Asian Journal of Applied Science and Technology (AJAST)
(Peer Reviewed Quarterly International Journal) Volume 3, Issue 1, Pages 143-150, Jan-March 2019

Cloud-Based Smart Factory Retro Fitment Device for Garment Industry

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Article Received: 29 August 2018 Article Accepted: 20 December 2018 Article Published: 17 February 2019

ABSTRACT

The objective of the proposal is to provide Information Technology (IT) power to make existing Textile factories into Smart Factories. The proposed IOT based smart factory 4.0 will empower factory management and employees in Planning, predicting, monitoring and controlling of daily operations for sustainable growth. The Proposed research work captures daily production status at various data collection points and list out the production status online. The collected information will be displayed in the required format to the supervisors, operational manager and plant general manager to planning and execution. The proposed product will have complete capability to capture all the pain points in all 5Ms: Man, Machine, Material, Method and Money monitoring. The smart factory implementation used to collect the production and machine related information from the factory floors to data server. Other production statuses are collected with the help of mobile application and PC based data collection points. Factory efficiency, Capacity, targets and actual production status with lists of reports will be generated using this platform.

Keywords: Cloud computing, Data Analytics, Mod-bus, PLC, Smart Factory.

INTRODUCTION

The textile industry has become the largest employment generating sector. This industry mainly deals with the design and production of yarn cloth and distribution. Now a day's industrial manufacturing and monitoring move towards with the help of industry 4.0. The term industry 4.0 refers to a further developmental stage in the organization and management of the entire value chain process that involved in the manufacturing industry. Another name for this process is the 'fourth industrial revolution'. The business web and the social web also play an increasingly important role in the digital transformation to industry 4.0. All these new networks offered by industry 4.0 within an internet of things, services, data, and people mean that manufacturing is set to undergo enormous changes in the future.

The fourth mechanical upset is described by the presentation of the Internet of things (IoT) and the Internet of administrations ideas into assembling, which empowers shrewd manufacturing plants with vertically and on a level plane incorporated creation frameworks. In ventures around the world, profoundly adaptable procedures that can be changed rapidly empower individualized large-scale manufacturing. Variations are self-decided through things conveying their own generation information to clever machines, which know about the earth, trade data, and control forms in creation and co-ordinations without anyone else. Information is gathered along the whole life cycle in substantial amounts and put away decentralized to empower neighborhood choices; be that as it may, the said information are as yet straightforward to be traded with accomplices. With the end goal to understand this vision, components, for example, machines, stockpiling frameworks, and utilities must have the capacity to share data, and also act and control each other self-sufficiently. Such frameworks are called digital physical frameworks (CPS). CPS developed through complex systems administration and the mix of installed frameworks, application frameworks, and foundation, empowered by human-machine cooperation. As opposed to customary frameworks utilized for generation or co-ordinations,

INDUSTRY 4.0

a) Factory 4.0

The physical and virtual universes become together and objects incorporating machines are furnished with sensors and actuators. Savvy producing execution will make utilization of ideas, for example, IoT to encourage this change. The selective component in 4.0 is to satisfy singular client necessities with item variations in a little part measure, down to one-off things. The accessibility of all significant data progressively will empower fabricating frameworks to meet client necessities without waste because of the reconfiguration of mechanical production systems or setup times through powerful business and building forms.

Industry 4.0 will prompt virtualization and modularization of generation process and inventory network, accomplishing adaptability and personalization of creation dependent on CPS and IoT together with ERP, MES, PLM, SCM, and other programming frameworks. CPS can screen the creation procedure and acknowledge decentralized basic leadership and self-streamline. Continuous correspondence among machine and machine (M2M) or human could be actualized through IoT and CPS. Data is shared over the whole community arrange. From crude materials to item deals, advanced GPS beacon is associated with one another as indicated by standard conventions for information examination, blunders figure and self-arranging.

In this specific circumstance, keen assembling and co-ordinations frameworks can create the ideal esteem stream to satisfy ongoing requests and additionally make new BMs dependent on better prescient support, heartiness in item plan, and versatile co-ordinations.

