Cotton Collection Machine

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Abstract— This work will give a new technology in the field of cotton boll picking mechanism and to develop machine which is low weight ergonomically which could be used to pick cotton bolls. In India entire cotton is handpick by labor, internationally available machine for cotton boll picking is costlier and its shows that due to spindle type cotton picking machine, percentage of short fiber content increases result in poor quality of cotton fiber strength. Suction type cotton boll picking machine will give new technology in the field of agriculture, which is helpful for Indian farmer, it is not costly and easy to handle. Farmer can easily use suction type cotton-picking machine. We use the vacuum pump for sucking the cotton and 200 liter cast iron strong tank for store the cotton. This all assembly is mounted on the wheel trolley and we can collect the cotton at one location.

Keywords: Cotton Ball, Vacuum Pump, Store Tank

I. INTRODUCTION

Cotton, the most important commercial crop playing a key role in economic and social affairs of the world continues to be acclaimed as 'king fibre'. It is the oldest among the commercial crops of the world. The culture and history of India is intimately related at all periods with the growth of cotton and cotton textiles. The British Empire, for over a century, from 1840 AD made a big fortune on Indian cotton, available, to it as the cheapest raw material for its world encompassing textile industry. Among the fibre crops, cotton provides about 80 per cent of the raw materials for the manufacture of textile in the country. Today cotton is the number one agricultural commodity, sustaining Indian economy with export earnings worth Rs.35872 cores. Cotton picking is one of the major labor intensive operations in cotton cultivation consuming the lion's share of the expenditure. Since the varieties used in our country require cotton picking at several stages, the use of mechanical cotton pickers is not feasible as in the case of defoliated picking method. Hence the only option is the selective picking method. It is very hard to realize a mechanically operated selective picker. Therefore, a pneumatic cotton picker was developed.

Cotton defined as "A soft white fibrous substance which surrounds the seed of the cotton plant and is made into textile fibre and thread for sewing". It can be defined as "A crop plant with white hairs". Cotton harvesters or so called cotton pickers are readily available in the market but are expensive and reduce the quality of cotton fibres. In India, cotton is still hand-picked which gives a high quality cotton but requires more time for picking. Spindle type cotton harvesters is a type of cotton picking machine. It uses a spindle which is rotating at high speed about their axes, attached to the drum. The cotton fibre gets wrapped around the spindle and is taken off by a special device called as doffer and is collected in the storage tank. Due to the wrapping of cotton around spindle bars the cotton fibre gets stretched reducing the cotton fibre strength and the quality of the cotton. It also increases the trash content during picking. Many research conducted in the field of pneumatic cotton-picking machine for increasing their efficiency in cotton boll quality various papers were presented in the field of development of cotton picker. Some of the literature are listed in support of development of cotton picker. Ankit Sharma, S.S Ahuja and V.P Sethi developed a machine concluded that the maximum efficiency could be achieved by using 25mm diameter Suction pipe and suction pressure of 45mm of Hg. Minimum trash content was observed by using a 20mm.Diameter Suction pipe and suction pressure of 30mm

II. PROBLEM STATEMENT

1) The main problem identified through this traditional process was the process was time consuming and was of headache to farmers with scarcity of labours.
2) The high and massive output machines mainly clear the farm along with the weed and the cotton.
3) The same problem was arriving with the suction pressure machine, due to high suction force this machine was sucking cotton along with the nearby available weeds with the cotton ball.
4) This adversely affects the quality of cotton and the strength of cotton fibres

A. Objectives:

1) Cotton collection in farm is the big task for the farmer and it takes a too much time to collect and store in one location so we need to develop the machine which Collect the cotton.
2) Main objective of the project is to design the maximum vacuum creating pump.
3) Objective of this project is to save the time of the farmer for collecting the Cotton.

B. Scope:

There is a big scope for developing the project for collecting the cotton in India because India is the farming country. In India there is more than 50% people are doing the farming and cotton is main farm in this. Cotton is useful for making the cloth for wearing and also for different application so there is scope to design the high results providing and efficient cotton collecting machine by using the air vacuum.

one of the difficult tasks in sun drying. This study was then conceptualized by looking into existing designs.

