Smart Diagnosis of Injection Moulding Machine Using Ultrasonic Sensor and Monitoring Using GSM

D.C.Kumaresan, V.Jayakumar, G.N.Sachin Amressis

Abstract: ***The plastic infusion forming is broadly utilized for the assembling of entangled molded and high esteem included items. The plastic infusion shaping machine is the most vital gear for the business. The improvement of the infusion forming machine significantly influences the use of plastic parts in the fields of hardware, media transmission, and therapeutic treatment and auto enterprises. Lately, the fast improvement of the control method in the infusion forming machine gives conditions to the modern infusion shaping. This paper plans the infusion forming machine control frameworks based controller, the new control framework is sensors and utilizing Arduino. Savvy sensors and actuators present intend to reasonably improve robotization innovation. Infusion shaping machine controlling procedure is hard with hand-off rationale. So Arduino controlling framework utilized for implantation shaping machine. This procedure is superior to the transfer rationale and it gives a viable and simple approach to control the water powered framework.***

Index Terms: ***Injection molding, Paper industry, Manufacturing Industry, Hydraulic Injection Molding Machine, Actuators, Ultrasonic Sensor.***

I. INTRODUCTION

Infusion forming machine control framework is made out of driving framework and electronic controller. GSM based remote innovation intended to address the one of a kind needs of ease, low-control remote sensor. This new control framework can accomplish better execution is powerful, Will diminish vitality utilization of the adjustment framework. The temperature of the machine is about sixty degree Celsius. So that the sensor we used can withstand that much Celsius and can give accurate result with the help of actuators. [1] to [4]

II. EXISTING SYSTEM

A. EXISTING MODEL

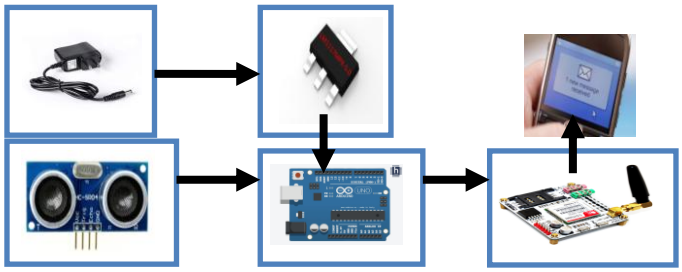
B. WORK FUNCTION

The existing module doesn't use any external mechanism. They use only mankind as a source to gaze the Injection Molding machine. There are thirty seven types of bars are used. Each bars takes different time to operate. So this makes the mankind difficult to gaze. If the machine operates to fail and the mankind failed to gaze means the machine become cool. And it takes more time to start again at operating temperature. [5] to [9]

C. DISADVANTAGES

- Mankind is requiring for observing the working condition of the machine.
- Mankind may make some flaw.
- Machine becomes cool and it takes time to restart.
- It makes delay in the production.
- It makes great loss to the company.

III. PROPOSED BLOCK DIAGRAM



IV. COMPONENT USED

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- **Arduino Uno:**

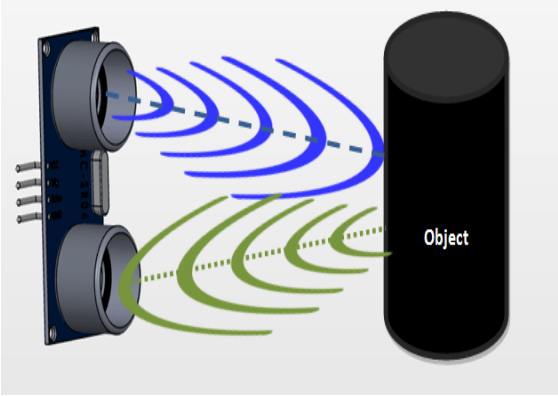
The arduino UNO board is a controller subject to AT MEGA 328. This is fourteen computerized info/yield sticks in which 6 can be utilized as PWM yields, a 16 MHz fired resonator, an ICSP header, a USB association, 6 simple information sources, a power jack and a reset catch.[12]

- **5V EU Cable:**

This connector is high caliber and dependability. It is light and simple to convey while voyaging. The completely directed 110~240V makes that can be utilized around the world. The yield voltage is 5V.The max yield current spans 1A. [13]

- **HC-SR04 Ultrasonic sensor:**

As showed up over the HC-SR04 Ultrasonic (US) sensor is a 4 stick module, whose stick names are Vcc, Trigger, Echo and Ground freely. This sensor is an unmistakable sensor used in various applications where studying assignment or perceiving objects are required. The module has two eyes like exercises in the front which plots the Ultrasonic transmitter and Receiver. The sensor works with the essential collaborator school condition that Partition is equivalent to the result of speed and time The Ultrasonic transmitter transmits a ultrasonic wave, this wave goes in air and when it gets tended to by any material it gets reflected back toward the sensor this reflected wave is seen by the Ultrasonic recipient module as showed up in the picture underneath..[15]



- **SIM900A:**

SIM900A is worked with double band GSM/GPRS motor SIM900A wears out frequency 900 to1800 MHz. SIM900A going with interface, that licenses are accomplice PC comparably as a microcontroller with MAX232. The speed of data transfer is configurable from 9600 to 115200 from AT heading. [10]

It requires a SIM card to be worked and works over a system go bought in by the system administrator. It tends to be associated with a PC through sequential, USB or Bluetooth association. GSM modem is generally desirable over a GSM cell phone. [11]

V. WORKING PRINCIPLE

That the 5V EU cable is used to feed the Arduino board and the regulator is used to regulate the power supply. The Ultrasonic sensor is connected to the Arduino board and the receiver of the Ultrasonic sensor should not receive the signal form the transmitter more than ten minutes. If it receives the signal more than ten minutes means it vigilant the proprietor about the issue in the machine with the help of GSM module.