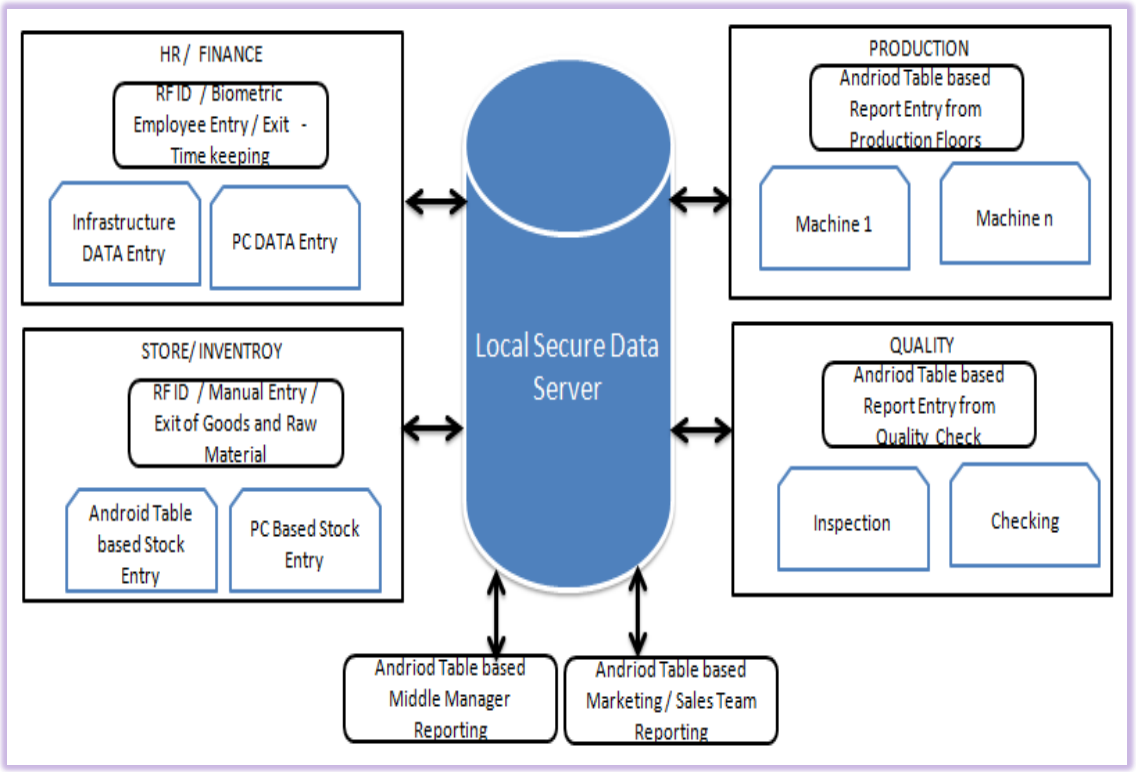

Fig 1: System Block diagram for smart factory 4.0.

 Online ISSN: 2456-883X

b) Textile 4.0

Material 4.0 would be a procedure chain of free generation. Data transporter can be a material compartment, bobbin, twist pillar, and texture. Radio recurrence recognizable proof innovation (RFID) and sensors are fundamental to gather and store data, for example, gear task status, and upkeep data. The plant will self-arrange and self-upgrade rapidly and adaptable to meet custom assembling orders. In the interim, all data will be encouraged back to the MES and ERP frameworks for future administration choices. Future upkeep would be all the more convenient and proficient. MES framework stockpiles and shows gadget operational data, hardware evaluation, and support calendars and observing framework would transmit data to the machine producer and get a 3D model and repair guide, or call for remote upkeep from the supplier.

- **Smart Factory**: Regardless of whether there have been numerous endeavors to characterize the idea of Smart Factory (or Intelligent Factory), "The Smart Factory is characterized as a production line that setting mindful helps individuals and machines in the execution of their errands. This is accomplished by frameworks working in the foundation, purported Calm-frameworks and setting mindful implies that the framework can think about setting data like the position and status of a question. These frameworks achieve their assignments dependent on data originating from the physical and virtual world. Data of the physical world is e.g. position or state of an apparatus, rather than data of the virtual world like electronic archives, illustrations, and reproduction models. Calm frameworks are alluding in this setting to the equipment of a Smart Factory.

- **Internet of Things**: IoT is coming from the concept that each object of existence will be given property that permits the thing to speak with the setting and assist human activities in the background. This idea, whether or not usually nearer to the patron market, will be applied additionally to trade. The IoT permits “things and objects, like RFID, sensors, and actuators, mobile phones, which, through distinctive addressing schemes to act with one another and get together with their neighboring ‘smart’ parts, to achieve common goals”. This definition is comparable to the one provided for Hertz systems: after all, ‘object’ and ‘things’ will be understood as CPSs that share a singular and customary purpose. Besides this, the IoT paradigm focuses on the necessity of internet like structure wherever each object is clearly and unambiguously diagnosable and communicates with an alternative object through normal protocols.

- **Cloud Computing**: Cloud computing is characterized because the delivery of computing services over the web. The cloud suppliers provide Cloud computing services to their customers and charge their customers on the usage of area and keep data within the cloud. Cloud computing is used for many functions, as an example, for private use business use.. Purposely or accidentally, we have a tendency to use cloud computing whereas at an equivalent time performing arts various tasks on computer or mobile.

