GUJARAT TECHNOLOGICAL UNIVERSITY

DESIGN AND DEVELOPMENT OF AUTOMATIC WEIGHING & COUNTING MACHINE FOR BILLING

IDP Report

Submitted by

Team ID: 26420

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fulfilment for the award of the degree of

BACHELOR OF ENGINEERING

in

Mechatronics Engineering Department

2017-18

In Association with

Hem Marketing Services

Makarpura, Vadodara, Gujarat

G H PATEL COLLEGE OF ENGINEERING & TECHNOLOGY BAKROL ROAD, VALLABH VIDYANAGAR – 388 120

HEM Marketing Services
Manufacturer of : MATERIAL HANDLING EQUIPMENT
749/5, G.I.D.C., MAKARPURA, VADODARA - 390 010.
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HEM/GCET/CER/2018-19/004
Date : 10.05.2018

CERTIFICATE

This is to certify that **Ms. Saloni Shah, Mr. Parin Shah, Mr. Mrugaksh Trivedi** Students of **8th Semester** having the Discipline **B.E. (Mechatronics)** from the **G. H. Patel College of Engineering & Technology** they have been working on the project named ***Design and Development of Automatic Weighing & Counting machine for Billing,*** as part of their IDP (Industrial Development Project) being the subject of their course of study in 4th year i.e. 7th & 8th Semester.

We found them sincere and dedicated towards their work.

They have also completed their project within a time frame allotted to them. The details of the project is as under:

Name of the Organization	:	**Hem Marketing Services**
Name of the Project	:	*Design and Development of the Automatic Weighing & counting machine for Billing*
Duration of the project	:	*During 7th & 8th semester*

	Name of the Students' undergone project work	***enrollment nos.***
1.	***Ms. Saloni Digishbabu Shah***	*140110120052*
2.	***Mr. Parin Kaushik Shah***	*140110120051*
3.	***Mr. Mrugaksh Trivedi***	*140110120058*

We wish them all the very best for their study and future endeavor.

Mr. Hitesh Desai
For, **HEM Marketing Services**

HEM MARKETING SERVICES BARODA

CERTIFICATE

Date: 09/05/2018

This is to certify that the dissertation entitled "**DESIGN AND DEVELOPMENT OF AUTOMATIC WEIGHING & COUNTING MACHINE FOR BILLING"** has been carried out by:

Parin Shah (140110120051)

Saloni Shah (140110120052)

Mrugaksha Trivedi (140110120058)

under my guidance in fulfilment for the degree of Bachelor of Engineering in Mechatronics (8th Semester) of Gujarat Technological University, Ahmedabad during the academic year 2017-18.

Dr Anand Y. Joshi Professor, GCET	Bhavik Ardeshana Ass. Professor, GCET	Mr Hitesh Desai Partner, Hem Marketing Services.

ACKNOWLEDGEMENT

We have taken much efforts in this project. However, it wouldn't have been possible without the support and help of many individuals and organizations. We would like to extend our gratitude to all of them.

With immense pleasure we express our deep and sincere gratitude, regards and thanks to our project guides Dr. Anand Joshi and Prof. Bhavik Ardeshana for their excellent guidance, invaluable suggestions and continuous encouragement at all the stages of our project work. Their knowledge and thought process to problem solving have been of great value to us. As a guide they have had a great influence on us, both as a person and as a professional.

We wish to express our warm and sincere thanks to Dr. Sanket Bhavsar (Head of Department of Mechatronics Engineering, GCET) and Mr. Hitesh Desai Partner, HEM MARKETING SERVICES for their support and the facilities provided by them in their esteemed organizations.

At last, we cannot forget our family members supporting us spiritually and emotionally throughout our college and our friends without whom the dissertation wouldn't have been this majestic.

ABSTRACT

The primary objective is to design and manufacture a machine to perform the task of automatically weigh and count which would give us an idea about the size of the commodity that is to be used; this data is then going to be used for billing purpose under different criteria's as set by the organization or the government for the prices respective to the quality of the commodity supplied.

The machine would do this quickly without much of the errors and would automatically consider the samples of 2kgs which would be weighed and counted simultaneously; then the further allotment of prices would be done as per the system data acquired or set for them.

Work Plan

Team ID: 26420

Semester 7						
Activity \ **Month**	**July**	**August**	**September**	**October**	**November**	**December**
Problem Identification	✓					
Literature Survey	✓	✓				
Preliminary Design		✓	✓	✓		
Components/ Mechanisms Identification			✓	✓		
Report Writing			✓			
Presentation						✓

Semester 8						
Month **Activities**	**December**	**January**	**February**	**March**	**April**	**May**
Components' procurement	✓	✓				
Manufacturing		✓	✓			
Manufacturing and PLC selection			✓	✓		
PLC programming and Panel wiring			✓	✓		
Final assembly and Testing					✓	✓
Report Writing and Presentation						✓

Problem Summary

- In India, 60% of the economy is based on the Agricultural Sector and there is so much manipulation and interference in making bills for the commodities that the farmers have harvested.
- Here we are trying to develop a machine to generate proper revenue to the farmers as per the quality and weight as the primary parameters for giving them the equivalent price.
- Currently, this whole system is manual and being done under no supervision, so there is so much manipulation in every possible manner. This machine which we have developed will to help remove this problem.
- Also, there is large variation in size among the same agro-products coming from the different geographical locations. So time consumption will be more manually but the machine can handle the things with greater ease and perfection.

TABLE OF CONTENTS

1. INTRODUCTION

1.1 HISTORY OF AGRICULTURE IN INDIA:

- The history of agriculture in India dates back to the Rigveda. Today, India ranks second worldwide in the field of agriculture.
- Agriculture and allied sectors like forestry and fisheries accounted for 17.32% of the GDP (Gross Domestic Product) in 2017-18, about 50% of the total workforce.

1.2 INTRODUCTION ABOUT FOOD BILLING:

- Food billing involves the inspection, assessment, weight and count of various food regarding quality, freshness, shape, size and market value.
- In India food billing mostly done manually, by which food is assessed.
- Machines are also used for counting or weighing of food commodities and it involves sampling of products.
- Food billing for this particular machine is based on data acquired from the counting machine and the lot size of the item the farmer has brought.
- Depending on the count there are margins set such as 100-110 or 110-115 depending on the precision set and accordingly the count the system is going to consider the data and then generate the invoice.
- The weighing of the whole lot with the count of the commodity is going to decide the price of the whole lot that the farmer has brought for selling.
- This system would reduce the manipulative errors of the conventional practices and would give fair prices to the farmers.

1.3 Brief Project Description:

- Firstly, the farmers will bring their lot for selling (in tons) which is weighed under the continuous weighing component with the help of load cells and that data of weight is fed as the first parameter for billing; that is the lot weight.
- Here the weight of bags is also calculated. So for better precision that should be subtracted from total weight, which will be done by PLC algorithm.
- Then the sample as per the lot size is drawn at random from the whole lot and it is counted in the jantri machine; this data would be the second parameter for billing.
- Lastly, as per the sample report, the rate calculations are done according to norms set by the government or the agency dealing with the distribution of the commodity. Afterwards an invoice of the bill will be generated.
- Here the sampling is done at random, so no manipulation of any manner affects the overall billing record; and the precision of the lot size is met, as the whole lot is weighed and considered.
- Automatic billing would reduce discrimination and bias based problems which earlier existed and would provide the optimum price to the farmers as per the lot that they have brought.

2. LITERATURE REVIEW

2.1 FOOD COUNTING:

Counting is carried out on the basis of passing component through photo-cell sensor. As the single commodity passes through it, the count automatically increased by 1.

As the fruits or vegetables are coming from the hopper to panel, they arrange in the two rows. The panel guides the commodities to photo-cell sensor. Photo-cell is placed at the end of panel, as the commodities reach to the end, the photo-cell detects the single quantity, which causes the automatic increase in the count by one. When the all quantity passed though it the counter display will show the final quant of the specific quantity.

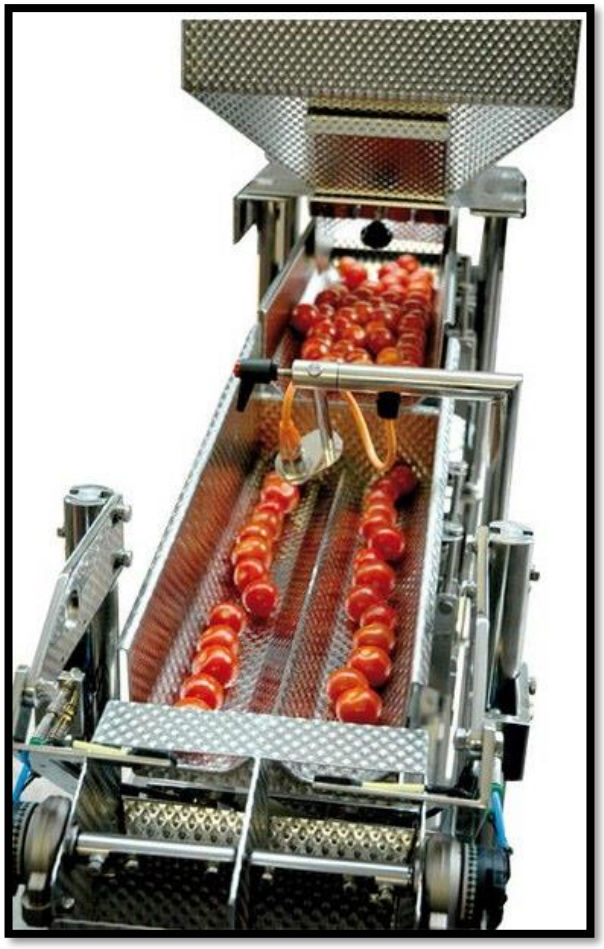

Fig. 1 Counting Machine

2.2 FOOD WEIGHING:

Automatic weighing plays an important part in many fields of applications: Raw materials are handled in trading centres using automatic belt weighers, Large quantities of commodities and or hopper weighers, smaller quantities of commodities being meant for end users are automatically filled and weighed by gravimetric filling instruments, by catchweighers or checkweighers. Commodities transported on AGVs or in ASRS system or by rail are often weighed automatically by in-motion road vehicle weighing instruments or automatic railweighbridges, respectively. New research and measurement method are especially observed in the field of waste disposal, weighing of container wagons in cross-border traffic, shovel dozers for weighing building materials, and automation of processes in the food and non-food industry. It is necessary to have automatic weighing and on international efforts towards uniformity of specifications and test procedures for automatic weighing machine.

The measuring principle is same as a non-automatic weighing instrument except for the automatic loading and unloading of the load receptor. A catchweigher is an automatic weighing instrument. Catchweighers in the narrower sense are: weigh price labellers, hopper weighers, postal and rate indicating scales, shovel dozers and refuse vehicles with on-board weighing systems.

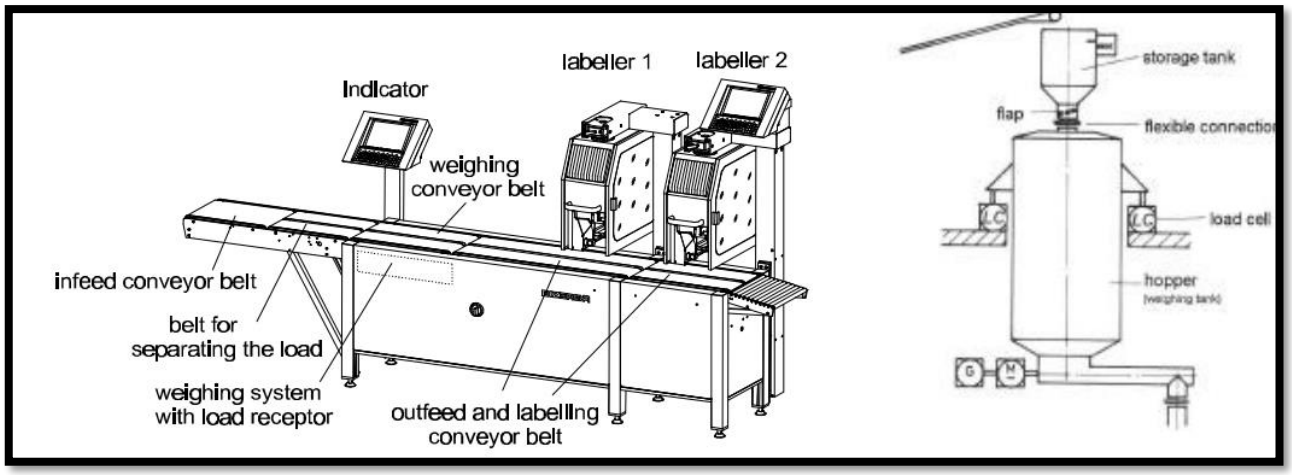

Fig. 2 Typical set-up of a weigh price labeller & Principal of a hopper weigher

Hopper weighers or hopper scales have a load receptor in the form of a tank or a hopper to take in bulk material or liquid to be weighed, as shown in Fig. 2.2.1. The most important usage of hopper scales is the precise production of batches by weighing the components to be mixed, building material scales like weigh components for example cement/mortar, in food industry.

2.3 RESEARCH PAPERS

2.3.1 Research paper 1

Automatic Seed Counting System:

The mechanism used in the Automatic Seed Counting machine was quite simple consisting of a basic hopper through which seeds were going to get segregated and then with the help of the photo cell the counting was going to be done.

A photodiode is used as the sensing device that permits seeds of specific sides to be resolved as separate pulses. The construction is also quite simple consisting of regular controller, a 16*2 LCD display, photo diode, photo cell, conveyer system and also different support mechanisms which leads to the further development.

A servo motor is used for better performance and IR sensor for checking the feed of the seeds. The controller Arduino Atmega 328 was enough or counting and sensing purposes at low power.

Overall the development techniques that they used is what was unique and the way they utilized each and every source how so ever small in the best efficient manner possible is what was so fascinating about the overall system.

2.3.2 Research Paper 2

Design and Implementation of High Precision Advanced Weighing Machine with TFT Panel

A digital weighing scale widely uses a load cell to measure weight. It converts pressure into appropriate voltage levels. This voltage level filtered and converted into digital data using 24-bit sigma-delta Analog to digital convertors and processed by embedded hardware with specific microprocessor or microcontroller along with variety of applications controlled with embedded hardware.

The whole system was very systematically designed with each of the components chosen to perfection with their optimum parameters set to give the best results at the minimum rate. The way it was explained in depth about the techniques that they've used to all the detailed descriptions of the smallest of the components is properly stated. The thought process towards maximizing the utilization of the components and in making the system error free by using combinations of load cells in a unique orientation also helped in understanding new and advanced way of data capturing and using.

