

IOTBASED SMARTFACTORY WITH CONTROL ROOM FOR TEXTILE INDUSTRY

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Abstract—In this project, Industrial 4.0 with control room will be implemented in Lakshmi Machine Works Ltd. (LMW) in order to bring reentering sight, control, and data visibility across the entire supply chain. It gives manufacturers the ability to predict when potential problems are going to arise before they actually happen. With IoT systems in place, preventive maintenance is much more automated and streamlined. Implementation consists of three phases, studying the industry, installing spin connect- this is a web-based monitoring and control application where the data can be accessed remotely, and introducing control room incorporated with the dashboard. In phase - I, study and data collection about the industry was completed and significant changes have been incorporated in phase - II in installation of control room with spin connect application and dashboard was done. With this system we can have control across the entire supply chain that will increase productivity and reduce downtime of the plant.

Index Terms - Industrial 4.0, Smart factory, Control room (keywords)

1. INTRODUCTION

IoT in industry has created a new revolution in industrial world. Which has given rise to INDUSTRIAL 4.0 which is known as Smart industries? By connecting industrial machineries and sensors with internet, the user can monitor and control machines from anywhere in the world, identify and rectify problems, implement new process, reduce man work and increase accuracy and overall efficiency. Industry 4.0 has brought many professions to change. Industry 4.0 is powered by the Industrial Internet of Things (IIoT) and cyber-physical systems – smart, autonomous systems that use computer-based algorithms to monitor and control physical things like machinery, robots, and vehicles.

2. SMART FACTORY

A Smart Factory is a concept deriving from IIoT that envisages production environment as a fully automated and intelligent network of systems that enables facilities, machines and logistics chains within the manufacturing plant to be managed without human intervention. Moreover, a smart factory is a place where all these things happen thanks to the exchange of data not only between production tools and machines, but also between all elements in the production technology chain. This in turn fuels machine learning so that operations can be carried out more efficiently and bring more savings than would be ever possible if the production processes remained solely under human supervision.

