IJAREEIE

e-ISSN: 2278-8875
p-ISSN: 2320-3765

International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

Volume 10, Issue 4, April 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.122

| e-ISSN: 2278 – 8875, p-ISSN: 2320 – 3765| www.ijareeie.com | Impact Factor: 7.122|

||Volume 10, Issue 4, April 2021||

DOI:10.15662/IJAREEIE.2021.1004045

Performance of Winding Machine in Transmitter and Receiver for PLC Applications

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ABSTRACT: The area of instrumentation has ushered in a modern era of global change. Monitoring the operation using a Programmable Logic Controller is extremely useful. The PLC is the control system's heart in an automatic framework. The use of PLC cuts down on the need for human interference and sorting. The tyre production process is completely automated, reducing the need for manual labour. Several computers are used in the production phase. Bead winding is an effective machine that produces a large number of beads in a single turn. It generates approximately 8000 beads per turn. These beads are extremely significant in the production of tyres. It gives the tyre grip and power. There is a former with a bolt that keeps the scale of the bead constant. Small failures in bead output result in significant financial loss; this mistake is avoided using PLC, and the system is constantly tracked, with wireless connectivity employed in conjunction with the PLC to provide input to the operator. This type of failure occurs in the industry, and in our project, we will address this issue in the bead winding machine. The Bead Winding Machine is described in this article, as well as how the error is removed.

KEYWORDS: PLC, Wireless Communication, Winding Machine and PLC

I. INTRODUCTION

PLCs (programmable logic controllers) are commonly used around the globe, with implementations in nearly every aspect of existence. The demand for fault management systems is increasing in a variety of fields today. PLC implementation meets both of these requirements. The first move in this paper is to use a PLC to control the Bead winding machine, and the second step is to fix the fault that occurred [1]-[5]. This device therefore stops the fault from occurring in the first place. The PLC software controls the Bead Winding machine, and data is transmitted through wireless communication. The data is transmitted via antenna and fed through a loud speaker. The production of tyres is divided into seven phases. Our main emphasis is on the bead winding machine, where we can execute our project using PLC and wireless communication. 8000 beads per second are generated by a bead winding system [6]-[10]. The Bead has a circular appearance and is inserted into the tyre's surface. The scale of the beads varies depending on the tyre. Bead is made up of rubber and carbon, which are combined with wire to create beads. The bead is then fed into the Pre heater portion, which includes 70-80 degree Celsius hot water. The bead is then fed into the cooling section, where it is cooled to 29 degrees Celsius. The bead then passes over the former, where the scale of the bead is held by the bolt in the former. The former spins at a rate of 1000-1500rpm [11]-[12]. The former is driven by a variable frequency drive (VFD).

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II. PROPOSED SYSTEM

There is a possibility that the bolt in the former could loosen due to the constant rotating of the former. If the bolt loosens, the size of the bead can differ, and it may not fit into the casing, and if the operator fails to verify the location of the bolt, it can result in a significant loss, since they manufacture approximately 8000 beads per move, many of which are wasted, as each bead costs more.

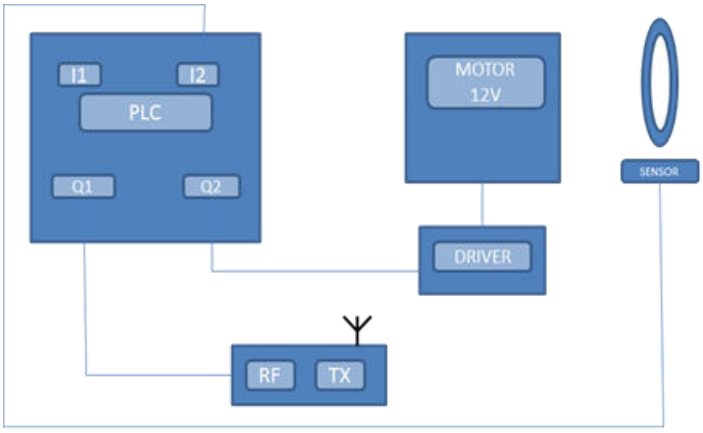

Figure.1. Block diagram consist PLC and RF transmitter.

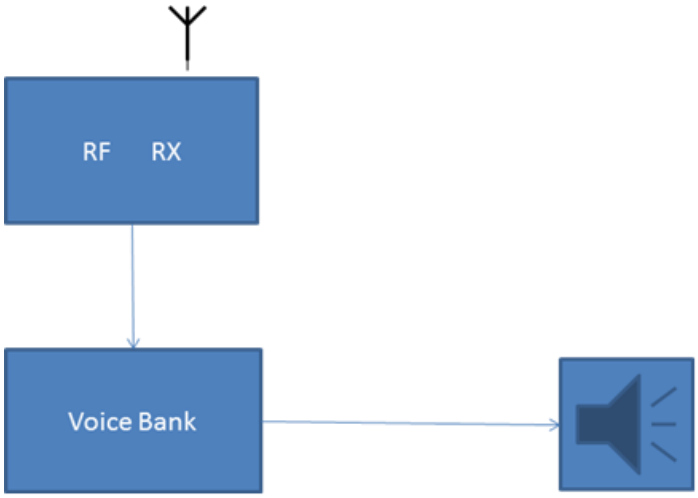

Figure.2. Block diagram consist of RF receiver and voice bank.