3. DATA COLLECTION OF AGRICULTURAL COMMODITIES

3.1 DATA COLLECTION SHEET OF VEGETABLES AND FRUITS

We have gather some data about size variation between the same agricultural products from some vegetables marketplaces, Agriculture Product Market Committee (APMC-Vadodara) and various storerooms.

Tomato			
Sr. no.	length	width	Height
1	46	44	39
2	44	42	42
3	45	42	41
4	37	30	31
5	30	28	34
6	70	48	48
7	44	33	30
8	69	52	52
9	71	51	50
10	72	52	55

Chikoo		
Sr no.	length	diameter
1	50	50
2	44	40
3	48	44
4	60	57
5	38	35
6	30	28
7	40	38
8	59	56
9	44	41
10	70	68

Orange		
Sr no.	length	diameter
1	63	54
2	45	36
3	70	80
4	69	54
5	45	51
6	58	60
7	66	62
8	75	81
9	60	49
10	50	45

Apple		
Sr no.	length	diameter
1	40	45
2	44	35
3	43	30
4	54	45
5	58	50
6	63	55
7	74	60
8	36	30
9	68	55
10	45	40

Chikoo		
Sr no.	length	diameter
1	50	50
2	44	34
3	48	28
4	60	54
5	38	28
6	30	25
7	40	38
8	59	45
9	44	30
10	54	25

Lemon		
Sr no.	length	diameter
1	31	37
2	37	39
3	40	35
4	44	36
5	28	28
6	32	30
7	31	32
8	51	41
9	42	41
10	54	47

Ladyfinger		
Sr no.	length	Diameter
1	129	18
2	122	19
3	141	11
4	164	11
5	60	13
6	68	12
7	42	13
8	59	12
9	72	12
10	141	11

Onion		
Sr no.	length	diameter
1	60	75
2	42	31
3	42	40
4	51	47
5	60	78
6	54	59
7	58	59
8	56	63
9	47	35
10	65	76

Beat		
Sr no.	length	width
1	45	43
2	77	54
3	57	58
4	69	77
5	75	91
6	81	84
7	76	85
8	72	54
9	44	38
10	72	89

4. CAD MODEL

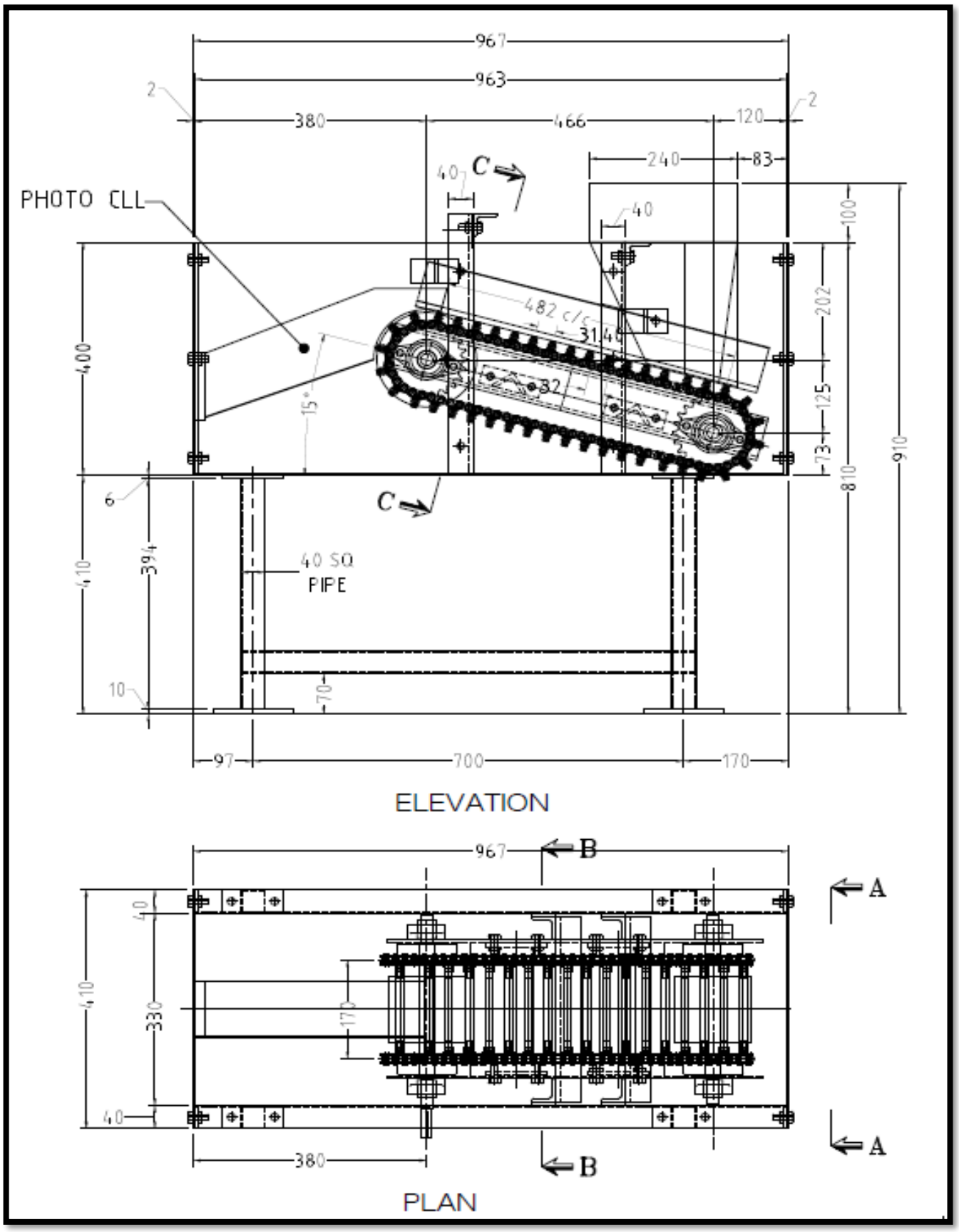

Figure 3 : CAD Model

4.1 Block Diagram

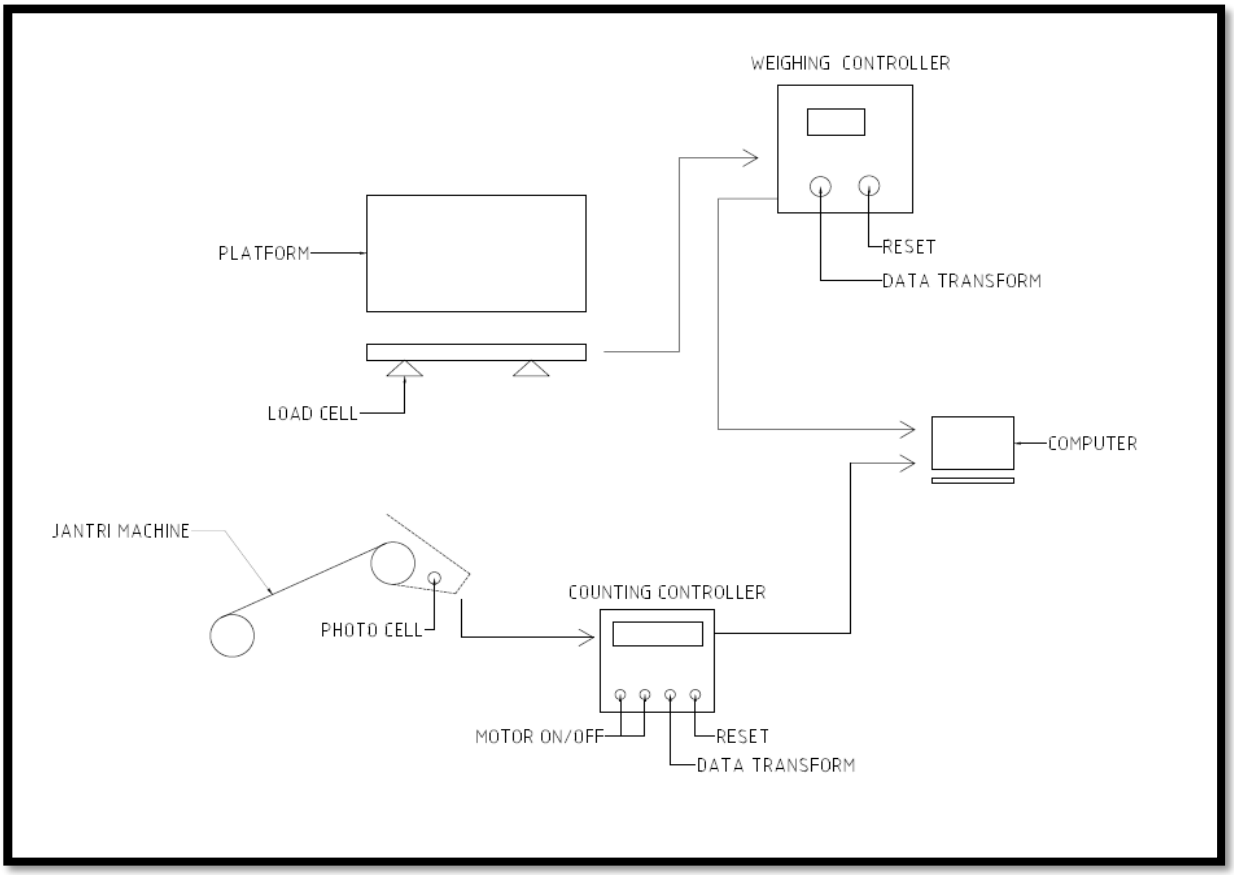

Figure 4 : Block Diagram

- Firstly, the farmers will bring their lot for selling in bulk which is going to get weighed under the continuous weighing component with the help of load cells and that data of weight is fed as the first parameter for billing; that is the lot weight.
- Here the weight of bags is also calculated; so for more precision that should be subtracted from total weight, which will be done by PLC algorithm.
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- Here the sampling is done at random, so no manipulation of any manner affects the overall billing record, and the precision of the lot size is met, as the whole lot is weighed and considered.
- Automatic billing would reduce discrimination and bias based problems which earlier existed and would provide the optimum price to the farmers as per the lot that they have brought.

5. SELECTION PROCEDURE

- **Motor Selection:**

Calculation:

Teeth	Chickoo
4	1
24	?

=6 chikoo/revolution

The speed set for 60 chikoo's per minute is 10 rpm.

FOS = 1.5

Thus rpm = 1.5*10 = 15 rpm

The motor rpm is 1440
So we design a gear drive to reduce the rpm to 15

Designing of gear drive.
1440/15 = 96

Thus, the reduction required is 1:96.
The market gear box is of the ratio 1:50.

1440/50 = 28.8 rpm.
Required rpm = 15

Thus 28.8/15 = 1.92 is the setting parameter.

By the different combinations and availability of the gear drive, we selected 27T for machine shaft and 14T for gear shaft.

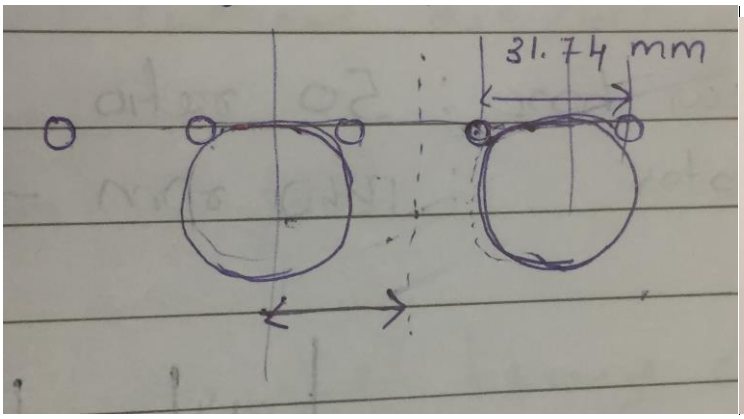
Hence gear box ratio =50
Motor is of 1440 rpm & 0.5HP

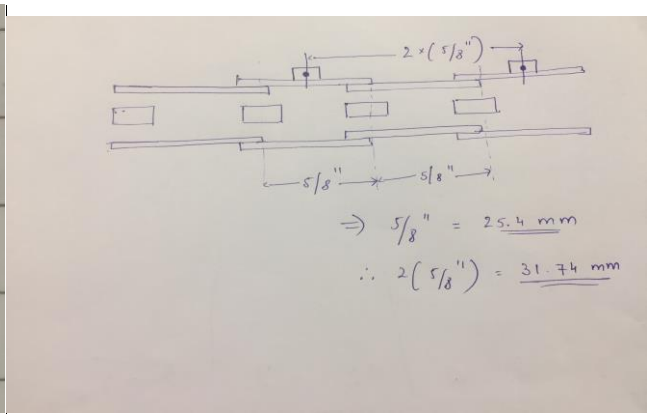
- **Chain Selection:**

Length of Chain = (2* Centre to Centre distance of sprocket) + (chain wrapped on one sprocket)
=2*482 + 15.87*24
=1344.88mm

Total no of links = 1344.88/15.87
=84.74
=85(approx.)
Therefore, chain length = 85*15.87
= 1348.95mm
Total length of chain required = 2*1348.95
= 2697.9mm
Total no of rods = 1348.95/31.74
= 42.5
=43(approx.)
Hence considerable length of chain = 43*31.74
= 1364.82mm

Therefore, total chain required = 2*1364.82
= 2729.64mm



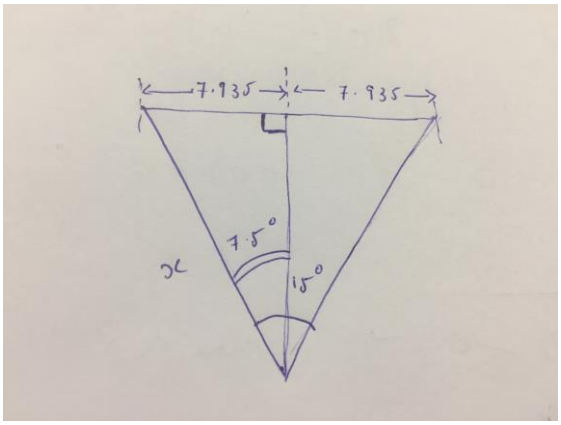


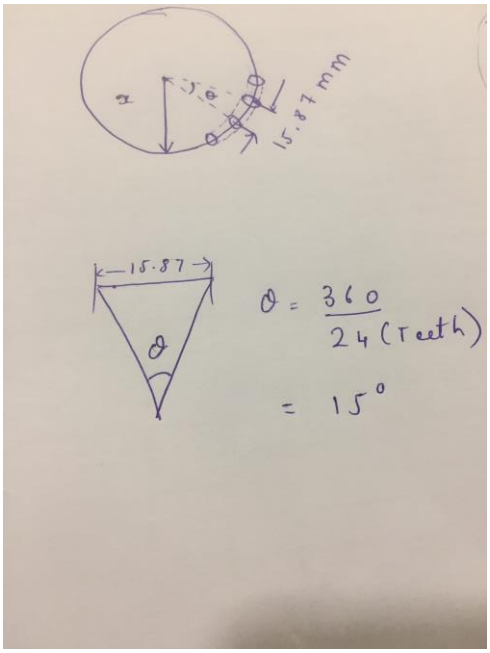
- **Bearing Selection:**

The bearing we selected is self-aligning to compensate the misalignment between the motor and pulley shaft.

