

Automatic Material Storage and Retrieval System using PLC and SCADA

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Abstract

In any industry the storage & retrieval of any material or product is very important. The main purpose to make such a instrumentation oriented project is to design a prototype of automated storage & retrieval system for small loads and to reduce the human effort and manpower.

This paper includes design and structure analysis of material storage and retrieval system with the help of PLC and SCADA. The prototype model of automated storage and retrieval system developed consist of the control hardware and software SCADA.

Keywords: PLC, SCADA, Automation, Proximity Sensor.

1. INTRODUCTION

Automation plays important role in every field. It emphasizes on making any process automatic that increases productivity, accuracy and safety by reducing time and human efforts. PLC plays a vital role in the world of automation and instrumentation.

The main purpose of the project is to get knowledge of design and fabrication. The design is an environment friendly and uses simple properties such as mechanical and automation properties which use PLC and SCADA system.

The design is done so that knowledge of designing, mechanism and forces analysis are increased. In order to reduce human effort, we planned to create material storage and retrieval system.

Automated Storage and Retrieval (ASR) Systems have many benefits to different manufacturing systems. The benefits of ASR System include better inventory control, larger inventory and storage capacities, and faster and more effective materials handling. Materials handling has always been a challenge in any manufacturing environment being a non-value added process and potentially unsafe in certain industries (ex. steel, chemical, aerospace).

The paper is presented into several sections. Section 2 describes about the hardware of project and its selection criteria. It is subdivided into four parts as power supply, controller, input section and output section. In section 3 the software logic behind the operation is presented. Section 4 gives advantages of implemented system. Section 5 enlists the disadvantages. Applications are listed in Section 6. Future scope for project is described in section 7. And the section 8 represents the results and conclusion.

2. HARDWARE DESCRIPTION

1. Sensor-

The sensor usually plays its vital part as an input signal transmitter for the PLC in this system. Optocoupler Proximity sensor detect an object without touching it and therefore do not cause abrasion or damage to the object.

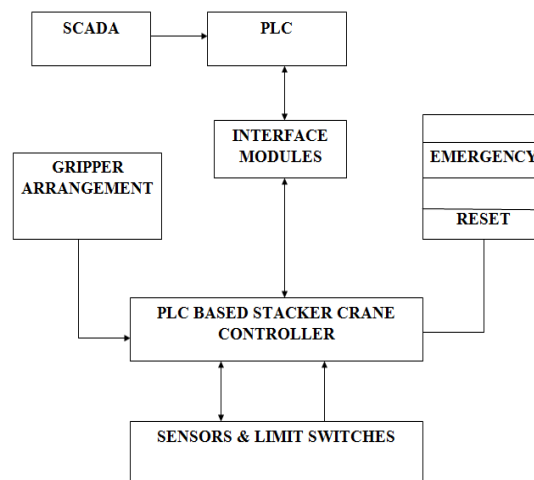


Fig -1: Block diagram

2. PLC (Programmable Logic Controller) -

The PLC is the brain of the system.

PLC: DVP DVP-64EH

This PLC is selected based on

- 32 inputs 32 outputs
- High speed input output model.
- Dual communication port.

The dedicated software for this PLC is DVPSOft 2.30 and is programmed using ladder language.

3. DC motor-

It is used to operate the directions of the crane and the gripper. The motor operation is performed using PLC and relays. Triaxial operation is performed here that is, X axis, Y axis and Z axis. Hence three motors are used to perform these operation and one for the gripper movement.

4. SCADA-

It is used to enter the details of the storage and retrieval. In our project we have used Ellipse since it is easy to operate. RS-232 is used for serial communication.

3. SOFTWARE DESCRIPTION

1. WPLSoft 2.30

WPLSoft 2.30 is the software dedicated to the PLC used in project. One of the simple programming languages 'Ladder Diagram' is used for programming the PLC.

2. Elipse SCADA

Connection to most devices (PLCs, RTUs) in the market.

Less time required for developing and maintaining applications.

Algorithm-

- [1] Select the location where the object is to be stored or retrieved.
- [2] Press start button followed by the store/retrieve button.
- [3] If store button is pressed, proximity sensor will sense the presence of object.
- [4] If object is present, motor 'X' will start rotating in forward direction till the selected location and will stop.

[5] After reaching the selected point, the motor 'Y' which will lift the object to the selected location.

[6] Once the object reaches the selected position, motor 'Z' (in/out) will place the object at that location.

[7] The gripper motor will release the object.

[8] The motor Z will rotate in reverse direction to lower the gripper platform.

[9] The X motor will rotate in direction reverse to the previous one to return to home position.

[10] Same as for retrieval operation.

4. ADVANTAGES

[1] The automated system helps humans to enable the handling of materials easily.

[2] This system reduces labour cost while increasing safety.

[3] Time saving approach.

5. DISADVANTAGES

[1] It requires skilled knowledgeable & experienced engineer.

[2] Requires significant investment.

[3] Requires timely maintenance & upgradation.

6. APPLICATIONS

[1] Warehouses of different businesses such as Amazon Flip kart etc.

[2] Chemical Industries.

[3] Libraries.

[4] Large scale pharmacies.

7. FUTURE SCOPE

[1] By using the signal processing we can implement this system with voice analysis.

[2] By using the new technology and sensors we can implement this system with hand gesture.

8. RESULT & CONCLUSIONS

We have implemented a compact, economic and use friendly 'Automatic Storage and Retrieval System'

This paper has proposed an application of automation illustrating a PLC based automatic storage and retrieval system. Aim of the project is to develop a system that can help to extend its use over wider area. We have got the experience of brainstorming for logical thinking to developing the program.

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