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Automatic ream handling system for as/rs (automatic storage and retreival system) In paper machine 3

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ABSTRACT: Tamil Nadu Newsprint and Papers Limited (TNPL) produces sheet bundle which is called ream can be stored in ASRS (Automatic Storage and Retrieval System) of 7000 tons capacity. Reams which are stored in ASRS can be retrieved and ready for loading point at any time. AS/RS system process is controlled by PLC (Programmable Logic Controller using the PLC process can be controlled manually and automatically as well .In TNPL finishing house area, the reams are packed manually by using brown sheet and being sent to the shrink wrapping machine. In which reams are packed by polythene cover. A single ream bundle contains 500 sheets and 4 or 5 reams are sent for eight fans for reams packing operation. From shrink wrapping machine the packed reams are collected and fed in to the ASRS input conveyor manually. In our project the system eliminates manual handling and will be controlled by PLC with automation and manual control. By extending the output conveyor from shrink wrapping machine reams are pushed to the next perpendicular conveyor using hydraulic pusher and collected by input conveyor of AS/RS. The system also comprises storage conveyor to control the ream flow during maximum production. This system will produce the time consumption and manual efforts.

Index Terms: ASRS, Conveyor, PLC, Shrink Wrapping Machine.

I. Introduction

A. Overview of TNPL

TNPL, which it's operated in the year 1984, has completed 26 years of operation. The company has grown from the initial capacity of 90000 tons per to the present level of 400000 tons per annum. Under the mill expansion plan, TNPL installed a new state of the art paper machine (paper machine) at a capital outlay of Rs.1000 crore. The machine has 5.45M deckle, operating at 1100 meter per minute speed and is capable of producing high quality pigmented and surface sized papers. The annual production capacity of the machine is 155,000 MT. It has the advantage of low specific energy consumption. The backward integration of chemical bagasse pulping line completed simultaneously as of the mill expansion plan will increase chemical bagasse pulp production from 400 tons per day to 500 tons per day. A multi fuel high pressure boiler has been installed with steam generation capacity of 125 tph to take care of the additional steam requirement. As a part company's corporate social responsibility initiatives, for which TNPL has set apart 3% of its previous year net profit amounting to Rs 3.78 Crore TNPL's forward thinking polices have led to consistent growth from the initial capacity of 90,000tpa to the present capacity of 400000 tpa.

The continuous growth has made TNPL to emerge a significant player in the Indian paper industry with the credit of being the largest producer of writing paper in the country. A large portion of the equipment installed in TNPL are first of its in the Indian paper industry. TNPL's operational and financial performance is one of the best in the Indian paper industry. Consistent maximum utilization at the highest efficiency of production facilities and constant effort in keeping the cost low have made TNPL a star performance.

With an increased demand, the company has expanded its pulping capacity by installing new chemical hardwood line and upgrading the chemical bagasse pulp line. The company Alsohave a power plant with 126 MW power generation capacity.

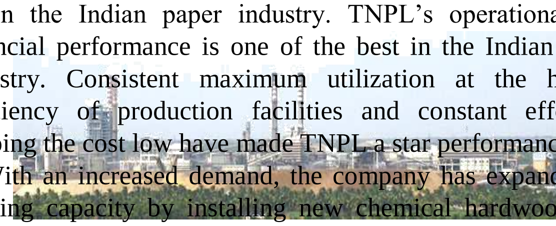


Fig 2: TNPL Karur.

The company is an eminent manufacturer of paper from bagasses and has a world-wide credibility in trade. Based on the concept "Waste to wealth", TNPL have built a cement plant with a capacity of 600 tpd to manufacture high grade cement from waste materials like lime sludge and fly ash. TNPL is the first paper mill to produce cement from these solid wastes. TNPL has increased the productivity to 900 tpd by introducing a Pre-calciner and other balancing equipment in the existing plant.

The paper board machine supplied by VOITH, Germany has many advanced features like tandem shoe press, speed sizer for surface sizing, three on-line coating stations, hard and soft nip calendering and a winder.

B. TNPL Products

TNPL offers high-quality surface sized and non-surface sized paper to suit the needs of modern high speed printing machines. TNPL's cutting edge technology backed by experienced professionals ensures quality products to customers. TNPL's manufacturing processes are equipped with state-of-the-art control systems to maintain critical quality parameters on line. The paper produced by TNPL is eco-friendly as the pulp is manufactured out of renewable raw material and is subjected to Elemental Chlorine Free (ECF) bleaching. As the paper is acid free, it has a longer color stability and enhanced permanency in terms of strength characteristics. TNPL caters to the requirements of multifunctional printing processes like sheet-fed, web offset, and digital printers. The paper reels have uniform profile with strength properties to cope even with high speed machines. TNPL manufactures Printing and Writing Papers in substances ranging from 50 GSM to 110 GSM.

II. PROGRAMMABLE LOGIC CONTROLLER

A Programmable Logic Controller, PLC or Programmable Controller is a digital computer used for automation of electromechanical processes, such as control of machinery on factory assembly lines, amusement rides, or light fixtures. PLCs are used in many industries and machines. Unlike general-purpose computers, the PLC is designed for multiple inputs and output arrangements, extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact.