- **Sprocket Selection:**

to find Pitch circle diameter:
sin7.5 = 7.935/x
radius x=60.8mm
Hence, PCD= 2*60.8 =121.6mm
This shows the distance from centre roller of chain of one side to opposite side.





- **Load-cell Selection:**

According to the requirement we've acquired the load cell of ADI with the range of 100kgs.

Type- Shearing beam
Model No- 60710
Made by- ADI
Load Cell Transmitter (0-50 Kg)
Convert Signal (2.4mV per volt)

- **PHOTO CELL:**

Type - PNP NO
Made by - Creative Electronics

Sensing Distance- 500 mm (Max)
It has one Transmitter and Receiver
input 24v DC

- **PLC Selection:**

The PLC we've selected is **PM554-TP-ETH** depending on the following parameters:

1. Number of on-board I/Os.

   On board digital input/outputs – 8 and 6 respectively

   On board analog input/outputs – N/A

2. Supply voltage - 24V DC
3. Program memory - 128kb
4. Resolution – on the basis of bit memory: 2^12
5. Scanning time- reduce up to 1ms.
6. Serial communication - 2 ports
7. Ethernet communication – 1 ports

6. MANUFACTURING PROCEDURE

- **Procurement:**

1. Side Frame
2. Clamp: Rectangular, L-shape
3. Channel
4. Rods
5. Sprocket
6. Chain
7. Pulleys
8. Motor
9. Gear box
10. Supports

- After procuring all the required raw materials we started the manufacturing process by cutting aluminium rod (in 43 pieces), pipe, channels, side frame, clamp, shaft into required dimensions with the help of Hex-Saw machine.
- Then on lathe machine we perform slotting operation on the rod pieces; and we also performed slotting on the pulley shaft.
- We performed Slotting of keyways on pulley shaft and sprocket using milling machine.
- With the help of Vertical Drilling machine, we drilled the holes of required diameters on side frame and rod pieces.
- Pulley was manufactured by gas welding and was connected to the shaft.
- Arc welding was used to join outer body and supporting frame of the machine.

MANUFACTURING AND ASSEMBLY OF JANTRI MACHINE

- Frist of all we started with main body of the machine which includes cutting and bending of the supporting structures i.e angle and base, joined with the side plate of the main body.
- Head and Tail Pulley were cut and fabricated using the welding machine. The outlet and inlet of the frames were fabricated by means of skirt-plane fabrication after which the inlet hopper was attached. This completes the outer frame and pulley assembly.
- Bolting of Aluminium rods and fitting them on the chain before attaching it in the main assembly.
- Now the holes are drilled in the outer frame to support the sprockets. As they are set at required angle the chain is mounted on them at an angle of 15 degrees and the material handling part is then assembled.
- Now to supply power, the driver mountings are attached i.e the gear drive and the motor. The gear box is attached to one of the sprocket through shaft to transfer the motion to the chain drive.
- Frame for the load cell mounting was manufactured by metal fabrication processes.
- Finally, the photo cell (sensor) is attached by proving the support through screws that are drilled in the outer frame.

Component	Material	Dimensions
Rod	Mild Steel	150 mm LG 13 dia.
Sprocket	Mild Steel	5/8” * 24T
Tail Pulley	Mild Steel	125 dia.
Head Pulley	Mild Steel	125 dia.
Chain	Mild Steel	5/8” * 2800mm
Motor		0.5 HP
Gear box		1:50 ratio
Hopper	Mild Steel	2mm thick
Support	Mild Steel	40 sq pipe
Side Frame	Mild Steel	967*400

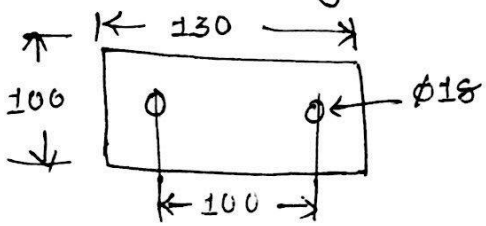
* SQ 40 pipe

① 394 mm lng – 04 nos , ③ 330 mm lng – 02 nos.

② 660 mm lng – 02 nos

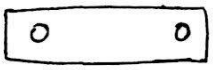
* flat 100 x 10

① 130 mm lng – 04 nos.



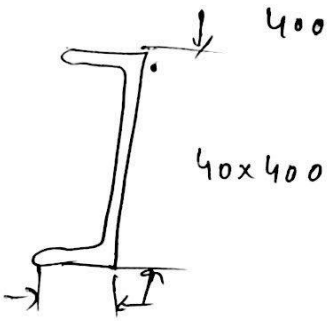
* ISA 40x6

306 mm lng – 02 nos



* 8mm thk

8thk x 400 x 410 mm – 02 nos.



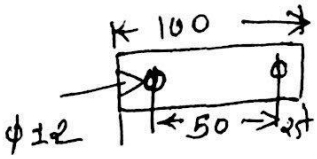
* Rod ϕ16

150mm lng – 42 nos.

(967 mm) (piece – 02)
(cutting length.)

* Flat 40x6

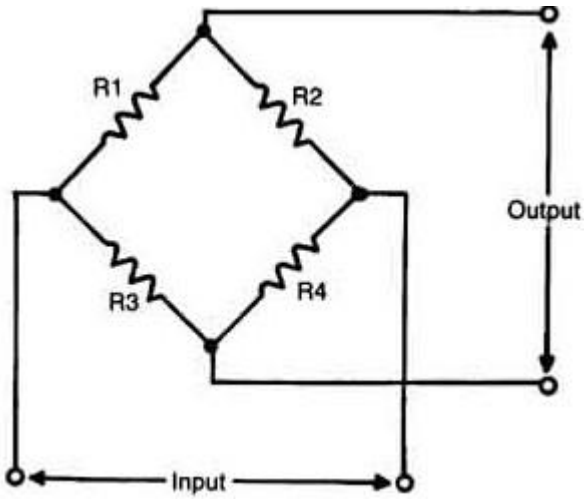
100mm lng – 04 nos



7. WORKING OF SYSTEM

- **Load-cell:**

  Strain gauge is attached to the any elastic member on which there exists, a suitable plane area to accommodate them. This arrangement is then used to measure loads applied to deform and deflect the member. When the strain gauge-elastic member combinations is used for weighing it is called a load cell.



- **Jantri machine:**

  The power supply given to the motor; will rotate the gear drive which will transfer the motion from smaller sprocket to larger sprocket then the chain drive will allow the materials to pass by and are collected in the holder bucket kept at the other end of the machine.

- **PLC program:**

0001
Input to PLC from loadcell through MODBUS RS485 which is a communication protocol between 2 devices.

COM- for communication (mode 2)
SLAVE- for controller ID
FCT- selection R/W factor (3- read)
TIMEOUT- similar to watchdog timer
ADDR - address

0002
We want accuracy upto 1 decimal point and real is for floating data type

0003
When TestStart and weightOK will be 1(enable) then o/p of AND block is high.
For SEL 1st i/p for enabling and when it is high it will select the 3rd i/p else 2nd .

0004
For counting we need to provide enable signal which is given to B0.
B2 is for reset.

0006
When TestStart and **CountoKOK** will be 1(enable) then o/p of AND block is high.
For SEL 1st i/p for enabling and when it is high it will select the 3rd i/p else 2nd

0007
Which will give count per kg

0008 to 00012
These networks will check grades according to the count per kg

00013
it will provide grade for the sample

00014
It computes price for sample

00015
It will calculate total price for the lot

00016
Define customer's name

00017
R_TRIG has used for detection of rising edge.
Output Q will remain false as long as input variable CLK is false.
This means each time function is called up, Q will return false until CLK has falling edge by rising edge.
It will select Customer 4 or 5.

00018 to 00021
It will select and transfer last four customer's name.

00022 to 00026
It will transfer grades of last 5 customers

00027 to 00031
It will transfer final price of last 5 customers

00032 to 00036
It will transfer weight of last 5 customers

00037 to 00041
It will transfer total price of last 5 customers

00042
It will provide 2sec delay while transferring data for digital i/p o/p values

00043
It will reset TestStart, TestOK and CountStart

00044
It will provide 2sec delay while transferring data for analog i/p o/p values.

00045 and 00046
Reset for WightLock and CountLock respectively

AC500-eCo
Ordering data

PM554

PM556

AC500-eCo CPUs

- 1 RS485 serial interface (2nd is optional)
- Centrally expandable with up to 10 I/O modules (standard S500 and/or S500-eCo modules can be mixed)
- Optional SD card adapter for data storage and program backup
- Variants with integrated Ethernet (Ethernet includes web server)
- Minimum cycle time per instruction: Bit 0.08 µs, Word 0.1 µs, Float-point 1.2 µs.

Program memory kB	Onboard I/Os DI/DO/AI/AO	Relay / Transistor outputs	Integrated communication	Power supply	Type	Order code	Price	Weight (1 pce) kg
PM554: digital I/Os								
128	8 / 6 / – / –	Transistor	–	24 V DC	PM554-TP	1SAP120600R0001		0.300
128	8 / 6 / – / –	Relay	–	24 V DC	PM554-RP	1SAP120700R0001		0.400
128	8 / 6 / – / –	Relay	–	100-240 V AC	PM554-RP-AC	1SAP120800R0001		0.400
128	8 / 6 / – / –	Transistor	Ethernet	24 V DC	PM554-TP-ETH	1SAP120600R0071		0.400
PM556: digital I/Os, 512 kB program memory								
512	8 / 6 / – / –	Transistor	Ethernet	24 V DC	PM556-TP-ETH	1SAP121200R0071		0.400
PM564: digital and analog I/Os (1)								
128	6 / 6 / 2 / 1	Transistor	–	24 V DC	PM564-TP	1SAP120900R0001		0.300
128	6 / 6 / 2 / 1	Relay	–	24 V DC	PM564-RP	1SAP121000R0001		0.400
128	6 / 6 / 2 / 1	Relay	–	100-240 V AC	PM564-RP-AC	1SAP121100R0001		0.400
128	6 / 6 / 2 / 1	Transistor	Ethernet	24 V DC	PM564-TP-ETH	1SAP120900R0071		0.300
128	6 / 6 / 2 / 1	Relay	Ethernet	24 V DC	PM564-RP-ETH	1SAP121000R0071		0.400
128	6 / 6 / 2 / 1	Relay	Ethernet	100-240 V AC	PM564-RP-ETH-AC	1SAP121100R0071		0.400
PM566: digital and analog I/Os, 512 kB program memory (1)								
512	6 / 6 / 2 / 1	Transistor	Ethernet	24 V DC	PM566-TP-ETH	1SAP121500R0071		0.400

Terminal blocks (9 and 11 poles) are necessary for each AC500-eCo I/O. The terminal blocks must be ordered separately.
(1) All analog inputs on PM564 and PM566 can be configured as digital inputs.

