



## Design & Fabrication of wheat Cleaning Machine

Author:-Awadhesh Kumar, Satyam Rai, Sachin Yadav, Vishal Sharma, Rajnish Kumar Singh

College: - IIMT COLLEGE OF POLYTECHNIC GREATER NOIDA

Department:-Mechanical Engineering Maintenance

**ABSTRACT:** *This project is related to grain cleaning. In this project 12 volt DC motor, Hooper, Mild Steel Frame, Aluminum square type shelves attached with inner frame. In this project we convert rotary motion of dc motor into reciprocating motion of sheaves. Traditional grain cleaning methods are labor-intensive, time-consuming, and yet very inefficient. The use of available mechanical seed cleaners is widely limited since they are expensive to own, operate, and maintain. A motor Operated Seed Cleaner is developed and its performance evaluated. Appropriate engineering principles and methodologies were used in the sizing and construction of the machine. The PoS-Cleaner presents a more viable cleaning option for smallholder farmers in rural and remote areas with no access to the national grid, therefore producing high-quality seeds. This will eventually facilitate agricultural value addition and increase individual family incomes in Uganda. Article highlights A pedal operated multi-seed cleaner was developed. Achieved 5 times higher seed cleaning rates compared to traditional cleaning technologies. Attained higher separation efficiencies of seed and externalities compared to traditional technologies.*

**Keywords-**wheat cleaning machine, Design, Fabrication & Working of wheat cleaning machine,.

### 1.INTRODUCTION

#### 1.1 BACKGROUND

Cereals and pulses form the largest percentage of carbohydrate and protein sources for the majority population in the developing countries. In Uganda, cereals and pulses account for 25 % and 14 % respectively of the crop area (FAO, 2003). Most of the food supply comes from small scale farming (operating on less than 2 acres). Taking an example of beans where an estimated 60-90% is attributed to small scale farming (MAAIF, 2018a). As such, a lot of effort in terms of research funding has been directed to developing varieties that are high yielding, maturing in a short time, and resistant to pests and diseases to create favorable farming conditions for small scale farmers. However, limited funding or research has been allocated to developing postharvest handling technologies to handle the increased yields. In contrast to developed countries where advanced post-harvest handling technologies such as combine harvesters are used for threshing, cleaning, and temporary storage, manual methods are still employed in developing countries even on a large scale. It must be noted that the limited research that has focused on postharvest handling technologies of cereals and pulses in developing countries has focused on threshing, drying and storage neglecting the unit operation of cleaning (Tefera et al., 2011; Kumar & Kalita, 2017; Bradford et al., 2018; River et al., 2018). Yet, cleaning is considered to be one of the most effective unit operations in reducing levels of Mycotoxins in grains (Bullerman & Bianchini, 2007). Apart from threshing using sticks, there are now both manual and motorized shellers or threshers that small-scale farmers can have access to

use. Similarly, hermetic storage methods have been developed such that farmers can access other than the traditional systems of storage like heaping in house, open-air hanging, and traditional granaries (Omotilewa et al., 2018).

#### 1.2 wheat Cleaning Machine

a machine for cleaning and sorting the grain. The operation of the grain cleaning machine is based on differences in the width, thickness, and length of the grain, and in the aerodynamic properties, surface condition, shape, and specific weight. Grain is sorted for thickness on screens with elongated holes; screens with round holes are used to sort for width. The screens are usually flat and oscillate; less frequently cylindrical revolving screens are used. Brushes, beaters, and other devices are used to remove particles stuck in the screens. Length separators are used to separate seeds by length and fans to separate them by aerodynamic properties; gravity and electromagnetic seed cleaners are used for separating by surface condition and shape, and pneumatic picking table separators are used to separate by specific weight. A distinction is made between simple and complex grain cleaning machines. A simple machine has one or two working elements, and a complex machine has several, usually including fans, screens, and cylinder sorters. Grain cleaning machines can be mobile or stationary. Mobile machines are used on threshing floors; stationary machines are used at cleaning and drying stations and at plants with flow technology. In the agriculture of The USSR, grain is cleaned and sorted at grain cleaning stations and cleaning and sorting stations using OS4.5A and OVP20 mobile units and OVS10B and SVU5 stationary machines. The cleaning and drying stations also use winnowers, length separators, electromagnetic machines, sorting machines, and dryers.



## 2. OBJECTIVES

### I. FIRST CLEANING SECTION

- Blending of Wheat (for consistency in finished product)
- Removal of Coarse Impurities
- Removal of Dust
- Removal of Ferrous Metals
- Removal of Sand and Fine Particles
- Removal of Stones
- Removal of Husk and Light Particles
- Removal of Long and Round Particles
- Surface Treatment for Bacteria Count Reduction
- Moisture Measurement
- Removal of Non-Wheat Material
- Removal of Wheat not Suited for Milling

### II. SECOND CLEANING SECTION

- Tempering (addition of water to condition wheat for grinding > 14.5%)
- Additional Surface Treatment
- Scouring (Regular or Intensive)
- Peeling (Light Peeling or Peeling)
- Pearling (De-Banning, Typically used in Durum Milling)

Hard / Soft / Durum Wheat's Wheat Cleaning Requirements:-

#### Soft Wheat

Special Cleaning House Requirements:

- Removal of Foreign Seeds (Corn, Soy, Smell, )
- Vomitoxin Infestation (Surface Treatment, Impacting, Aspiration)
- Only Short Temper Required due to Soft Kernel

Structure

## 3.METHODOLOGY

An electrical machine that is used to convert the energy from electrical to mechanical is known as a DC motor. The DC motor working principle is that when a current-carrying conductor is located within the magnetic field, then it experiences a mechanical force. This force direction can be decided through Fleming's left-hand rule as well as its magnitude.

