International Journal of Latest Research in Engineering and Management" (IJLREM)
ISSN: 2456-0766
www.ijlrem.org ⁄⁄ Volume 05 Issue 05 ⁄⁄ May 2021 ⁄⁄ PP 01-04

Implementing effective mechatronics applications towards enhanced productivity in ginning factory

Dr.Ashok G. Matani[1], Chetana Bhagat[2]
[1](Professor- Mechanical Engineering Government College of Engineering, Amravati – 444 604 [M.S.] India)
[2](2nd Year M. Tech. Production Engg Government College of Engineering, Amravati – 444 604 [M.S.] India)

Abstract: In this paper the author proposes a system to improve the productivity of ginning factory with the help of mechatronics concept. In large and growing factories, there is still some work that is carried out by the human beings like keeping record of measurements and moving bales of cotton from pressing unit to measurement & from measurement to storage room. This manual work can be reduced and will result in improving productivity with the help of some electro-mechanical arrangements.
Keywords: Arduino, Conveyer belt, Load cell, Mechatronics, VFD.

1. Introduction

"Ginning, in its strictest sense, refers to the process of separating cotton fibres from the seeds. The cotton gin has its principal function- the conversion of a field crop into a salable commodity. Thus, it is the bridge between cotton production and cotton manufacturing. At one time the sole purpose of cotton gin was to separate fibres from seed. But today's modern cotton gin is required to do much more. To convert mechanically harvested cotton in to a salable product, Gins of today have to dry and clean the cotton, separate the fiber from the seed, further clean the fibres and place the fibres into an acceptable package for commerce. The Cotton Gin actually produces two products with cash value i.e. the fibre and the cotton seed. Cotton seeds are usually sold to cotton oil mills for conversion into a number of important and valuable products, but in some cases they may be saved for planting purpose. The fibres are more valuable products, and the design and operation of cotton gins are usually oriented towards fibre production. In essence, the modern cotton gin enhances the value of the cotton by separating the fibre from seed and by removing objectionable foreign matter, while preserving as nearly as possible the inherent qualities of the fibre."

Thus the ginning has become a very important area to get the edge in the cotton business. Many of the ginning industries are well developed and taking advantages of growing technology.

This paper mainly focuses on improving productivity of ginning and pressing unit in cotton industry, in today's word of robotics, ginning factory is lagging behind to use the tool like robotics arms and electro-mechanical systems for improving production and reducing manual work, as manual work will encourage more and more human error in measuring and keeping records. It is also possible to move an object with the help of electric motor. Proposed system will help ginning and pressing industries to do so.

There, we are going to propose a system that will start measuring the weight of cotton bale as soon as it found the weight on load cell. Once the weight get stable, it will put it in SD card that is attached to the system and will glow the red light to indicate that system has recorded the weight after successful recording of weight, it will start electric motor to move conveyer belt, conveyer belt will move the bale of cotton from measuring point to the storage area.

2. Objectives

2.1 Identifying problems in ginning and pressing cotton industry in keeping records.
2.2 Identifying problems in work delay in shifting cotton bales from measuring point to the storage room.
2.3 Evolve the technique to minimize the error that causes useless hold up in the assembly line.
2.4 Developing a method to keep records in digital manner.

3. Proposed system

Proposed system is mainly divided in to two parts:
3.1 Mechanical implementation
3.2 Electrical implementation

3.1 Mechanical implementation

Mechanical implementation consists of conveyer belt and motor assembly and load cell with weighing system,The conveyor belt system consists of more than two plates (also called drums), with an unlimited central

transmission loop, a moving, rotating belt that creates the effect of the objects it carries. One or more of the pulleys will be enabled to move the belt and the moving objects and the system

