

STUDY OF INDUSTRIAL AUTOMATION WITH NEW GENERATION MECHATRONIC SYSTEM USING MULTIPLE TECHNOLOGY – USING INDUSTRY 4.0

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ABSTRACT

With the new era of Industrial revolution 4.0 the time has come to change into new world of Automation using Internet. This will help in getting things done in short time with less effort. The new era technology introduces involvement of multiple technologies, say Pneumatics, Hydraulics, PLC, Sensorics, Mechatronics & Robotics, and apart from this there is vital role of Information technology.

This Research paper is an attempt to develop complete automation utilising multiple technology to enhance productivity. The experiment represents the automatic control of Pneumatic equipment, PLC, Sensors using together to achieve multitasking information.

In this we have interfacing with various technology to work using internet, making some apps to operate the system. With the help of Information technology apps can be made accordingly to run the system & monitor the system.

In this system we have used the machine safety which is very important for automation, if any obstacle comes in the way of operation the machine stops. These safety features help to work efficiently. The entire structure is explained in this paper. The performance & functionality of the system is validated by Industry persons & the results are presented here.

INTRODUCTION

Industry 4.0 is nothing but it is fourth revolution of Industry. Now the Industry has enter into the fourth revolution where the systems are working with the help of Internet or you can say by tablet. The first revolution was Mechanization, Second was Electrification, Third was Digitization & the fourth is using Internet.

The Industrial Revolution 1.0 is the first revolution and based on Mechanical terms called as Mechanization which consists of following

- Mech. control (cam disc, cam)
- Energy: water / steam power



The Industrial Revolution 2.0 is the Second revolution and based on Electrical terms called as Electrification which consists of following

- Punch cards as program memory
- Conveyer belts
- Master shafts
- Energy: electrical

The Industrial Revolution 3.0 is the Third revolution and based on Digital terms called as Digitization which consists of following

- Freely programmable control units
- PLC and PC based control units
- Field busses(Ethernet based)
- Flexible production systems
- Electronical data storage



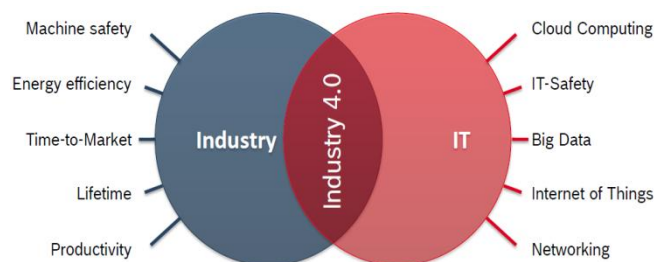
The Industrial Revolution 4.0 is the fourth revolution and based on Connection/Internet. which consists of following

- People as key players
- Distributed intelligence
- Fast integrationandflexible configuration
- Open standards
- Virtual real-time representation
- Digital life-cycle management
- Secure value-creation network



A. Industry 4.0

Meaning : Industry + IT ie. Combination of Industry with IT (Information Technology).



Industry 4.0 describes the **merging** of industry and IT

B. Approach

- Distributed Intelligence:
- Distributed Factory Control
- Open Standards:
- Sercos or OPC UA guarantee future proof machines
- Connect ERP, MES or own tools with the machine control
- Virtual real time representation:
- Boost machine development by using virtual models
- Virtual Commissioning

C. People as a key player

- Extended space for decisions and participation
- Opportunities for stress regulation
- New challenges and opportunities for engineer's and skilled worker's knowledge

D. Features

- Interactive digital board –Active Cockpit
- Work piece controlled production –RFID

- Cyber physical systems
- Intelligent work places
- Cloud-Engineering –Cloud alarming
- Reconfiguration of the production –SAP ME
- Connectivity –Horizontal and vertical communication

DESCRIPTION OF THE SYSTEM.

A. Overview of the entire system [11].

There are three stations comprising an Industrial plant. The first station is for Raw material handling called as Rack which consists of following

Station 1: Rack

- Machine control panel
- Conveyor belt with 24 VDC motor
- 2 Separating Racks
- Sensor Technology analog/digital
- Removal Unit
- Profibus Coupler
- Safety Technology (optional)
- PLC XLC L25
- Connected Industry 4.0

Open Core Engineering, HMI & RFID (optional)

The Second station is to process the raw material hence called as Processing station, consists of

Station 2: Processing

- Machine control panel
- Conveyor belt with 24 VDC motor
- Pinning Unit
- Pick & Place Portal
- Press Pneumatic or Hydraulic (optional)
- Profibus decentralized fieldline I/O
- Safety Technology; two hand release (optional)
- PLC XLC L25

