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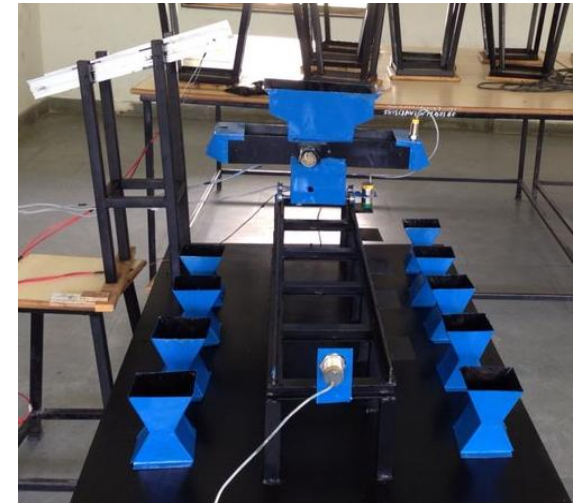
IMPROVEMENT IN MATERIAL HANDLING SYSTEM IN GINING INDUSTRY

Internal Guide:- H.C.Patel

By,

- 10ME51: OZA VISHVAS M.
- 10ME6O: THAKKAR JAYDEEP R.
- 10ME46: MODH AKASH B.
- 10ME38: RATHOD KULDEEPSINH P.

INTRODUCTION

- In the last several years material handling has become a new, complex, and rapidly evolving science for moving material in industry. Material handling is field concerned with solving the problem involving the movement, storage and control throughout the process of manufacturing.

- Proper material handling gives so many advantages and benefits in profit.

- It has been estimated that average material handling cost is roughly 20-40% of the total production.

- By saving the material handling cost, the cost of production can be reduced considerably.

- In cotton ginning industries, material handling can be defined as science of conveying, elevating, transporting and storing of materials.

- Main material handling system in ginning is raw cotton feeding system.

- For raw cotton feeding, convectional cotton factories uses simple belt mechanism to carry raw cotton to the processing plants like an expeller.

- But in present cotton industries there are so many problems related to belt conveyor mechanism.

- For solving this difficulties improvement in this handling system is necessary.

BELT CONVEYOR MATERIAL HANDLING SYSTEM

# Manual seed cotton distribution in conventional ginning

• Undoubtedly the first method of ginning cotton was with the human fingers, a method that has continued in use throughout the centuries.

DRAWBACKS OF BELT CONVEYOR

- Power consumption is more be cause more number of motors are used.

- Production efficiency is less.

- Slipping stretching problem of belt

- Heat generation due to continues working of belt, may cause accident.

- Productivity is less.

- Special attention is required in installation.

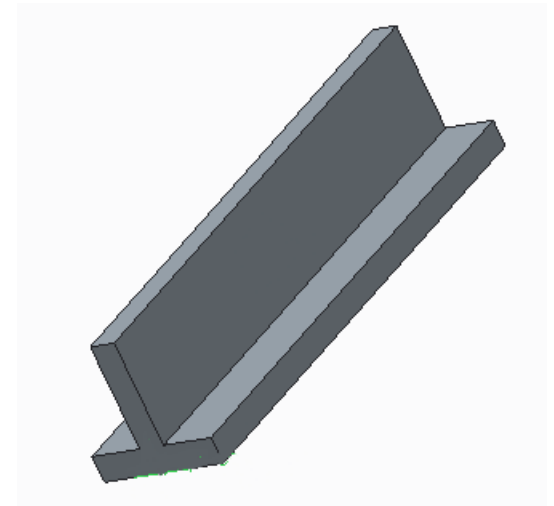- Speed is limited up to 2000 m/min
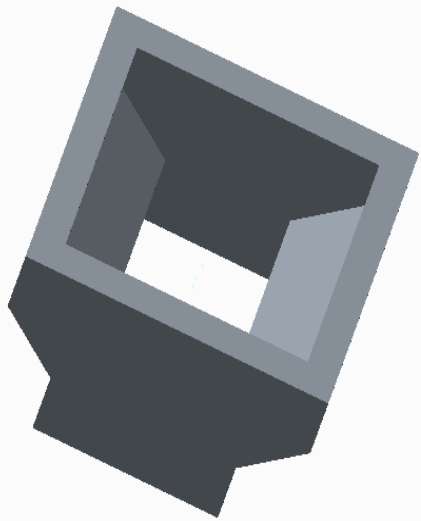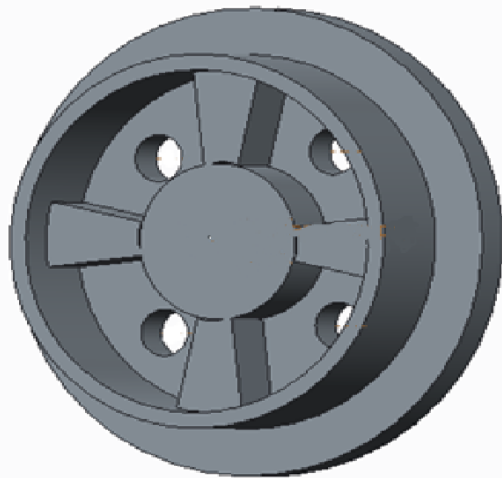
- Power is limited up to 700 kW