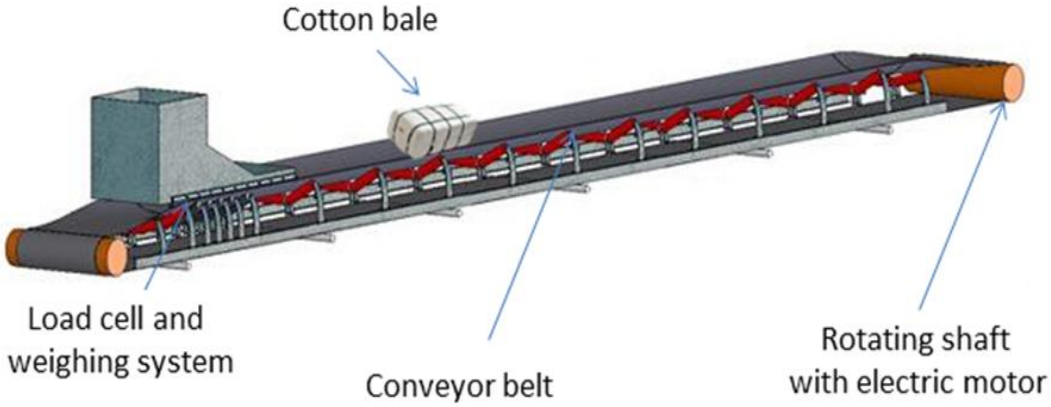


Fig.3.1 Mechanical implementation of System

3.2 Electrical implementation

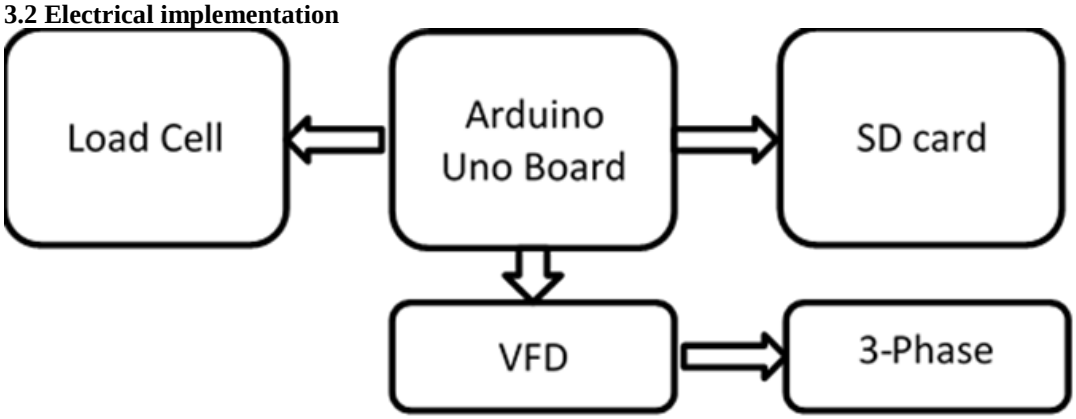


Fig.3.2 Electrical implementation of System

The electrical implementation of system consists of following elements:

Arduino Uno: Arduino UNO is an excellent board to start with electronics and encoding. If this is your first experience thinking about the platform, the UNO is the most powerful board you can start playing with. UNO is the most widely used and written board for the entire Arduino family.

Fig.3.2.a Arduino Uno

Load Cell: A load cell is a power sensor. It converts forces such as tension, congestion, pressure, or torque into a measurable electrical signal and is matched to the use of a signal condition. As the power applied to the load cell increases, the electric signal changes to a straight line.

