

Implementation of RFID in Contactor Assembly Line for Data Login and Monitoring

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ABSTRACT: The automation of factory machine is commonly done using Programmable Logic Controller (PLC). This is a technique providing for data login and monitoring providing for data login and monitoring using the RFID. This machine is the contactor Assembly Line machine. In this we are using components like Proximity sensor, PLC controller, Communication module and RFID reader. In this contactor Assembly Line we are using 13 stations; each station performs the specific task. To avoid the manual work and to get the accurate output we are introducing the contactor assembly line, and this new technique saves the much time. This total process will take only 1.44 seconds to complete the task. Siemens PLC (S7-1500) was used as a main controller in the project. The mode of communication between all the devices was Profinet. All the digital IO's (Sensors and Actuators etc) were connected to Remote IO Modules and all the remote IO Modules were communicating with PLC with the profinet communication. The major elements used in the machine were Servo Motor, Laser Marking, Camera and Label Applications.

KEYWORDS:RFID, PLC, Proximity sensor, Servo Motor.

I. INTRODUCTION

Assembly line operates more efficiently with radio frequency identification. RFID can play a huge role in improving assembly line efficiency and productivity. RFID reduces human mistakes and guarantees correct data tracking. RFID information can be used to ensure that correct labor, machine, tooling and components are available and ready to use at each processing step, thereby eliminating paper work and reducing down time. One of the biggest benefits of RFID is ensuring the accuracy of build instruction in a manual assembly environment. Assembly line operates more efficiently with radio frequency identification. This reduces human mistakes and guarantees correct data tracking.

Contactor is used for high current load application. They are designed to control and reduce the arc produced when the heavy motor currents are interrupted. This coil will mostly be controlled by a lower voltage Programmable Logic Controller (PLC). This will depend on the requirement. When current is stopped, the coil gets de-energized and thus the contactor gets open circuit.

A **proximity sensor** is a sensor able to detect the presence of nearby objects without any physical contact. A proximity sensor often emits an electromagnetic field or a beam of electromagnetic radiation (infrared, for instance), and looks for changes in the field or return signal. The object being sensed is often referred to as the proximity sensor's target. Different proximity sensor targets demand different sensors. For example, a capacitive proximity sensor or photoelectric sensor might be suitable for a plastic target; an inductive proximity sensor always requires a metal target.