- **Automation**: HR automation is the process of healing paper-based HR processes into the streamlined computer web-based online system. It is based on the concept of self-service. Self-service enables business owners, managers and employees to perform HR related functions on their own at their convenience from their computer web server. The Inventory Management System is a real-time inventory database capable of

connecting multiple stores and data's. This can be used to track the product or to manage the distribution of stock between several branches of a larger franchise. In any case, the framework simply records deals and restocking information and gives notice of low stock at any area through email at a predetermined interim. The objective is to decrease the strain of following instead of to deal with all store support. Additionally highlights may incorporate the capacity to produce reports of offers, however again the understanding is left to the administration. Likewise, since robbery does once in a while happen, the framework gives answers for affirming the store stock and for redressing stock amounts.

c) Production monitoring

A production observance system could be a method that's designed to record the general of the assembly line in a real time manner. The system collects all knowledge from the assorted sections of the assembly line and is relayed to workers and managers performing on the road. The info that's collected by the observance system is employed in raising the potency of the assembly line of each and every section. It utilizes IoT and custom production of the observance code to perform the info collection method. The system is sometimes connected to the assorted processes of the road like automatic machinery. The system receives knowledge signals concerning the processes whether or not they are running swimmingly or if they are encountering any issues within the section. Once the information has been collected by the workers and managers, they'll create suitable changes to the assembly line in terms of speed, daily production targets, production rates, and alternative values. The observance code will show all the new values to the workers and set the assembly line to fulfill the daily targets and maintenance.

PROTOTYPE MODEL OF PRODUCTION MONITORING DEVICE

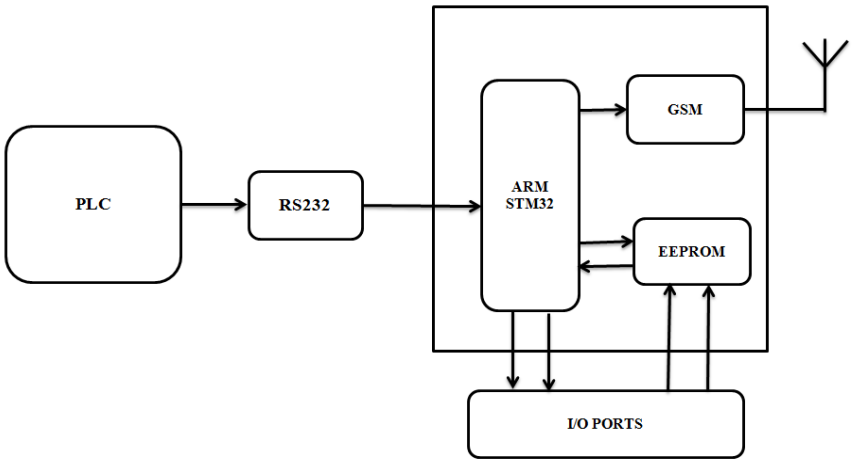

Fig 2: Hardware Block diagram for smart factory 4.0.

Real-time production monitoring information can be classified into two main categories. One is related to the status of resources and another one is performance. Machine breakdowns, material or tool shortages and longer-than-expected processing times give resource problems. From Industry 4.0 point of view, this application

achieves the undertaking to give an instrument to CPSs checking, as indicated by the worldview of the Internet of Things. Some sort of task isn't normally schedulable or unsurprising and requires the mediation of a human administrator to repair the fall flat and restart the machine. The proposed arrangement takes care of the issue to advise this data to human administrators in the most limited conceivable time, significantly lessening machine downtime. These frameworks empower a site administrator to screen and control machines and procedures that are conveyed among different remote locales. An appropriately composed PLC framework spares time and cash by taking out the requirement for administration staff to visit each site for assessment, information gathering/logging or make alterations. The real-time industry monitoring is done by collecting the PLC sensor data's. Data's such as

1. **PLC id**
2. **Voltage**
3. **ON time and OFF time**
4. **Manufacturer DATE and TIME of machine**
5. **Fault number**
6. **Power**
7. **Speed selection**
8. **The current running speed of the machine**
9. **Frequency**
10. **Direction**
11. **Alarm**
12. **Local and remote lock**

The above sensor esteems are taken from the PLC through ace slave correspondence by RS232. The gathered sensor information's are spared in EEPROM of the ARM and send to the server when the association is accessible. In the event that the association is accessible means, the information's are sending to the neighborhood server through the GSM. In which the information's exchanged through the web which takes a shot at rule IOT. So all the gathered data can be seen or screen anyplace, wherever and whenever. On the off chance that the server connection is appropriated among the directing individual then it is exceptionally helpful to screen the machine when there is any blame in the machine it very well may be effortlessly settled.