Before the PLC, control, sequencing, and safety interlock logic for manufacturing automobiles was mainly composed of relays, cam timers, drum sequencers, and dedicated closed-loop controllers. Since these could number in the hundreds or even thousands, the process for updating such facilities for the yearly model change-over was very time consuming and expensive, as electricians needed to individually rewire relays to change the logic. Digital computers, being general-purpose programmable devices, our soon applied to control of industrial processes.

Early PLCs our designed to replace relay logic systems. These PLCs our programmed in "ladder logic", which strongly resembles a schematic diagram of relay logic. This program notation was chosen to reduce training demands for the existing technicians. Other early PLCs used a form of instruction list programming, based on a stack-based logic solver. Modern PLCs can be programmed in a variety of ways, from the relay-derived ladder logic to programming languages such as specially adapted dialects of BASIC and C. Another method is State Logic, a very high-level programming language designed to program PLCs based on state transition diagrams.

Many early PLCs did not have accompanying programming terminals that our capable of graphical representation of the logic, and so the logic was instead represented as a series of logic expressions in some version of Boolean format, similar to Boolean algebra. As programming terminals evolved, it became more common for ladder logic to be used, for the aforementioned reasons and because it was a familiar format used for electromechanical control panels. Neour formats such as State Logic and Function Block (which is similar to the way logic is depicted when using digital integrated logic circuits) exist, but they are still not as popular as ladder logic. A primary reason for this is that PLCs solve the logic in a predictable and repeating sequence, and ladder logic allows the programmer (the person writing the logic) to see any issues with the timing of the logic sequence more easily than would be possible in other formats.

Early PLCs, up to the mid-1990s, our programmed using proprietary programming panels or special-purpose programming terminals, which often had dedicated function keys representing the various logical elements of PLC programs. Some proprietary programming terminals displayed the elements of PLC programs as graphic symbols, but plain ASCII character representations of contacts, coils, and wires our common. Programs our stored on cassette tape cartridges. Facilities for printing and documentation our minimal due to lack of memory capacity. The very oldest PLCs used non-volatile magnetic core memory.

The functionality of the PLC has evolved over the years to include sequential relay control, motion control, process control, distributed control systems and networking. The data handling, storage, processing poor and communication capabilities of some modern PLCs are approximately equivalent to desktop computers. PLC-like programming combined with remote I/O hardware, allow a general-purpose desktop computer to overlap some PLCs in certain applications. Regarding the practicality of these desktop computer based logic controllers, it is important to note that they have not been generally accepted in heavy industry because the desktop computers run on less stable operating systems than do PLCs, and because the desktop computer hardware is typically not designed to the same levels of tolerance to temperature, humidity, vibration, and longevity as the processors used in PLCs.

In addition to the hardware limitations of desktop based logic, operating systems such as Windows do not lend themselves to deterministic logic execution, with the result that the logic may not always respond to changes in logic state or input status with the extreme consistency in timing as is expected from PLCs. Still, such desktop logic applications find use in less critical situations, such as laboratory automation and use in small facilities where the application is less demanding and critical, because they are generally much less expensive than PLCs.

III. PLC TOPICS

A. Features

Control panel with PLC (grey elements in the center). The unit consists of separate elements, from left to right; poor supply, controller, relay units for in- and output. The main difference from other computers is that PLCs are armored for severe conditions (such as dust, moisture, heat, cold) and have the facility for extensive input/output (I/O) arrangements. These connect the PLC to sensors and actuators. PLCs read limit switches, analog process variables (such as temperature and pressure), and the positions of complex positioning systems.

Some use machine vision. On the actuator side, PLCs operate electric motors, pneumatic or hydraulic cylinders, magnetic relays, solenoids, or analog outputs. The input/output arrangements may be built into a simple PLC, or the PLC may have external I/O modules attached to a computer network that plugs into the PLC.

B. Scan Time

A PLC program is generally executed repeatedly as long as the controlled system is running. The status of physical input points is copied to an area of memory accessible to the processor, sometimes called the "I/O Image Table". The program is then run from its first instruction rung down to the last rung. It takes some time for the processor of the PLC to evaluate all the rungs and update the I/O image table with the status of outputs. This scan time may be a few milliseconds for a small program or on a fast processor, but older PLCs running very large programs could take much longer (say, up to 100 ms) to execute the program. If the scan time our too long, the response of the PLC to process conditions would be too slow to be useful. As PLCs became more advanced, methods our developed to change the sequence of ladder execution, and subroutines our implemented. This simplified programming could be used to save scan time for high-speed processes; for example, parts of the program used only for setting up the machine could be segregated from those parts required to operate at higher speed.Special-purpose I/O modules, such as timer modules or counter modules such as encoders, can be used where the scan time of the processor is too long to reliably pick up, for example, counting pulses and interpreting quadrature from a shaft encoder. The relatively slow PLC can still interpret the counted values to control a machine, but the accumulation of pulses is done by a dedicated module that is unaffected by the speed of the program execution.

