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DESIGN AND FABRICATION OF PNEUMATIC CORN SEPERATOR

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ABSTRACT

In this study, corn seeding unit was designed and evaluated. The physical and mechanical properties of two varieties of grain and corn maize were measured. Then, seed separator unit (thrasher) was evaluated for three-toed flapper (the tip of the square, circle and triangle) according to the force and torque. The appropriate design (triangular) was selected. Test and evaluation were done for two varieties of corn (KSC 704 and SNK 600) in the range of 13-15% and 20-24% MC and three cylindrical thrasher speed (rpm 140, 280 and 400) at five replications. The results showed that the capacity of Sheller for KSC 704 and SNK 600 are 50.9 and 31.53Kg/hr respectively. The best performance is 91.95% for KSC 704 at 400rpm and initial moisture content. The highest efficiency of separation unit was calculated 66.91% for KSC 704 (400rpm and Initial MC). Total loss of system increased by increasing MC and rotation speed of thrasher. The lowest lost was occurred at 13-15% MC and 140 RPM.

I. INTRODUCTION

Automation can be achieved through computers, hydraulics, hydraulics, robotics, etc., of these sources, hydraulics form an attractive medium. Automation plays an important role in automobile. Nowadays almost all the automobile vehicle is being atomized in order to product the human being. The automobile being vehicle is atomized for the following reasons

- To achieve high safety
- To reduce man power
- To increase the efficiency of the vehicle
- To reduce the work load
- To reduce the fatigue of workers
- To high responsibility
- Less Maintenance cost

II. LITERATURE REVIEW

Rudragouda Chilur, Sushilendra Kumar (2018), developed a maize sheller. In this they said that a farmers (small-medium) are lack of economic technologies with maize dehusking and shelling, which fulfils the two major needs as crops and as livestock in farming. The portable medium size (600 kg/h capacity) electric motor (2.23 kW) operated Maize Dehusker cum Sheller (MDS) was designed to resolve the issue by considering engineering properties of maize.

Nkakini, S. O., Ayotamuno, M. J., Maeba, G. P. D., Ogaji, S. O. T., & Probert, S. D. (2007) made manually operated continuous flow maize sheller. This sheller uses abrasion between a rotating shelling-disc and stationary concave compartments to achieve the stripping. A manually-operated handle is used to rotate two shafts, one of which translates rotational motion to become linear motion of a slider crank. The slider pushes the maize cobs into the sheller continually one after another. Though manually operated, the sheller can provide a continuous flow; the kernels being collected via a chute.

Mogaji, P. B. (2016) made a improved maie shelling machine. The objective of this work is to design and develop an improved maize shelling machine in terms of better time management, affordable cost, portability and mechanical efficiency. The method used involved selecting appropriate materials, and utilisation of theories of failure that enable the determination of allowable shear stress on the bearing supports. It features the design calculations necessary for the completion of this work. The improvement in this work is its shelling efficiency without breaking the maize cob. The machine can be operated both manually and mechanically. A maize Sheller with a capacity of 3 horsepower was made effective for the shelling of maize. The efficiency of the machine is 96%

III. FACTORS DETERMINING THE CHOICE OF MATERIALS

The various factors which determine the choice of material are discussed below.

1. Properties:

The material selected must posses the necessary properties for the proposed application. The various requirements to be satisfied can be weight, surface finish, rigidity, ability to withstand environmental attack from chemicals, service life, reliability etc.
The following four types of principle properties of materials decisively affect their selection

a. Physical
b. Mechanical
c. From manufacturing point of view
d. Chemical

The various physical properties concerned are melting point, Thermal Conductivity, Specific heat, coefficient of thermal expansion, specific gravity, electrical Conductivity, Magnetic purposes etc. The various Mechanical properties Concerned are strength in tensile, compressive shear, bending, torsional and buckling load, fatigue resistance, impact resistance, elastic limit, endurance limit, and modulus of elasticity, hardness, wear resistance and sliding properties.

2. Manufacturing Case:

Sometimes the demand for lowest possible manufacturing cost or surface qualities obtainable by the application of suitable coating substances may demand the use of special materials.

3. Quality Required:

This generally affects the manufacturing process and ultimately the material. For example, it would never be desirable to go for casting of a less number of components which can be fabricated much more economically by welding or hand forging the steel.

4. Availability of Material:

Some materials may be scarce or in short supply. It then becomes obligatory for the designer to use some other material which though may not be a perfect substitute for the material designed. The delivery of materials and the delivery date of product should also be kept in mind.

5. Space Consideration:

Sometimes high strength materials have to be selected because the forces involved are high and the space limitations are there.

IV. COMPONENT AND DESCRIPTION

Major parts:

- Air Compressor
- Pressure Gauge
- Actuators
- Solenoid Valve
- Flow control Valve
- Connectors
- Hoses

Air compressor:

Compressors can be broadly classifieds into two groups.
They are:

- Positive Displacement Compressor
- Dynamic Compressors

Positive Displacement Compressor:

Successive volumes of air isolated and then compressed to a higher pressure. There are essential two forms of positive displacement compressor, reciprocating and rotary.

