International Journal of
Advances in Scientific Research and Engineering (ijasre)

E-ISSN : 2454-8006

DOI: http://doi.org/10.31695/IJASRE.2018.32775

Volume 4, Issue 8
August - 2018

Design and Implementation of PLC Based System to Generate History Card for Ta Shop

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ABSTRACT

In this project, we deal with PLC and SCADA in order to avoid manual work and to avoid manual history card. The PLC used here is Siemens and software we are using for SCADA digital report are Simatic WinCC and Simatic manager. Simatic WinCC for SCADA designing and linking SQL via VBS. Here we develop a digitally generated History Card which reduces the cost of manual History Cards. Hence, it shows it is developed via the server. Because of this Project the line workers manual work is eliminated. The input from the RFID sensors is given to PLC where it acts as the controller and sends the output to SCADA from where it dumped to SQL via Ethernet and again fetched via SCADA whenever it is required to Monitor. The scope of this project is for easy breakdown analysis, faster fault identification via andon board, alarm identification on the emergency, less human intervention, more production, loss of history eliminated and reduces the Cost.

Keywords: Programmable Logic Controller (PLC), Structured Query Language (SQL), Supervisory control and data acquisition (SCADA), Transaxle Shop (TA), Visual Basic Script(VBS).

1. INTRODUCTION

In industries Nowadays PLC are commonly used in the workspace, it is a challenge to the developer to make PLC and SCADA systems human friendly and less hazardous and also eco-friendly. And the PLC logics must be developed in such a way that any ambiguity, the PLC itself corrects. By generating alarms for any emergency breakdowns, delay in the production can be avoided. Therefore our project is developed in such a way that the PLC follows the logics which are written in simatic manager using Ladder Logics and also indicates the breakdown and any emergency in the line in its way and along with this it also monitors the TA Shop and Records every Data of the machine which is one of the most important and difficult task. Our SCADA is compactable to Fetch all the data in all types like Auto or manual indication by the human or machine, it records the data through RFID sensor which is the main source to fetch data and sends to SQL. The Query written in the SQL enables to fetch the data from SQL and Display the data through SCADA. Loss of the Data is avoided to the maximum. Because of which Human intervention in the line will be eliminated. Along with Supervision, every machine it is controlled through PLC. Real time monitoring can be done by sitting somewhere far from the line. The data via this project we are storing in different ways, so that no complaints must be generated in future for the data loss. Firstly, the data are stored in PLC, second in the SQL, next in the notepad in txt format. So, that no historical data loss must take place in future days. If the data storage is lost at some point due to breakdowns or by any mistake of the worker then too we must fetch the data via other source. All these features combined

together forms the title of our project. Hence, the purpose of the project is to provide digitally generated report which renders the Historical Data regarding the Different Elements like Quality, Process, Maintenance, Management of the TA Shop Which is controlled and monitored Via SCADA. Here we are using Siemens PLC and software is Simatic Wincc, Sematic Manager and SQL and Hard disk is required for regular Backup. TA shop is transaxle assembly shop ,were the engine gears are assembled in 18 different station by the workers manually or auto.

2. PROPOSED METHODOLOGY

The software which are used and their specifications are Simatic Wincc(Step7) is the standard software package used for Graphic design. Simatic Manager (V7.0 SP3) software package used for configuring and programming the SIMATIC programmable logic controllers. Visual basics script (version 6) programming Language is used for the relation between SQL and SCADA. 1 GHz 64-bit (x64) processor , 2 GB RAM (64-bit), 20 GB available hard disk space (64-bit) ,DirectX 9 graphics device with WDDM 1.0 or higher driver. **PLC**: SIMATIC S7-300 CPU 317-2 PN/DP Model is used.Central processing unit with 1 MB work memory, 1st interface MPI/DP 12 Mbit/s, 2nd interface Ethernet Profibus, with 2-port switch, Micro Memory Card. **Computer/ Processors**: The implementation of SCADA is heavily dependent on processing speed, Monitoring is ease. **Computer Networks :** Ethernet cable.

The below Fig 1 shows the block diagram of our project i.e. History Card and the main components required

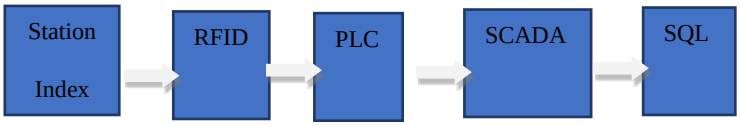

Figure1: Block Diagram of overall project

2.1 RFID Sensor

RFID sensors are used to give PLC a sense of localization, i.e the Logic it has to run after the index of TA line worker.