C. System Scale

A small PLC will have a fixed number of connections built in for inputs and outputs.Typically, expansions are available if the base model has insufficient I/O.Modular PLCs have a chassis (also called a rack) into which are placed modules with different functions. The processor and selection of I/O modules are customized for the particular application. Several racks can be administered by a single processor, and may have thousands of inputs and outputs. A special high speed serial I/O link is used so that racks can be distributed away from the processor, reducing the wiring costs for large plants.

D. User interface

PLCs may need to interact with people for the purpose of configuration, alarm reporting or everyday control. A human-machine interface (HMI) is employed for this purpose. HMIs are also referred to as man-machine interfaces (MMIs) and graphical user interfaces (GUIs). A simple system may use buttons and lights to interact with the user. Text displays are available as well as graphical touch screens. More complex systems use programming and monitoring software installed on a computer, with the PLC connected via a communication interface.

E. Communications

PLCs have built in communications ports, usually 9-pin RS-232, but optionally EIA-485 or Ethernet. Modbus, BACnet or DF1 is usually included as one of the communications protocols. Other options include various field buses such as DeviceNet or Profibus. Other communications protocols that may be used are listed in the List of automation protocols.

Most modern PLCs can communicate over a network to some other system, such as a computer running a SCADA (Supervisory Control and Data Acquisition) system or web browser.

PLCs used in larger I/O systems may have peer-to-peer (P2P) communication between processors. This allows separate parts of a complex process to have individual control while allowing the subsystems to co-ordinate over the communication link. These communication links are also often used for HMI devices such as keypads or PC-type workstations.

F. Programming

PLC programs are typically written in a special application on a personal computer, then downloaded by a direct-connection cable or over a network to the PLC. The program is stored in the PLC either in battery-backed-up RAM or some other non-volatile flash memory. Often, a single PLC can be programmed to replace thousands of relays.

Under the IEC 61131-3 standard, PLCs can be programmed using standards-based programming languages. A graphical programming notation called Sequential Function Charts is available on certain programmable controllers. Initially most PLCs utilized Ladder Logic Diagram Programming, a model which emulated electromechanical control panel devices (such as the contact and coils of relays) which PLCs replaced. This model remains common today.

IEC 61131-3 currently defines five programming languages for programmable control systems: function block diagram (FBD), ladder diagram (LD), structured text (ST; similar to the Pascal programming language), instruction list (IL; similar to assembly language) and sequential function chart (SFC). These techniques emphasize logical organization of operations.

While the fundamental concepts of PLC programming are common to all manufacturers, differences in I/O addressing, memory organization and instruction sets mean that PLC programs are never perfectly interchangeable between different makers. Even within the same product line of a single manufacturer, different models may not be directly compatible.

G. Security

Prior to the discovery of the Stuxnet computer virus in June 2010, security of PLCs received little attention. PLCs generally contain a real-time operating system such as OS-9 or VxWorks and exploits for these systems exist much as they do for desktop computer operating systems such as Microsoft Windows. PLCs can also be attacked by gaining control of a computer they communicate with.

H. Simulation

In order to properly understand the operation of a PLC, it is necessary to spend considerable time programming, testing, and debugging PLC programs. PLC systems are inherently expensive, and down-time is often very costly. In addition, if a PLC is programmed incorrectly it can result in lost productivity and dangerous conditions. The advantages of using PLC simulation tools such as PLCLogix are that they save time in the design of automated control applications and they can also increase the level of safety associated with equipment since various "what if" scenarios can be tried and tested before the system is activated.

I. PLC Compared With Other Control Systems

PLCs are well adapted to a range of automation tasks. These are typically industrial processes in manufacturing where the cost of developing and maintainingthe automation system is high relative to the total cost of the automation, and where changes to the system would be expected during its operational life. PLCs contain input and output devices compatible with industrial pilot devices and controls; little electrical design is required, and the design problem centers on expressing the desired sequence of operations. PLC applications are typically highly customized systems, so the cost of a packaged PLC is low compared to the cost of a specific custom-built controller design. On the other hand, in the case of mass-produced goods, customized control systems are economical. This is due to the loour cost of the components, which can be optimally chosen instead of a "generic" solution, and where the non-recurring engineering charges are spread over thousands or millions of units. For high volume or very simple fixed automation tasks, different techniques are used. For example, a consumer dishwasher would be controlled by an electromechanical cam timer costing only a few dollars in production quantities. A microcontroller-based design would be appropriate where hundreds or thousands of units will be produced and so the development cost (design of poor supplies, input/output hardware and necessary testing and certification) can be spread over many sales, and where the end-user would not need to alter the control. Very complex process control, such as used in the chemical industry, may require algorithms and performance beyond the capability of even high-performance PLCs. Very high-speed or precision controls may also require customized solutions; for example, aircraft flight controls. Single-board computers using semi-customized or fully proprietary hardware may be chosen for very demanding control applications where the high development and maintenance cost can be supported. "Soft PLCs" running on desktop-type computers can interface with industrial I/O hardware while executing programs within a version of commercial operating systems adapted for process control needs.