Data-Sheet

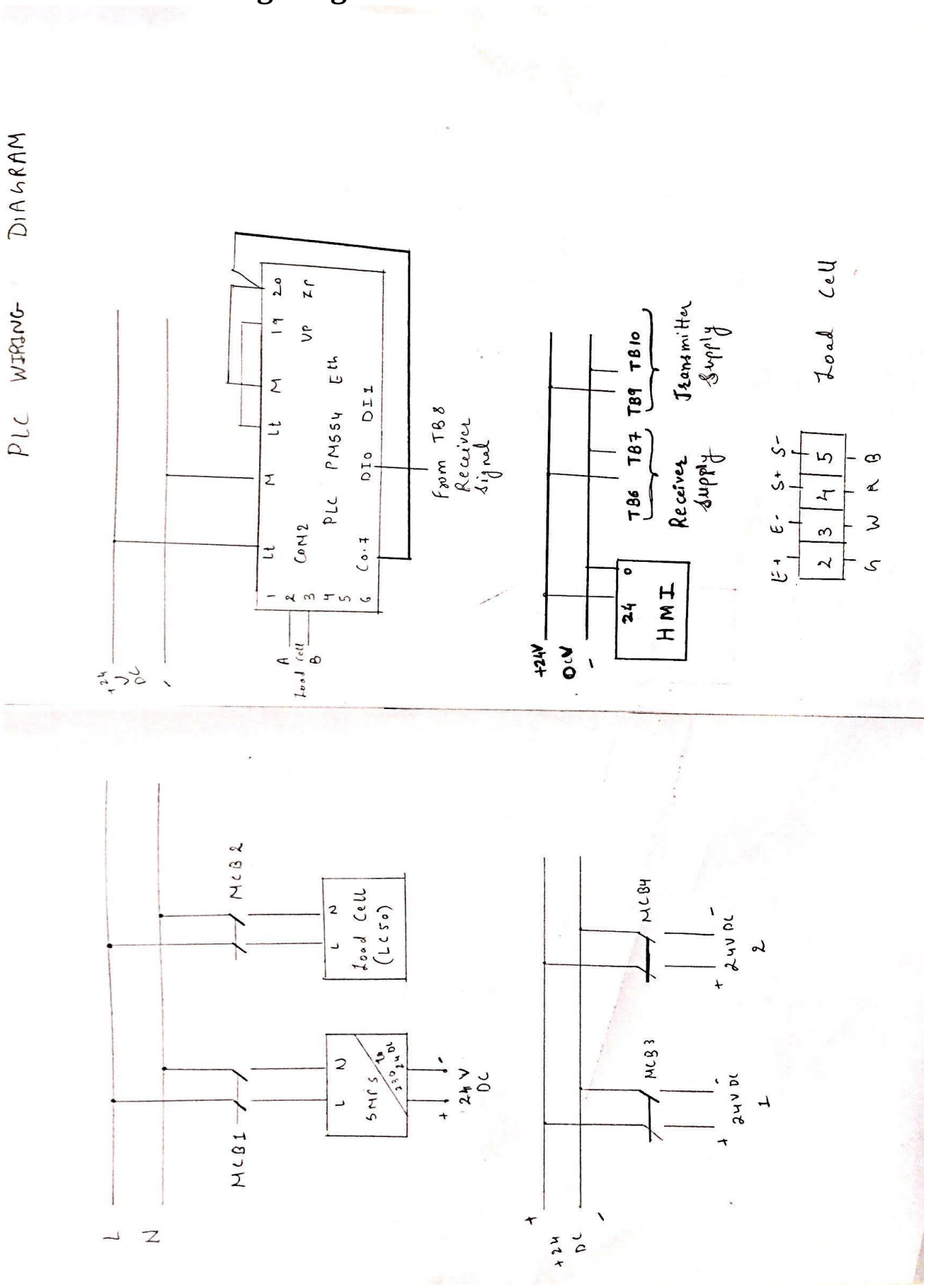
3

AC500-eCo CPUs

Type	PM554-TP	PM554-RP	PM554-RP-AC		PM554-TP-ETH	PM556-TP-ETH
Supply voltage	24 V DC		100-240 V AC		24 V DC	
Current consumption on	24 V DC		100 V AC	240 V AC	24 V DC	0.07 A
Min. typ. (module alone)	0.06 A	0.08 A	0.02 A	0.012 A	0.07 A	0.19 A
Max. typ. (I/Os)	0.18 A	0.22 A	0.2 A	0.11 A	0.19 A	512 kB
Program memory	128 kB					130 kB thereof 2 kB saved
Integrated data memory	14 kB thereof 2 kB saved					
					512 kB	1024 kB
Web server's data for user RAM disk	–					
Data buffering (of saved data)	flash memory					
Real-time clock (option with battery back-up) (1)	●					
Program execution						
Cyclical	●					
Time controlled	●					
Multi tasking	no, 1 task + 1 interrupt task max.					
Interruption	●					
User program protection by password	●					
Cycle time for 1 instruction (minimum)						
Binary	0.08 µs					
Word	0.1 µs					
Floating	1.2 µs					
Onboard digital inputs						
Channels	8 (including 2 counter inputs)					
Signal voltage	24 V DC					
Onboard digital outputs						
Channels	6 (including 2 PWM outputs)					
Relay / Transistor	Transistor	Relay	Relay	Relay	Transistor	Transistor
Rated voltage	24 V DC	240 V AC	240 V AC	240 V AC	24 V DC	24 V DC
Nominal current per channel	0.5 A	2 A resistive	2 A resistive	2 A resistive	0.5 A	0.5 A
Onboard analog outputs						
Channels	-					
signal ranges	-					
Onboard analog inputs						
Channels	-					
signal ranges	-					
Max. number of centralized inputs/outputs						
Max. number of extension modules on I/O bus	up to max. 10 (S500 and/or S500-eCo modules allowed)					
Digital inputs	320 + 8					
Digital outputs	320 + 6					
Analog inputs	160					
Analog outputs	160					
Max. number of decentralized inputs/outputs						
I/O modules decentralized	on CS31 bus: up to 31 stations with up to 120 DI / 120 DO each or up to 32 AI/32 AO per station					
Internal interfaces						
COM1						
RS485	●					
Sub-D connection	●					
Programming, Modbus, ASCII, CS31	●					
COM2 (option) (2)						
RS485	●					
Terminal block	●					
Programming, Modbus, ASCII	●					
Ethernet	–					
RJ45	–				●	
Ethernet functions: Programming, Modbus TCP/IP, UDP/IP, integrated Web server, DHCP, FTP server, SNTP client					●	
SMTP	–					
RUN/STOP switch	●					●
LED display for power, status and error	●					
Approvals	see detailed overview page 154 or www.abb.com/plc					

(1) Real-time clock requires optional TA561-RTC or TA562-RS-RTC.
(2) COM2 requires TA562-RS-RTC or TA562-RS.

- **PLC Wiring Diagram**



9. COSTING

1. Components on rent

Component	Rent per month
Motor and Gearbox	1200
Load-cell and controller	500
PLC	1000
HMI	500
Total Rent	**3200**

2. Purchased Components

Component	Price
Bearing	955
Chain	525
Sprocket (6 no.)	1890
Aluminium Rods	780
Side Plate	3750
Pipe	1780
Pulley	4200
Labour	4000
Total	**17,880**

The final cost of the actual machine would be close to **Rs: 1,10,000 /-** with installation and testing.

10. EXPECTED OUTCOMES

- The scope of the process is very good as in future it can be used in every possible agricultural manufacturing unit and thus every farmer would get the right price for the quantity they produce.
- The system is fast; yet by changing the sensors and by using better ways of data collection it can be made faster according to the advancements in technology.
- Security layers can be added in the software so that in future no corruption of data can happen in offline or online systems.
- Size of the machine can be customized as per the requirements and as per the usage.
- Further best possible solution to the current problem of manipulation of prices and corruption is the outcome from this machine.

11. FUTURE SCOPE

1) Expansion of the system in terms of harvest processed in a day.

2) Scalability in terms of the use of this machine for various other fruits and vegetables.

3) Better UI or user interface can be made to make the system simpler and easy to work with for a layman.

4) Packaging can be added separately and the whole system can be modified additionally as the whole in one system from harvest to product.

5) Sorting of the fruits and vegetables can be added making the system most advanced and market ready.

6) Process time can be reduced further after adding all the components and by making needed adjustments which would make the system fast without errors.

7) At the end the target would be to reduce the human interaction to NIL so that there is no error in the system altogether.

12. CONCLUSION

- By designing this system we have completely removed all possible human interactions within the system which were causing problems of discrimination, manipulation, favourism and all other smaller elements.
- Also, the technological advancement in the system through automation has made the system more reliable through the record collection and monitoring techniques and has reduced the overall process time substantially.
- With the successful installation of the system, the farmers would get the satisfactory amount for their harvest.

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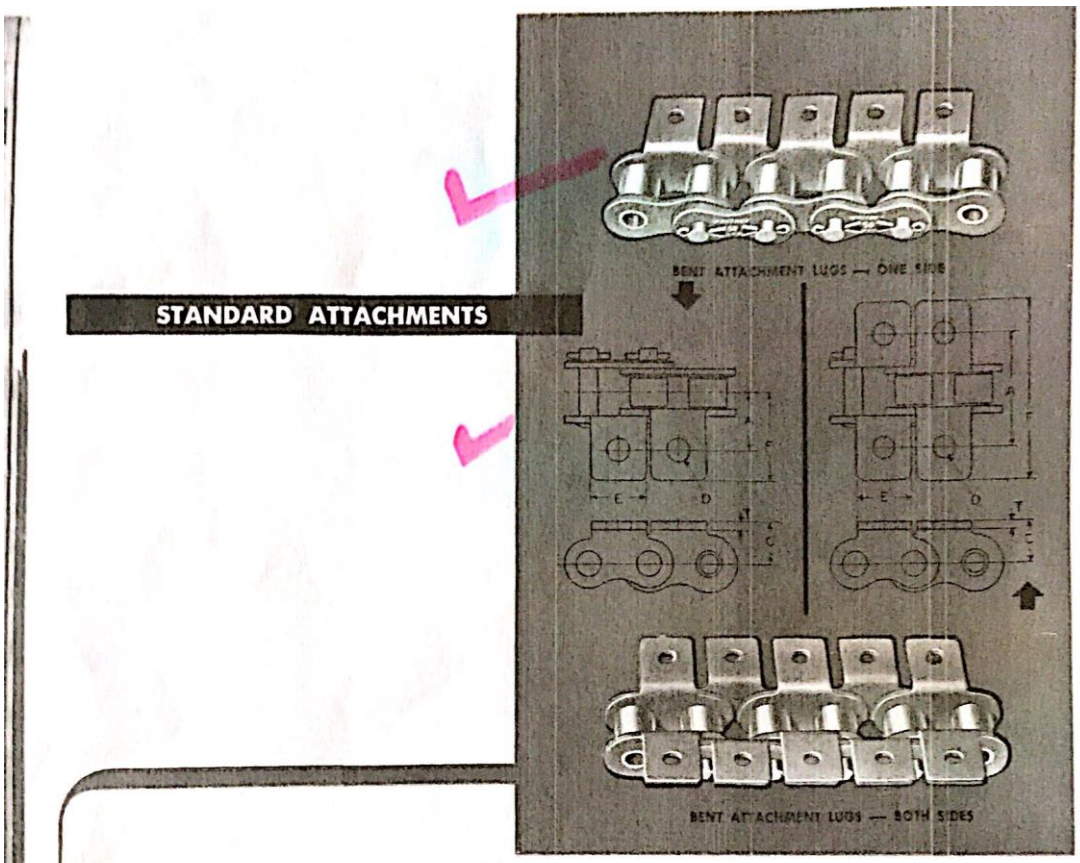
- https://www.youtube.com/watch?v=v5vHGsCmFCU

ANNEXTURE A

Table of figures:

ANNEXTURE B: DATASHEETS



STANDARD ATTACHMENTS

bent attachment lugs — one side ‡

CHAIN No.	PITCH	DIMENSIONS — INCHES A	C	D†	E	F	T
35-1	3/8	3/8	1/4	7/64	5/16	17/32	.050
41-1	1/2	15/32	5/16	9/64	3/8	5/8	.050
40-1	1/2	1/2	5/16	9/64	3/8	41/64	.060
50-1	5/8	5/8	13/32	13/64	1/2	53/64	.080
60-1	3/4	3/4	15/32	13/64	5/8	1 9/32	.094
80-1	1	1	19/32	17/64	3/4	1 37/64	.125
100-1	1 1/4	1 1/4	25/32	21/64	1	1 3/4	.156
120-1	1 1/2	1 1/2	29/32	25/64	1 1/8	2 11/64	.187
140-1	1 3/4	1 3/4	1 9/32	29/64	1 3/8	2 15/32	.219
160-1	2	2	1 1/4	33/64	1 1/2	2 49/64	.250

bent attachment lugs — both sides

35-1	3/8	3/4	1/4	7/64	5/16	1 1/16	.050
41-1	1/2	15/16	5/16	9/64	3/8	1 1/4	.050
40-1	1/2	1	5/16	9/64	3/8	1 13/32	.060
50-1	5/8	1 1/4	13/32	13/64	1/2	1 13/16	.080
60-1	3/4	1 1/2	15/32	13/64	5/8	2 3/16	.094
80-1	1	2	19/32	17/64	3/4	2 37/64	.125
100-1	1 1/4	2 1/2	25/32	21/64	1	3 1/2	.156
120-1	1 1/2	3	29/32	25/64	1 1/8	4 11/32	.187
140-1	1 3/4	3 1/2	1 9/32	29/64	1 3/8	4 15/16	.219
160-1	2	4	1 1/4	33/64	1 1/2	5 5/8	.250

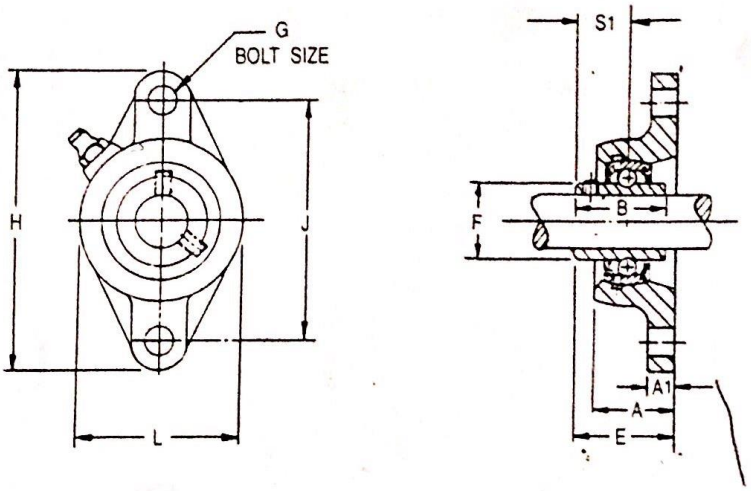
F dimensions are nearest fractional dimensions. †D dimensions are for standard bolt sizes. ‡Note: Attachments will be lo on the riveted side of cottered chain as illustrated, unless otherwise specified.

32

HEM MARKETING SERVICES
749/5, G.I.D.C. Estate,
Makarpura, Vadodara - 390 010.