SEIMENS is the chosen PLC. SIMATIC S7 Family is the name given to SIEMENS' brands. S7-200, S7-300, and S7-400 are the models. We're using the S7-200 in there's an issue, the voice alarm would go off. Because of its compact scale, the S7-200 is referred to as a micro PLC is shown in figure 2. Elevators, car washes, and other smaller, stand-alone applications will all benefit from the S7-200. More specific industrial applications, such as bottling and packing equipment, may also benefit from it. The software is stored in a portable EEPROM on the S7-200 is shown in figure 1.

In the industry, squirrel cage induction motors with variable frequency drives (VFDs) are becoming increasingly common. This is made possible by advancements in power electronics technologies and the lower cost of VFDs. Variable frequency drive drives the former in the bead winding unit (VFD). VFDs have the following advantages: they do not need a starting current, they transform AC to DC and back to pulsating AC, they may raise or decrease the motor's rpm, they have a high performance at low speeds, and they have a high power factor.

The primary goal of the early warning system is to deter errors from occurring in the first place. PLC is in charge of the majority of the controls. The PLC is programmed with the commands, and it avoids the fault by emitting a voice warning. In a single rotation of the former, it produces three sets of beads, and there is a counter that counts the

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beads, and when the count reaches 200, the voice alarm sounds for a certain time we set, which could be 40-60 seconds, and the operator must check the position of the bolt and reset the counter, otherwise the counter will reset to zero, and if he fails to check or reset the counter, the counter will reset to zero, and if he fails to check or reset the counter, the counter will correct the error in bead output using this early warning device.

A radio frequency transmitter is a system that uses radio waves to relay data. It can communicate in both serial and parallel modes. A part of an RF transmission device must be dedicated to the production of a high-frequency carrier wave, as well as the conversion of information into electrical pulses and their amplification to the desired degree.

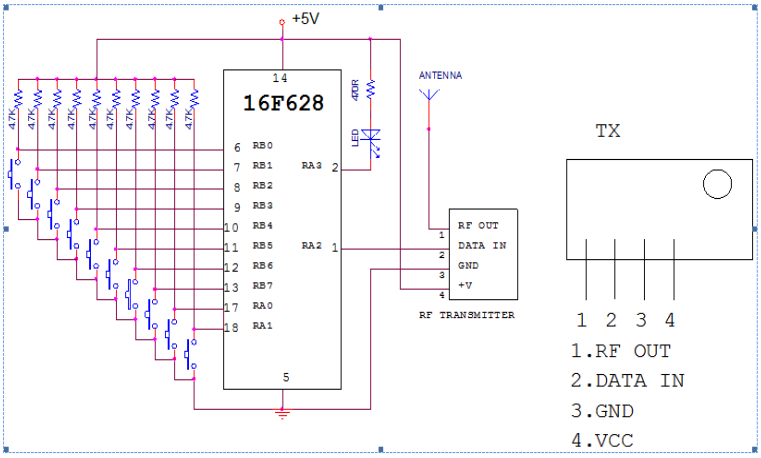

Figure.3. Block diagram of transmitter.

The aim of this circuit is to produce various data formats for various operations and transmit them using a 433.92MHz carrier wave is shown in figure 3. The input from the transmitter is received by the receiver through the antenna. The receiver module has an 8-pin connector. RF optical receiver and decoder circuits are used in the receiver circuit is shown in figure 4.

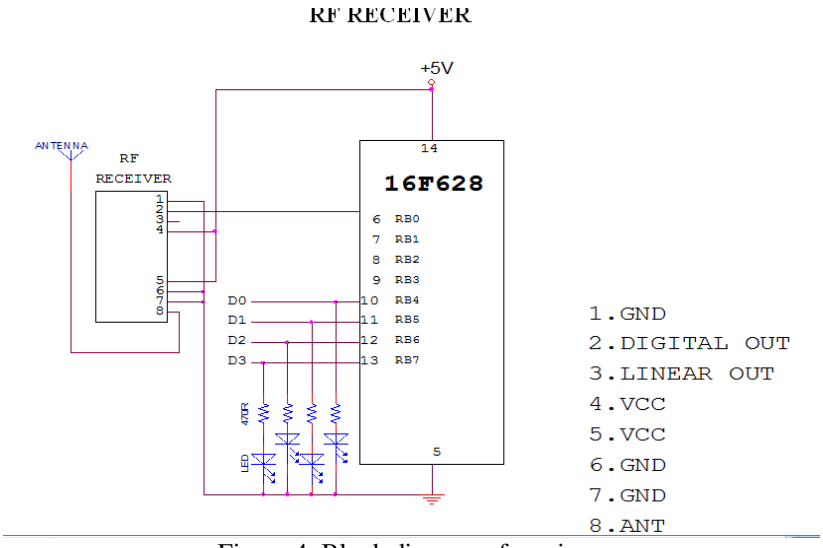

Figure.4. Block diagram of receiver.