J. PLC Input and Output devices

The term I/O refers to Input/Output. I/O is information representing the data that is received from sensing devices and the commands that are sent to actuating and indicating devices. The I/O System is the collection of physical elements of the control system that either provide or use I/O data. There are two major types of I/O:

- Digital Device - binary devices which must be in one of only two states: on or off.

- Analog Device - continuous devices – sense and respond to a range of values.

K. Digital I/O

Digital input devices are binary – they may be either on or off, open/closed. Common digital field input devices include pushbuttons, limit switches, and photo eyes. Common digital output devices include relays, motor starters, and solenoid valves.

L. Analog I/O

Analog input devices sense continuous parameters. The information that they provide is given as a continuous range of values, not just an on or off indicator. Common analog inputs are pressure, temperature, speed, etc. Analog output devices respond to a range of output values from the controller. Common analog output signals include motor speed, valve position, air pressure, etc. I/O modules connect "real world" field devices to the controller. They convert the electrical signals used in the field devices into electronic signals that can be used by the control system, and translate real world values to IO table values.

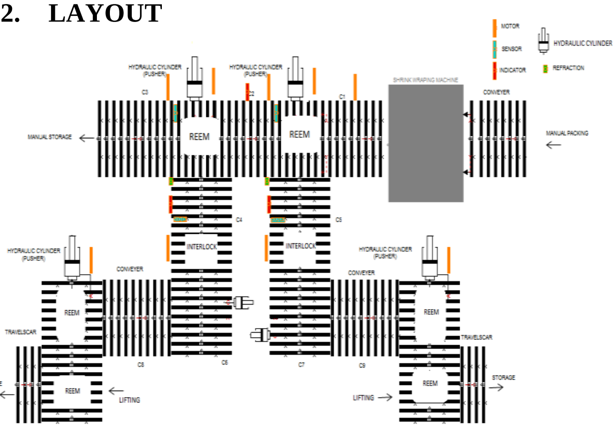
IV. AUTOMATIC REEM HANDLING SYSTEM FOR ASRS (AUTOMATIC STORAGE AND RETREIVAL SYSTEM)

1. INTRODUCTION

TNPL produces sheet bundle which is called Ream can be stored in ASRS (Automatic Storage and Retrieval System) of 7000 tons capacity. Reams which are stored in AS/RS can be retrieved and ready for loading point at any time. AS/RS system process is controlled by PLC (Programmable Logic Controller), using the PLC process can be controlled manually and automatically as well. In TNPL finishing house area, the reams are packed manually by using brown sheet and being sent to the shrink wrapping machine. In which reams are packed by polythene cover. A single ream bundle contains 500 sheets and 4 or 5 reams are sent for eight fans for reams packing operation. From shrink wrapping machine the packed reams are collected and fed in to the AS/RS input conveyor manually.

In our project the system eliminates manual handling and will be controlled by PLC with automation and manual control. By extending the output conveyor from shrink wrapping machine reams are pushed to the next perpendicular conveyor using hydraulic pusher and collected by input conveyor of AS/RS. The system also comprises storage conveyor to control the ream flow during maximum production. This system will produce the time consumption and manual efforts.

2. LAYOUT



3. SHRINKWRAPPINGMACHINE

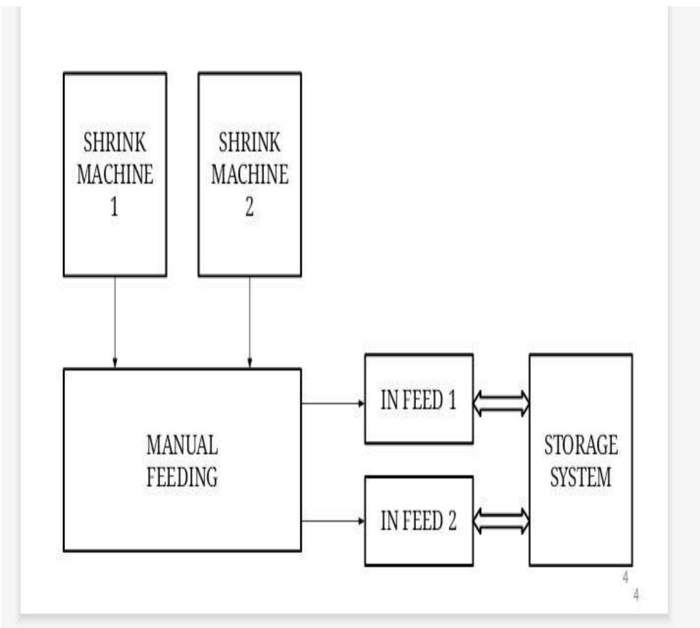
Shrink wrap, also shrink wrap or shrink film, is a material made up of polymer plastic film. When heat is applied, it shrinks tightly over whatever it is covering. Heat can be applied with a hand held heat gun (electric or gas)or the product and film can pass through a heat tunnel on a conveyor.