Figure 1.1: RFID sensor

Radio frequency identification reader it uses the magnetic field automatically, for the tracking of tags which have been assigned to different stations. It consists of a tag which has electronic data which are given to the PLC. Passive tags collect energy from a nearby station which as RFID reader's interrogating the radio waves.

2.2. Programmable Logic Controller (PLC)

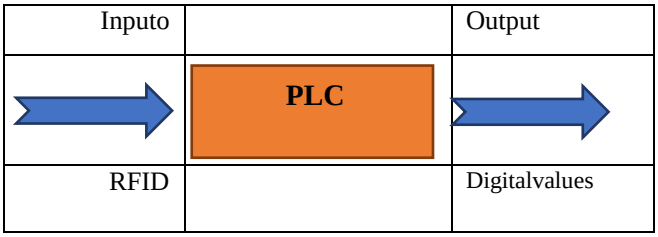

Figure 1.2: Block diagram of PLC.

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In the above fig (1.2) we are taking input to the PLC through the RFID tag which are placed on the line for every station. It reads the tags for the particular station and provides the input for PLC. Then the ladder logics run accordingly controller and stores the data in digital format for further process of fetching and storing the data of different machines of transaxle assembly shop.

2.3 Structured Query language(SQL)

SQL it is a type of language which is domain specific language used in programming and designing for managing data held in a relational database management system. The scope of SQL includes data query, data manipulation, data definition and data access control everything is done through SQL database management. Select the tables, Inserting the tables, Updating the tables, deleting the table and fetching the data via query in the SCADA.

2.4. Supervisory control and Data Acquisition system (SCADA)

The SCADA station refers to the servers and it is composed of a single PC. The data servers communicate with devices in the field through process controllers like PLCs. The PLCs are connected to the data servers either directly or via networks or buses. The SCADA system utilizes a network, the WAN and LAN consists of internet protocols used for communication between the master station and devices. The physical equipment's like sensors connected to the PLCs . The PLCs convert the sensor signals to digital data and sends digital data to master. According to the master feedback received by the PLC, it applies the electrical signal to relays. Most of the monitoring and control operations are performed by PLCs.

2.5 Flow Diagram

The inputs from sensors and actuators are applied to programmable logic controller through simatic Manager by creating ladder diagrams. The data obtained from PLC is fed to SCADA through Ethernet cable, the SCADA management is done through simatic wincc by creating tags and alarm management systems ,on the output side the digital reports are generated.

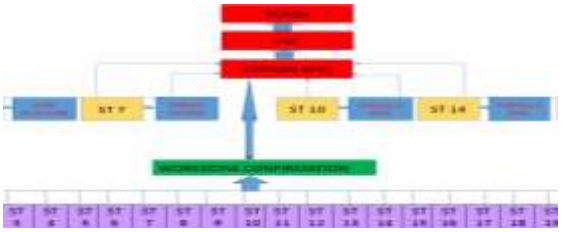

Figure 4: Flow Diagram .

The inputs from sensors and actuators are applied to programmable logic controller through simatic Manager by creating ladder diagrams. The data obtained from PLC is fed to SCADA through Ethernet cable, the SCADA management is done through simatic wincc by creating tags and alarm management systems, and on the output side the digital reports are generated.

3. RESULT

The output of our project is that a PLC and SCADA based system helps in the industry where were supervision and monitoring are strictly exhibited .Implementation of Supervisory control system and generating digital reports for transaxle assembly shop helped us to secure loss of historical data and it can be reduced completely, break down alarms can be detected, accurate and consistent information can be obtained, faster fault identification , improved availability of the system and increased production with reduced cost thus the purpose of our project is served

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Figure 2: Andon Board Analysis

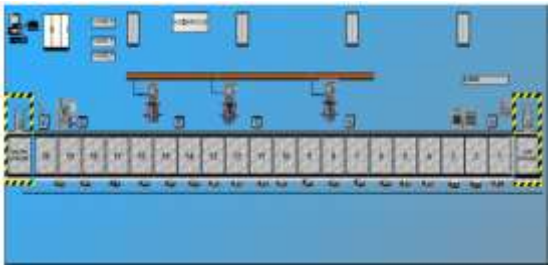

Figure 3: Overall Project Setup

4. CONCLUSION

We have developed Digital History card algorithm which is efficient to perform the task. Our project uses sensor for the input to the PLC and SCADA for designing and monitoring. . Alarm occurrence and time consumed to resolve (Availability Report) Display of warning and events, Production report, Current Status of each Station, Line monitoring, remote diagnosing and trouble shooting. Andon board is used for the display the work schedule of workers, to detect emergency, for tactime visualization. For working of all these sensors and to display we have written codes in PLC ladder logic, Graphic Designing, Tagging, Generated SQL query and VBS. By running the codes in Simatic wincc and ladder logics in Simatic manager we are able to fetch the data via RFID and finally output via SCADA.

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