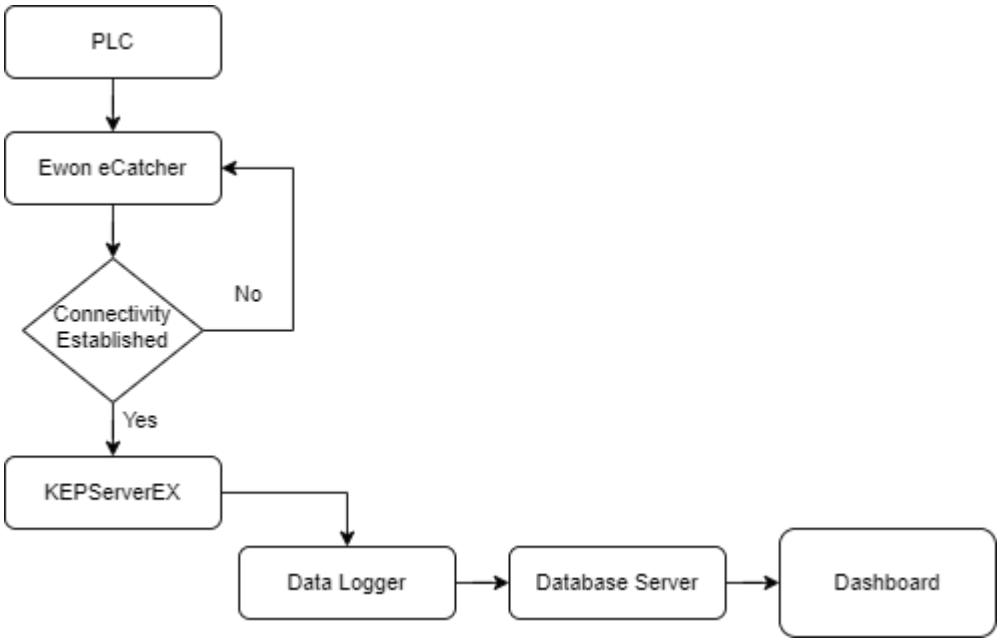

Fig 1. System Flowchart

To explain the system in a better way we have broken down the process into sub-tasks:

A. Data Extraction

A Programmable Logic Controller (PLC) is an industrial computer control system that continuously monitors the state of input devices and makes decisions based upon a custom program to control the state of output devices. To monitor plc data, we need tags which are directly linked to sensors and other variable data. The PLC has Tags which is a name you assign to an address of device/PLC. It is also called "variable" or "symbol" depending on the manufacture of the device/PLC. You must configure the tag using a configuration tool on the device/PLC. When a new project is created in the Siemens Tia portal ladder logic and tags are created at some point these tags have specific address that we need to import them to KepServerEX software. After noting down the address and names of the tags we want to import we go to the KepServerEX software and created a new channel and add a device we will be using Siemens S7-1200 plc.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 7.39 ⁜ Vol. 11, Issue 4, April 2022

DOI: 10.17148/IJARCCE.2022.11407

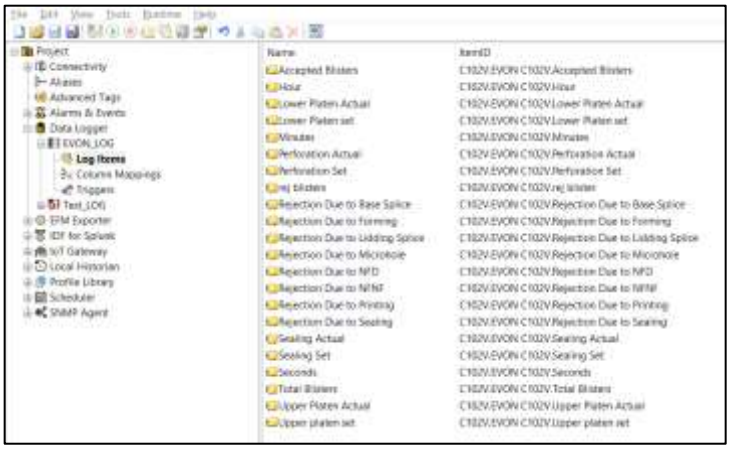

Fig 2. Data Tags

Results Messages

	id	_NAME	_NUMERICID	_VALUE	_TIMESTAMP	_QUALITY
1	1	Channel2.12345.Accepted Blisters	0	3	2022-02-12 16:15:13.000	192
2	2	Channel2.12345.Hour	0	15	2022-02-12 16:15:13.000	192
3	3	Channel2.12345.Lower Platen set	0	42	2022-02-12 16:15:13.000	192
4	4	Channel2.12345.Minutes	0	58	2022-02-12 16:15:13.000	192
5	5	Channel2.12345.rej blister	0	7	2022-02-12 16:15:13.000	192
6	6	Channel2.12345.Rejected due to bad forming	0	3	2022-02-12 16:15:13.000	192
7	7	Channel2.12345.Rejected due to bad sealing	0	4	2022-02-12 16:15:13.000	192
8	8	Channel2.12345.Seconds	0	20	2022-02-12 16:15:13.000	192
9	9	Channel2.12345.Total Blisters produced	0	10	2022-02-12 16:15:13.000	192
10	10	Channel2.12345.Upper platen set	0	52	2022-02-12 16:15:13.000	192
11	11	Channel2.12345.Seconds	0	21	2022-02-12 16:15:15.000	192
12	12	Channel2.12345.Seconds	0	22	2022-02-12 16:15:16.000	192
13	13	Channel2.12345.Seconds	0	23	2022-02-12 16:15:17.000	192
14	14	Channel2.12345.Seconds	0	24	2022-02-12 16:15:17.000	192
15	15	Channel2.12345.Accepted Blisters	0	5	2022-02-12 16:15:18.000	192

Fig 3. Tag Storage in Database Table

B. Data Monitoring

The previous step explained how we could extract the data and store it in a database. In this step we create a dashboard web application to display the data in a visualized format. The Tag Data is stored in the row-column format. Therefore, using PHP and Transact-SQL we write certain queries to fetch the required tag data into our webpage where that data is fed to a visualized and formatted blocks which helps in monitoring the machine's data in real-time.