There are thirty seven different types of bars used for manufacturing. These the kit can be used for all the thirty seven types using actuators and can able to give cent percent accuracy. And the temperature of machine is about sixty degree Celsius. The sensor is placed in the door step of the hydraulic type injection molding machine. [14]

VI. POSITIONER SIZING

- **WEIR TYPE SPOUT BANG:**

positioner size	12	25	50	75	101	130	150
Bang	5/8”	2”	3”	3”	3.1/8”	3.1/2”	4.5/8”

spout size	½	¾	1	1 ¼ & 1 ½	2	2 ½	3	4	6
Bang	¼”	3/8”	½”	13/16”	11/8”	13/8”	15/8”	21/8”	31/8”

- **STRAGHITWAY SPOUT BANG:**

positioner size	12	25	50	75	101	130	150
Bang	5/8”	2”	3”	3”	3.1/8”	3.1/2”	4.5/8”

spout size	1	1 ½	2	2 ½	3	4	6	8	10
Bang	15/16”	1 ¼”	1 7/8”	2	2 5/16”	3 5/16”	4 ¼”	6 ¼”	7 ½”

VII. ABBREVIATIONS AND ACRONYMS

- **PWM :** Pulse Width Modulation
- **ICSP :** In-Circuit Serial Programming
- **MHz :** Megahertz
- **USB :** Universal Serial Bus
- **V :** Volts
- **A :** Ampere

VIII. CONCLUSION

These the kit can able to provide cent percent accuracy even for thirty seven types of bars and even at sixty degree Celsius. So the production rate can be improved. As well as the profit for the company can be improved.

REFERENCES

1. Homin Song ,John S. Popovics ,”Development of an automated contactless ultrasonic scanning measurement system for wavefield imaging of concrete elements” IEEE

International Ultrasonics Symposium (IUS),2017
2. R.Klambauer,A. Bergmann, "A new principle for an ultrasonic flow sensor for harsh environment ", IEEE SENSORS PP 1-3 ,2017.
3. Raquel Ventura ; Xavier Berjaga"Comparison of multivariate analysis techniques in plastic injection moulding process"2015 IEEE 20th Conference on Emerging Technologies & Factory Automation (ETFA),Year: 2015,Page s: 1 – 6.
4. Z. Fan ; R. X. Gao "Acoustic-based wireless data transmission for process monitoring" , IEEE International Instrumentation and Measurement Technology Conference (I2MTC),2013.
5. Alberto Tellaeche "Machine learning algorithms for quality control in plastic molding industry", IEEE 18th Conference on Emerging Technologies & Factory Automation (ETFA) PP; 1 – 4, Year: 2013
6. Jin-wei Chen , Bai-ping Xu " The application of cavity pressure profile in the injection molding process parameters optimization " , 2010 International Conference on Mechanic Automation and Control Engineering , PP 5350-5353, 2010.
7. Zhaoyan Fan ; Robert X. Gao ,"Self-energized acoustic wireless sensor for pressure-temperature measurement in injection molding cavity" sensors, 2009 IEEE,Year: 2009,Page s: 65 - 68
8. N. Costa,B. Ribeiro "A neural prediction model for monitoring and fault diagnosis of a plastic injection mouldingprocess",
9. B. Ribeiro "Support vector machines for quality monitoring in a plastic injection molding process," PP: 401 - 410,2005.
10. Quan-Fang Wang ; Ruxu Du "A DNA algorithm for feature selection in condition monitoring of manufacturing processes",2005 International Symposium on Intelligent Signal Processing and Communication Systems, 2005,Page s: 773 – 776
11. PL.Somasundaram, V.Jayakumar, "Computation of short run marginal cost in open access transmission system" Journal of chemical and Pharmaceutical Science, ISSN: 0974-2115, Special issue1, pp 275 -279, Feb 2017.
12. R Karthikeyan, GN Sachin Amreiss, PV Based Interleaved Boost Converter for Pumping Applications, Internationall Conference on Intelligent and Advanced System, https://doi.org/10.1109/ICIAS.2018.8540613 , Kuala Lumpur, Malaysia
13. Karthikeyan R, Chenthurpandiyan S, Generalized Space Vector PWM Algorithm for Minimizing THD in Hybrid Multilevel Inverters, International Review of Electrical Engineering, 6(5), 2011, 2094 - 2099.
14. Karthikeyan R, Pandian SC, An Efficient Multilevel Inverter System for Reducing THD with space Vector Modulation, International journal of computer applications, 23(2), 2011,0975-8887.
15. Jayakumar V, "Single Phase Fifteen Level Inverter using Seven Switches for Industrial Applications" Journal of Advances in Chemistry, ISSN 2321-807X, Volume 12 Number 21, pp 5355 – 5364, Dec 2016.

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