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Study and Implementation of Automation of the Production Line for Feeder in the General Organization of Tobacco

Alaa Hmedan [1], Yaarob Badr [2]
Department of Industrial Automation Engineering
University of Tartous
Tartous - Syria

ABSTRACT
The study focused on the study, design and implementation of an automated system for the packaging line, where the traditional packaging mechanism was based on primitive manual packaging, which resulted in slow production, large waste and the need for many working hands and thus irregularity or non-uniformity of the packaging of the product in general. These reasons have resulted in reduced profits and product viability. In this study, a reference was provided that did not exist in an illustrative way to implement a production line that takes into consideration the local conditions and the possibilities available and how to compensate for the shortcomings that are difficult to secure and the methodology used in this case, including simple control and advanced control.

Keywords :—Industrial automation, Packaging, Honey, Automatic control, Production line, PLC.

I. INTRODUCTION

Tobacco is one of the most important economic crops. It is considered the third agricultural crop in the country and it is cultivated in about 60 thousand and it is cultivated, cultivated and manufactured by about 90,000 people. The world produced in 1971 is estimated at more than four and a half tons of raw tobacco In 1985 more than six and a half million and in 1990 about seven and a half million tons [1].

The product is a type of product in the enterprise and suffers from weakness in the packaging mechanism used, depending on the mechanism of manual packaging by workers, which leads to slow process and irregular in packaging and weight of the product and thus reduce profits. Due to the economic conditions and unfair sanctions on the country, it was not possible to import foreign machines ready from outside countries [2]. In order to overcome the problem, a team of technicians was formed in the field of mechanics and electricity to implement the packaging line and based on local expertise. This is a challenge and opens the horizon if it succeeds in implementing other production lines. The subject of the study shall be a reference study for all economic institutions that can be adopted as reference in similar cases. The problems facing the subject are the ability to design the production line of mechanics in the first place to comply with the requirements of electrical control, also the problem of securing the required control devices of sensors, logic programmable devices and engines and their own drive and connect this group to meet the requirements of the line of packaging to be able to The implementation of the required parameters are specific and adjustable and can be operated with the lowest number of workers and with high efficiency and long hours of work [3]. In this research, we will study and implement the packaging line in several stages, starting with the mechanical design process, the mechanism used in the design and the things that have been taken into consideration, and thus reaching a final result in which the packaging line is designed mechanically to meet the production requirements.

And then work on the stage of electrical design, which will be installed electrical controls such as engines, sensors and heaters, and at this stage will be focused on the task of each electrical component in line in addition to the specifications of the addition to the principle of work and mechanism to benefit from it.

The final stage is the automatic control and installation of the automatic control line and controls. The focus will be on the specifications of the controls used, their specifications, how they are connected, and the mechanism of their programming, which allows control of the production line as required and achieving the desired results [4].

II. MECHANICAL DESIGN

A team consisting of some mechanics technicians was formed at the General Organization of Tobacco to follow up the subject of mechanical design of the packaging line. The general shape of the packaging mechanism was determined in several stages [5]:

Mechanically the production line can be divided into several mechanical parts:

- The mechanism of fixing the rollers of the coil of the cellophane roller for packing the product (the pastor)
- The mechanism of forming and forming cellophane as appropriate to contain the product and its suitability for seal and packaging
- Mechanism of tightening cellophane or rollers Cellophane.
- Side sealing mechanism.
- Mechanism for preparing the envelope for sealing.
- Cutting and sealing mechanism.
- Mixing and mixing mechanism of the product.
- Product exit mechanism.

- Mechanism of controlling the weight of the product.

III. ELECTRICAL DESIGN

Four motors are used in the packaging line with different capacities. The engines are all of the type of engine with the squirrel cage. This engine is characterized by its very wide spread in the industrial automation after the advent of modern technologies and advanced in controlling the speed of these engines very accurately and because it is the first low cost and effectiveness. The engine shaft is connected by a serrated shaft to the transmission. It is driven by tensile rollers, sealing rollers and folding rollers. This motor is controlled by an inverter so that its speed changes continuously with the speed of the flow of the product so that the two speeds can be adjusted. The motor is connected by a serrated shaft and a hog for transmission. The shears and the final packaging are moved. This motor is controlled by an inverter so that its speed changes continuously and the product flow rate changes so that the two speeds can be adjusted and waste is avoided. The motor shaft is connected by a three-arm mixer that mixes the product into the mixing funnel. This motor is controlled by an inverter so that its speed changes continuously and the product flow rate changes so that the two speeds can be adjusted and the waste is avoided. The motor shaft is connected by a helical screw that takes a certain amount of the product from the mixing funnel and outputs it to the product exit nozzle so that a certain quantity of the product is cut and cut. This motor is controlled by an inverter so that its speed changes continuously and the speed of the product is changed so that the speed can be adjusted in the product. The motor shaft is connected with several rollers. A conveyor belt moves on its surface. Cut the product that needs to be wrapped out of the exit nozzle by the snail motor [6].

