Design And Fabrication Of Cotton Wrenching Machine

Kathirvel K, Vignesh P, Yuvaraj N, Vignesh kumar P, Sivaraman M

Abstract: Almost 100 percent of cotton is picked manually in Republic of India although plenty of recent technology is offered worldwide Indian farmers come with typical farming techniques, the most reasons for this over years was that the majority of the cotton farmers in Republic of India square measure little farmers (i.e. little land farmers) and most of the technology doesn't favor it, conjointly Brobdingnagian quantity of cash needs to be spent on a number of the on top of mechanism that could be a major roadblock. The prime goal of the project is to modify the cotton extraction, appropriate for tiny scale production and conjointly to scale back the high labor value pay for gathering. The project titled Cotton painful Machine includes of a specially designed spinned roller, which will be rotated by a motor. there'll be 2 spinned rollers that square measure fastened parallelly with some clearance between them. These 2 rollers square measure created to rotate in wrong way for effective extraction of cotton from the plant. The spines hooked up to the rollers were primarily based information taken on the typical of the space of cotton flowering within the branches of the plant. On the highest of the roller mistreatment belt transmission 2 rollers square measure connected to the motor output. A bunch of fibre brushes square measure seamed along and fastened on either aspect of the roller. For higher handling, the handle is placed at each the ends. Four wheels made from iron square measure fastened to every corner of the machine for transportation. 2 collection boxes square measure hooked up at the bottom of the brushes for collection the extractedcotton.

INTRODUCTION

Agriculture prevails to be the backbone of our nation since many years. Agriculture is a long-term process that follows many steps like crop selection, land preparation, seed selection, seed sowing, irrigation, crop growth, fertilizing and at last it ends up with harvesting. Each variety of crop takes different time to reach the process of cultivation stage. One such time taking crop is cotton. cotton is the most important fibre crop not only in India but of the entire world. It prevails as a raw material for the textile textile industries. In India cotton is cultivated on a large scale. About 170 kilograms of cotton is produced in India as per 2018-2019 report. Cotton also involves varies process for its cultivation. Among all the process the most tedious process is harvesting. On reviewing the journals, it is clear that there are many processes being utilized in India for extracting the cotton but no machine is that much effective in harvesting it. So, our project titled cotton wrenching machine would be the best solution for extracting the cotton from the plant. This machine could extract the cotton from the plant with the help of specially designed spinned rollers which rotates in opposite direction over the plant, so it could pinch and extract the flower from the branches. Then the specially designed fibre brushes will pick the flower from the plant and makes fall into collecting box.