PRO E DESIGN OF MODEL PARTS
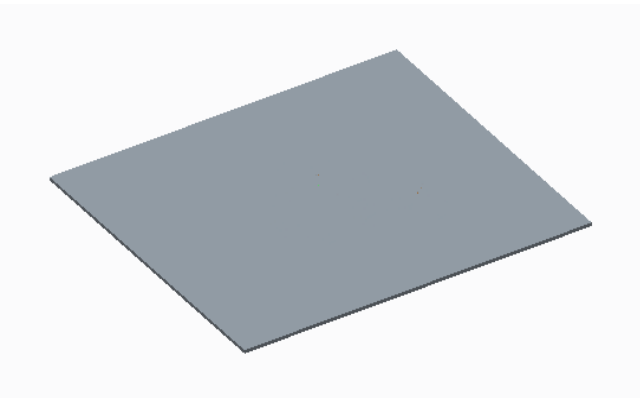
BASE PLATE

I SECTION

T SECTION

HOPPER

WHEEL
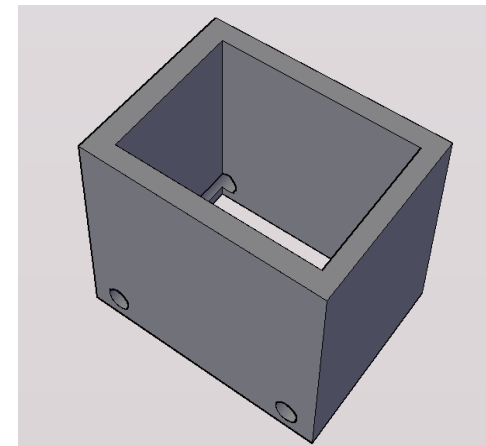
BOX
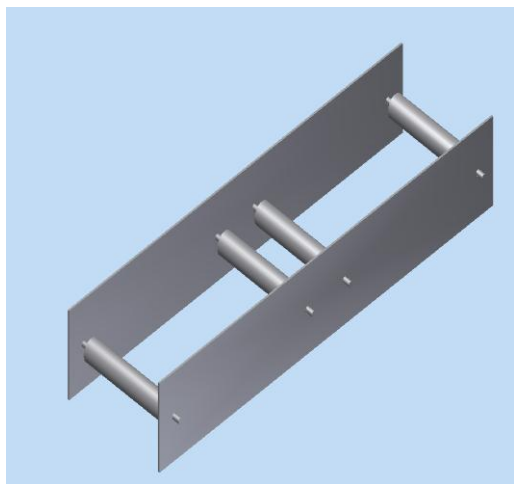
CONVEYER
DISTRIBUTION
SYSTEM
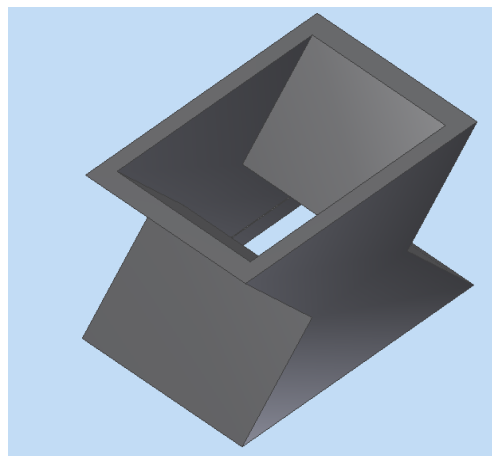
CHARKHAS
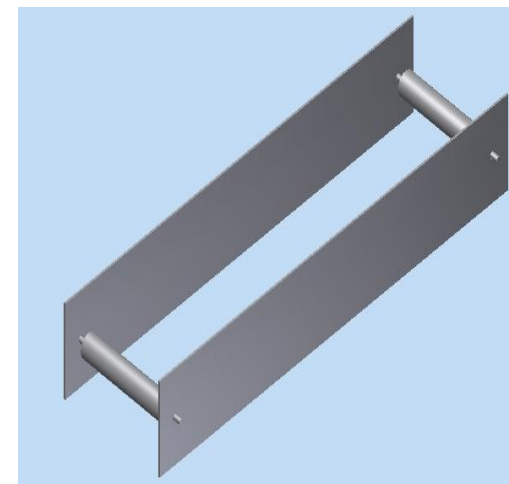
ELEVATING CONVEYER