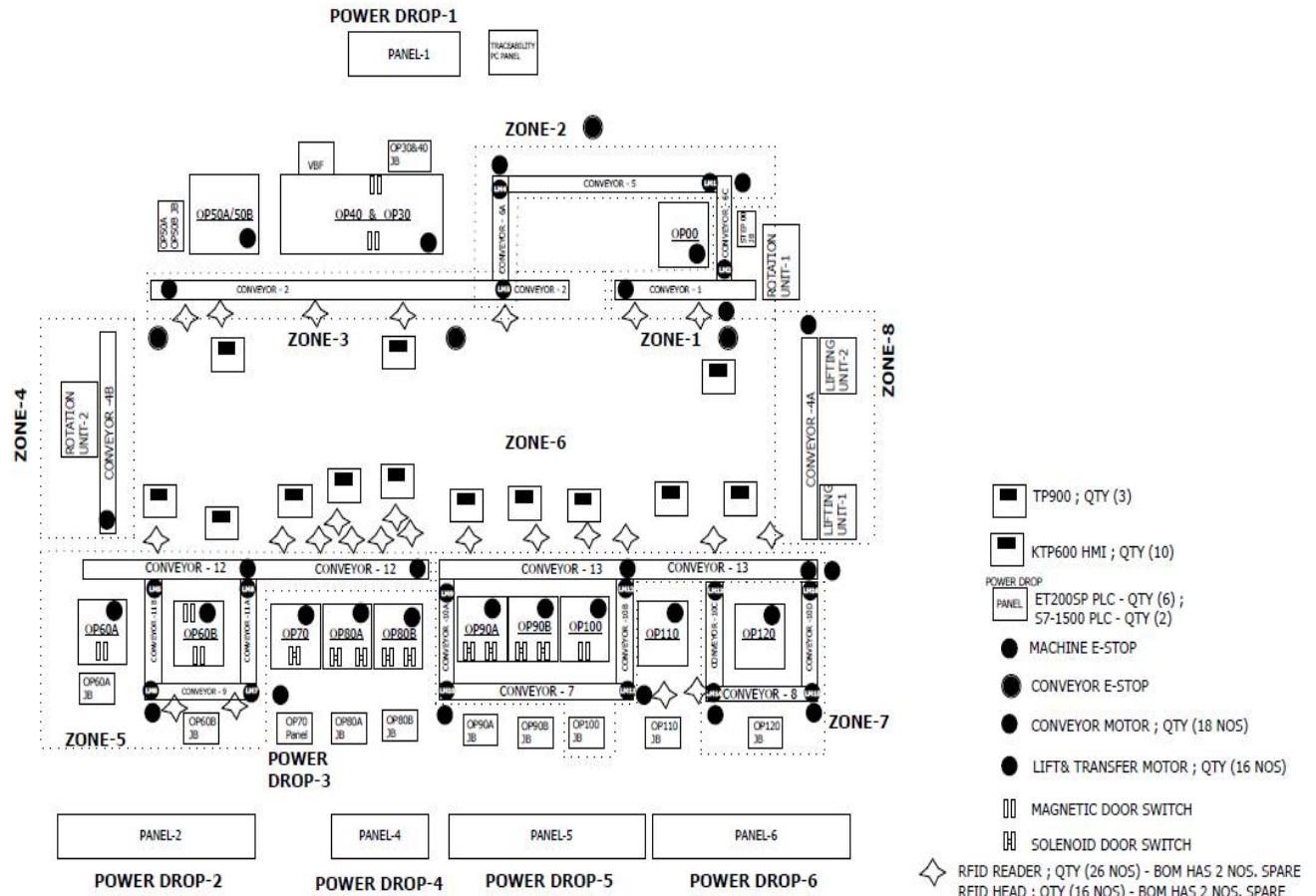


Fig 1: System Architecture

The RFID is a new technology which provides additional tools. Thereby we can save our money, it's easy to operate. The contactor assembly line is used for data login and data monitoring automatically. Each component has its own task. The main advantage of this machine is if one section operates wrongly even though machine's further components will keep on performing. And therefore mismatching component data alone will inform that the component is mismatched.

II. RELATED WORK

A solenoid is a 3 dimensional structure of wire. When this wire is wrapped around a metallic block in a coil and electricity is passed through it, it has some special magnetic properties. Electromagnetic induction makes it an electromagnet that can be switched on or off. The side in which the current appears to be passing clockwise is the South Pole, and the side in which the current seems to be passing anticlockwise is the Northern Pole. The solenoid works just like a bar magnet, and therefore has many uses. This principle is used to create valves, among other things. Where the solenoid operates an electric switch, it is a relay. This is the Magnetic Door Switch Set, a small reed switch assembly specifically designed to alert you when doors, drawers, or any other aperture opens. These types of switches are primarily used in home security systems.

When each magnet piece comes within 20mm of each other they complete the circuit with the internal reed switches. Each Magnetic Door Switch set can accept a max voltage of up to 100V at 500mA. Additionally each set is housed in durable ABS plastic and, with the included screws, can easily mount to most surfaces.

Applications involving the transportation of heavy or bulky materials. Conveyor systems allow quick and efficient transportation for a wide variety of materials, which make them very popular in the material handling and packaging industries. Many kinds of conveying systems are available and are used according to the various needs of different industries. There are chain conveyors (floor and overhead) as well. Chain conveyors consist of enclosed tracks, I-Beam, towline, power & free, and hand pushed trolleys.

Conveyor systems are used widespread across a range of industries due to the numerous benefits they provide.

- Conveyors are able to safely transport materials from one level to another, which when done by human labor would be strenuous and expensive.
- They can be installed almost anywhere, and are much safer than using a forklift or other machine to move materials.
- They can move loads of all shapes, sizes and weights. Also, many have advanced safety features that help prevent accidents.
- There are a variety of options available for running conveying systems, including the hydraulic, mechanical and fully automated systems, which are equipped to fit individual needs.

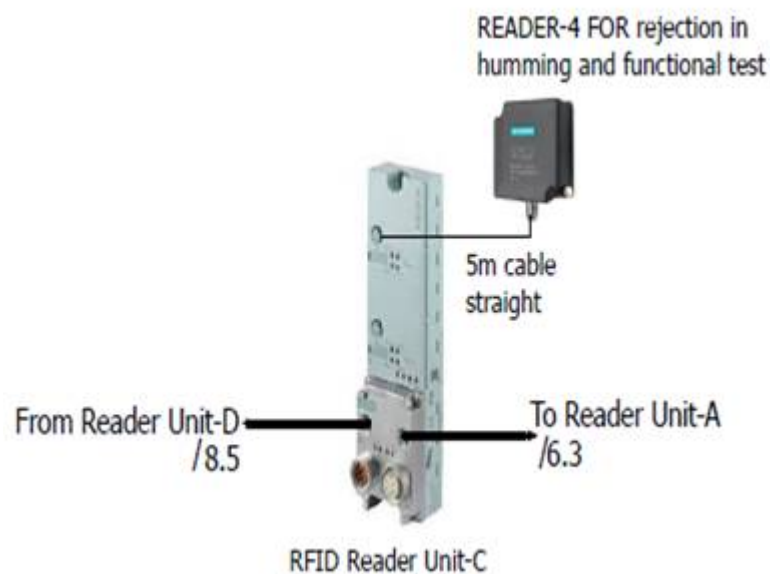


Fig 2: RFID Reader

Conveyor systems are commonly used in many industries, including the Mining, automotive, agricultural, computer, electronic, food processing, aerospace, pharmaceutical, chemical, bottling and canning, print finishing and packaging.