FIG:5 CHAIN SELECTION

INDUSTRIAL DUTY-YCJT SERIES



All dimensions are in metric

UNIT	SHAFT DIAM.	H	J	L	A	E	B	A1	F	S1	BOLT SIZE G	BEARING NUMBER
YCJT	20	111.9	89.7	60.3	27.8	37.3	30.96	10.3	27.55	18.26	10	GYE20KRRB
YCJT	25	123.8	99.2	69.8	28.6	38.9	34.11	11.1	33.82	19.84	10	GYE25KRRB
YCJT	30	141.3	116.7	79.4	30.2	42.1	38.1	11.9	40.3	22.22	10	GYE30KRRB
YCJT	35	155.6	130.2	92.1	34.1	46.0	42.87	11.9	46.82	25.39	12	GYE35KRRB
YCJT	40	171.4	143.7	104.8	38.1	54.0	49.22	12.7	52.26	30.17	12	GYE40KRRB
YCJT	45	179.4	148.4	111.1	38.9	54.0	49.22	12.7	57.9	30.17	12	GYE45KRRB
YCJT	50	188.9	157.2	115.9	42.9	60.3	51.59	12.7	62.63	32.54	16	GYE50KRRB
YCJT	55	215.9	184.2	127.0	46.8	64.3	55.55	16.7	69.76	33.33	16	GYE55KRRB
YCJT	60	247.6	202.1	136.5	49.2	71.4	65.07	17.5	76.47	39.67	16	GYE60KRRB

FIG6: BEARING SELECTION

SPROCKET DIAMETERS

No. of Teeth	¼" PITCH		Chain No. 35 Gage Plug Diameter .200"		⅜" PITCH		Chain No. 40 Gage Plug Diameter .312"		Chain No. 41 Gage Plug Diameter .306"		½" PITCH		Chain No. 50 Gage Plug Diameter .400"	
	Pitch Diam.	Out-side Diam.	Root Diam.	Over Gage Plugs	Pitch Diam.	Out-side Diam.	Root Diam.	Over Gage Plugs	Root Diam.	Over Gage Plugs	Pitch Diam.	Out-side Diam.	Root Diam.	Over Gage Plugs
9	1.096	1.256	.896	1.280	1.462	1.674	1.150	1.752	1.156	1.746	1.827	2.092	1.427	2.200
10	1.214	1.380	1.014	1.414	1.618	1.839	1.306	1.930	1.312	1.924	2.023	2.299	1.623	2.423
11	1.331	1.502	1.131	1.518	1.775	2.003	1.463	2.068	1.469	2.062	2.219	2.504	1.819	2.596
12	1.449	1.625	1.249	1.649	1.932	2.166	1.620	2.244	1.626	2.238	2.415	2.708	2.015	2.815
13	1.567	1.747	1.367	1.756	2.089	2.329	1.777	2.386	1.783	2.380	2.612	2.911	2.212	2.993
14	1.685	1.868	1.485	1.885	2.247	2.491	1.935	2.559	1.941	2.553	2.809	3.113	2.409	3.209
15	1.804	1.990	1.604	1.994	2.405	2.652	2.093	2.704	2.099	2.698	3.006	3.315	2.606	3.390
16	1.922	2.111	1.722	2.122	2.563	2.814	2.251	2.875	2.257	2.869	3.204	3.517	2.804	3.604
17	2.041	2.231	1.841	2.232	2.721	2.975	2.409	3.021	2.415	3.015	3.401	3.719	3.001	3.787
18	2.159	2.352	1.959	2.359	2.879	3.135	2.567	3.191	2.573	3.185	3.599	3.920	3.199	3.999
19	2.278	2.473	2.078	2.470	3.038	3.296	2.726	3.339	2.732	3.333	3.797	4.120	3.397	4.184
20	2.397	2.593	2.197	2.597	3.196	3.457	2.884	3.508	2.890	3.502	3.995	4.321	3.595	4.395
21	2.516	2.713	2.316	2.709	3.355	3.617	3.043	3.657	3.049	3.651	4.193	4.522	3.793	4.582
22	2.635	2.833	2.435	2.835	3.513	3.778	3.201	3.825	3.207	3.819	4.392	4.722	3.992	4.792
23	2.754	2.954	2.554	2.947	3.672	3.938	3.360	3.975	3.366	3.969	4.590	4.922	4.190	4.979
24	2.873	3.074	2.673	3.073	3.831	4.098	3.519	4.143	3.525	4.137	4.788	5.122	4.388	5.188
25	2.992	3.194	2.792	3.186	3.989	4.258	3.677	4.293	3.683	4.287	4.987	5.322	4.587	5.377
26	3.111	3.314	2.911	3.311	4.148	4.418	3.836	4.460	3.842	4.454	5.185	5.522	4.785	5.585
27	3.230	3.434	3.030	3.425	4.307	4.578	3.995	4.612	4.001	4.606	5.384	5.722	4.984	5.775
28	3.349	3.554	3.149	3.549	4.466	4.738	4.154	4.778	4.160	4.772	5.582	5.922	5.182	5.982
29	3.468	3.673	3.268	3.663	4.625	4.897	4.313	4.930	4.319	4.924	5.781	6.122	5.381	6.172
30	3.588	3.793	3.388	3.788	4.783	5.057	4.471	5.095	4.477	5.089	5.979	6.321	5.579	6.379
31	3.707	3.913	3.507	3.902	4.942	5.217	4.630	5.248	4.636	5.242	6.178	6.521	5.778	6.570
32	3.826	4.033	3.626	4.026	5.101	5.377	4.789	5.413	4.795	5.407	6.376	6.721	5.976	6.776
33	3.945	4.152	3.745	4.141	5.260	5.536	4.948	5.566	4.954	5.560	6.575	6.920	6.175	6.968
34	4.064	4.272	3.864	4.264	5.419	5.696	5.107	5.731	5.113	5.725	6.774	7.120	6.374	7.174
35	4.183	4.392	3.983	4.379	5.578	5.855	5.266	5.884	5.272	5.878	6.972	7.319	6.572	7.365
36	4.303	4.511	4.103	4.503	5.737	6.015	5.425	6.049	5.431	6.043	7.171	7.519	6.771	7.571
37	4.422	4.631	4.222	4.618	5.896	6.175	5.584	6.203	5.590	6.197	7.370	7.718	6.970	7.763
38	4.541	4.751	4.341	4.741	6.055	6.334	5.743	6.367	5.749	6.361	7.568	7.918	7.168	7.968
39	4.660	4.871	4.460	4.856	6.214	6.494	5.902	6.521	5.908	6.515	7.767	8.117	7.367	8.161
40	4.780	4.990	4.580	4.980	6.373	6.653	6.061	6.685	6.067	6.679	7.966	8.316	7.566	8.366
41	4.899	5.110	4.699	5.095	6.532	6.813	6.220	6.839	6.226	6.833	8.165	8.516	7.765	8.559
42	5.018	5.229	4.818	5.218	6.691	6.972	6.379	7.003	6.385	6.997	8.363	8.715	7.963	8.763
43	5.137	5.349	4.937	5.334	6.850	7.131	6.538	7.157	6.544	7.151	8.562	8.914	8.162	8.956
44	5.257	5.468	5.057	5.457	7.009	7.291	6.697	7.321	6.703	7.315	8.761	9.114	8.361	9.161
45	5.376	5.588	5.176	5.573	7.168	7.451	6.856	7.475	6.862	7.469	8.960	9.313	8.560	9.354
46	5.495	5.708	5.295	5.695	7.327	7.609	7.015	7.639	7.021	7.633	9.159	9.512	8.759	9.559
47	5.614	5.827	5.414	5.811	7.486	7.769	7.174	7.794	7.180	7.788	9.357	9.711	8.957	9.752
48	5.734	5.947	5.534	5.934	7.645	7.928	7.333	7.957	7.339	7.951	9.556	9.911	9.156	9.956
49	5.853	6.066	5.653	6.050	7.804	8.088	7.492	8.112	7.498	8.106	9.755	10.111	9.355	10.150
50	5.972	6.186	5.772	6.172	7.963	8.247	7.651	8.275	7.657	8.269	9.954	10.309	9.554	10.354
51	6.091	6.305	5.891	6.288	8.122	8.407	7.810	8.430	7.816	8.424	10.153	10.508	9.753	10.548
52	6.211	6.425	6.011	6.411	8.281	8.566	7.969	8.593	7.975	8.587	10.351	10.707	9.951	10.751
53	6.330	6.544	6.130	6.527	8.440	8.725	8.128	8.748	8.134	8.742	10.550	10.907	10.150	10.945
54	6.449	6.664	6.249	6.649	8.599	8.885	8.287	8.911	8.293	8.905	10.749	11.106	10.349	11.149
55	6.569	6.783	6.369	6.766	8.758	9.044	8.446	9.067	8.452	9.061	10.948	11.305	10.548	11.343
56	6.688	6.903	6.488	6.888	8.917	9.203	8.605	9.229	8.611	9.223	11.147	11.504	10.747	11.547
57	6.807	7.022	6.607	7.004	9.076	9.363	8.764	9.385	8.770	9.379	11.346	11.703	10.946	11.741
58	6.927	7.142	6.727	7.127	9.236	9.522	8.924	9.548	8.930	9.542	11.544	11.902	11.144	11.944
59	7.046	7.261	6.846	7.243	9.395	9.681	9.083	9.704	9.089	9.698	11.743	12.102	11.343	12.139
60	7.165	7.381	6.965	7.365	9.554	9.841	9.242	9.866	9.248	9.860	11.942	12.301	11.542	12.342
61	7.284	7.500	7.084	7.482	9.713	10.000	9.401	10.022	9.407	10.016	12.141	12.500	11.741	12.537
62	7.404	7.619	7.204	7.604	9.872	10.159	9.560	10.184	9.566	10.178	12.340	12.699	11.940	12.740
63	7.523	7.739	7.323	7.721	10.031	10.318	9.719	10.340	9.725	10.334	12.539	12.898	12.139	12.935
64	7.642	7.858	7.442	7.842	10.190	10.478	9.878	10.502	9.884	10.496	12.738	13.097	12.338	13.138
65	7.762	7.978	7.562	7.960	10.349	10.637	10.037	10.658	10.043	10.652	12.936	13.296	12.536	13.332
66	7.881	8.097	7.681	8.081	10.508	10.796	10.196	10.820	10.202	10.814	13.135	13.495	12.735	13.535
67	8.000	8.217	7.800	8.198	10.667	10.956	10.355	10.976	10.361	10.970	13.334	13.694	12.934	13.730
68	8.120	8.336	7.920	8.320	10.826	11.115	10.514	11.138	10.520	11.132	13.533	13.893	13.133	13.933
69	8.239	8.456	8.039	8.437	10.985	11.274	10.673	11.294	10.679	11.288	13.732	14.092	13.332	14.128

FIG7: SPROCKET SELECTION

SPROCKET DIAMETERS and METHODS OF MEASUREMENT

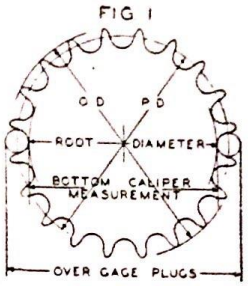
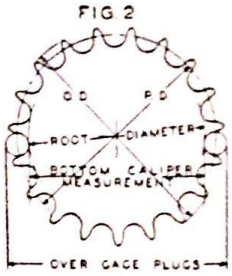


Fig. 1 Measurements for even tooth sprocket.

Fig. 2 Measurements for odd tooth sprocket.



The Sprocket Root Diameter gives the depth to which the sprocket teeth are cut, but since this dimension can not be measured on an odd tooth sprocket, a procedure, developed by this company and now widely used, should be followed in checking the tooth measurements.

As illustrated in figures 3 and 4, steel gage plugs, whose diameters are equal to the chain roll diameter, are placed in opposite tooth spaces on the sprocket. The measurement Over Gage Plugs taken with a micrometer or vernier should agree with the corresponding dimension for the given sprocket, as shown in the tables on pages 54-60.

With odd tooth sprocket measurements the gage plugs are placed opposite each other within one tooth, and the table dimensions are corrected for this condition. These dimensions are subject to a small negative working tolerance.

The Root Diameter equals the Pitch Diameter minus the Gage Plug Diameter.

The Bottom Caliper Measurement, which is equal to the dimension Over Gage Plugs minus twice the gage plug diameter is sometimes used in checking sprocket tooth measurements, but this method is not as accurate as the former procedure.

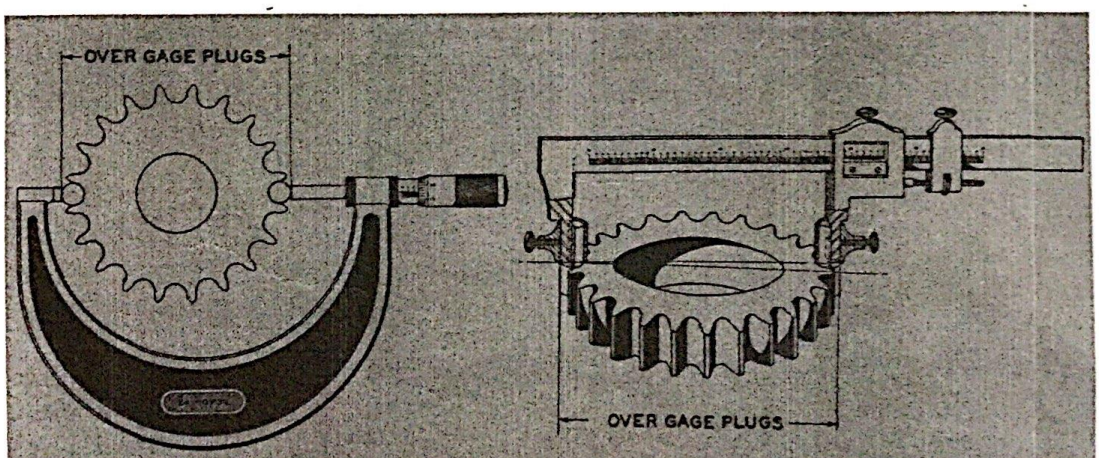


Fig. 3 Fig. 4

In measuring small sprockets a micrometer may be used. For large diameter sprockets a Vernier or Caliper will be necessary.

FIG8: SPROCKET DIAGRAM

EMRV	A	B	B1	C	C1	D(H7)	D1(j6)	Dm(j6)	E(h8)	F	G	G1	G2	H	H1	J	K	L	L1	M	N	O	P	Q
025	70	83	22	45	34	11	9	9	45	22	45	50	37	65	22.5	-	-	81	101	35	48	25	-	35.5
030	80	97	20	54	44	14	9	9	55	32	56	63	45	65	29	51	20	102	128	40	57	30	75	44
040	100	122	23	70	60	18(19)	11	11	60	43	71	78	53	75	36.5	60	23	128	164	50	71.5	40	87	55
050	120	144	30	80	70	25(24)	14	14	70	49	85	92	64	85	43.5	74	30	153	199	60	84	50	100	64
063	144	174	40	100	85	25(28)	19	19	80	67	103	112	75	95	53	90	40	173	219	72	102	63	110	80
075	172	205	50	120	90	28(35)	24	24	95	72	112	120	90	115	57	105	50	192	247	86	119	75	140	93
090	206	238	50	140	100	35(38)	24	24	110	74	130	140	108	130	67	125	50	234	309	103	135	90	160	102
110	255	295	60	170	115	42	28	28	130	-	144	155	135	165	74	142	60	149	324	128	167.5	110	200	125
130	293	335	80	200	120	45	30	30	180	-	155	170	155	215	81	162	80	165	340	147	187.5	130	250	140
150	340	400	80	240	145	50	35	35	180	-	185	200	175	215	96	195	80	197	374	170	230	150	250	180