4. COMPOSITION

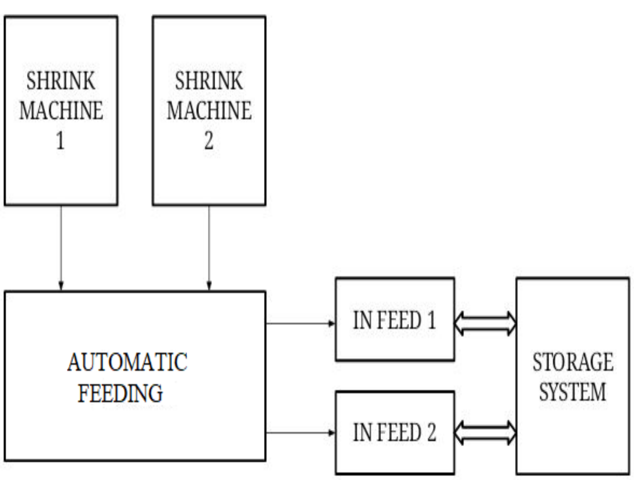
The most commonly used shrink wrap is polyolefin .It is available in a variety of thickness, clarities, strengths and shrink ratios. The two primary films can be either cross linked or non-cross linked. Other shrink films include PVC and several other compositions.

Co extrusions and laminations are available for specific mechanical and barrier properties for shrink wrapping food. For example, five layers might be configuration as EP/EVA/co polyester/EVA/EP, where EP is ethylene –propylene and EVA is ethylene –vinyl acetate copolymer.
A Shrink film can be made to shrink in one direction (unidirectional or mono-directional) or in both directions (bidirectional).

5. BLOCK DIAGRAM OF EXISTING METHODS



6. BLOCK DIAGRAM OF PROPOSED METHOD



7. SEQUENCE OF EVENTS

- Initially assume that all devices are in AUTOMATED view.
- REAMS are being loaded in conveyor.
- The bundle which is called Ream are output of the shrink wrapping machine are collected by the extended conveyor.
- Prescribed load withstanding limit of Ream is say approximately 60- 70Kg.
- When the START is “ON” the Ream which is from the Shrink Wrapping Machine moved to the Extended Conveyor.
- The reams moved are sensed by the “OBJECT SENSOR” and moved to the perpendicular conveyors by the use of HYDRAULIC PUSHER.
- Immediately after reaching the REEM to the respected area it will sense by the sensor and pushed by another HYDRAULIC PUSHER.
- The REAMS pushed by the HYDRAULIC PUSHER are loaded to the pallet which is capable of loading capacity of 3½ tons.
- The REAMS loaded in the pallet are lifted by the “LIFTER” and which are to be taken to the “TRAVELSCAR”.
- The pallet loaded in the TRAVELSCAR are travelled to the Storage Area and stored in the respected area with respect to the BARCODE.
- If the Storage Area is completely full, immediately it will indicate and “ALARM” is “ON” the REEMS are moved to the MANUAL STORAGE.
- The above process is handled by PLC (PROGRAMMABLE LOGIC CIRCUIT) programming language through the AUTOMATION.

EXISTING SYSTEM:

- In the existing system the reams are packed manually by using brown sheet and being sent to the shrink wrapping machine.
- In which the reams are packed by the polythene cover.
- A single ream bundle contains 500 sheets and 4 or 5 reams are sent for eight fans for reams packed operation.
- From shrink wrapping machine, the packed reams are collected and fed into the storage system input conveyor manually.

DRAWBACKS:

- Time consumption is high
- Requires manual efforts
- Leads to the failure of the palletizer conveyor
- Limited storage at a particular time
- Labor cost

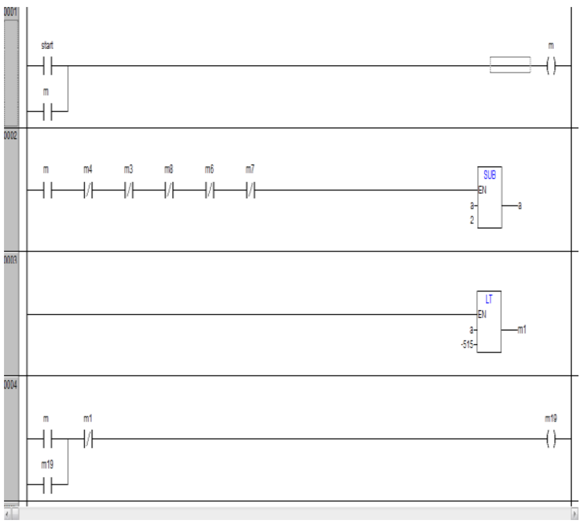
PROPOSED SYSTEM:

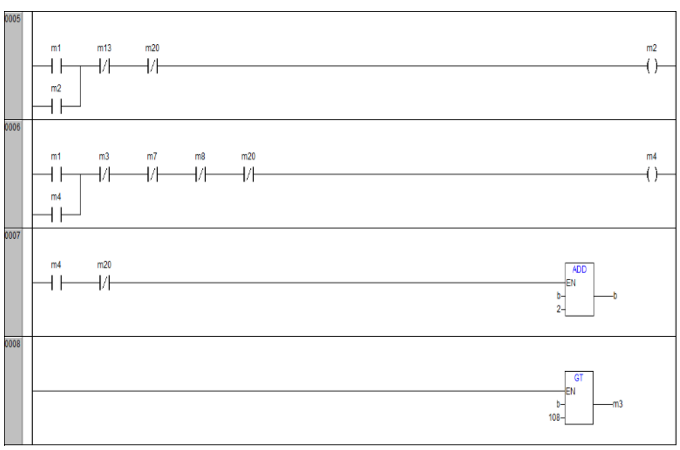
The proposed system will be able to solve the problem of fed the reams to the storage system by the introduction of new conveyors.

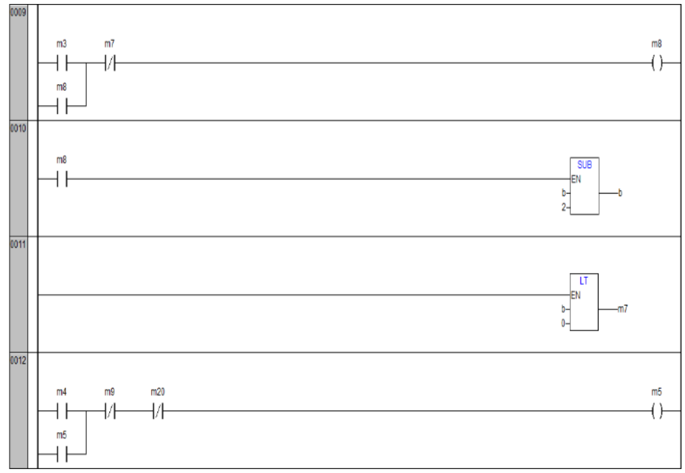
The conveyors are from the shrink machine to the storage system.

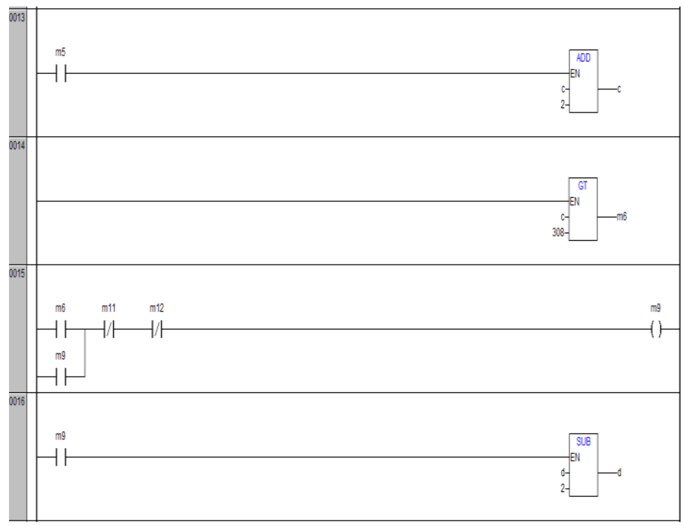
The conveyor consists of different types of sensors and stopper plates to handle the ream flow.