Dynamic Compressors:

These are rotary continuous machines in which a high speed rotating element accelerates the air and converts the resulting velocity head into pressure. Positive displacement compressors work on the principle of increasing the pres employs rotating vanes or impellers to impart velocity and pressure to the flow of the air being handled. The pressure comes from the dynamic effects such as centrifugal force.

Pressure gauge:

Pressure gauge is used for measuring the outlet pressure of air from the compressor. The gauge used is Bourdon type pressure gauge.

Actuators:

An actuator is a device that is used to apply a force to an object Fluid power actuators can be classified into two groups:
Linear actuators are used to move an object or apply a force in a straight line.
Linear actuators can be divided into two types.
They are:

- Single acting
- Double acting

Single acting:

Single acting cylinder is only capable of performing an operating medium in only one direction. Single acting cylinders are equipped with one inlet for the operating air pressure, and can be produced in several designs. Single cylinders develop power in one direction only. Therefore no heavy control equipment should be attached to them, which is required to be moved on the piston return stoke. Single action cylinder requires only about half the air volume consumed by a double acting for one operating cycle.

Double acting cylinders:

A double acting cylinder is employed in control systems with the full pneumatic cushioning and it is essential when the cylinder itself is required to retard heavy loads. This can only be done at the end positions of the piston stock. In all intermediate positions a separate externally mounted cushioning device must be provided with the damping feature. The normal escape of air is out off by a cushioning piston before the end of the stock is required. As a result the sit in the cushioning chamber is again compressed since it cannot escape but slowly according to the setting made on reverses. The air freely enters the cylinder and the piston stokes in the other direction at full force and velocity.

Directional control valves:

Directional control valve on the receipt of some external signal, which might be mechanical, electrical or a fluid pressure pilot signal, charges the direction of or stops, or starts the flow of fluid in some part of the pneumatic/hydraulic circuit.

Flow Control Valves:

These are used to control the rate of flow of a fluid through the valve.
A directional control valve on the receipt of some, external signal, which might be mechanical, electrical or a fluid pilot signal, changes the direction of stops, or starts the flow of fluid in some part of the pneumatic/hydraulic circuit. They can be used to carry out such functions as:

- Controlling the direction of motion of an actuator
- Selecting alternative flow paths for a fluid.
- Stopping and starting the flow of fluid.
- Carrying out logic functions such as AND, OR, NAN

V. SPECIFICATION

Double Acting Pneumatic Cylinder:

- Stroke length: Cylinder stoker length 170 mm = 0.17 m
- Pistondiameter: 45 mm Piston rod: 15 mm Quantity:1
- Seals: Nitride (Buna-N) Elastomer
- End cones: Cast iron Piston: EN – 8
- Media: Air
- Temperature: 0-80 ° C
- PressureRange: 10 N/m^2

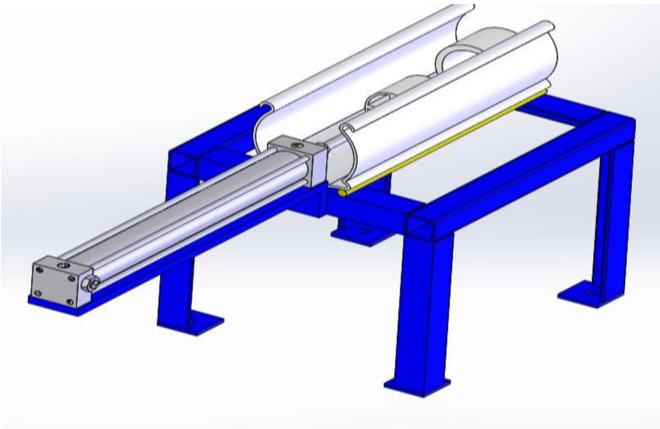
Solenoid Valve:

- Size: 0.635 x 10^{-2} m
- Part size: G 0.635 x 10^{-2} mMax
- Pressure range: 0-10 bar
- Quantity: 2

Flow Control Valve:

- Port size :0.635 x 10^{-2} m

- Pressure: 0-8 bar
- Media: Air



- Quantity: 1

Connectors:

- Max working pressure: 10 bar
- Temperature: 0-100 ° C
- Fluid media: Air
- Material: Brass

Hoses:

- Max pressure: 10 bar
- Outer diameter: 6 mm = 6 x 10^{-3}m
- Inner diameter: 3.5 mm = 3.5 x 10^{-3}m

GENERAL MACHINE SPECIFICATIONS:

Drill unit:

- Short capacity: 0.635 x 10^{-2} m
- Barrel diameter (ID): 40 mm = 40 x 10^{-3}m

Clamping Unit:

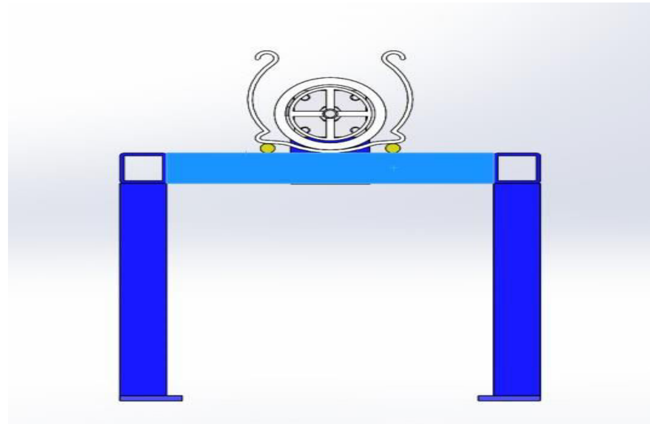
- Clamping: Auto clamping
- Max Clamping Size: 100 mm = 0.1m Pneumatic
-
- Type of cylinder: Double acting cylinder
- Type of valve: Flow control valve & solenoid valve
- Max air pressure: 8 bar

General Unit:

- Size of machine (L x H):0.6096 m x 0.6096 m
- Weight:45 kg = 441.45

Hose:

- Max pressure: 10bar



- Outer diameter: 6mm= 6 x 10^{-3}m.

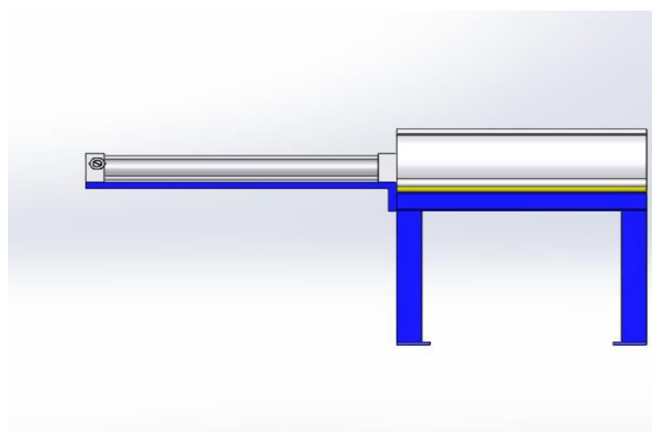
VI. DESIGN CALCULATION

Max pressure applied in the cylinder (P) : 8 BAR.
Area of cylinder (A) : (13.14 Pressure applied:12.56 cm^2 = 12.56 x 10-2 m2
Force exerted in the piston (F) :Pressure applied x area of cylinder D^2.

VII. 3D DESIGN

VIII. Isometric View:

Figure: 1



Front View:

Figure: 2

Side View:

Figure: 3

Top View:

Figure: 4

IX. COMPONENTS PUCHASED FOR FABRICATION AND ASSEMBLY OF CORN

SEPERATOR

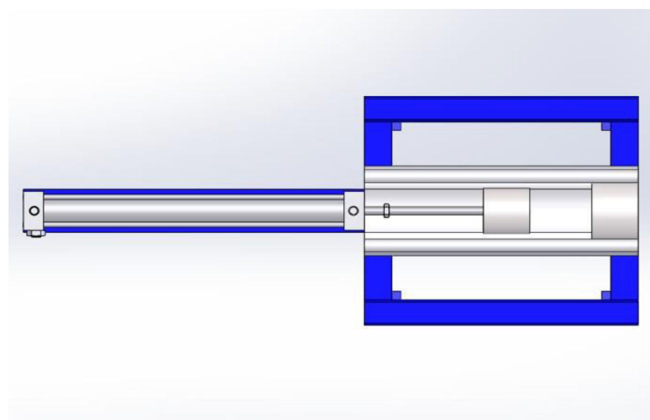
Figure: 5

X. COST ESTIMATION

MATERIAL	QUANTITY	COST(INR)
AIR COMPRESSOR	1 NOS	5000
DIRECTION CONTROL VALVE	1 NOS	1000
PNUEMATIC CYCLINDER	1 NOS	2000
CONNECTING HOSES	1 NOS	200
FLOW CONTROL VALVE	1 NOS	1000
BEARING WITH BEARING CAP	1 NOS	500
VEHICLE MODEL FRAME	1 NOS	1000
TOTAL		10700

Table: 1

XI. APPLICATION & ADVANTAGES



Applications:

- In all small, medium scale industries.
- Material Transportation application.
- Used in constructions and buildings.
- It is used for safety handled manufacturing products.
- It is used in agriculture.

Advantages:

- It requires simple maintenance.
- Checking and cleaning is easy because the main parts are screwed Handling is easy.
- Replacement of parts is easy.

XII. CONCLUSION

By increasing MC, system efficiency increased, total lost and thresher efficiency is reduced. Capacity for a variety of KSC 704 and SNK600 were reported 50.9 and 53.31 g/h respectively Varieties and MC interaction was significant on separation efficiency and total lost while variety and speed affected on total lost only. Increasing speed caused to increase separation efficiency and total lost. Efficiency and separation efficiency increased by increasing MC. Increasing of speed caused to increase efficiency and separation efficiency. The separation efficiency reduced by increased MC while it increased by increasing speed. The most appropriate MC for the best separation efficiency was 13-15% MC and 400 rpm. Increasing MC and speed increased total lost.

It is used ag

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