Motors are tools for scraping the viscous materials of the product is installed so that the product does not stick to the product and does not fall on the packing cellophane.

IV. SENSORS

Irrational polarization sensor: Approaching sensors in general have become one of the most important sensors in the field of industrial automation for several reasons, the most important of which is the low cost, high efficiency and multiple forms available. Intrusion Sensitive Sensitivity The principle of its work can be simplified by simulating the metal body a circuit with certain constants associated with mutual induction. The intrusive proximity sensor was used in the packaging line to be carried out after the bags were stamped and removed after the number of times the seal scissors were rotated. A metal spike was installed on the surface of the spindle of the sealing scissors and the intrusive proximity sensor was installed at a distance of 3 mm. In this way we have an output signal from this sensor to the processor we will use later in the control process [7].

Bimetal metal coupling: the simplest form or composition of a temperature sensor that can be used to give an on-off signal when the temperature is reached is a metal double element. Metallic coupling consists of two slices of different metals (such as copper and iron) connected together, the mineral having a different expansion coefficient. Therefore, when the temperature of the metal coupling is increased, its slope is increased so that one of the two metals expands more than the other. The most stretched metal is on the outside side of the bend. When cool the slide occurs the opposite. This movement of the chip can be used to connect or disconnect electrical contacts and therefore at a certain temperature will cause an on-off connection or separation of the current in the circuit. The device is not precise enough but it is used as a temperature regulator called a thermostat (in household appliances such as central heating, irons, heaters and ovens).

RTD heat detector: The electrical resistance of metals or semiconductors changes with temperature. In the case of metals: it uses platinum, nickel or nickel alloys where their resistance changes in a linear way and in a wide range with temperature although the actual variation in resistance to each degree is relatively small. In the case of semiconductors: such as thermistor shows significant changes in resistance but nonlinear. Such reagents can be used as one of the joystick arms of the Whitton and the cantilever output is taken as a measure of temperature Another way is to use a voltage divider circuit where the change in thermistor resistance changes the voltage drop to a resistor The output of the two methods is an analog signal taken as a temperature measure.

Thermal diodes and heat transistors: Diodes and transistors are used as temperature sensors because the rate of positive and negative charges during semiconductor connections is affected by temperature. Integrated circuits combine these heat-sensitive elements with special circuits to give a temperature-related output voltage [8]. The most common integrated circuit is the LM35 which is given an output of 10 mV / C (10 mV for each centigrade) when fed with + 5V. An on-off temperature switch can be made from an analog sensor by connecting the analog output to a voltage comparator which compares it to a specified value. The logic signal 1 is produced when the input voltage of the temperature is equal to or greater than the specified setting value and if not Logic Reference. Integrated circuits such as (LM3911N) combine thermal sensing element with amplifier operations. When connected as a comparator, the output turns whenever the temperature reaches the control point and is directly given an on-off temperature controller.

Thermocouples: This type is common. Thermoforming consists mainly of two asymmetric wires A and B forming a link. When heated, the probe is at a temperature higher than the other joints in the circuit (which is kept at a cool and steady temperature). An electric impulse is generated based on hot link temperature. The output voltage of the thermocouple is small and needs to be amplified before it is connected to the analogue channel input Circuits are also needed to compensate for the temperature of the cold connection because its temperature affects the value of the electric impulse generated by the hot link. Magnification and compensation are also with

filters to reduce the interference effect from the 50 Hz upstream often incorporated into the signal processing unit [9].

Of the major options or types mentioned, we used the type 2 sensor: the RTD sensor because it is relatively inexpensive and easy to install and is available in many forms. For our case, the shape of the sensor is chosen so that its surface is part of a circle perimeter so that it is touching simply to seal the seal and thus measure the actual temperature received by the packing cellophane.

V. INVERTERS

Is an integrated device dedicated to control the engines that operate on the AC, no matter how much the engine is estimated where there are devices starters from half a horse to 120 HP This device is called the reciprocating alternator and it also enriches the ways of starting the movement known as the curtain delta and the ways to start resistors or transformers primary because through this device we were able to control the frequency and voltage.