It is driven by a controlled power supply of +5V. In the power area, there are 10f and 0.1f capacitors to prevent noise. The PIC 16F628 is an 8-bit microcontroller pack from PIC (peripheral device controller). It has a 2K word application memory, 224 bytes of RAM memory, and 128 bytes of EEPROM memory. Since the PIC16F628 uses

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flash memory, the software can be conveniently rewritten using the PIUC compiler, which is quite handy. It has a programmable IC and 20 pins. Because of its broad availability, low cost, huge user base, limited instruction set to learn, and serial programming, the PIC16F628 is common with most industrial developers. A collection of registers on the PIC serves as general-purpose RAM. STACK is a piece of hardware on the PIC that is used to save the return addresses. The PIC16F628 uses flash memory to enable the PIUC programmer to quickly rewrite the software.

The speech may be captured over a certain amount of time, such as 40-60 seconds. There are several exclusive features in the voice wallet, such as It does not need an external IC, has non-volatile flash memory, is simple to use, user-friendly, and has an automatic power-down function. The pre-recorded messages can be saved everywhere. By choosing the appropriate sound, this can be replayed. The power amplifier circuit receives the IC's output. It amplifies the signal to the appropriate degree in the amplifier circuit. Multiple messages may be accessed sequentially or randomly on the computer. A limit of eight messages can be saved. Portable voice recorders, toys, and a variety of other commercial and industrial uses are also good candidates for the unit. There are a total of 8 input switches (S1-S8). Each message should have its own timer. BUSY is a pin that shows whether or not the IC is operational. The signal is amplified and sent to the speaker through the LM386 amplifier. By attaching a speaker to the SP+ and SP- pins, the sound can be heard.

When the PLC is reset, the system begins automatically thanks to an auto pick switch I1 that is still held in the ON spot. When the input switch I2 is pushed, the motor starts and the clock begins counting the beads automatically. When the user tests the location of the bolt and resets the clock, the voice ceases and the counter resets to the first position. However, in certain situations, if the user fails to reset the counter at 200 counts, the output Q2 (Human Machine Interface) is activated, and the machine stops automatically.

III. PLC SIMULATION RESULTS

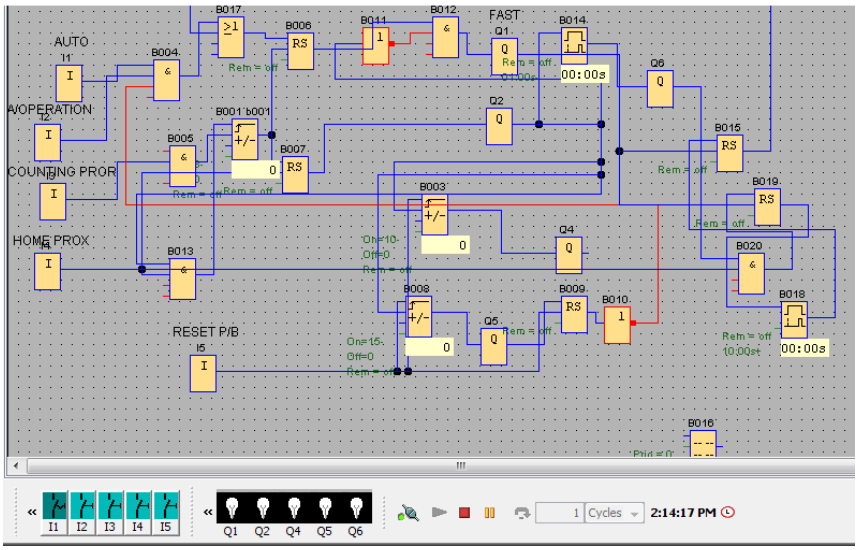

Figure.5. PLC Simulation Output

This PLC software has five inputs (I1, I2, I3, I4, and I5) and five outputs (Q1, Q2, Q3, Q4, and Q5). I1 is the auto pick key, which is held in the ON spot; I2 turns on the motor; I3 is the counting sensor; I4 is the data from the home position sensor to verify the former's right position; and I5 is the reset button, which resets the metre when pushed. Q1 is the output when the former runs hard, Q2 is the output when the former runs sluggish, and Q6 is the output when the bead winding cutting phase occurs. When the counter exceeds 200, the output Q4 is activated, and when the counter is reset, the counter resets. When the counter reaches 250, the output Q4 and Q5 are enabled, and the clock ends at Q5 is shown in Figure 5. The simulation is the first aspect of our mission, and the hardware components are used for the second part.