WORKIG OF TROLLEY MECHANISM

- Trolley works on structural base, made of I-section and T-section.

- Height of this structure is 1.5m to 2m from the ground level according to the application at the middle of all production plant.

- An elevating conveyor providing raw cotton to the trolley, when trolley fully load with material, it start moving on the base.

- Trolley divides material in to two parts of the system by dividing mechanism.

- From there, small conveyor takes the raw cotton up to the 'charkhas'.

- Metal plates are fitted on the edge of the base at where the charkhas are placed at that side. Third metal detector is fitted on the bottom side of the trolley and nearer to base. It detects the metal plates and giving the order to proxy sensor for the activation

- Proxy sensor is the main part of the model. Function of the sensor is to detect the cotton in charkhas, if there is already cotton in the charkha it sense and does not feed the raw cotton in it, if there is no cotton in the charkha it séance the requirement of raw cotton in each charkhas and feed material as per the requirement.
- This whole mechanism is operated by plc programming.

PROGRAMABLE LOGIC CONTROL

- PLC is an industrial computer control system that continuously monitoring the state of input devices and makes decision based upon custom program to control state of output devices.

- Almost of all production line, machine function or process can be greatly enhanced used this type of control system.

- However biggest benefit of using PLC is ability to change and replicate the operation or process while collecting and communicating vital information.

- PLC is modular so advantage of PLC, to mix and match the type of input and output devices to best suit your application.

- Ladder Diagram (LD) Type plc used for our project model.