VI. AUTOMATIC CONTROL

After designing the mechanical part and installing the electrical elements in the packaging line we come to the most important part of how to control these elements to achieve the end. Modern technologies have provided many options in the areas of automatic control and industrial automation from central processing units, independent processing units, drive drivers and digital or analogue controllers.

The competition to build modern industrial machines with high working speeds and huge production capabilities has led to the development of automation in the field of automated manufacturing processes, taking advantage of the qualitative jumps in the world of electronics and the emergence of microprocessors, electronic computers and others. This has contributed to the construction of machines that reduce the burden on the worker, increase the speed and quality of production, reduce the cost of the product to the consumer and increase the profits for the product. It is automatic control in mechanical ways using the rotating camshafts through the use of electric elephants, which became able to control the processes of manufacturing sequentially after the introduction of counters and timers in their systems to form what is called the logic of Rhalihat to the introduction of computers in various forms, which is the most popular programmable logic controllers PLC (Programmable Logic Controller to industrial control area [10].

This method is designed to reduce the burden of electrical and electronic design to a minimum through the possibility of selecting one of the control devices available in the markets and designed very well to include everything you may need control process and commensurate with the industrial atmosphere (from a stable feeder units of digital income or analogue fit All sensors, anti-noise and electrically isolated input and output units).

PLC is a special computer designed for industrial control, easy to install and programming, and it is tough enough to withstand the worst working conditions (vapors, heat, vibration, external interference).

The logical controller was programmed to achieve the desired results. During the programming process, a digital expansion and a similar expansion were added to the device. The digital expansion was used as one input and one output due to the completion of the main inputs and outputs in the device. The analogue expansion has been added to control the speed of the four motors used in a harmonious manner so that the total production speed is increased by pressing the test speed booster and at each pressure the speed increases [11].

When connecting the feed to the operating line, the human interface screen will display the screen. When pressing the power button, either the stapler or the START button on the human interface, the p0000 signal will be activated on the plc input and activated. The memory location is activated in the plc with the address m0000, which is responsible for activating and operating the engine the address is p0040.

When the line is rotated, the cover pulley moves in front of the shear-sensitive sensor. When the front-line signal is received from the pager4-tagged shear sensor, this signal activates the m0017 memory address. With this signal, the p0041 scissors engine is activated and when the front of the scissor spindle is received with the address p0005, this signal activates the m0015 memory address. When this signal is received, the shear engine is deactivated pending another signal from the shear sensitive sensor. A signal from the memory address m0017 also does a piston opening the exit nozzle of the product with the address p0092 and when the front of the front of the pinon nozzle sensor with the address p0082 is through this signal activates the memory address p0040, which, when it sends off the activation signal Bston exit nozzle of the product waiting for another signal Of the shear sensitivity.

VII. CONCLUSIONS

After the completion of the study and implementation of the packaging line in the stages of mechanical design and design, electrical design and choice of control system has been running the line and was prevented from some minor problems, such as the deviation of the material slightly off track, the work of the line with high efficiency and impressive results where the accuracy of packaging is large and close to what would have produced Packaging lines imported from abroad and reached the result that, and with the appropriate investment of local competencies and expertise, it is possible to implement and install large and efficient production lines and also to overcome the unjust sanctions imposed on the country, And when cooperation between the scientific department represented by universities and research graduates and the industrial sector.

The packaging line implemented greatly improved the packaging quality of the product and also improved the product itself because the sealing mechanism was very good and effective and did not allow the influence of the outside or air on the product where it was previously exposed and thus reduce the quality of the product. The production speed was

also very large and reached five times the previous production speed and with greater accuracy and longer working periods. It does not require a large number of workers. Only 3 workers for monitoring and supplying the raw materials.

This production line was the nucleus and focus of management in the General Organization of Tobacco and as a result of its success, several other production lines were studied. As a final result it can be said that the production line was a very important study because it was based on local experiences and local tools and achieved very good results and provided the institution economically at a large level at the long run and this study is a practical reference can be used in other industrial institutions as a practical reference for similar projects. We recommend the researchers to develop this study and to expand it by applying it to similar projects and mentioning the points with which this study differs and how it can be overcome and replaced by adopting the orientation towards the industrial sector for these studies of economic benefit in the Syrian Arab Republic. Between the scientific and academic sectors and the industrial sector, and we recommend that the industrial sector institutions benefit from the research that is applied in the industrial field and to apply it in order to achieve the benefit. Finally, we recommend that you rely on local expertise in the process of Industrial development in general in the Syrian Arab Republic.

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