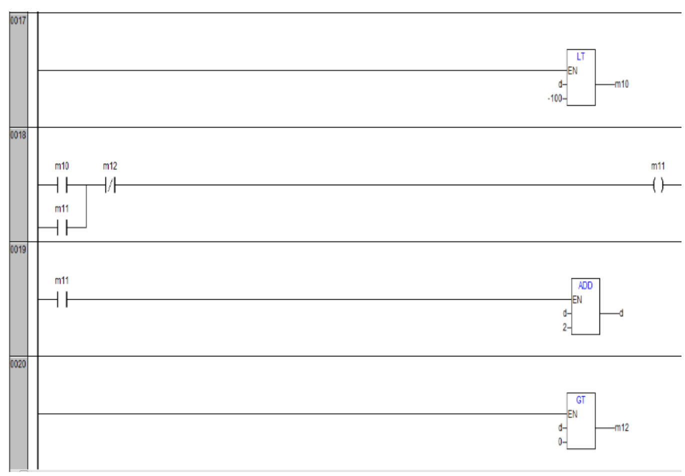
8. LADDERLOGICDIAGRAM









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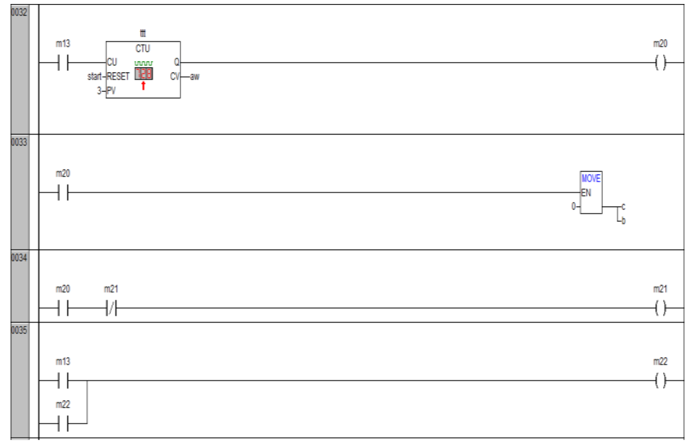
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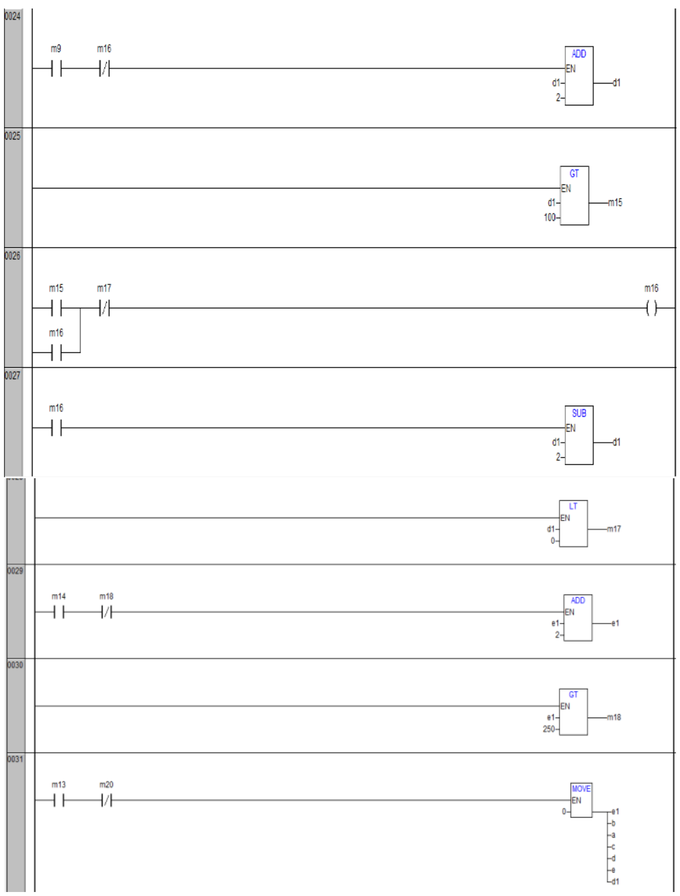
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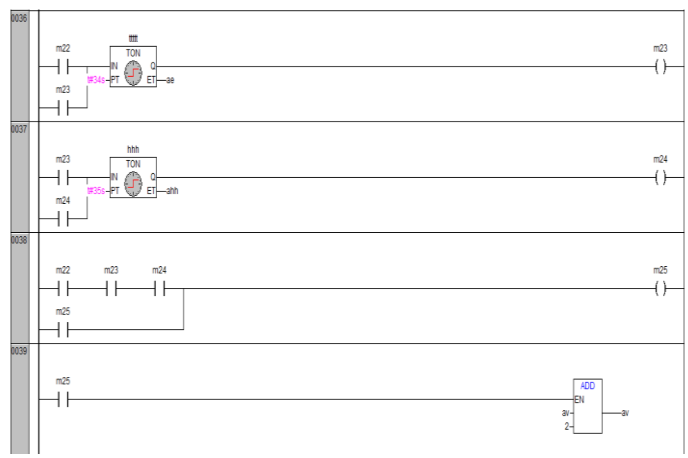
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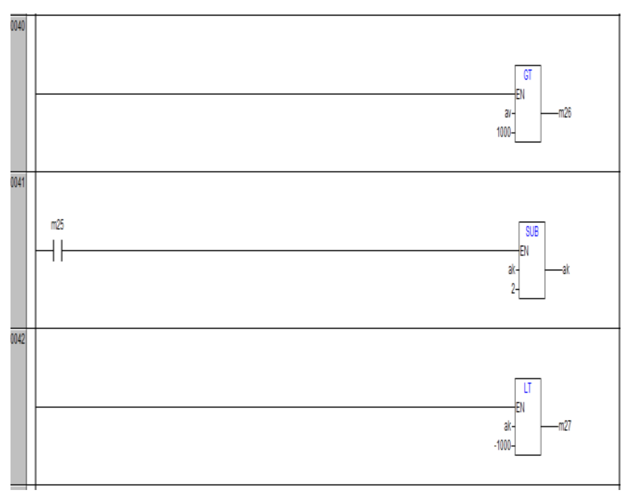
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a. **PROGRAM PLC_PRG**

```
VAR
    start AT %IX62.0: BOOL;
    m AT %MX0.0: BOOL;
    a: INT;
    m1 AT %MX0.1: BOOL;
    m2 AT %MX0.2: BOOL;
    b: INT;
    m3 AT %MX0.3: BOOL;
    m4 AT %MX0.4: BOOL;
    m5 AT %MX0.5: BOOL;
    c: INT;
    m6 AT %MX0.6: BOOL;
    m7 AT %MX0.7: BOOL;
    m8 AT %MX0.8: BOOL;
    m9 AT %MX0.9: BOOL;
    d: INT;
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    m11 AT %MX0.11: BOOL;
    m12 AT %MX0.12: BOOL;
    e: INT;
    m13 AT %MX0.13: BOOL;
    m14 AT %MX0.14: BOOL;
    d1: INT;
    m15 AT %MX0.15: BOOL;
    m16 AT %MX1.0: BOOL;
    m17 AT %MX1.1: BOOL;
    d2: INT;
    m18 AT %MX1.2: BOOL;
    e1: INT;
    m19 AT %MX1.3: BOOL;

    ttt: CTU;
    aw: INT;
    m20 AT %MX1.4: BOOL;
    m21 AT %MX1.5: BOOL;
    m22 AT %MX1.6: BOOL;
    ttttt: TON;
    ae: TIME;
    m23 AT %MX1.7: BOOL;
    hhh: TON;
    ahh: TIME;
    m24 AT %MX1.8: BOOL;
    m25 AT %MX1.9: BOOL;
    av: INT;
    m26 AT %MX1.10: BOOL;
    ak: INT;
    m27 AT %MX1.11: BOOL;
END_VAR
```