PLC PROGRAM

Proximity sensor

A proximity sensor is a sensor able to detect the presence of nearby objects without any physical contact by using an electromagnetic radiation.
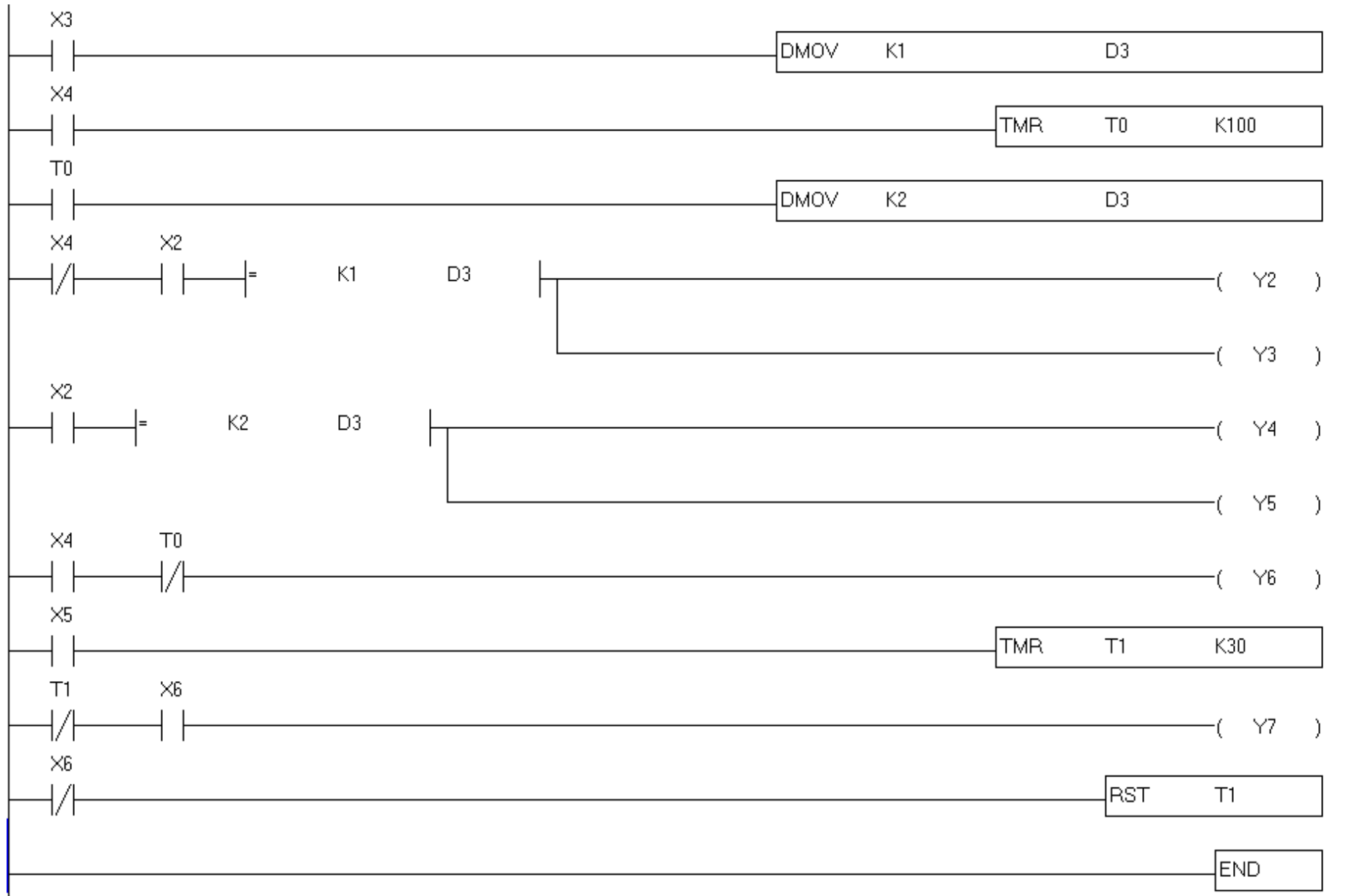
- Proxy sensor is the main part of the model.
- Function of the sensor is to detect the cotton in charkhas, if there is already cotton in the charkha it sense and does not feed the raw cotton in it, if there is no cotton in the charkha it sense and feed required quantity of cotton.

Metal detector

- A metal detector is a portable electronic instrument which detects the presence of metal nearby.

- Three metal detectors are used in model.

- Two metal detectors are fitted on both end of the base. They sense the trolley from both the end and giving the forward and backward movement to the trolley.

- Metal plates are fitted on the edge of the base at where the charkhas are placed at that side. Third metal detector is fitted on the bottom side of the trolley and nearer to base. It detects the metal plates and giving the order to proxy sensor for the activation.

ADVANTAGES OF TROLLEY SYSTEM

- TO REDUCE NOISE :

    In case of long belts number of rollers and motors are used, it makes too much noise. This problem is solved in trolley be cause of less equipment are used.

- TO REDUCE LABOUR, OPERATING, AND INSPECTION COST :

    Trolley is fully automatic system for material feeding so that labour and inspection cost is reduced. Less number of operators are needed so operating cost is also reduced.

- TO INCRESES SPACE UTILISATION:

     Due to less equipments are used in trolley compare as belt mechanism.

- TO REDUCE ELECTRICITY :

     In belt mechanism compulsory all motors are working at a time where as In trolley at a time only one or two motors are in work.

- TO INCREASE PRODUCTIVITY :

     By the trolley system material is feeded as per the requirement manner so efficiently in less time.

