

"SMART AND ENERGY EFFICIENT METAL SORTING PLANT WITH IOT INTEGRATION"

¹L.K.Guttedar, ²Pooja Disale, ³Supriya Machale, ⁴Vaishali Narawade

Electronics and Telecommunication Dept., Savitribai Phule Pune University

Email: ¹laxman.guttedar@gmail.com, ²poojadisale0803@gmail.com, ³supriyamachale63@gmail.com, ⁴narawadevaishali95@gmail.com

Abstract— The paper presents a smart approach for a real time inspection and selection of objects in continuous. The real challenge is how to improve existing sorting system. In industry sharp edge of metal particles can be harmful for humans, if human are working on metal sorting system. Our system works without human interface. Metal sorting using robotic arm is proposed for metal sorting from junk on conveyor belt. Automation is used as a tool for improving quality of the products of the plant.

Keywords— Programmable Logic Controller, AT-Mega board VFD, HMI.

I. INTRODUCTION

Determining real time and highly accurate characteristics of small objects in a fast flowing stream would open new directions for industrial sorting processes. The present paper relates to an apparatus and method for classify in and sorting small-sized objects, using electronic systems and advanced sensors operating on the basis of a physical and geometric characterization of each element. It synchronizes the movement of robotic arm to pick the metal particles moving on a conveyor belt. It aims in sorting the metal objects which are coming on the conveyor by picking and placing the objects in its respective pre-programmed place. Thereby eliminating the monotonous work done by human, achieving accuracy and speed in the work.

The project involves proximity sensors that sense the metal object's and sends the signal to the PLC. The PLC sends signal to circuit which drives the various motors of the robotic arm to grip the object and place it in the specified location. The process plant can be operated through mobile phone / or apps running on mobile, indication of overall operational data on mobile by IOT based solution. To develop energy efficient and user friendly system metal sorting plant. This will help to provide and increases human-beings safety and energy conservation directly and indirectly.

II. SYSTEM MODEL

A. Objective of Project:

The purpose is to create a proper method for handling hazardous metal waste. To develop energy efficient and user friendly system metal sorting plant. This will help to provide and increases human-beings safety and energy conservation directly and indirectly.

The control system consists of:

1. Motors: For the movement of conveyor belt and robotic arm.
2. VFD: To control the speed of motors
3. HMI: To observe the process on screen and control it.
4. Proximity Sensors: To read the position of scrap and send it to PLC.
5. PLC: This block works as the central processing unit of this control system. It takes input from HMI, proximity sensors, VFDs and controls the flow of process i.e. motors using VFDs.

B. Block diagram

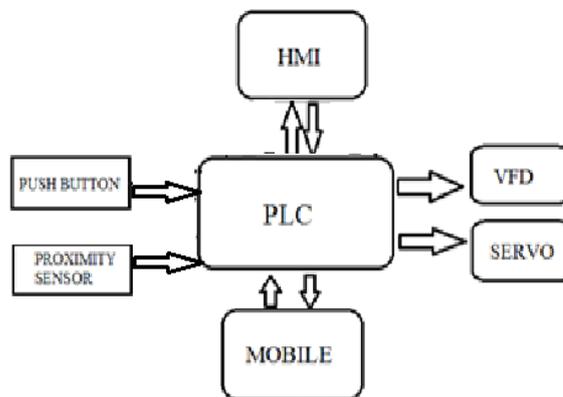


Fig.1 Block diagram

III. WORKING:

1. When job (junk) is placed on conveyor belt, the first photo sensor gets on and turns the system on.
2. The robotic arm scan through the job, when metal is detected by proximity sensor on robotic arm the electromagnetic mechanism gets on and sort the metal from the junk. If no job detect the conveyor belt gets off.
3. This process plant can be operated through mobile phone / or apps running on mobile, indication of overall operational data on mobile by IOT based solution.

4. Networking port on PLC (FX5U-32MT/ES) can be used to implement IOT based application to control and monitor the whole plant through mobile phone from anywhere in the world.

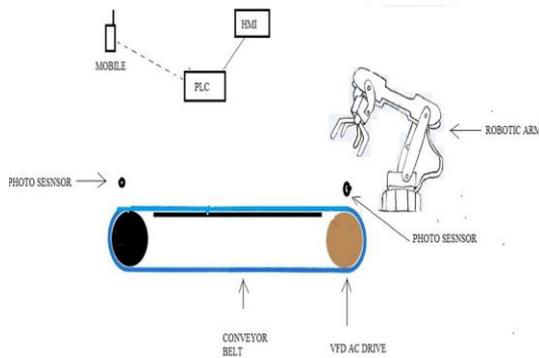
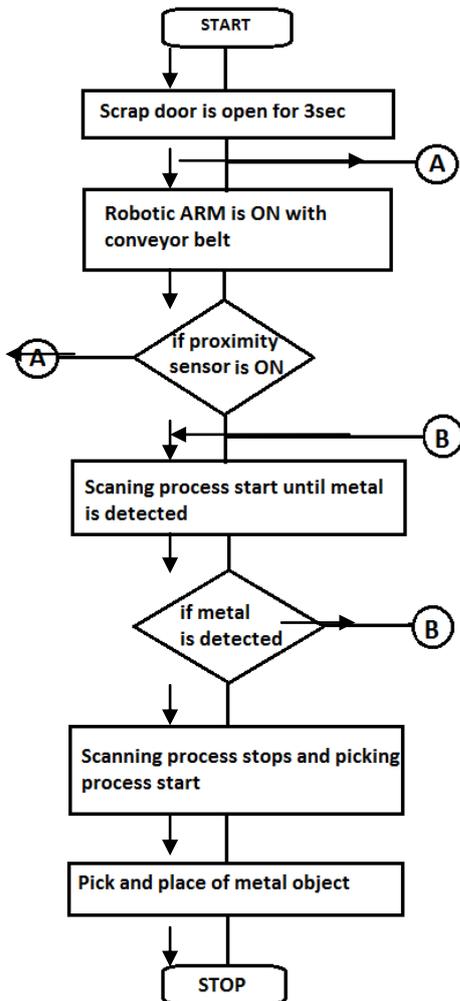


Fig.1 Actual system

IV. FLOWCHART



V. RESULTS



Fig.3 HMI Design



Fig.4 Pick and place process



Fig.5 Metal detection

VI. CONCLUSION:

Energy consumption is reduced by activating electromagnetic arm only when is detected by proximity sensors, also speed of conveyor belt is controlled by VFD instead of geared motor. And this process plant can easily convert to DARK INDUSTRY as human interference not needed.

REFERENCES

- [1] Alessandro Golfarelli, Rossano Codeluppi and Marco Tartagni,-A Self-Learning Multi-Sensing Selection Process: Measuring Objects One by One by ARCES – LYRAS LAB University of Bologna, Campus of Forli,©2007 IEEE, IEEE SENSORS 2007
- [2] 'Process Control Instrumentation Technology – by Curtis Johnson.
- [3] Programmable Logic Controllers, Principals and applications by John W. Webb,Ronold A Reis
- [4] The Internet of Things in Cloud by Honbo Zhou
- [5] Internet of Things by Rolf H.Weber, Romana Weber
- [6] IEEE Internet of Things Journal,vol.1,no.4 August 2014