IV. CONCLUSION

Small errors like this are common in industries, and they may result in significant losses. We may reduce human error and financial loss by using a PLC in a bead winding machine. This facilitates the detection and correction of the

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mistake. In the business, alarms are commonly used to signal when errors exist, and the bead winding system also has an alarm to indicate the pressure value, which sounds when it reaches the fixed stage. These types of warnings are common in all industries, and in our project, we only tried a voice alarm to make it easier for the operator to locate the error that occurred. In the future, the voice warning method would be used in the sector.

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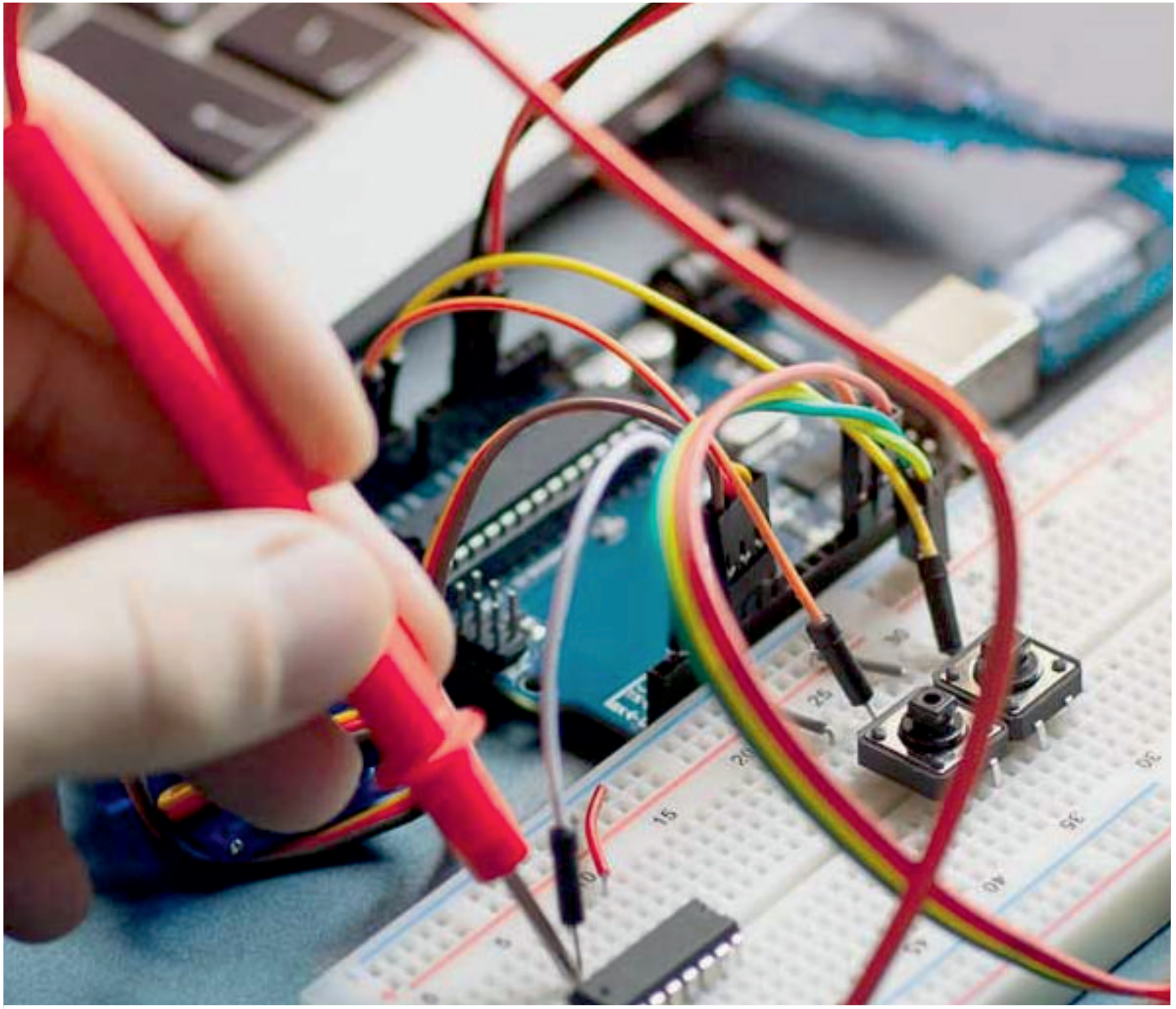

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