COMPARISON OF DIFFERENT DISTRIBUTION SYSTEMS WITH RESPECT TO LINT OUTTURN

Feeding system	Ginning Factory	No. of gins	Type of gins	Lint output (kg/h)		
				First	centre	End
Belt Conveyor	F1	10	Jumbo	73	73	72
Trolley	**FA**	**10**	**Jumbo**	**75**	**74**	**75**
Screw conveyor	FB	10	Jumbo	72	72	70

SAVINGS OF ELECTRICITY COST

- In siddhi industries material(cotton) handling process is performed by belt conveyer system.

- In this system for material handling 11 motors are used.

- The specification of this motors are as below:

MOTOR SPECIFICATION IN BELT DRIVE

SR.NO.	HP	AMPERE	VOLTAGE	RPM
1	3	4	415	935
2	3	4.4	415	1440
3	3.2	4.8	415	935
4	3	4	415	1440
5	3	4.4	415	935
6	3.2	4.8	415	1440
7	3	4	415	935
8	3.2	4.4	415	1440
9	3	4.8	415	935
10	3.2	4	415	1440

- Here each motor of 3hp is used.
- Thus electricity consumption of one motor per hour is:
- P(for 1 hour)=3*0.745

  =2.23kwh

- From industrial data ginning industry runs every day 8am to 8 pm means 12 hours.
- The electricity consumption of one motor per day:

- P(for 1 day)=12*2.23

    =26.76kw

- And ginning season per year is about 6 to 7 months.

- Thus we assume total working days are 180 days.

- Total electricity consumption of one motor per year is:

- P(for 1 year)=26.76*180

    =4816.8kw

- Here in siddhi industries 11 motors are used for belt type material handling system.

- Thus total power consumption during year for 11 motors are:

- Total p(for belt)=11*4816.8

  =52984.8kw

- If we apply trolley system it uses 4 motors of 3hp.

MOTORS IN TROLLEY SYSTEM

SR.NO	HP	AMPERE	VOLTAGE	RPM
1	3	6.6	220	1440
2	3	3.8	380	1440
3	3	6.0	240	1440
4	3	6.6	220	1440

- Thus energy consumption after apply trolley system:
- Total power consumption for trolley

  p(trolley)=4*4816.8

  =19267.2kw

- Saving of electricity consumption after appling trolley system over belt system

 =p(belt)-p(trolley)

 =52984.8-19267.2

 =33717.6kw

COST ANALYSIS

- According to geb data for electricity consumption charges for industries are as follow:

Energy consumption	Energy units	Fixed charges	Energy charges(in rs.)
First 50 units	Kwh	0.00	2.60
51-100 units	Kwh	0.00	3.25
101-150 units	Kwh	0.00	4.88
151-200 units	kwh	0.00	5.63
201-250 units	kwh	0.00	6.38
251-300 units	kwh	0.00	6.88
301-400 units	kwh	0.00	7.38
401-500 units	kwh	0.00	7.88
Above 500 units	kwh	0.00	8.38

- For siddhi industries, they use 450kwh capacity required.

- Charges from table 1kwh=7.88rs.

- Total electricity bill for belt system:

- Charge=total consumption*unit charge

    =52984.8*7.88

    =417520.22Rs

- Total electricity bill for trolley system:

- Charge=total consumption*unit charge

  $$=19267.2*7.88$$

  $$=151825.53Rs$$

- Cost reduction(saving)after appling the trolley system=c(belt)-c(trolley)

  $$=(417520.22-151825.53)Rs$$

  $$=265694.69Rs$$

Conclusion

- Different seed cotton distribution systems in modern Indian ginneries exhibited productivity loss from 2.7 to 9.6% due to unavailability of sufficient seed cotton for processing in gins. No loss of productivity was observed with trolley feeding single side because of sufficient seed cotton available for processing in each gin.

- Trolley system consumes less power than the other conventional system, feeding the material in a required manner, long belt slipping problem reduced, heat generation problem solved, productivity increases.
- Feeding timing of the cotton at the exact to the charkha is improving so that the wastage of seed cotton reduced. Feeding rate of seed cotton increases.

- Power requirement gin for different kind of distribution systems varied from 52984kw. Trolley feeding system required minimum power 19267kw, From the cost analysis according to power consumption as compare to conveyor system trolley system saves RS. **265694.69 Per year.**

THANK YOU