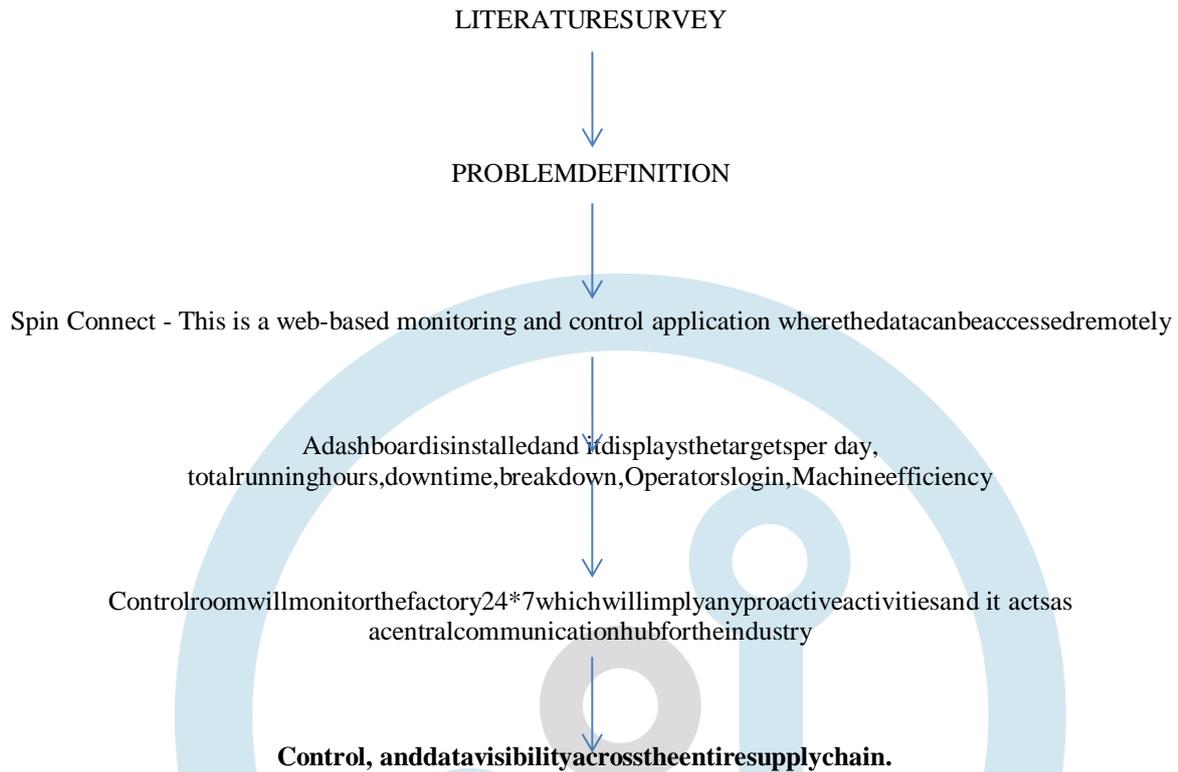
3. ABOUT INDUSTRY

Lakshmi Machine Works Ltd. (LMW) is one of the most respected organizations in India Inc. which has made significant contribution in taking India onto the global textile map. Established as a provider of spinning technology to Indian textile mills, the company currently is a leading global textile machinery manufacturer and one among the few in the world to offer complete spinning solutions to customers. “Industry 4.0 creates that has been called a ‘Smart Factory’

4. PROBLEM DEFINITION

- In order to obtain greater insight, control, and data visibility across the entire supply chain of Lakshmi Machine Works Ltd. (LMW)
- To perform preventive maintenance and other maintenance activities in much more automated and streamlined way.
- Ongoing research on industry 4.0 for textile industry that ensures productivity and efficiency, better flexibility and agility, and increased profitability and optimization of the resources.

5. METHODOLOGY



5.1 IMPLEMENTING FACTORY 4.0 WITH SPIN CONNECT

Being the physical basis for every smart factory, sensors are needed throughout the manufacturing plant to monitor the status of assets, gather and analyze data and use the resulting insights to optimize production. But for the sensors to do all these kinds of operations there must be a platform to provision and manage them, enabling them to gather data and to present it in an insightful and user-friendly way. With the concept of the smart factory in mind, the spin connect IoT Data Orchestration has introduced a novel solution for manufacturing data collection and monitoring to respond to the growing market demand. Sensors transmit the gathered data via Bluetooth Low Energy gateways that can be installed in many different places inside the facilities. The data then is passed on to the platform which enables system operators to track the location and status of connected assets in real-time by means of data visualizations. These internet help fulfil quick decision making processes which are in dispense when dealing factory floor emergencies or strategic asset management.



Figure 5.1 Spinconnect in LMW

5.2 SPIN CONNECT WITH CONTROL ROOM CONCEPT

LMW Spin Connect is a web-based monitoring and control application which networks the process from Blow room to Winder. This system captures and displays parameters like Speeds, Production Stoppages, Quality, Power etc. It helps in close monitoring of Plant Utilization and Productivity levels. Control application where the data can be accessed remotely. A data alerting mechanism is also incorporated in it. Data regarding the specific parameters and health monitoring of the machines in running conditions can be obtained and appropriate action taken accordingly. This real-time information obtained could be used for various analysis purposes. The notification-enabled dashboard lets enable customer's to have a complete control over the machines. Web-based system helps in connecting system anytime anywhere through Laptops, Computers, Tablets & Mobile phone. All the previous data can be retrieved and can be used for analysis and comparisons. Simpler connectivity of system results in easier maintenance. Database is like an encyclopedia of the plant which is further useful in achieving better productivity with better quality at minimal production cost. It gives businesses greater insight, control, and data visibility across their entire supply chain.