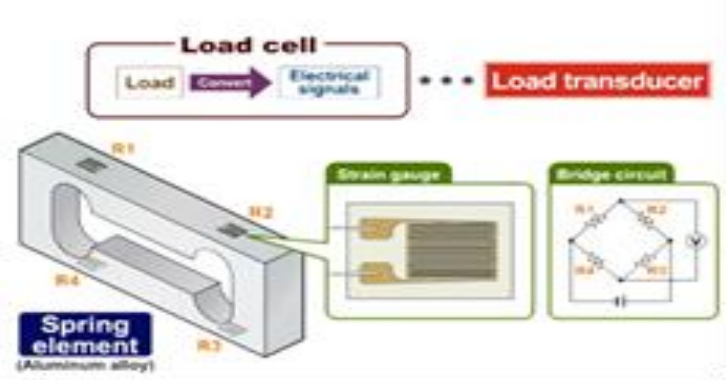


Fig3.2.b Load Cell

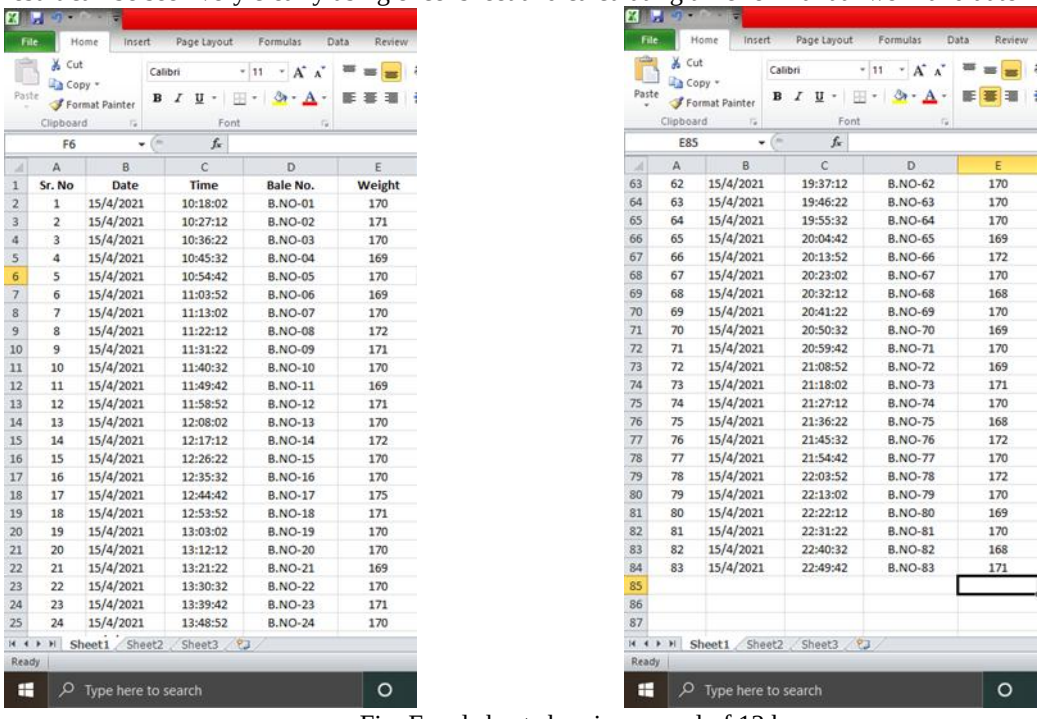
SD card: SD card, short for Secure Digital card, is a type of memory card used to read and write a lot of data on a variety of mobile electronics, cameras, smart devices, and more. SD card can be removed from the SD card model after logging data for a required period of the time and data can be accessed from computer.

VFD: Variable Frequency Drives (VFD) allow for the control of spinning objects so that the speed can be precisely controlled and the detailed acceleration profile of spinning and reversing can be handled at all. In short VFD is a third-phase three-phase AC separator. VFD used for ramping up a motor for smooth startup or to prevent a heavy load from on starup.This is accomplished by adjusting frequency delivered to motor.

3-Phase Motor: Three-phase motors (also classified as motor-phase 3) are widely used in the industry and have become the function of many mechanical and electronic systems because of their simplicity, guaranteed reliability, and long service life. Three-phase motors are a single example of an induction motor type, also known as an asynchronous motor, operating using electromagnetic induction motors.

4. Experiment Results

Result can be seen very clearly using excel sheet and calculating time for manual work and automotive work.



Sr. No	Date	Time	Bale No.	Weight
1	15/4/2021	10:18:02	B.NO-01	170
2	15/4/2021	10:27:12	B.NO-02	171
3	15/4/2021	10:36:22	B.NO-03	170
4	15/4/2021	10:45:32	B.NO-04	169
5	15/4/2021	10:54:42	B.NO-05	170
6	15/4/2021	11:03:52	B.NO-06	169
7	15/4/2021	11:13:02	B.NO-07	170
8	15/4/2021	11:22:12	B.NO-08	172
9	15/4/2021	11:31:22	B.NO-09	171
10	15/4/2021	11:40:32	B.NO-10	170
11	15/4/2021	11:49:42	B.NO-11	169
12	15/4/2021	11:58:52	B.NO-12	171
13	15/4/2021	12:08:02	B.NO-13	170
14	15/4/2021	12:17:12	B.NO-14	172
15	15/4/2021	12:26:22	B.NO-15	170
16	15/4/2021	12:35:32	B.NO-16	170
17	15/4/2021	12:44:42	B.NO-17	175
18	15/4/2021	12:53:52	B.NO-18	171
19	15/4/2021	13:03:02	B.NO-19	170
20	15/4/2021	13:12:12	B.NO-20	170
21	15/4/2021	13:21:22	B.NO-21	169
22	15/4/2021	13:30:32	B.NO-22	170
23	15/4/2021	13:39:42	B.NO-23	171
24	15/4/2021	13:48:52	B.NO-24	170