I. CONCLUSION

The PLC being an effective tool in automation can automate any process logically along with the usage of I/O. The main advantage in this regard is the retentively. Even if one PLC fails, then another PLC connected in the same network will retake the process without causing any interruption or malfunction. This kind of Cheaper and well efficient design if installed can create a perfect sequence of operation. The main Moto is to provide smooth and precise handling of paper storage. Since everything is automated the storage and retrieval process with quick and more efficient then input to the system requires more consistent. Our project ensures the same. Similarly in case of production expansion the system needs some small changes in program generally in timer circuits. Thus a separate setup is not required such that the existing system itself will be well sufficient to meet maximum production

BASE PAPER

Design and Analysis of Multipurpose Conveyor for Shrink Wrapping Machine

IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684,p-ISSN: 2320-334X, PP 48-54 www.iosrjournals.org International Conference on Emerging Trends in Engineering & Management 48 |Page (ICETEM-2016) **Cherian Johny1 , Rajesh R2 1** PG student, Department. of Mechanical Engineering, SNGCE, Mahatma Gandhi University,India 2 Associate Professor, Departments of Mechanical Engineering, SNGCE, Mahatma Gandhi University, India Conveyor units play an important role in packaging industries for material handling purpose. Different type of conveyors are using for industrial application now-a-days like belt conveyors, screw conveyors, bucket conveyors etc. This paper mainly focus on the design&analysisof a multipurpose conveyor system for shrink wrapping machine which can adjust its length, height used as powered & gravity type. In shrink wrapping machine, packaged goods are sealed in special shrinkable film, and then passed through a steam shrink tunnel. Instantaneously, film encloses the product like a second transparent laminated skin, without any folds. For developing this conveyor system data are collected through market analysis, competitive analysis, and customer need analysis, developed QFD and Product Design Specification. After that a

Concept is generated and decomposed that physically & functionally. The best concept also selected by Pugh's method & finally benchmarked. Engineering Analysis is performed which include developing geometry, Qualitative analysis like DFMA, DFMEA and Quantitative Analysis like Design Calculation, material selection, mechanical element selection and Detail Design considering GD & T & Assembly using CATIA V5. Keywords -Conveyor System, Concept Generation, QFD, DFMEA, CATIA V5.

Design, Analysis and Implementation of a Robotic Arm-The Animator

Md. AnisurRahman1 ,AlimulHaque Khan1 , Dr. Tofayel Ahmed3 , Md. Mohsin Sajjad2 1. Electrical & Electronic Engineering, Bangladesh University (BU). 2. Electrical & Electronic Engineering, Bangladesh University of Engineering & Technology (BUET). 3. Cowater, Canadian International Development Agency (CIDA).A humanoid robotics is a new challenging field. To co-operate with human beings, humanoid robots not only have to feature human like form and structure, but more importantly, they must prepared human like behavior regarding the motion, communication and intelligence. The model number of this beginner is ASR K-250. This paper we consider the mechanism and mechanical structure of ASR K-250 (Beginner) and its implementation.

RESEARCH ON BELT CONVEYOR MONITORING AND CONTROL SYSTEM

S Wang, W Guo, W Wen, R Chen, T Li… - … Conference on Information …, 2010 - Springer
Abstract the design and development objective of the entire belt conveyor control system is
to minimize physical labor, which can make full use of other energy and variety of
information other than manpower operation so as to increase efficiency and reduce
accidents. This paper makes an in-depth analysis of implementation possibilities and
requirements of the ARM-based monitoring of belt conveyor system by using LM3S8962
chip as a research object to design a set of belt conveyor monitoring system.

RESEARCH PAPER ON PLC

W.ZHENG and **J.FANG** ,"**PLC INTRODUCTION,"2012 IEEE** 26th international parallel and distributed processing symposium workshops & PhD forum,shanghai,2012,pp.2347-2348.