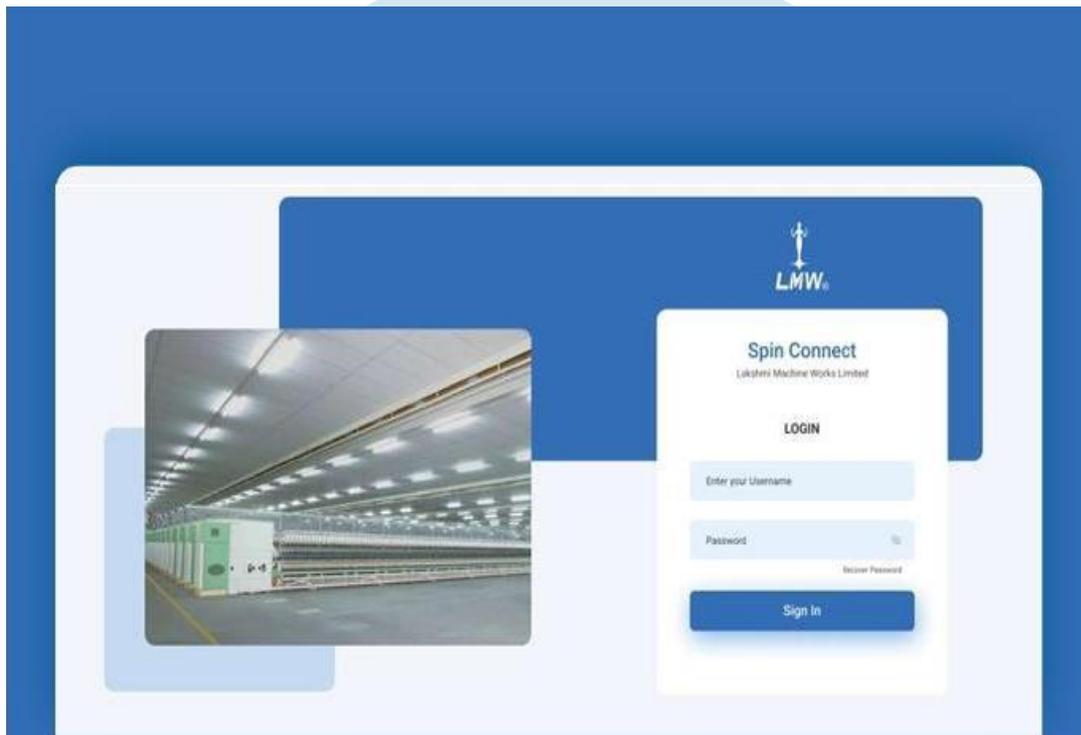


Figure 5.2 Spin connect Login

All the variable parameters in machines can be changed from anywhere even through mobile phones. This helps in implementing quicker solutions and also reduces the machine downtime. With IoT in place at a factory, employees can get better visibility into their assets worldwide. Standard asset management tasks such as asset transfers, disposals, reclassifications, and adjustments can be streamlined and managed centrally and in real time.

5.2.1 CHALLENGES

Spin Connect Edge is a textile industry management application that follows a domain-centric approach, where the end-user requires training to operate it, and also the presentation and categorizing of data was not appropriate, because of which it was necessary to streamline machine efficiency collected through the KPI *sina* centralized station.

5.2.3 SOLUTION

We have implemented the Drilldown approach with which the end-users will obtain crucial parameters in their respective dashboard. This helps users to visualize and articulate the performance of plants from a holistic point of view, i.e., from plant to unit, unit to device, device to a specific parameter that helps LMW to identify the gaps. Now with the current UI Spin Connect Edge can generate the reports and Spin Connect details of the product KPIs within a few mouse clicks without any training.

5.3 DASHBOARD

Dashboard displays vital information of the plant and employee details. It is visible to not only the superiors but also to the operators, it displays the targets per day, total running hours, downtime, breakdown, Operators log in, Machine efficiency, so that it increases the self-responsibility of operators and thus any mistakes can be easily tracked by the superiors. With control room

incorporated with the dashboard, control room can be used as a central communication hub and will be helpful in maintaining records and reports for various purposes.