III. CALCULATION

1) Specification of motor

1) Step 1:

Battery-12V DC

As per this we are using motor of 12V operation

2) Step 2:

Motor 12V DC 1A

Speed-1440 rpm

Torque-32Kg/m

2) Pressure for Suction

Pressure formula for the gas is,

Pv = nRT
P = Pressure
V = Volume
n = Number of moles = 1
T = Temperature in kelvin = 273°+30°
=303° kelvin
R = 0.0821(constant)
Given – Tank – 100 litre = V1
Pipe size = 2.5cm diameter
Pipe length =100cm=1m
a) Volume of pipe cylinder
V2= 3.1415(r)^2h
=3.141*(1.25)^2*1
V2=4.90litres
b) Total volume
VT =V1+V2
=100+4.90
=104.9litres
So, PV = nRT
P*104.9=1*0.0821*303
P = 0.2371kpa
=237.1pa
c) Velocity
V = √2gh
h =237.1/(0.549*9.81)
=44.02
V =√2*9.81*44.02
=√864.66
V =29.40m/s

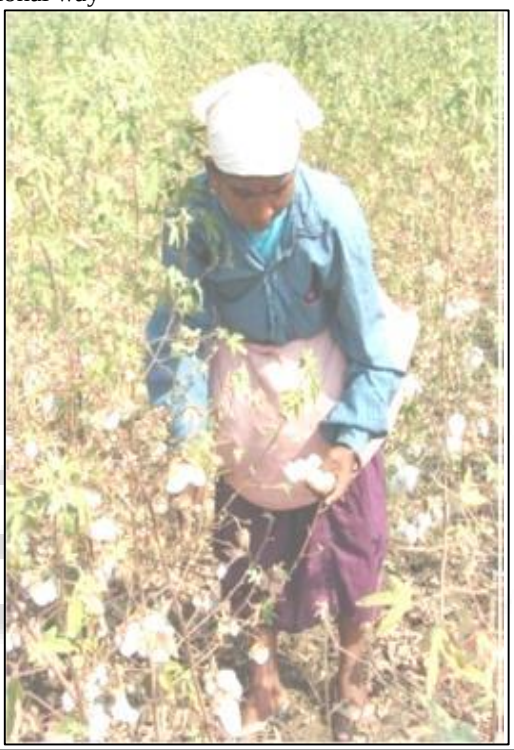
B. Material Selection

Frame – Mild steel material(1 inch,18 gauge)
Wheel – Standard
Tank – 100 litres
Pipe – Hose flexible pipe of 2.5cm size
Motor & Battery – 12v operating

IV. WORKING

With technological advancement and development in science, various new techniques were brought in use. They were deeply dependent on the suction force used to pick cotton in field. There developed various machines which use a hydraulic tool to pick cotton in filed. Some machines directly harvest the complete field through its big tool machineries equipment. The big problem arising with these machines was that excess work of separation cotton from its weed was increased. Due to mixing of cotton ball with weeds and other parts caused the adverse effect on the quality of fibres produces in cotton. They use to damage the fibres of cotton which implant poor strength to the textile. Al so these heavy and Costly machines were inappropriate for small scale farmers as it costs much more than the total profit generated by the small scale farmers. These machines were not useful and cause much energy consumption. There was scope generated with idea of portable and handy machine design which was efficient than the previously developed machines. With due development of the idea to design a hand and portable machine which was able to be capable of working as compared to 2-3 workers at single device. This idea gave birth to the design of a cotton picking machine which would work on the suction pressure developed. And this suction pressure was used to suck cotton from cotton ball. Basically the design of machine consist of a suction motor which runs on a high speed rpm to develop the desired suction pressure that can suck the cotton from cotton ball. It was basically dependent on the idea of working of vacuum cleaner machine. It has a hollow long pipe head which sucks cotton form cotton ball. This machine was inadequate and improper in use since it sucks cotton as well as the nearby weeds attached to the cotton. The sudden fall in suction pressure due to blockage in motor by weed causes the machine to stop functioning and causes improper and unnecessary interruptions to the process.