62	15/4/2021	19:37:12	B.NO-62	170
63	15/4/2021	19:46:22	B.NO-63	170
64	15/4/2021	19:55:32	B.NO-64	170
65	15/4/2021	20:04:42	B.NO-65	169
66	15/4/2021	20:13:52	B.NO-66	172
67	15/4/2021	20:23:02	B.NO-67	170
68	15/4/2021	20:32:12	B.NO-68	168
69	15/4/2021	20:41:22	B.NO-69	170
70	15/4/2021	20:50:32	B.NO-70	169
71	15/4/2021	20:59:42	B.NO-71	170
72	15/4/2021	21:08:52	B.NO-72	169
73	15/4/2021	21:18:02	B.NO-73	171
74	15/4/2021	21:27:12	B.NO-74	170
75	15/4/2021	21:36:22	B.NO-75	168
76	15/4/2021	21:45:32	B.NO-76	172
77	15/4/2021	21:54:42	B.NO-77	170
78	15/4/2021	22:03:52	B.NO-78	172
79	15/4/2021	22:13:02	B.NO-79	170
80	15/4/2021	22:22:12	B.NO-80	169
81	15/4/2021	22:31:22	B.NO-81	170
82	15/4/2021	22:40:32	B.NO-82	168
83	15/4/2021	22:49:42	B.NO-83	171

Fig. Excel sheet showing record of 12 hour

From sheet we can see that ginning can produce 82 bales per 12 hour using automated system that was only 73 bales per 12 hours using manual shifting and writing records on paper.

Production Improvement:
Material: Pure Cotton
Color: White
Purity : 99% purity
Pattern: 3.8 to 4.2micronaire
Length: 28-29mm
Each bales weight: ~170 to 173
Total production in Kg per 12Hr: 13959

5. Conclusions

With the proposed system it is possible to implement the system to prove the productivity using mechatronics concept, previously by using manual work there will be many chances of human reading error as well as its hard to keep the record of measured value. Proposed system use conveyer bet for shifting the cotton bales from one place to another with the help of electric motor that will be another major advantage of reducing man power and improving productivity

References

[1]. P. Bharath et al, "Study of Ginning and Pressing Mill ", International Journal of Emerging Technology and Innovative Engineering Volume I, Issue 4, April 2015 ISSN: 2394 - 6598 www.ijetie.org
[2]. Ashok G. Matani , "Productivity Improvement of Assembly Line of Cotton Ginning Machines , International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 – 8958, Volume-8 Issue-6, August 2019.
[3]. K Dharma Reddy et al," Productivity Improvement By Using Line Balancing And Automation Strategies in order To Improve overall Equipment Effectiveness" , International Journal of Engineering Science Invention (IJESI) ISSN (Online): 2319 – 6734, ISSN (Print): 2319 – 6726 www.ijesi.org ||Volume 7 Issue 1|| January 2018
[4]. Ratnesh Gedam et al," Productivity Improvement through MOST Technique in Assembly Line at Medium Size Manufacturing (MSM)", Imperial Journal of Interdisciplinary Research (IJIR) Vol-3, Issue-7, 2017 ISSN: 2454-1362.
[5]. Dharit Pambhar et al "A Case Study on Productivity Improvement of Assembly line using VSM Methodology", International Conference on Ideas, Impact and Innovation in Mechanical Engineering, Volume: 5 Issue: 6 (ICIIIME 2017)
[6]. Shamuvel V. Pandit et al, " Productivity Improvement by Application of Line Balancing", International Journal of Innovative Research in Science, Engineering and Technology (An ISO 3297: 2007 Certified Organization) Vol. 3, Issue 4, April 2014
[7]. Swapnil T. Firake et al, "Productivity Improvement Of Automotive Assembly Line Through Line Balancing", International Journal of Technical Research and Applications e-ISSN: 2320-8163, Volume 2, Issue 3 (May-June 2014), PP. 124-128
[8]. Nikhil Verma et al, "Productivity Improvement in Assembly Line of an Automobile Industry", IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 12, Issue 4 Ver. III (Jul. - Aug. 2015), PP 01-06 www.iosrjournals.org
[9]. G. K. Dhongade et al, "Performance Improvement of Cotton Processing Industry by using Taguchi Doe", IJSTE - International Journal of Science Technology & Engineering | Volume 2 | Issue 09 | March 2016.