Figure 5.3 Spinconnect Dashboard

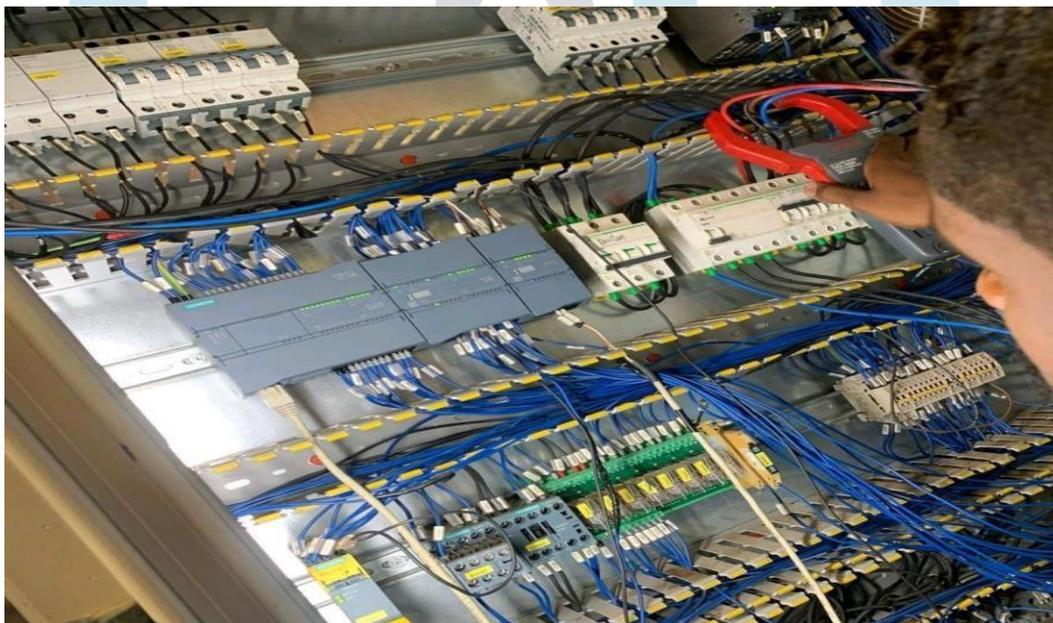


Figure 5.3.1 Dashboard PLC circuit

5.4 CONTROL ROOM

Continuous (24X7) delivery of good quality support to the entire system served areas to performance standards and outputs and complying with all statutory/environmental regulations as defined in the company's policy. Means of communication is through mobile phones and mail in case of any emergencies. Control room is meant to follow standard operating procedure

5.4.1 CONTROL ROOM ACTIVITIES

STEP 1

- Shift engineer will take in charge of control room from his relieving engineer.
- Operator taking charge discusses the issues which had occurred in the previous shift like any leakages, PI, Breakdowns, etc.
- Confirms that all shift engineers in the field have signed in the Logbook.

STEP2

In the Spin connect Screen following parameters are available

- Employee details
- Target
- Machine running condition
- Shift details

STEP3

Generating reports based on

- Daily reports
- Weekly reports
- Monthly reports
- Quarterly reports
- Half yearly reports
- Yearly reports

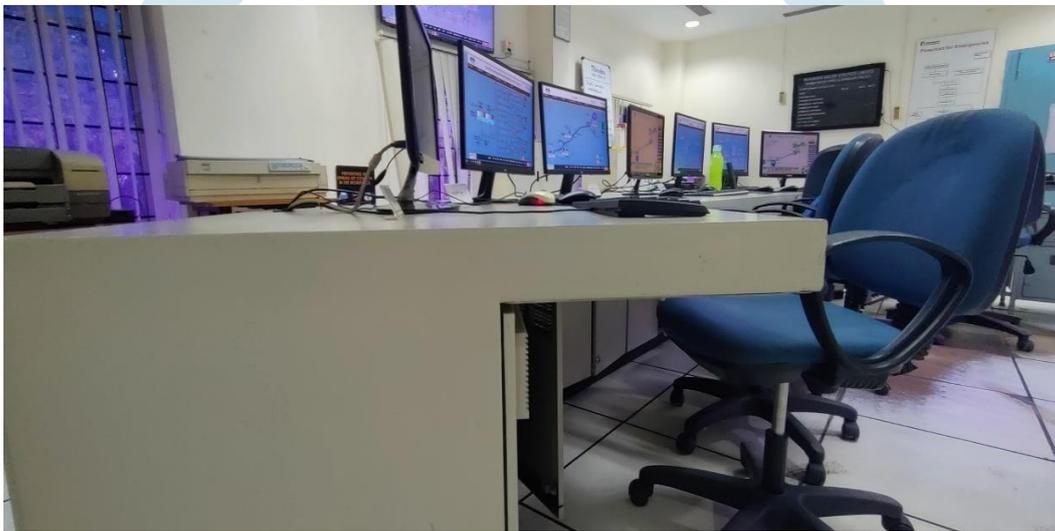


Figure 5.4 Control room in LMW

6. CONCLUSION

The boom of global "re-industrialization" would make manufacturing more intensely competitive and the traditional model is substituted for emerging model, which could be called integration of industrial chain better than an industrial revolution, and all participants in the production process collaborate production in a new way. Textile industry must be aware of the new challenges and respond with a judicious action in order to reduce production cost, improve manufacturing productivity, promote industrial growth, change the labor force structure and ultimately change the competitiveness of the company and the region. The industry was completely studied, starting from intake to end, and found out industry 4.0 will be apt for Lakshmi Machine Works Ltd. In order to obtain greater insight, control, and data visibility across their entire supply chain. With spin connect application and control room in action Lakshmi Machine Works Ltd has become a IOT based smart factory, which is a standing testimony for the successful completion of project.

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