EMRV	R	S	T	BL	β	b	bm	b1	b2	t	tm	t1	t2	d(h6)	f1	fm	m	V	V1	V2	Wt. in K.G.
025	6	17	5.0	-	10°	4	3	-	-	12.8	10.4	-	-	11	-	-	-	22.5	23	25.5	1.0
030	6.5	21	5.5	M6 X 11(n=1)	0°	5	3	3	5	16.3	10.2	10.2	16.0	14	-	-	M6	27	30	32.5	1.2
040	6.5	26	7	M6 x 8(n=4)	45°	6	4	4	6	20.8(21.8)	12.5	12.5	20.5	18	-	-	M6	35	40	43.0	2.3
050	8.5	30	7	M8 x 10(n=4)	45°	8	5	5	8	28.3(27.3)	16.0	16.0	28.0	25	M6	M6	M10	40	50	53.5	3.5
063	8.5	36	8	M8 x 14(n=8)	45°	8	6	6	8	28.3(31.3)	21.5	21.5	28.0	25	M6	M6	M10	50	50	53.5	6.2
075	11	40	10	M8 x 14(n=8)	45°	8(10)	8	8	8	31.3(38.3)	27.0	27.0	31.0	28	M8	M8	M10	60	60	63.5	9.0
090	13	45	11	M10 x 18(n=8)	45°	10	8	8	10	38.3(41.3)	27.0	27.0	38.0	35	M8	M8	M12	70	80	84.5	13.0
110	14	50	14	M10 x 18(n=8)	45°	12	8	8	12	45.3	31.0	31.0	45.0	42	M10	M10	M16	85	80	84.5	35.0
130	16	60	15	M12 x 21(n=8)	45°	14	8	8	14	48.8	33.0	33.0	48.5	45	M10	M10	M16	100	80	85.0	48.0
150	18	72.5	18	M12 x 21(n=8)	45°	14	10	10	14	53.8	38.0	38.0	53.5	50	M12	M12	M16	120	82	87.0	84.0

FIG9; GEAR BOX SELECTION

AC500-eCo
Technical data

AC500-eCo CPUs

Type	PM564-TP	PM564-RP	PM564-RP-AC	PM564-TP-ETH	PM566-TP-ETH	PM564-RP-ETH	PM564-RP-ETH-AC
Supply voltage	24 V DC		100-240 V AC	24 V DC			100-240 V AC
Current consumption on	24 V DC		100 V AC 240 V AC	24 V DC			100 V AC 240 V AC
Min. typ. (module alone)	0.095 A	0.11 A	0.02 A 0.011 A	0.10 A	0.10 A	0.12 A	0.023 A 0.014 A
Max. typ. (I/Os)	0.21 A	0.24 A	0.21 A 0.125 A	0.22 A	0.22 A	0.25 A	0.22 A 0.13 A
Program memory	128 kB				512 kB	128 kB	0.22 A 0.13 A
Integrated data memory	14 kB thereof 2 kB saved				130 kB thereof 2 kB saved	14 kB thereof 2 kB saved	
Web server's data for user RAM disk							
Data buffering (of saved data)	flash memory			512 kB	1024 kB	512 kB	
Real-time clock (option with battery back-up) (1)	●						
Program execution							
Cyclical	●						
Time controlled	●						
Multi tasking	no, 1 task + 1 interrupt task max.						
Interruption	●						
User program protection by password	●						
Cycle time for 1 instruction (minimum)							
Binary	0.08 µs						
Word	0.1 µs						
Floating	1.2 µs						
Onboard digital inputs							
Channels	6 (including 2 counter inputs)						
Signal voltage	24 V DC						
Onboard digital outputs							
Channels	6 (including 2 PWM outputs)						
Relay / Transistor	Transistor	Relay	Relay	Transistor	Transistor	Relay	Relay
Rated voltage	24 V DC	240 V AC	240 V AC	24 V DC	24 V DC	240 V AC	240 V AC
Nominal current per channel	0.5 A	2 A resistive	2 A resistive	0.5 A	0.5 A	2 A resistive	2 A resistive
Onboard analog inputs							
Channels	2						
signal ranges	0...10 V / can be configured as digital input 24 V DC						
Onboard analog outputs							
Channels	1						
signal ranges	0...10 V / 0...20 mA / 4...20 mA						
Max. number of centralized inputs/outputs							
Max. number of extension modules on I/O bus	up to max. 10 (S500 and/or S500-eCo modules allowed)						
Digital inputs	320 + 8						
Digital outputs	320 + 6						
Analog inputs	160 + 2						
Analog outputs	160 + 1						
Max. number of decentralized inputs/outputs							
I/O modules decentralized	on CS31 bus: up to 31 stations with up to 120 DI / 120 DO each or up to 32 AI/32 AO per station						
Internal interfaces							
COM1							
RS485	●						
Sub-D connection	●						
Programming, Modbus, ASCII, CS31	●						
COM2 (option) (2)							
RS485	●						
Terminal block	●						
Programming, Modbus, ASCII	●						
Ethernet							
RJ45	–			●			
Ethernet functions: Programming, Modbus TCP/IP, UDP/IP, integrated Web server, DHCP, FTP server, SNTP client SMTP	–			●	●		
RUN/STOP switch	●						
LED display for power, status and error	●						
Approvals	see detailed overview page 154 or www.abb.com/plc						

(1) Real-time clock requires optional TA561-RTC or TA562-RS-RTC.
(2) COM2 requires TA562-RS-RTC or TA562-RS.

FIG10: PLC SELECTION

ANNEXTURE C: PDE

College : G. H. PATEL COLLEGE OF ENGINEERING & TECHNOLOGY, V V NAGAR
Department : Mechatronics Engineering
Discipline : BE
Semester : Semester 8
Project Name : Design and Development of Automatic Counting and Weighing Machinne for Billing
Team ID : 26420

Form 1 – APPLICATION FOR GRANT OF PATENT

Applicants :

Sr. No	Name	Nationality	Address	Mobile No.	Email Id
1	Trivedi Mrugaksh Rambhai	Indian	Mechatronics Engineering , G. H. PATEL COLLEGE OF ENGINEERING & TECHNOLOGY, V V NAGAR , Gujarat Technologycal University.	9537928134	mrugakshtrivedi@gmail.com
2	Shah Parin Kaushik	Indian	Mechatronics Engineering , G. H. PATEL COLLEGE OF ENGINEERING & TECHNOLOGY, V V NAGAR , Gujarat Technologycal University.	8200450316	Parinshah902@gmail.com
3	Shah Saloni	Indian	Mechatronics Engineering , G. H. PATEL COLLEGE OF ENGINEERING & TECHNOLOGY, V V NAGAR , Gujarat Technologycal University.	9998021234	saloni250996@gmail.com

Inventors :

Sr. No	Name	Nationality	Address	Mobile No.	Email Id
1	Trivedi Mrugaksh Rambhai	Indian	Mechatronics Engineering , G. H. PATEL COLLEGE OF ENGINEERING & TECHNOLOGY, V V NAGAR , Gujarat Technologycal University.	9537928134	mrugakshtrivedi@gmail.com
2	Shah Parin Kaushik	Indian	Mechatronics Engineering , G. H. PATEL COLLEGE OF ENGINEERING & TECHNOLOGY, V V NAGAR , Gujarat Technologycal University.	8200450316	Parinshah902@gmail.com
3	Shah Saloni	Indian	Mechatronics Engineering , G. H. PATEL COLLEGE OF ENGINEERING & TECHNOLOGY, V V NAGAR , Gujarat Technologycal University.	9998021234	saloni250996@gmail.com

I/We, the applicant(s) hereby declare(s) that:

Following are the attachments with the applications :

Form 2 - PROVISIONAL/COMPLETE SPECIFICATION

1 . Title of the project/invention :
Design and Development of Automatic Counting and Weighing Machinne for Billing

1. Preamble to the
description : Provisional

2. Description

1. Field of Project / Invention /
Application : Automation; Mechatronics
Engineering

Application:
To make unbiased billing process of agricultural commodities like Chikoos.

1) Prior Art / Background of the Project /

Invention : Automatic weighing of objects through

load cells.

2) Summary of the Project / Invention :

By developing this machine we have successfully rectified all possible discriminations or manipulative actions exercised earlier through the manual counting and billing process. Also, automation has increased the speed of the whole process exponentially thereby advancing the whole technology of automatic billing. Hence the whole setup would now help farmers get the true value of their commodities in speculated time duration and is a new advancement in digitalizing India.

d) Objects of Project / Invention :

Load Cell - ADI: 60710
Photo Cell - Creative Electronics
Motor - Elecon:M80043150
Gear Box - Elecon: EM-17003065

Bearing - NTN:UCFL-204
PLC - ABB:PM564-TP-ETH

e) Drawings :

26420_Drawing1.png
26420_Drawing2.png

f) Description of Project / Invention : (full detail of project) :

Firstly, the farmers will bring their lot for selling in bulk which is going to get weighed under the continuous weighing component with the help of load cells and that data of weight is going to be fed as the first parameter for billing; that is the lot weight.

Here the weight of bags is also calculated. So for more precision that should be subtracted from the total weight which will be done by PLC algorithm.

Then the sample as per the lot size is drawn at random from the whole lot and that sample is counted in the jantri machine; this data would be the second parameter for billing.

Lastly, as per the sample report, the rate calculations are done according to norms set by the industry. Afterward, an invoice of the bill will be generated.

Here the sampling is done at random, so no manipulation from any side is affecting the overall billing record and the precision of the lot size is met, as the whole lot is weighed and considered.

Automatic billing would reduce discrimination and bias based problems which earlier existed and would provide the optimum price to the farmers as per the lot that they have brought.

1) Examples :

2) Claims (Not required for Provisional Application) / Unique Features of

Project Claims: N/A

Unique Features:
The whole setup is compact in size.
PLC programming has increased the processing time.
PLC look-up table can be modified easily as per the market price of the product.
HMI screen also provides the real-time visualization of the process.
Any layman operator can easily operate the whole machine.

1) Claims

2) Date and signature

3) Abstract of the project / invention :

The primary objective is to design and manufacture a machine to perform the task of automatically weigh and count together which would give us an idea about the size of the commodity that is to be used; this data is then going to be used for billing purpose under some norms which will be set by the organization or the government for the prices according to the quality of commodity supplied. The machine would do this quickly without data manipulation and would automatically consider the samples of 2kgs which would be weighed and counted simultaneously and then the further allotment of prices would be done as per the system data acquired or set for them.

Form 3 – STATEMENT AND UNDERTAKING UNDER SECTION 8

Name of the applicant(s) : I/We, Trivedi Mrugaksh Rambhai ,Shah Parin Kaushik ,Shah Saloni

Name,Address and Nationality of the joint applicant : Hereby declare :

1) that I/We have not made any application for the same/substantially the same victim invention outside India.

2) that the rights in the application(s) has/have been assigned to

Name of the Country	Date of Application	Application Number	Status of the Application	Date of Publication	Date of Grant
N/A	N/A	N/A	N/A	N/A	N/A

To be signed by the applicant or his authorised registered patent agent :
Name of the Natural Person who has signed :

(iii)That I/We undertake that upto the date of grant of the patent by the Controller, I/We would keep him informed in writing the details regarding corresponding applications for patents filed outside India within three months from the date of filing of such application.

Dated this 9 day of May 2018

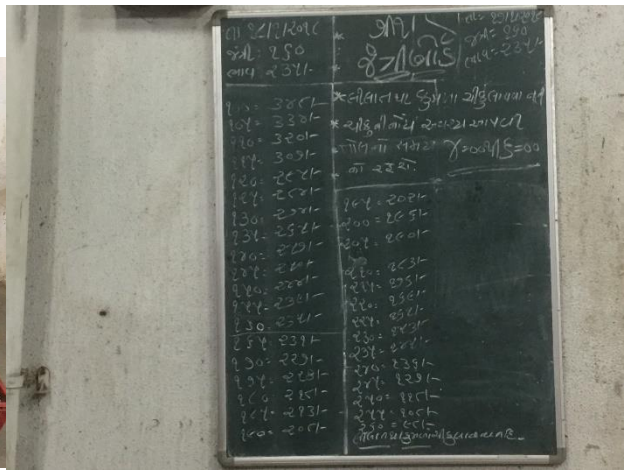
Signature.....

Trivedi Mrugaksh Rambhai ,Shah Parin Kaushik ,Shah Saloni

To,
The Controller of Patents,
The Patent Office,
At Mumba

ANNEXTURE D:

FIG11: SITE VISIT



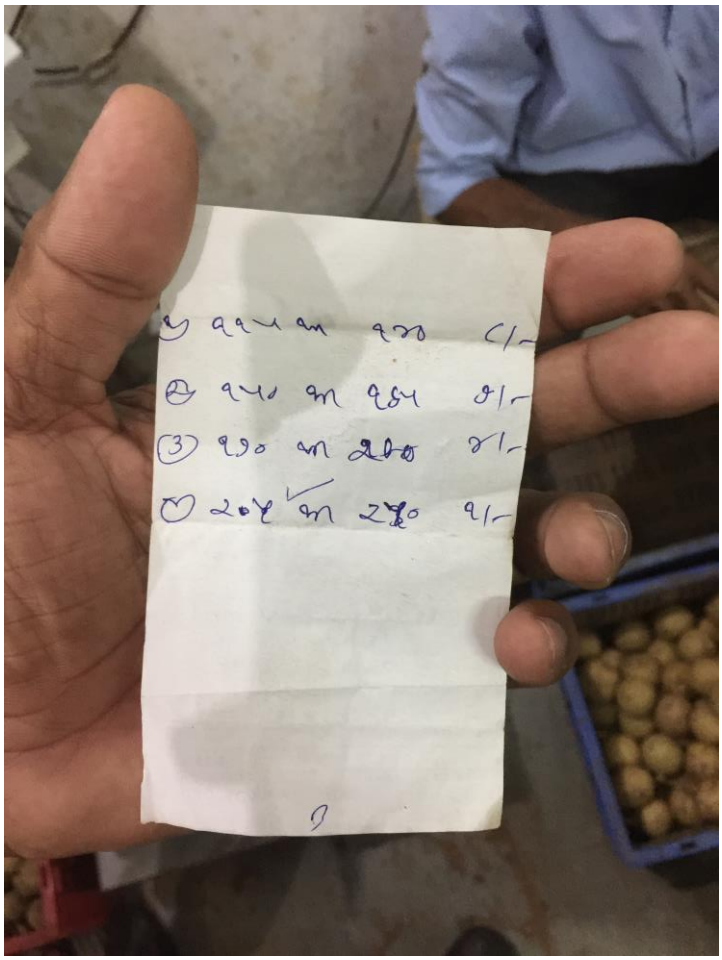


FIG12: SITE VISIT

ANNEXTURE E:

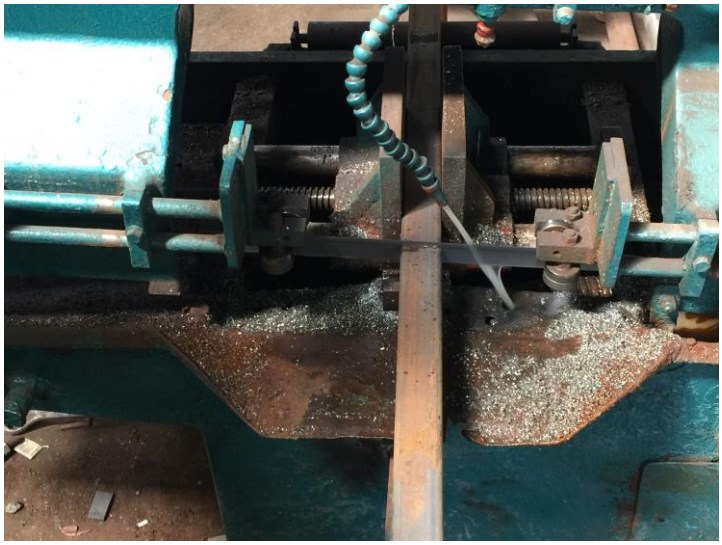


FIG13: PHOTOS AT WORK SITE

FIG14: PHOTOS AT WORK SITE

ANNEXTURE F: BMC

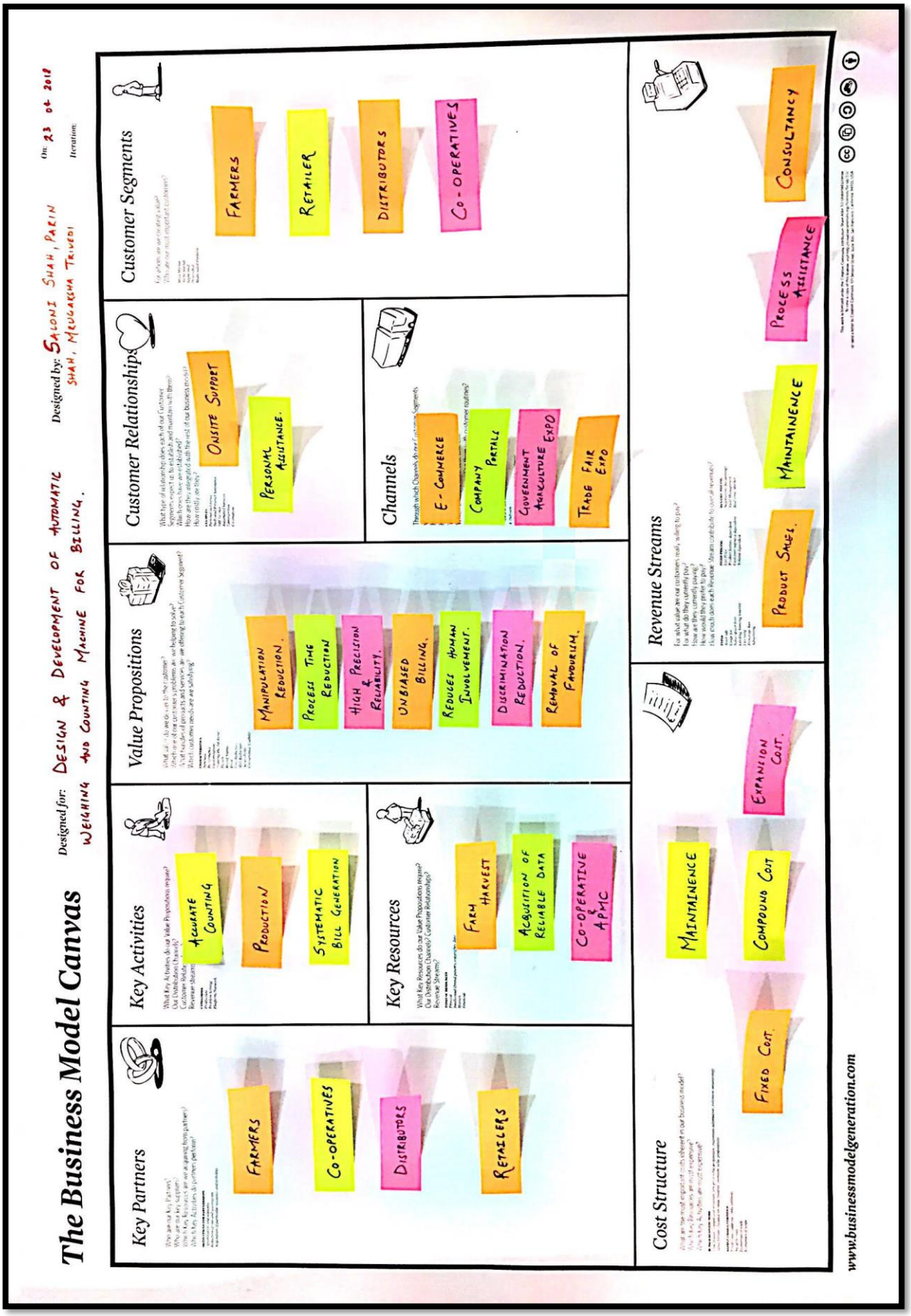


FIG15: BMC

GUJARAT TECHNOLOGICAL UNIVERSITY

Chandkheda, Ahmedabad

Affiliated

G H Patel College of Engineering and Technology

A Report On-

Business Model Canvas

In fulfilment for the award of the degree
Of
BACHELOR OF ENGINEERING
in
Mechatronics Engineering 8th SEM (A.Y. 2017-18)

Submitted by:
Group id:
26420

Name of Student	Enrollment No.
Parin Shah	140110120051
Saloni Shah	140110120052
Mrugaksha Trivedi	140110120058

Dr. Anand Y Joshi
(Faculty Guide)

Prof Bhavik Ardeshana
(Faculty Guide

Dr. Sanket N Bhavsar
Head of the Department

Academic Year
(2017-2018)

INDEX

G.H. PATEL COLLEGE OF ENGINEERING & TECHNOLOGY

VALLABH VIDYANAGAR

DEPARTMENT OF MECHATRONICS ENGINEERING

CERTIFICATE

*This is to certify that the Business Model Canvas has been carried out by*_____

Enrollment No _____

under my guidance and supervision for the award of the degree of Bachelor of Engineering in MECHATRONICS ENGINEERING (Semester - VIII) at G. H. Patel College of Engineering & Technology, Vallabh Vidyanagar during the academic year 2017-18.

Date:

Guide:
Dr. Anand Y Joshi
MC Department
GCET

Head of the Department
Dr. Sanket N Bhavsar
MC Department
GCET

ACKNOWLEDGEMENT

In performing our project, we had to take the help and guideline of some respected personal, who deserve our greatest gratitude. The completion of this assignment gives us immense pleasure. We would like to show our gratitude to

Dr. ANAND Y JOSHI, Prof. Bhavik Ardeshana, G H PATEL COLLEGE OF ENGINEERING AND TECHNOLOGY for supporting us throughout and guiding us through numerous consultations. We would also like to expand our deepest gratitude to all those who have directly and indirectly guided us in doing this project.

We would also like to thank our department of Mechatronics Engineering for supporting us in performing and evaluating this project.

INTRODUCTION

Business model canvas is used to validate the market significance of products and services which will be of technology nature in this case. Technology projects are often solutions or processes that solve a technical problem. However, the market implementation of such solutions also require that the problem solution is designed to overcome not just the technical barriers but also market and business-related barriers of costs, customer reach and collaborations and those that pertain to the practical nature of limited initial capacities within the team.

Thus, business model canvas can be used to visualize such market problems and customer expectations. This exercise will increase the market potential and penetration of technology goods and services. This will make them more effective in market.

Business Model Canvas is a strategic management and lean startup template for developing new or documenting existing business models. It is a visual chart with elements describing a firms or product's value proposition, infrastructure, customers, and finances. It assists firms in aligning their activities by illustrating potential trade-offs. BMC comprises of the following segments.

1. Customer Segments
2. Value Proposition
3. Channels
4. Customer Relationships
5. Revenue Streams
6. Key Activities
7. Key Resources
8. Key Partnerships
9. Cost Structure

Customer Segments

3) ***Farmers:*** **-** The main design that we've made is for the convenience of the farmers so that they're paid as per the harvest that they've produced; thus, they are the first customer.

4) ***Retailers:*** **-** The second people concerned are the retailers who would buy harvest from the co-operatives and would further send it to markets.

5) ***Distributors:*** **-** The distributors are the third people who would use the system and then use the harvest for the further distribution.

6) ***Co-operatives:*** **-** Co-operatives are one of the major sector which would use the machine on a higher scale and use it to the optimum level's.

Customer Relationship

3) ***Personal Assistance:*** **-** Personal assistance instills trust and confidence in company and provides for long term relationship.

4) ***Onsite Support:*** **-** Onsite support spares the customer any hardships and creates a healthy and long-term relationship.

Value Proposition

4) ***Manipulation Reduction*: -** The system designed reduces the manipulative actions of humans and would make the system more transparent.

5) ***Process time Reduction*: -** The system developed is more advanced and can perform the same manual operations in minimal time with supreme accuracy.

6) ***Removal of Favourism***: - The system involves minimum human interaction thus making it free from favourism and other discriminations that earlier existed.

7) ***Unbiased Billing*: -** The system designed would serve its purpose of farmer's satisfaction by being an open transparent platform for goods exchange.

Channels

3) ***E-commerce Web sites*: -** E-commerce platforms have a wide reach due to greater internet penetration and can provide competitive rates.

4) ***Company Portal*: -** Company portal is another platform for users to better understand the products and buy them.

5) ***Trade fair and Expo*: -** The trade expos contribute a large amount of sales volume and are considered easily reachable and trustworthy.

6) ***Government Agricultural expo*: -** These are great platforms to inform the potential users about your products.

Key Resources

1) ***Farm Harvest:*** **-** Farm harvest is the key resource that is going to be used in the system.

2) ***Acquisition of Reliable Data:*** **-**The acquisition of the data in an error-proof manner is must fir the system to be reliable. This is another key resource that is very important for various purposes

3) ***Co-operatives and APMC:*** **-** These are important as the members under whose supervision the system is going to be functioned.

Key Partnerships

1) ***Farmers:*** **-** The main design that we've made is for the convenience of the farmers so that they're paid as per the harvest that they've produced; thus, they are the first customer.

2) ***Retailers:*** **-** The second people concerned are the retailers who would buy harvest from the co-operatives and would further send it to markets.

3) ***Distributors:*** **-** The distributors are the third people who would use the system and then use the harvest for the further distribution.

4) ***Co-operatives:*** **-** Co-operatives are one of the major sector which would use the machine on a higher scale and use it to the optimum level's.

Cost Structure

1) ***Component Cost:*** **-** Component Cost will be the one of the primary costs.

2) ***Expansion Cost:*** **-** It includes cost for research & development and for future expansion.

3) ***Fixed Cost:*** **-** In includes components like salaries, rents, utilities etc.

4) ***Maintenance*****:** **-** It includes the cost of maintaining various machine elements as well as the working system.

ANNEXTURE G

3.1 CANVAS 1 – AEIOU SUMMARY CANVAS

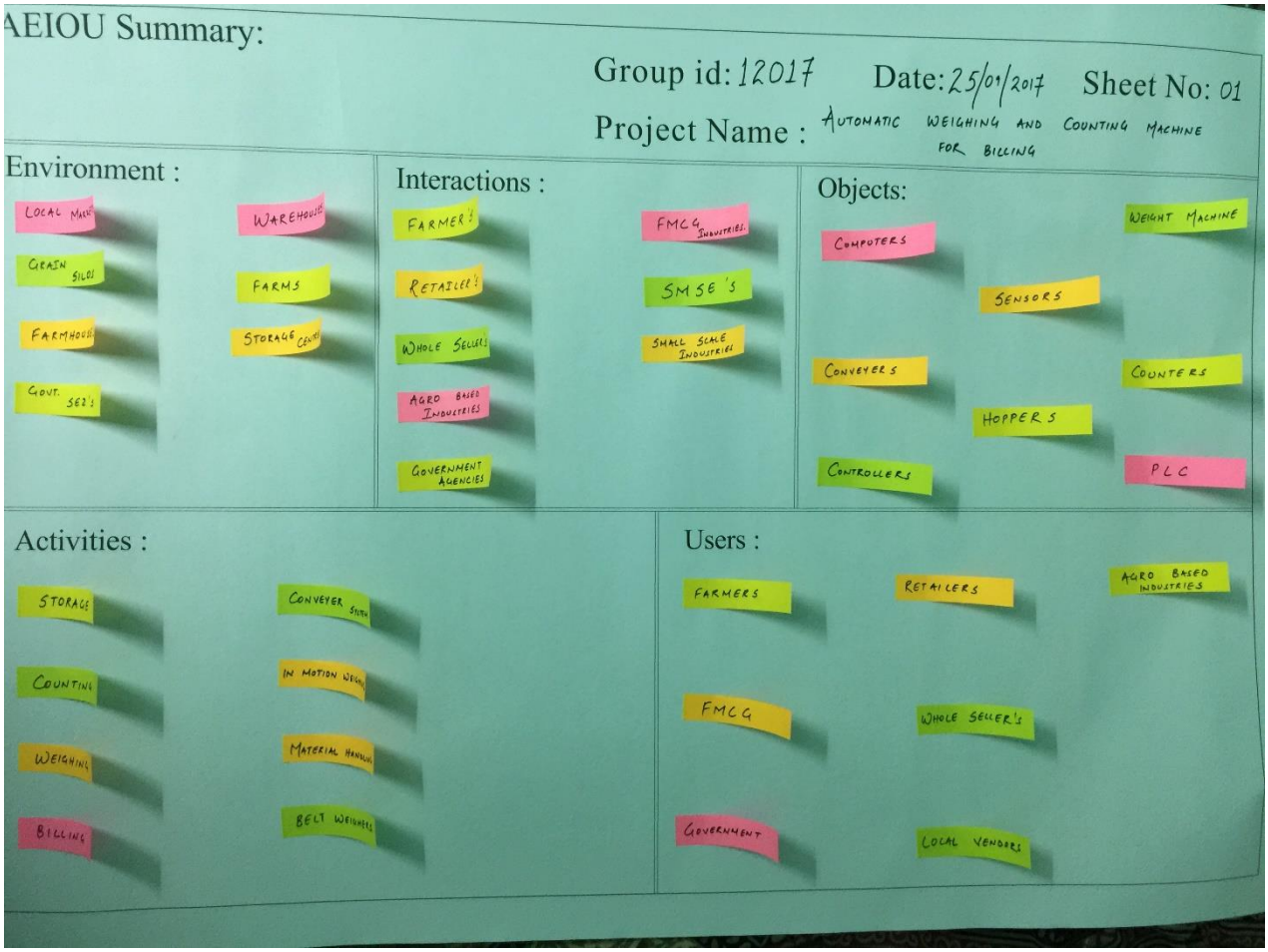


Fig16 AEIOU Summary Canvas

This canvas encompasses five key elements of product design namely: Activities, Environment, Interactions, Objects and users. The working environment is the major aspect for product design as it gives the idea about required strengths, necessary dimensions (if there are restrictions in size), weather conditions etc. Objects include the major components required for the product designing. Interactions and users includes that what kind of people, sectors or government bodies will take the product in their usage.