Traditional way



By Using Machine

V. CASE STUDY

Hour	Manual Picking Kg/Hr	Cumulative Picking (Kg)	Machine Picking Kg/Hr	Cumulative Picking (Kg)
1	9	9	10	10
2	9	18	10	20
3	8	26	10	30
4	8	34	10	40
5	7	43	10	50
6	7	50	10	60
7	6	56	10	70
8	6	62	10	80

A. Fans and Blower

Fans and blowers provide air for ventilation and industrial process requirements. Fans generate a pressure to move air (or gases) against a resistance caused by ducts, dampers, or other components in a fan system. The fan rotor receives energy from a rotating shaft.

Equipment	Specific Ratio	Pressure rise (mmWg)
Fans	Up to 1.11	1136
Blowers	1.11 to 1.20	1136 – 2066
Compressors	more than 1.20	-

Fans, Blowers and Compressorare differentiated by the method used to move the air, and by the system pressure they must operate against. As per American Society of Mechanical Engineers (ASME) the specific ratio - the ratio of the discharge pressure over the suction pressure - is used for defining the fans, blowers and compressors.

B. Fan Types

Table Fan Efficiencies	
Type of fan	Peak Efficiency Range
Centrifugal Fan	
Airfoil, backward curved/inclined	79-83
Modified radial	72-79
Radial	69-75
Pressure blower	58-68
Forward curved	60-65
Axial fan	
Vanaxial	78-85
Tubeaxial	67-72

Fan and blower selection depends on the volume flow rate, pressure, type of material handled, space limitations, and efficiency. Fan efficiencies differ from design to design and also by types. Typical ranges of fan efficiencies are given in table.

Fans fall into two general categories: centrifugal flow and axial flow.

In centrifugal flow, airflow changes direction twice - once when entering and second when leaving (forward curved, backward curved or inclined, radial)

In axial flow, air enters and leaves the fan with no change in direction (propeller, tubeaxial, vaneaxial)

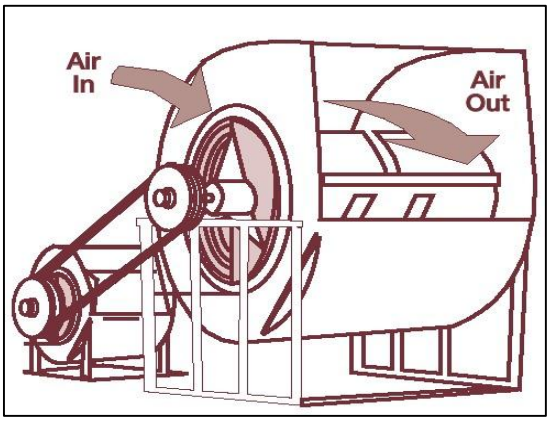


Fig. 5.1: Centrifugal Fan

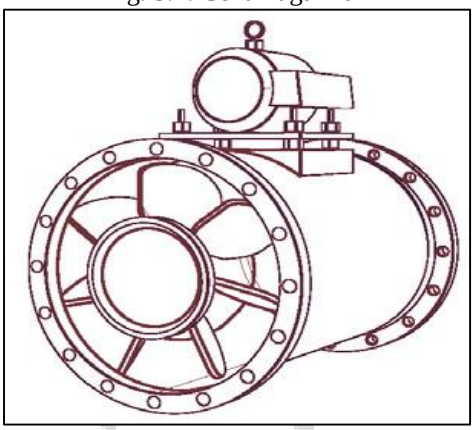


Fig. 5.2: Axial Fan

Tubeaxial fans have a wheel inside a cylindrical housing, with close clearance between blade and housing to improve airflow efficiency. The wheel turn faster than propeller fans, enabling operation under high-pressures 250 – 400 mm WC. The efficiency is up to 65%.

