

Design and Development of Pneumatic Cotton-Picking Machine

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Abstract: - A pneumatic type cotton boll picking machine is designed and developed to pick cotton from cotton boll by using pure suction method. This suction pressure and velocity at inlet and outlet of impeller is calculated. Pneumatic cotton boll picking machine is having low weight ergonomically and efficient for Indian farm. It is knapsack type machine. When engine get start, impeller start rotating and suction is created at the outlet. By using this suction pressure cotton can be picked from cotton boll with the help of hose pipe.

Index Terms- Pressure, Cotton Boll, Pneumatic.

I. INTRODUCTION

The project deals with the automations of work in the agriculture where 44% of all fibers cotton account has used in the world. It is an important commercial crop in India. India rank third in cotton production with 16.87 million bales from an area of 9.25 million hectares. Cotton in India harvested manually. A cotton picker machine that removes the cotton from the boll without damaging the cotton plant or by a cotton stripper, which strip entire boll off the plant is not existed in India. The average land holding capacity of farmers is 1-3 hectares of land. Hence, the use of cotton-picking machine will be useful in minimizing drudgery involving in hand picking as well as enhancing production of cleaner grade of seed cotton. In India entire cotton is handpicked by labour. In an International level machines are available for cotton picking is costlier and not affordable to Indian farmer also it is not suitable for Indian farming condition, so pneumatic type cotton boll picking machine will helpful for Indian farmer to pick cotton and it will reduce time and cost.

II.LITERATURE REVIEW

- 1) A shoulder mounted power driven cotton picker designed and developed. The terminal velocity of seed cotton found to be 3.2m/sec. Among the four systems of cotton-picking developed namely, pure suction, venture suction, single picking brush-cum-suction and counter rotating brushes-cum-suction, the last device fared better for picking cotton from the fully opened cotton bolls. A shoulder mounted

power driven cotton picker designed and developed. The average terminal velocity of seed cotton found as 3.2m/sec. The counter rotating brushes-cum suction system found better for picking the cotton from the fully opened cotton bolls than the others were namely, pure suction, venture suction and single picking brush-cum-suction systems. It is suggested that the power required to rotate the picking brush assembly is to be taken directly from the aspirator shaft instead of DC motor and battery set up[1]

- 2) The smaller straight spindle is use for cotton picking this spindle is more useful in removing cotton from boll . There was approximately twice as much fly off from the barbed spindle than from the smaller straight spindle at any given speed. Fly off also increased exponentially for each spindle type as the speed increased for both spindle types. The peak force required to remove the seed cotton from the spindle ranged from 50 to 100 % more for the smaller straight spindle than from the barbed spindle. It is suspected that, this is because the barbs on the tapered spindle act as small fans and create air currents that detract from their ability to pick the cotton.[2]
- 3) Agricultural mechanization refers to interjection of improved tools, implements and machines between farm workers and materials handled by them. Independent India ushered in a process of agricultural mechanization and revival of rural agro processing which got acceleration during post-Green Revolution period. Irrigation pump sets, power threshers, tractors, power tillers and matching implements, including for 65Million draft animals have became popular. Seed and seed cum fertilizer drills, planters, mechanical rice translators, vertical conveyor reapers, and combines soon followed. In the recent past, Zero-till Drill and Raise Bed Planters have found good acceptance from the farmers. Currently mechanization is in increasing demand. Farmers, policy makers, and developmental agencies now realize that for increasing production

and productivity at reduced unit cost of production, free of arduous labour, agricultural mechanization is essential. It brought in centre stage with globalization of world markets. Introduction of electromechanical power units supplementing and substituting traditional animate sources of farm power is going to continue. For achieving desired intensity of cropping average farm power requirement of 2 kW/ha is considered essential, currently it is 1.15kW/ha.[3]

III. CURRENT SCENARIO OF PNEUMATIC COTTON PICKING MACHINE



Fig.1 Currently available machineries

Internationally available machine are not suitable for Indian farm this type of machine is not use for small farm the average land holding capacity of Indian farmer is 2-3 hector, in India cotton is picked two times so we cannot use this machine. This type of machine is very costly for Indian farmer and not suitable for Indian farming condition.

