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Retrival System with Automatic Storage Using SCAD

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ABSTRACT

The ASRS developed consists of control hardware and software communicating over a Fieldbus network. A simulation model of the WIT ASR and an order generator were also developed and these are linked to a database and a results spreadsheet. This ASRS allows for a range of control strategies and order types to be investigated utilizing the order generator and the database. There was also a facility developed which allows this mathematical model to run the actual requirements that the ASRS physical model works with, this allows for complete correlation between both models. The development of a mathematical model plus a physical model ensures better understanding of ASRS making the sequence of operations obvious and helping to clarify the broad range of strategies to interested parties. The best recorded performance was with current dwell point, simultaneous travel, dual control, free-nearest storage and nearest retrieval strategies selected in combination. In general, dual control improved performance and throughput simultaneous travel was found to be better than rectilinear travel, dwell point at origin gave very poor results, and a dwell point at current, pick point or deposit point appears best.

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I. INTRODUCTION

Today, AS/RS systems are designed for automated storage and retrieval of various parts and items in an industry. The system operates under computerized control, maintaining an inventory of stored items. Retrieval of items is accomplished by specifying the item type and quantity to be retrieved. The computer determines where in the storage area the item can be retrieved from and schedules the retrieval. It directs the proper automated storage and retrieval machine to the location where the item is stored and directs the machine to deposit the item at a location where it is to be picked up.

SCADA (Supervisory Control and Data Acquisition) is a type of industrial control system (ICS). Industrial control systems are computer controlled systems that monitor and control industrial processes that exist in the physical world. SCADA systems historically distinguish themselves from other ICS systems by being large scale processes that can include multiple sites, and large distances.

II. SYSTEM DESIGN

INPUT:

Box in which various types of materials are present is placed on the conveyor belt from the unloading section. On every box there is a barcode that gives detailed information of the material in the box. When this object is placed on the conveyor belt; barcode scanner which is placed near to the conveyor belt scans the barcode and gives information about the object. This information is provided to the system and operator, at the same time the system analyzes the data given by load cell on the conveyor belt. This weight cell measures the weight of the object and gives information to the operator. According to the information provided by the scanner and the load cell system checks whether space is available on the rack or not to place the object. If the rack is overweight then the error is generated and according to that error object gets rejected by the rejecter system. If there is no error storing process is carried out.

The conveyor belt moves the object towards the rail. Then the object is placed on the rail, that moves in up- down and x-y direction according to object destination. When the rail comes to object destination sliders come out from the

rack block. Slider takes the object from the rail and stores the object on the rack. Fig. 1 represents the block diagram of the input module.

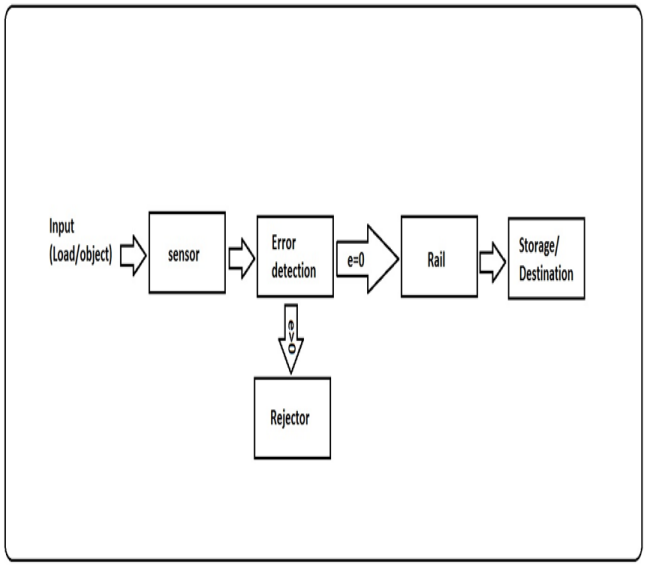

Fig. 1 Block diagram of automatic storage system

III.SECURITY

For the purpose of the data being secured and to protect the process from being tampered we provide 3 levels of security. In the first level the operator is only allowed to give the order for storing and retrieving data and to acknowledge alarms. In the second level the operator can make new recipes and save them for production. In the third level the operator can make changes in the program, redefine codes and the display in the window, etc. as per the new developments.

IV.SOFTWARE WINDOWS

The software windows are the visible windows which represent the process on the computer screen.

Fig. 2 represents the conveyor belt on which the load to be stored is placed. This conveyor belt has a barcode scanner mounted on top which scans and gives data to the system for verification.

If no error is detected, the box starts moving in the horizontal direction up to the rail. Depending upon the data encoded from the barcode scanner the rail will move to the destination and store the box into the rack. Fig. 4 shows the racks in which the box containing specific items is stored.

This stored box can be retrieved as and when needed by simply entering the code of the rack. This code is given to the system with the help of a keyboard designed for the task. Fig. 5 shows the keyboard. In this A, B, C, D represents the rows and 1, 2, 3 represents the columns of the rack. The rack being used in this simulation is 4*3 racks [3] [4].