LITERATURE REVIEW

Prof A. K. Mahalle et al. (2015), planned a Spindle - kind cotton selecting machine. The operating of that machine is as follows. The spindles, that rotate on their axes at high speed, ar connected to a drum that additionally turns, inflicting the spindles to enter the plant. The cotton fiber is wrapped round the moistened spindles then started by aspecial device known as the doffer, from that the cotton is delivered to an oversized basket carried higher than the machine. throughout wrapping of cotton fiber round the spindles bars, fiber was stretched can lead to augmented short fiber content and trash and thence loses fiber quality and strength. Durgesh Gupta et al. (2017), planned a system known as gas Cotton Picker. during this methodology the IC is as well as the shaft of blade. The engine rotates the crank shaft. The output shaft rotates with high speed would rotate the blade with same speed up to five00rpm with output power of 5.736KW. The high-speed blade would turn out the desired suction pressure at the attention of blade in order that solely cotton bolls would be plucked. the attention of the blade are going to be connected to the suction duct, more goes to the vessel (Polypropylene material). within the vessel, the hosepipe are going to be connected with the Nylon mesh filter which is able to avoid the cotton fibre to enter the pump (imPELLer). the within pressure of tank would be maintained at the desired worth. The air that is sucked within would be blown out by the centrifugal fan. For the need of optimum worth suction pressure, the suction pipes diameter are often modified. 2 folks at a time will suck the cotton bolls type the plants. The cotton picked would be collected in a very tank. Akash Mohanty et al (2016), planned the system spindle picker machine. The Spindle picker machines rely for his or her effectiveness upon the rotating spindles truly contacting the ripe cotton fiber and accomplishing physical adherence of the fiber to the spindles. This necessitates a large number of spindles to accomplish physical engagement with the cotton bolls, and even with a bigger variety of spindles; several of the bolls naturally ar uncomprehensible and left unpicked within the field. the employment of water for wetting the spindles introduces mechanical issues and special service wants. The water on the spindles additionally promotes discoloration and marking of the cotton. Special attention is needed to feed the water equally and within the optimum quantity. Moreover, inweather condition the water dampening system might sometimes freeze. Basically, the invention contains the applying of Associate in Nursing electric charge to the selecting spindles and inductively to the cotton being picked, so in result making a sexy force reaching out and drawing the cotton to the spindles, gaining contact thereby, with cotton that otherwise wouldn't be contacted. These electricity forces pull the fiber to the spindles and cause it to stick to the spindles, so aiding the wrapping operation and eliminating loss by dropping the cotton. The invention so contains more and therefore the preconditioning of the cotton within the open bolls by induced electricity force.
thus on cause the individual fiber to face and reach out for the rotating picker spindles coming into the selecting zone. Gautam Majumdar et al (2013), propose a system of Cotton strippers ar used as a scrutiny harvest machine. Found in areas wherever weather stop continual harvests, strippers ‘pull’ the complete boll, ripe or not or sever the stalk close to the surface of the bottom and take the complete stalk, at the side of cotton bolls into the machine and another machine is employed to get rid of the burr and vegetative matter. Cotton Stripper Early implements used a picket sled drawn by a horse or mule to tug cotton off the stalk. The sled was designed to reap cotton by propulsion the plants through a tapered gap wide enough for the stalks to undergo however slim enough to catch and take away open and sealed bolls. Most sleds harvested one row per pass, however multi row sleds were accessible. once “sledding,” farmers typically concentrated twig the turn-row to permit sealed inexperienced bolls to open before ginning. Aggressiveness in harvest home directly influences the quantity of seed cotton and foreign material harvested. The additional aggressive the harvest home actions, the upper the chance is to reap additional foreign material and generate bark. you would like to regulate stripper row units to the proper level of removal aggressiveness with goal of harvest home the smallest amount foreign material and inflicting the smallest amount seed cotton field losses. harvest home potency for brush-roll strippers is high, typically within the vary of 98-99%. However, some aspects of fiber quality (such as micrometer ire and length uniformity) are often reduced for stripped cotton thanks to the presence of immature fiber from bolls placed at the highest of the plant. The presence of immature fiber also can influence fiber length, strength, and color grade

MATERIALS AND METHODOLOGY

MATERIALS

Roller is the cylindrical body of rolled steel with desired dimension has fabricated. The entire circumference of the roller is welded with specially designed spines. The spines are welded in accordance with the results obtained from the average of the distance of flowering in the branches of the plant. Motor is harnessed for providing rotational power to the two rollers. For effective extraction of fibre from the plant the speed of the motor should be optimized. So, a 0.5 Hp DC motor is harnessed for this machine. The motor is placed at one end of the frame with bold support. The motor is placed in vertical position for the purpose of transmitting power to both the rollers. Bearings are meant for supporting the rotation of the shaft without any kind of axial vibrations. So, Plumber blocks are used to rotate the roller smoothly. A 1-inch plumber block is fixed into the end of the roller shaft. The plumber block gets its support from the frame. Pulleys are fixed at the top end of the roller shaft and above the plumber block. Single grooved pulley is attached to the motor and also for one of the pulleys. For another roller, a double grooved pulley is fixed. B type pulleys are used for effective transmission, which are of 1-inch diameter pulleys. Belts are those rubber made compound, which are used to transmit rotational motion between two pulleys. A 34-centimetre and 36-centimetre, B type belts are connected between motor and rollers. Among the two belts, one belt is connected as open type and other is of closed type, this is because to provide the rotation of the rollers in opposite direction. Batteries are used to provide DC power to the motor. For our project a 12-volt, 7 AH DC battery is used. On the motor side the battery is mounted. The battery is fully enveloped with sheet metal covering to protect it from water, dust which are common in the field. The collecting box plays a vital role in this machine, its function is to collect the cotton fibres that are loosened by the brush and are falling from the spines. A cuboid box is made using the sheet metal. Two boxes are fabricated and are kept on either side of the rollers. The collecting boxes are unfixed one, for the purpose taking out from the machine once the box get filled with cotton fibres. The boxes are placed at the basement of the structure. The whole apparatus is mounted over the frame. The entire structure of the machine is fabricated using a 2-inch box channel made of mild steel, which are welded together to form the structure. A special steel plate is welded to the side of the frame for the purpose motor mounting. The frame supports and holds the motor, roller, collecting box, battery etc. on the front side of the structure a converging beam is welded at the sides. The purpose this beam is to converge the plant into the clearance between the rollers, because the width of the plant varies from one plant to another. Handle is also provided at the back side of the structure, for moving the machine over the field. Fasteners are used in various parts of the machine. Fasteners are temporary joints which varies in different sizes according to the usage. Motor mounting, belt fixing, plumber block mounting etc. where the areas fasteners are harnessed in our machine. For our project 14 M8 bolts and nuts are used. Wheels are the vital part of the machine. Wheels provide movement of the machine into the field and they also give sufficient ground clearance to the machine. 4 iron wheels of 12-centimetre diameter are used. These wheels are fixed to each four corners of the structure.