IV.MATERIAL AND METHOD

Two-stroke petrol engine of 1.18 kW is connected to impeller which produce vacuum that vacuum create negative pressure head which is capable of removing cotton from cotton boll. In pure suction cotton sucked pneumatically from open cotton boll through the hose pipe and it is collected in collection tank.



Fig.2 Fabricated model of pneumatic picking machine.

V. PRESSURE CALCULTATION

Pressure created by impeller at the outlet.

$$P = 249.08 * 1$$

$$P = 249.08 * 1.1 \left(\frac{N * D * 39.37}{1.53 * 10^4} \right)^2$$

$$P = 2612.41 \text{ Pa.}$$

Now,

$$P = \rho gh$$

$$2612.41 = 1.H = 225.10m.$$

We know that,

$$V = 66.45m/s.$$

Velocity generate at the outlet of impeller is 66.45m/s.

$$\text{Pressure difference } \Delta P = P_2 - P_1$$

$$\Delta P = - 98732.59 \text{ N/m}^2$$

$$\text{Pressure Ratio} = P_2 / P_1$$

$$= 0.025577.$$

This pressure difference can easily suck cotton from cotton boll.

TABLE I. FIELD TRIAL

H o u r s	Manual Picking Kg/Hrs	Cumulative picking in kg	Machine Picking Kg/Hrs	Cumulative Picking in 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

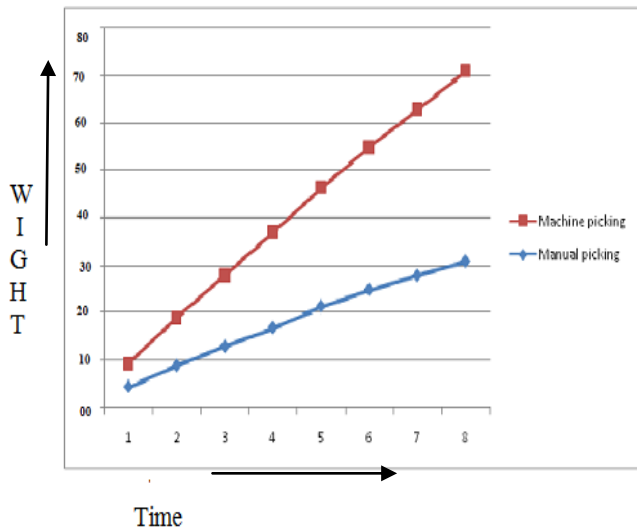


Fig.3 Manual picking and machine picking graph.

[4] Multiple attribute decision making for selection of mechanical cotton harvester S. S. Kohli¹, Manjeet Singh², Karun Sharma^{2*} and Gayatri Kansal³

[5] Mechanization 01 Colton Production By Dr. Gautam Majumdar CICR , Nagpur

[6] Feasibility and economic viability of Knapsack cotton picker in India By M. Muthamilselvan, k. Rangasamy and a. Sampathrajan, Indian J. Agric.res, Vol.42(2),86-91,2007

VI. NOVELTY OF APPROACH

This Proposed pneumatic cotton picker is better than that of existing present cotton picker system because of following reasons -

- This project will give new technology in the field of agriculture
- It is useful for Indian farming condition.
- It reduces handling cost.
- It saves labour cost and time consumption.
- Easy to handle.
- It has higher cotton boll picking efficiency and better quality of cotton fiber.

VII. SCOPE

In India entire cotton is handpicked by labour. Internationally available machine for cotton boll picking is costlier and not affordable to Indian farmer also it is not suitable for Indian farming condition. Pneumatic cotton boll picking machine will give new technology in the field of agriculture which is helpful for Indian farmer, it is easy to handle. Farmer can easily use pneumatic cotton-picking machine.

VIII. CONCLUSION

A pneumatic type cotton-picking machine is design and developed. The velocity and suction pressure is created to suck cotton from cotton boll and collect in a tank .The power required to create suction pressure to the shaft assembly of cotton-picking machine by using two strokes IC Engine.

REFERENCES

[1] Development of Shoulder Mounted power drive cotton picker By R. Murugesan, S. K. Shukla, Agricultural engineering, Vol 28(1-2).

[2] 2240 cotton quality as affected by changes in the spindle picker, Kevin D. Baker and Ed Hughs USDA, ARS, Southwestern Cotton

[3] Future Requirements of Agricultural Machines for Mechanizing Agriculture by Anwar Alam.