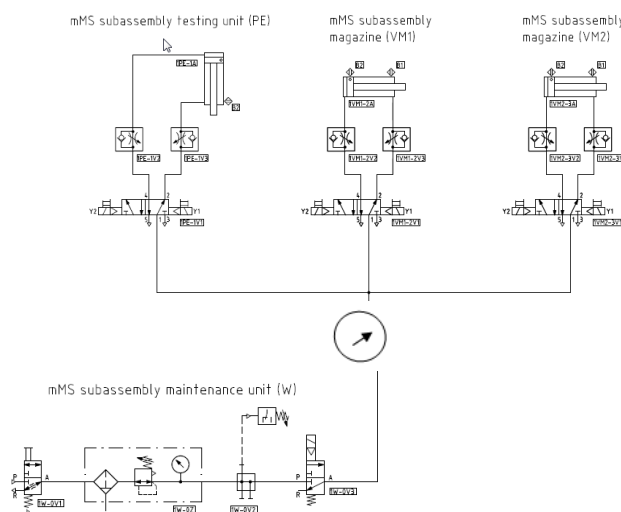
- Connected Industry 4.0
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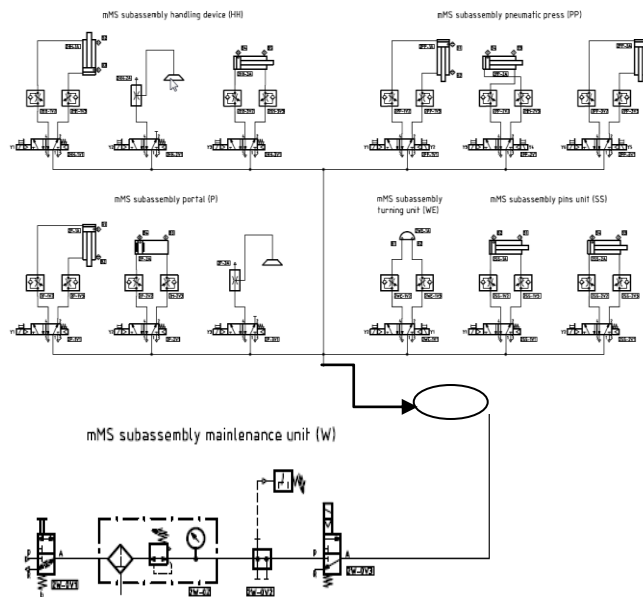
The third station is to store the product in racks so that it can be sent for packaging thus called as high rack warehouse have the following

Station 3: High Rack Warehouse

- Machine control panel
- Conveyor belt with 24 VDC motor
- Bus Technology: decentralized fieldline I/Os, Profibus, Sercos III
- Safety Technology
- Drive Technology: servo motor, axes with gear box and belt transmission.
- 2 axes Commissioning: Travel cycles(PLCopen), CNC, Robotics.
- Pneumatics: Rotary module, Cylinder, Gripper
- 3 Learning topics in one station: PLC programing (High rack Warehouse), Cartesian robot, CNC.
- PLC MLC L45

1. Pneumatic connection :





- Complete system on a small scale
- System consisting of three individual stations addresses the assembly of a cube

Open Core Engineering offers more ways of programming

- JAVA (APP)
- C/C++/C#
- LabView
- Microsoft Excel, Power Point
- Matlab/Simulink

2. Complete Industrial Plant using Industry 4.0.



IMPLEMENTATION OF RFID

By Implementing RFID ie. Radio Frequency Identification the component can be identified and making App for the machine, the entire machine can run with the help on App through Tablet or smart Mobile.

PLC software is installed in Laptop, & programming is incorporated. PLC is open core with high end technology. PLC programming is done, to have the required operation. Programming with Indra Logic [8,9,10] has been performed.

RESULTS AND EVALUATION

The environment for the control of the entire system is developed using Electro-Pneumatic control, PLC and RFID to increase the productivity.

This is Automatic operation with help of IT (computers) using internet for connectivity which simplifies the operation & enhances speed in the operation.

In overview we can say that it is helpful to all Industries for enhancing productivity using simpler way in Automation sector.

CONCLUSIONS AND FURTHER WORK

The overall structure for industrial automation using Connectivity through Information Technology(IT) and RFID has been successfully developed and presented.

The further work is to increase the safety of machine and incorporation of CNC to print as required.

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