Conveyor systems are commonly used in many industries, including the Mining, automotive, agricultural, computer, electronic, food processing, aerospace, pharmaceutical, chemical, bottling and canning, print finishing and packaging. Although a wide variety of materials can be conveyed, some of the most common include food items such as beans and nuts, bottles and cans, automotive components, scrap metal, pills and powders, wood and furniture and grain

and animal feed. Many factors are important in the accurate selection of a conveyor system. It is important to know how the conveyor system will be used beforehand. Some individual areas that are helpful to consider are the required conveyor operations, such as transportation, accumulation and sorting, the material sizes, weights and shapes and where the loading and pickup points need to be.

In that station 10 and 20 for humming test to test the component is ok or not ok, along with the test it will written in RFID. RFID will read the written test. This station 30 is oriented station test just turning the component for further component. This station will rotate the components in 90 degree. This station 40 loading the top cover for one set of component S00 model where as operation will perform for S00. This station 50 also loading the top cover for one set of components, S0 model where as operation will perform for S0. This station contains the two substations they are 60A and 60B. 60A for top cover checking and press using camera. 60B checking for the current leakage testing it is ok or not ok. If there is any current leakage it will alert through the message. This station 70 is used for marking the serial number and other details in top cover. The other details like (Barcode model and date & time). Its use is to cover the top portion of the machine alone. It will check the proper date and time automatically. In this station it will unscrew all the components using the servo motor. The function of the servo motor is to either a rotary actuator or a linear actuator that controls the angling, positioning speed and acceleration of a piece of machine. This station will apply the label of LH and RH both the sides. It applies details like Functions, Terminals, Stream the logo. And it will also print the labels. It covers only the side view of the machine. This station 100 is used to check the labels whether it is printed correctly or not in case of not Ok it the label will not be printed. Therefore this station mainly used to check to ok or not ok. These two stations will perform the same operation, where same operator will unload the component. It is usually for checking ok or not ok and also it will update the components.

III. EXISTING METHOD

The existing method was based on manual dependent, and it also contains paper work. The output was also dependent with further components like if one section is has error then other section will stop processing. Time delay to complete the process.

IV. PROPOSED METHOD

In this method we are using the RFID (Radio Frequency Identification) for avoiding the paper work. RFID information can be used to ensure that the correct Labor, Machine, Tooling and components are available and ready to use at each processing step, thereby eliminating paper work and reducing down time.

One of the biggest benefits of RFID is ensuring the accuracy of build instruction in a manual assembly environment. Assembly line operates more efficiently with radio frequency identification. This reduces human mistakes and guarantees correct data tracking. These methods have the following advantages:

- Easy to operate
- Reduces human mistakes
- Avoid paper work
- Reduces the down time
- Accurate output.

V. IMPLEMENTATION

Siemens PLC (S7-1500) was used as a main controller in the project. The mode of communication between all the devices was Profinet. All the digital IO's (Sensors and Actuators etc) were connected to Remote IO Modules and all the remote IO Modules were communicating with PLC with the profinet communication. The major elements used in the machine were Servo Motor, Laser Marking, Camera and Label Applicators.

RFID System was used to make the system more efficient and to log the important parameters during assembly and testing. The transponders were mounted on the pallets and RFID read and write units were mounted on individual stations. All the data was stored in the transponder. The RFID read and write units were communicating with the PLC with profinet communication.

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Siemens HMIs TP700 was available on each and every station to act as an interface between user and machine. All the information related to machine operation, quality parameters and troubleshooting procedure were displayed in the HMI.

Keyence scanner SR1000 is used at loading station (S0) to get the variant details of the introduced contactor. Siemens Make Cameras were checking the Print quality if label applicator as well as the correct positioning of the labels with respect to the Contactors.

All the Profinet nodes were connected in Tree Topology by using Phoenix make Ethernet Hub.