RESULTS

The monitoring information like ON time, OFF time and processing time, are shown in the results. In additionally the monitoring system offers the possibility to detect the faults and displayed what happened in a given period of time. ThingSpeak was originally launched by ioBridge in 2010 as a service in support of IoT applications.

Thingspeak is a free web service. It is used to collect and store sensor data in the cloud and develop Internet of things applications. The Thingspeak web service provides apps that let you analyze and visualize your data in any hardware, and then act on the data. Sensor data can be sent to Thingspeak from Arduino, Raspberry Pi, and other hardware.

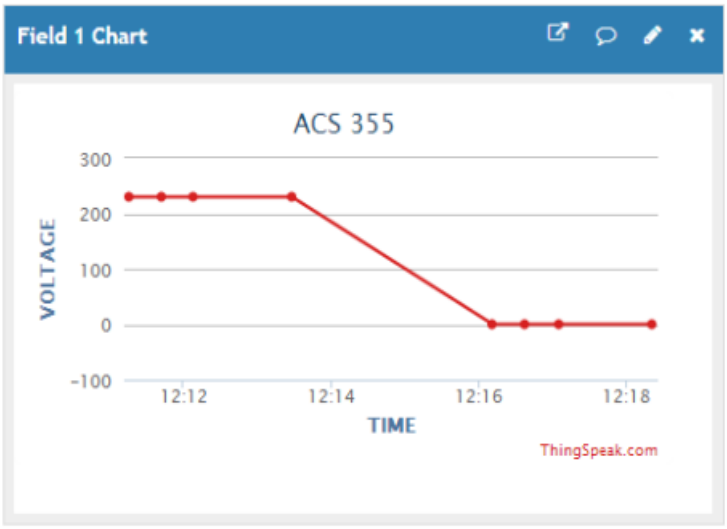

Fig 3: Voltage level has been taken from the machine.

Fig 3 illustrates the voltage level in y axis with respect to the time in x axis. The y axis shows the operating voltage taken from the machine. Unit of time is hours and voltage measured in Volts. ON condition the operating voltage present in the 230V and the machine goes to the OFF condition means the operating voltage goes to 0V.

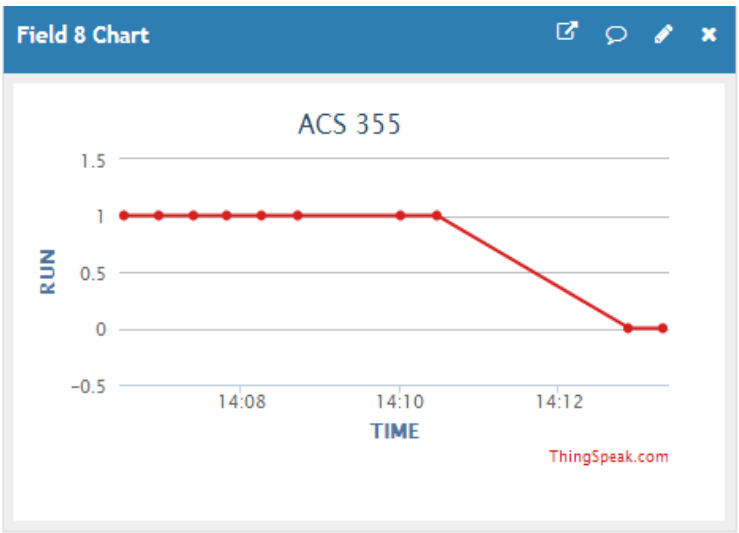

Figure 4: Running condition of the machine

Figure 14 illustrates the running condition of the machine in y axis with respect to the time in x axis. The machine is currently running condition means the data level present in the 1 and the machine goes to the OFF condition

 Online ISSN: 2456-883X

means the data level lies in 0. Likewise frequency, current, speed and on –off condition values are taken from the plc.

CONCLUSION

This research enables Information Technology (IT) power to make existing Textile factory into a Smart Factory. The smart factory 4.0 helps in empowering factory management to monitor employees and guides in Planning, predicting, monitoring and controlling of daily operations for sustainable growth. Industry 4.0 introduces the latest technological systems, such as the Internet of Things, cloud computing for future factory requirements. The application is designed to be user-friendly and it allows all instruments to be easy to interact between machines. The proposed method lists out daily production status online and updates the cloud server. The monitored data are collected from the PLC automatically and sending through the web server with the help of GSM. The product has several advantages such as the data capturing and monitoring and approval automation helped the textile industry to increase the productivity the proposed system provides excellent benefits to improved quality of product and improves profit and by reducing losses. The product has complete capability to capture all the pain points in all 5Ms: Man, Machine, Material, Method and Money monitoring.

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