METHODOLOGY

Problem Identification, Selection of Materials, Design and Design Calculation, Fabrication Work, Assembly, Trial Run

FABRICATION PROCEDURE

The main component of this machine is, a specially
designed spinned roller, which will be rotated by a motor. It consists of two spinned rollers which are fixed parallelly with clearance between them. These two rollers are made to rotate in opposite direction for effective extraction of cotton. The spine welded to the rollers are based on average distance between two cotton producing branches. On the top of the roller using belt transmission two rollers are connected to the prime mover. A bunch of fiber brushes are stitched together and fixed on either side of the roller. For effective handling, by taking the average of human height, the handle is placed. Four wheels made of iron are fixed to each corner of the machine to support transportation. Two collecting boxes are attached to the base of the brushes for collecting the extracted cotton.

**DESIGN CALCULATION**

The calculation starts with design of roller and spine angle and then frame design, motor calculation

1. **Motor calculation**

   Motor speed = 1400rpm

   Motor power = 372w Horse power = 0.5hp

   

   Power = \( \frac{2}{NT} \times 60 \)

   Torque = 60

   Torque = \( \frac{60}{2} \) 1400

   Torque = 2.5 Nm

2. **Roller calculation**

   Average length of the cotton plant = 1300mm

   Average length of flowering distance = 500 to 600 mm

   Average plant width = 300mm

   Clearance between two rollers = 250 mm

   Length of the roller = 600 mm

   Length of the spine arrangement = 500 mm

   Diameter of the roller = 60 mm

3. **Battery specifications**

   Type - lithium ion

   Voltage - 12 v

   Ampere hour - 7 Ah

   Running time - 1 hour

4. **Collecting Box Dimension**

   Volume of the box = b

   = \( \frac{15750000}{mm^3} \)

**Cotton wrenching machine**

When the machine moved over the plant, a converging plate will converge the plant to move in between the rollers. Due to cross belt connection between roller, they will revolve in opposite direction. so, if the motor is powered it will rotate the roller in opposite direction and at the time when the plant enters between the roller the spines will wrench the fibre from all over the plant. And on further rotation the wrenched cotton on striking the brushes will get loosened and will fall in the collecting box.

**CONCLUSION**

Thus, the cotton wrenching machine was fabricated as per the design and requirement. This machine will be of semi-automatic system, which requires two labours to operate it. When the cotton wrenching machine is operated over the
cotton field, it will effectively extract the cotton from plant. The spinned rollers pick the cotton from the plant when the plant enters in between the roller. For effective extraction of the cotton fibre, the rollers made to rotate in opposite direction. The fibre which got loosened and attached to the spines will be removed off with help of the nylon brushes and at last the falling fibres are collected in the collecting box.

REFERENCES