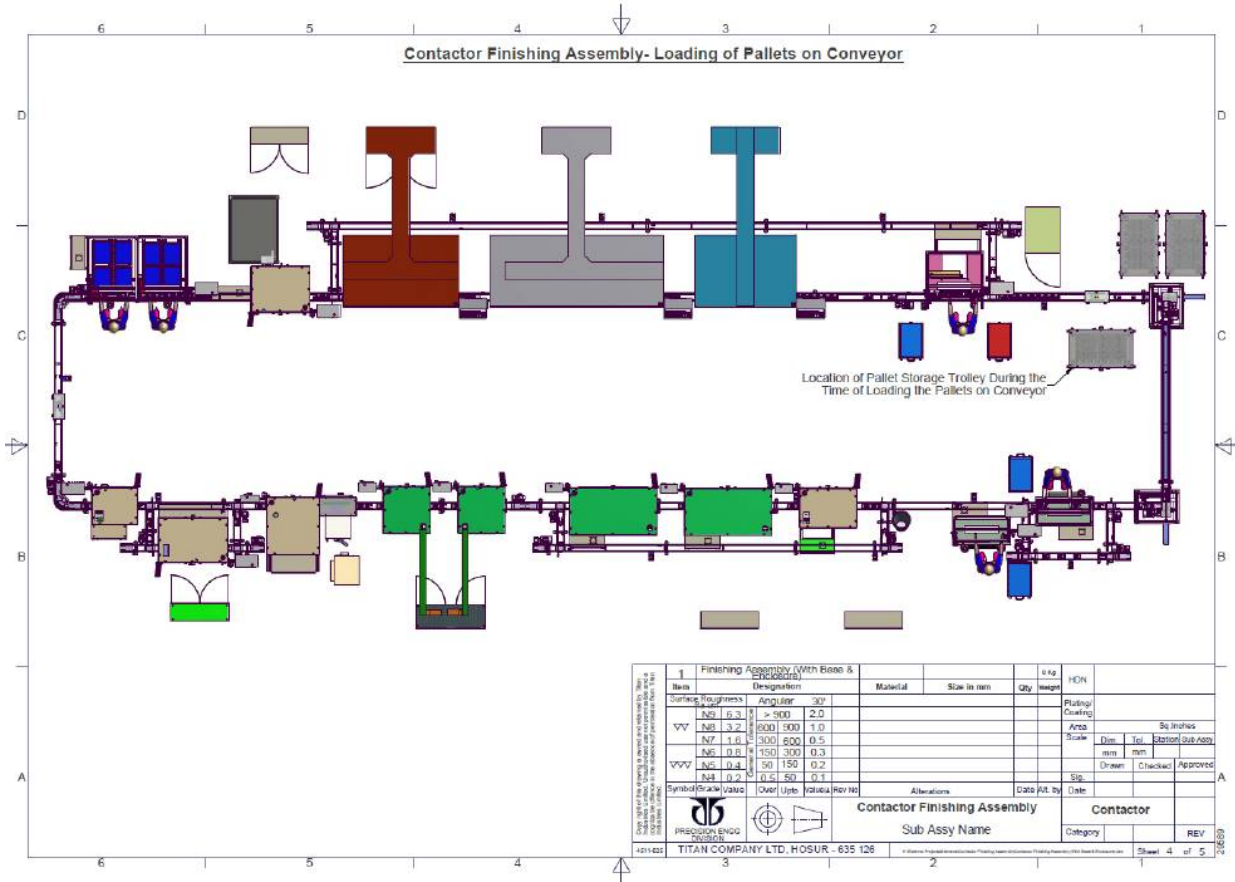


Fig 3: Contactor Assembly Line Architecture

VI. RESULT

Thus the contactor assembly line using RFID for data login and data monitoring has been designed successfully. This machine makes the use of RFID reader that relates the data login and monitoring machine which is in use. Here the data will be login and monitor every time when we use RFID reader. This machine is highly used in automation industries. The PC touchup in which RFID reader will read in machine.

There is a camera facility of notifying and capture the image and it will display in the monitor. But this project brings new facility if any section is not ok even though machine will pass the component to the further sections, finally that not ok sections will display at the end of the process. This is big advantage in this machine.



Fig 4: Hardware Design

VII. CONCLUSION

The conclusion of this project is to provide automatic system for data login and monitoring. As the all the stations are displayed in the monitor, so that the camera can scan the object easily. This machine is constructed and controlled by the RFID so that it is easy to monitor. Since it is advanced technology, the process can be done automatically. It saves the time and manual work can be reduced.

This machine can be used in all automation companies and all over the world. This is the most basic Contactor Assembly Line that could be implemented in every automation system for Data Login and Monitoring.

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ISSN (Online) : 2319 - 8753
ISSN (Print) : 2347 - 6710

International Journal of Innovative Research in Science, Engineering and Technology

An ISO 3297: 2007 Certified Organization

Volume 7, Special Issue 1, March 2018

6th National Conference on Frontiers in Communication and Signal Processing Systems (NCFCSPS '18)

13th-14th March 2018

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Department of ECE, Adhiyamaan College of Engineering, Hosur, Tamilnadu, India

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