3.2 CANVAS 2 – EMPATHY MAPPING CANVAS

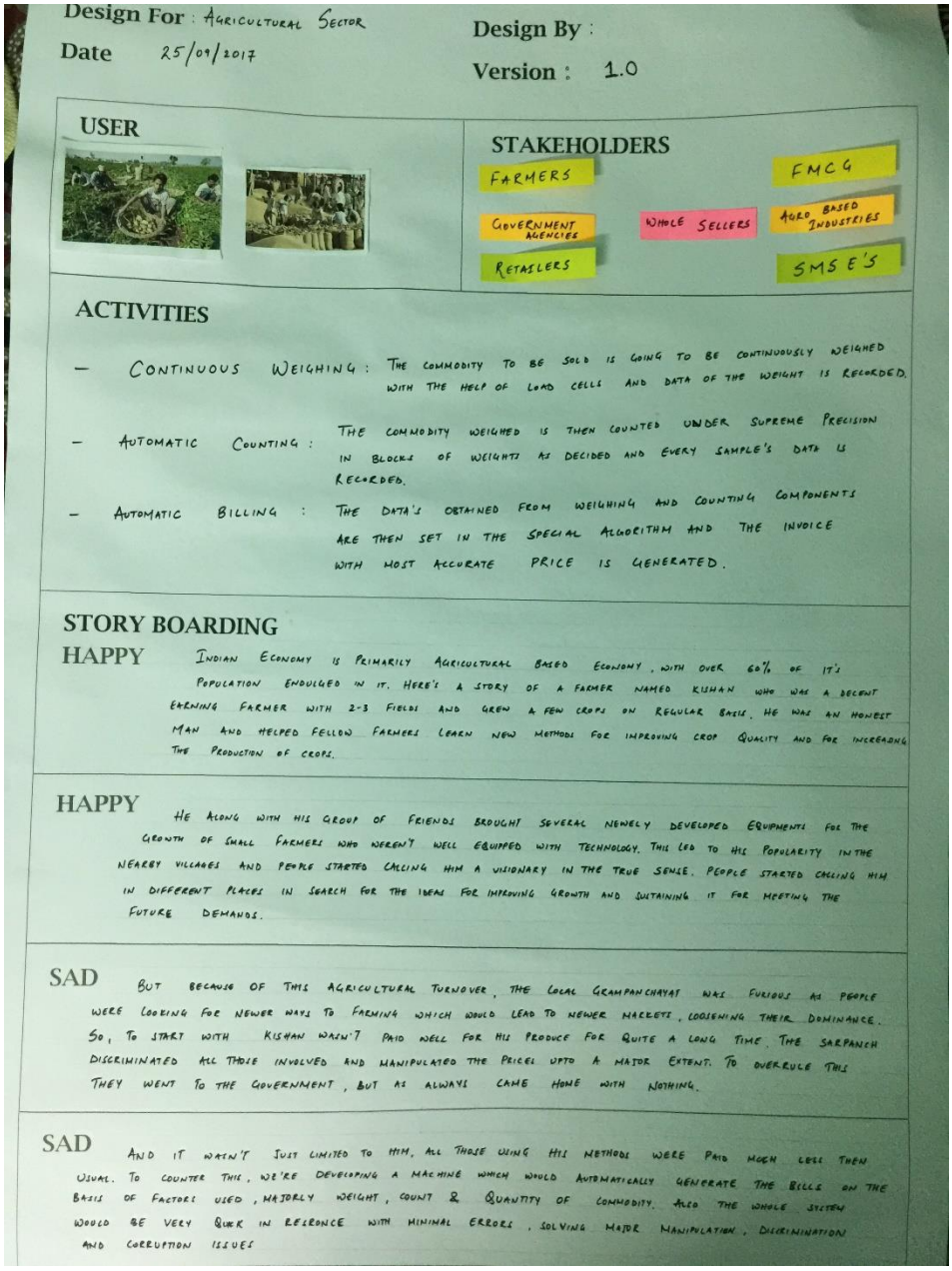


Fig. 17 Empathy Mapping Canvas

This canvas tells the story, why this product is required in the market, mainly concerned about the impact of the product on our society. Also it includes people who will be benefited by the product after it came into existence.

3.3 CANVAS 3 – IDEATION CANVAS

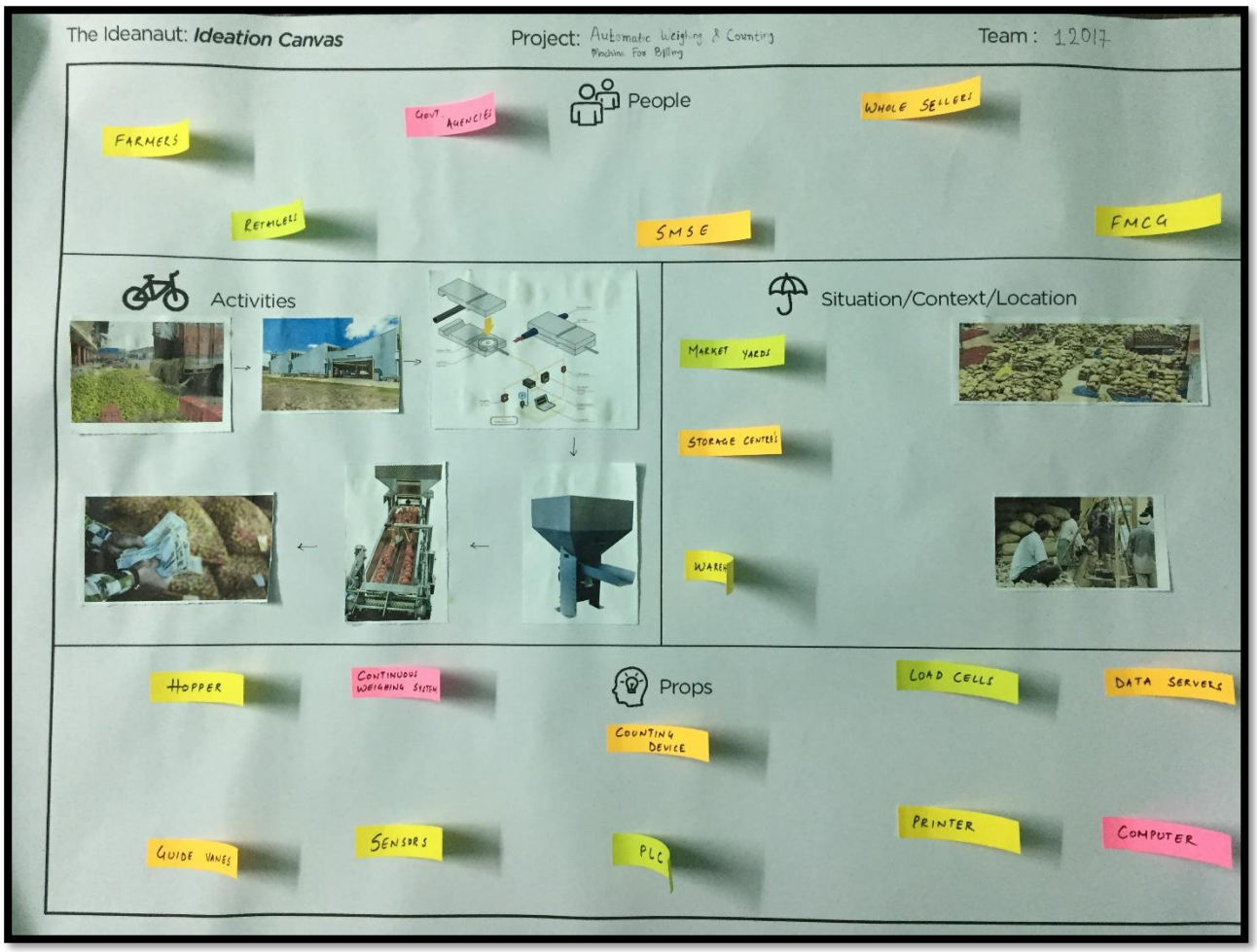


Fig. 18 Ideation Canvas

This canvas manifests the sequence of the different activities required in the single working cycle, also the list different components required in the product design. Moreover, it gives idea about situation and locations where the product will be used.

3.4 CANVAS 4 – PRODUCT DEVELOPMENT CANVAS

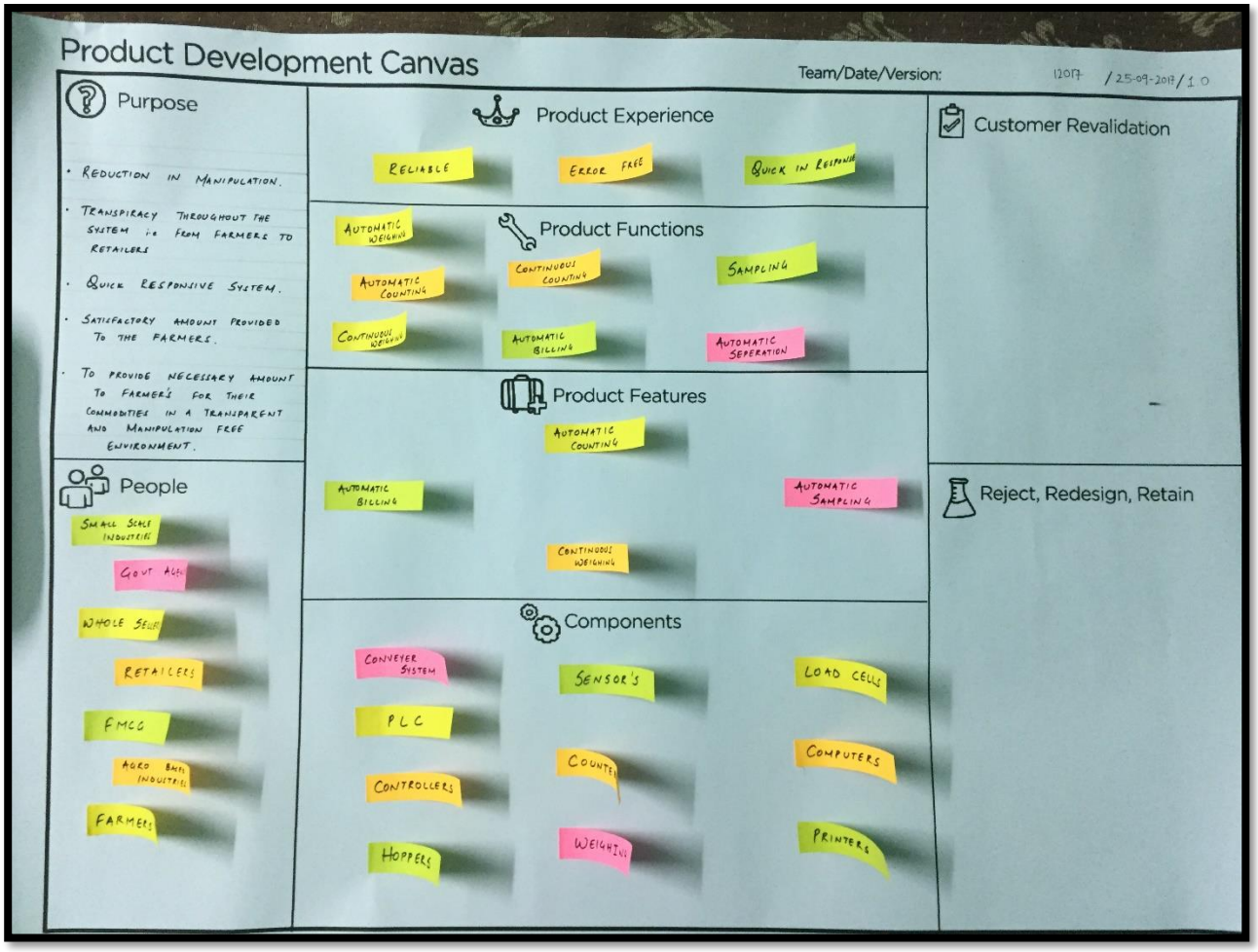


Fig. 19 Product Development Canvas

The purpose, why the product should design, for developing the product is shown in this canvas. Also its main features, functions and components are included in this particular canvas

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/ GUJARAT TECHNOLOGICAL UNIVERSITY fulfilment for the award of the degree of BACHELOR OF ENGINEERING in Mechatronics Engineering Department 2017-18 In Association with / CERTIFICATE Date: 09/05/2018 This is to certify that the dissertation entitled "DESIGN AND DEVELOPMENT OF AUTOMATIC WEIGHING & COUNTING MACHINE FOR BILLING" has been carried out by: Parin Shah (140110120051) Saloni Shah (140110120052) Mrugaksha Trivedi (140110120058) ACKNOWLEDGEMENT ABSTRACT The primary objective is to design and manufacture a machine to perform the task of automatically weigh and count which would give us an idea about the size of the commodity that is to be used; this data is then going to be used for billing purpose under different criteria's as set by the organization or the government for the prices respective to the quality of the commodity supplied.

The machine would do this quickly without much of the errors and would automatically consider the samples of 2kgs which would be weighed and counted simultaneously; then the further allotment of prices would be done as per the system data acquired or set for them. / Work Plan Team ID: 26420 Semester 7 _ _ _ _ _ _ _ Month Activity _/ _/ _/ _/ _/ _/ _ _Problem Identification _ _? _ _ _ _ _ _ _Literature Survey _? _? _ _ _ _ _ _Preliminary Design _ _ ? _? _ _ ? _ _ _ _ _Components/ Mechanisms Identification _ _ _ ? _ _ _? _ _ _ _Report Writing _ _ _ ? _ _ _ _ _ _Presentation _ _ _ _ _ _ _ ? _ _ Semester 8 _ _ _ _ _ _ _ Month Activities _/ _/ _/ _/ _/ _/ _ _Components' procurement _ _ ? _? _ _ _ _ _ _Manufacturing _ _? _? _ _ _ _ _Manufacturing and PLC selection _ _ _? _ _ ? _ _ _ _ _PLC programming and Panel wiring _ _ _ ? _ _ _? _ _ _ _Final assembly and

Testing _ _ _ _ _ _? _ ? _ _Report Writing and Presentation _ _ _ _ _ _ _ ? _ _ / Problem Summary In India, 60% of the economy is based on the Agricultural Sector and there is so much manipulation and interference in making bills for the commodities that the farmers have harvested.