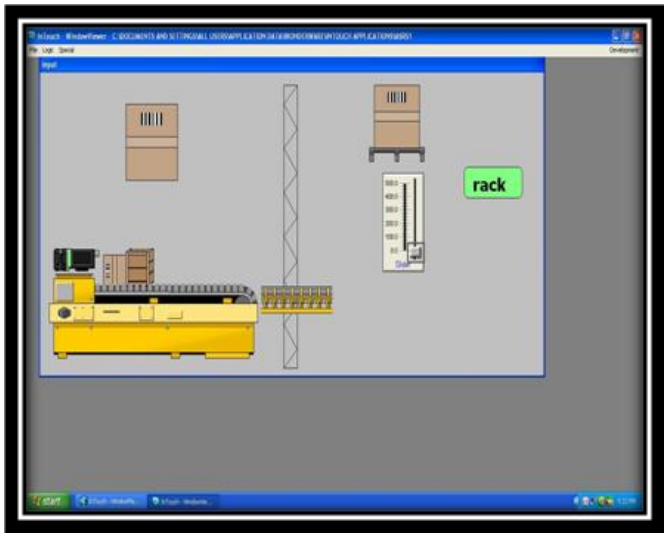

Fig. 2 Conveyor belt with barcode scanner

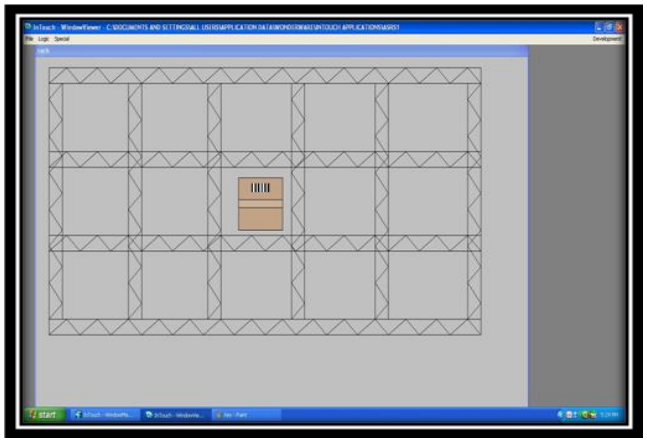

Fig. 3 Rack for storing the objects

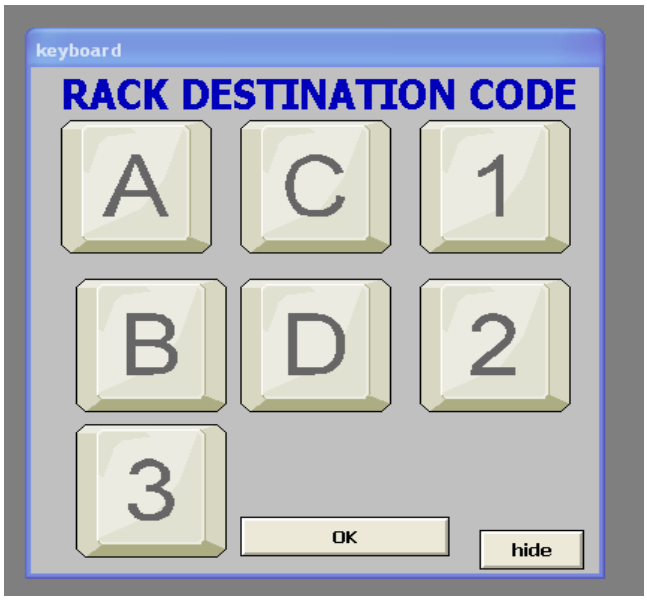

Fig. 4. Keyboard for retrieving the object

V. INTERFACING

The proposed communication between the PLC I/O modules and PC is with Profibus. DP which allows for the connection of field devices such as I/O modules with automation systems. The master PLC and the distributed I/Os both require Profibus ports. This is already ensured in the specification of the S7-412-2 master PLC. Profibus allows for quick disconnects. Easier wiring and efficiency benefits when equipment is being disassembled and reinstalled. Siemens claim that the installation of twisted pair field bus in material handling / conveyor applications generates savings of 50-60% or more over hardwiring all the input and output devices directly to the PLC terminals. Using Profibus, data from field devices can be used to priorities maintenance jobs. Instead of routinely pulling and diagnosing components which may catch them before maintenance is needed or after performance degrades significantly. Users can now replace components using data from the devices themselves, which can greatly reduce costs and downtime. Profibus also offers savings in wire.Terminations and labeling and associated labor costs.

VI. CONCLUSION

We have designed a simulation of the AS/RS and observed its output generated when a specific input is given. This output matches with our desired output.
Different alarms are set if an error gets generated. The security helps to prevent tampering of the program. If no error is detected, the rail carries the load to the predefined location set into the program. The real time function of SCADA helps us to keep a track of all the previous errors that had caused delay in the operation and helps to modify it. Using various sensors we can use this system in aviation industries, pharmaceutical industries, chemical plants, etc.

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