Vaneaxial fans are similar to tubeaxials, but with addition of guide vanes that

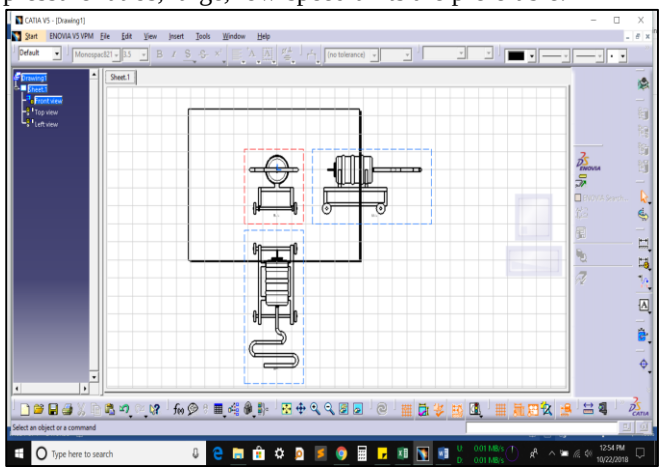
The different types of fans, their characteristics and typical applications are given in

Blowers can achieve much higher pressures than fans, as high as 1.20 kg/cm^2. They are also used to produce negative pressures for industrial vacuum systems. Major types are: centrifugal blower and positive-displacement blower. Centrifugal blowers look more like centrifugal pumps than fans. The impeller is typically gear-driven and rotates as fast as 15,000 rpm. In multi-stage blowers, air is accelerated as it passes through each impeller. In single-stage blower, air does not take many turns, and hence it is more efficient. Centrifugal blowers typically operate against pressures of 0.3 to 0.70 kg/cm^2, but can achieve higher pressures. One characteristic is that airflow tends to drop drastically as system pressure very conservative approach is adopted allocating large safety margins, resulting in over-sized fans which operate at flow rates much below their design values and, consequently, at very poor efficiency.

Once the system flow and pressure requirements are determined, the fan and impeller type are then selected. For best results, values should be obtained from the manufacturer for specific fans and impellers.

The choice of fan type for a given application depends on the magnitudes of required flow and static

pressure. For a given fan type, the selection of the appropriate impeller depends additionally on rotational speed. Speed of operation varies with the application. High speed small units are generally more economical because of their higher hydraulic efficiency and relatively low cost. However, at low pressure ratios, large, low-speed units are preferable.



CAD MODEL

C. Advantages

1) This machine saves the time of cotton collecting for farmer.
2) Cotton collection at one point is easy because of this machine.
3) High amount of cotton is able to collect in the tank.

D. Disadvantages

1) System is run by vacuum so some times because of leakage system is fail.
2) Electricity is required for run the system.

E. Application

1) Applicable for the big farm farmer for collecting the cotton.
2) Also this type of project use in industry for collecting the low weight components.
3) This type of machine is use for floor cleaning purpose also.

VI. Conclusion

We conclude from all above references that, the main conceptual idea behind the working of cotton picking machine was of suction force. All of them utilised the suction force in one or different forms which caused them to remove the unwanted weeds from the crop. Overall conclusion came out to be that both the high yield machine and cotton suction pressure machines creates excess work of separating cotton from weeds. It implants poor strength to the cotton fibres and lowers the quality of cotton produced.

References

[1] Design &Analysis of Cotton Picking Machine in View of Cotton Fibre Strength Nikhil Gedam; Prof.A.K.Mahalle International Journal of Engineering Research and General Science Volume 3, Issue 3, May-June, 2015

[2] "Performance evaluation of a manually operated cotton picker" Adebija J. A, and Jackson B. A. in African journal of agricultural research, vol. 8(29), pp. 38833887, 1 august 2013

[3] Determination of Variety Effect of a Simple Cotton Picking Machineon Design ParametersM. Bülent COŞKUN' GelişTarihi: 12.07.2002

[4] Quantitation of Fiber Quality and the Cotton Production-Processing Interface: A Physiologist's Perspective; Judith M. Bradow* and Gayle H. Davidonis

[5] The Effect of Harvesting Procedures on Fiber and Yarn Quality of Ultra-NarrowRow Cotton; David D. McAlister III and Clarence D. Rogers

[6] "A Study Of Mechanization of Cotton Harvesting In India: Implications For International Markets" SrinivasaKonduru, Fumiko Yamazaki &MechelPaggi, Final Report: Cotton Inc. Project #10-275

[7] Evaluation of Portable Cotton Picker,International Journal of Agriculture Innovations and Research Volume 2, Issue 1, ISSN (Online) 2319-1473.