Fig 4. Data Monitoring

C. Data Visualization

We have extracted the Production data, The Sensor Data. Thus, giving us plenty proof of concept to proceed for analysis of the gathered data. The Production Data includes accepted blisters, Rejected Blister, Total Blisters, Number of hours the machine ran in HH:MM:SS format and The Rejection Due to specific parts. The Temperature Sensor Data includes the temperature in degree Celsius for Platen, Perforation and Sealing parts of the machine. This data is passed to Chart.js library to visualise the rejection due to various factors and the number of blisters that are accepted or rejected into bar, pie chart respectively.

IJARCCE ISSN (O) 2278-1021, ISSN (P) 2319-5940

International Journal of Advanced Research in Computer and Communication Engineering

Impact Factor 7.39 ⁜ Vol. 11, Issue 4, April 2022

DOI: 10.17148/IJARCCE.2022.11407

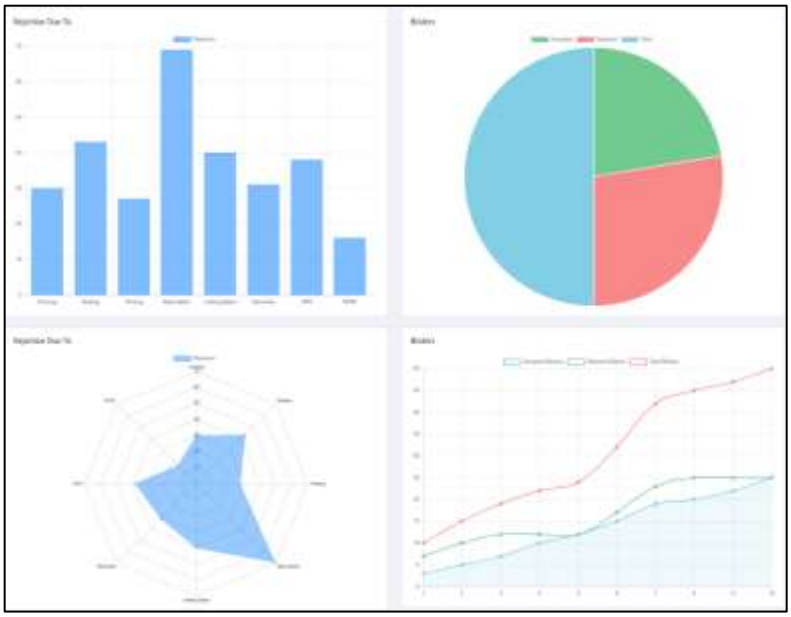

Fig 5. Data Visualization

IV. CONCLUSION

There are many industries that are greatly satisfied with the large opportunities of condition monitoring systems. It happens because machine health monitoring ensures equipment's long-term and consistent functioning while also saving money and time. The industries of manufacturing, oil and gas, petroleum, aerospace, defence, and others are leveraging machine condition monitoring systems to avert failures and ensure reliable operation of the equipment.

With this advanced solution, you're guaranteed of getting full visibility and accuracy in needed maintenance actions. There is no more need for unnecessary diagnosing expenses as you'll remember of what specific measures are needed at the proper time. When compared to average yearly downtime expenses, which include missed output and labour expenditures, this approach proves to be far more beneficial. You lay a strong basis for your consistent industrial and financial success by simply using machine condition monitoring software.

ACKNOWLEDGEMENT

We express our sincere gratitude to Head of Information Technology Department and our guide **Er. Sanam Kazi** for encouragement and facilities provided to us. We owe our profound gratitude to our project mentors **Mr Abhay Shinde and Mr. Raji Reddy** who provided valuable inputs at every stage

REFERENCES

[1]. B. LEANG, S. EAN, R. KIM, S. CHI AND K. YOO, "EXTRACT-ING SENSING DATA FROM PLCS IN SMART MANUFACTURING MACHINES,"2019 INTERNATIONAL CONFERENCE ON INTERNET OF THINGS (ITHINGS) AND IEEE GREEN COMPUTING AND COMMUNICATIONS (GREENCOM) AND IEEE CYBER, PHYSICAL AND SOCIAL COMPUTING (CPSCOM) AND IEEE SMART DATA (SMARTDATA), 2019, PP. 1249-1250, DOI:10.1109/ITHINGS/GREENCOM/CPSCOM/SMARTDATA.2019.00208.

[2]. HOU, TH.(., LIU, WL. & LIN, L. INTELLIGENT REMOTE MONITORING AND DIAGNOSIS OF MANUFACTURING PROCESSES USING AN INTEGRATED APPROACH OF NEURAL NETWORKS AND ROUGH SETS. JOURNAL OF INTELLIGENT MANUFACTURING 14, 239–253 (2003). HTTPS://DOI.ORG/10.1023/A:1022911715996