If the first finger is extended, the second finger, as well as the left hand's thumb, will be vertical to each other &

primary finger signifies the magnetic field's direction, the next finger signifies the current direction & the third finger-like thumb signifies the force direction which is experienced through the conductor.

$F = BIL$  Newton's

Where,

'B' is the magnetic flux density,

'I' is current

'L' is the conductor's length in the magnetic field.

## 4. PARTS USED IN WHEAT CLEANING MACHINE

### 12 Volt DC Motor

A DC motor is an electric motor that runs on direct current power. In an electric motor, the operation is dependent upon simple electromagnetism. A current-carrying conductor generates a magnetic field, when this is then placed in an external magnetic field, it will encounter a force proportional to the current in the conductor and to the strength of the external magnetic field. It is a device that converts electrical energy to mechanical energy. It works on the fact that a current-carrying conductor placed in a magnetic field experiences a force that causes it to rotate with respect to its original position. Practical DC Motor consists of field windings to provide the magnetic flux and armature which acts as the conductor.

### Brushless DC Motor

The input of a brushless DC motor is current/voltage and its output is torque. Understanding the operation of the DC motor is very simple from a basic diagram is shown below. DC motor basically consists of two main parts. The rotating part is called the rotor and the stationary part is also called the stator. The rotor rotates with respect to the



**Fig 1:Brush less DC motor**

### MILD STEEL

Mild steel is the steel that combines iron and carbon. Owing to iron presence it developed good magnetic properties. Mild is not alloy steel. Due to more carbon present its chemical composition is quite different from other elements or other steels as mild steel has a good surface quality and you can increase its surface hardness in different ways. Let's learn more about this material.



#### 4. WHEAT CLEANING MACHINE FABRICATION

1. The manufacturing processes of mild steel (low-carbon steels) resemble that of other carbon steels. These processes have been changing over time and are currently more efficient and cheaper than before. In modern manufacturing processes, three major steps are involved in producing mild steel out of pure iron or iron ore.

##### 1. Primary steelmaking

In this process, iron is mixed with coal and lime and heated in a blast furnace. Modern primary steelmaking uses modern furnaces such as Basic Oxygen Furnace or Electric Arc Furnace. The latter is generally used by manufacturers in developed countries, and steel parts that come out of the Electric Arc Furnace are of high quality.

##### 2. Secondary steelmaking

The purpose of secondary steelmaking is to mainly reduce the carbon (less carbon) contents to the desired extent and add other alloying elements to improve the properties of the steel. This step is mainly controlling and monitoring the heat treatments and cooling of the furnace.

##### 3. Casting and primary forming

As soon as the steel in the furnace reaches the specific carbon content and mechanical properties are enhanced to a certain degree, the steel is to be poured into a mould, which is called casting and some say cast iron which is not right. During this process, the liquid form of steel will be cured and formed into various geometries. These crystal structures cast steel will subsequently be cut into smaller shapes of parts.

The casted steel has plenty of defects and imperfections. A primary forming process called hot-rolling is applied. After hot-rolling, the steel gains **more strength, ductility, weld ability, etc.**

##### 4. Secondary forming

Generally speaking, there is a secondary forming process such as CNC-machining, cold-rolling, powder-coating, case-hardening, or electroplating to further improve the mechanical and chemical properties or aesthetics of the mild steel parts. At these processes, a metallic coating, such as a zinc coating or any other type of carbon steel, is properly applied.

#### Mechanical Properties Of Mild Steel

As you could judge from the chart above, mild steel has lower carbon content than other carbon steel. The mild steel has a mere carbon content of 0.25%.

GmbH & Co, Installation and Operating Instructions).

After the mixing process, the seed in the thin layer passes over magnetic rollers attracted by a strong magnetic field. according to the surface properties, which means separating the seed with a smooth surface from the rough and damaged seed. The previously cleaned seed passes to the dosing container of the mixer in All the ingredients loaded with iron

Mild steel has great impact strength, great ductility and weld ability, good malleability with cold-forming possibilities. With these properties, CNC-machining mild steel is easier than CNC-machining other types of steel.

The major disadvantage of mild steel is that it has a relatively low tensile strength, which means it'll break more easily than other types of steel. Fortunately, a heat-treatment process called carburizing can be used to improve tensile strength. Carburizing is a surface-hardening process that heats the mild steel to a certain temperature then cools down the steel, which makes the steel hardened on the surface when keeping the core of the steel soft

#### 5. ADVANTAGES AND DISADVANTAGES

##### ADVANTAGES

Sieving is a traditional and a very easy method of separation since it doesn't require much of your skills. It is a cheap method as the installation cost is very low. It takes lesser time in comparison to other methods of separation.

##### DISADVANTAGES

It cannot separate two substances in a mixture which have the same size. For example, it cannot separate a mixture of chalk powder from flour.

Several factors have been identified to influence the operation of this unit, including the size and shape of particles relative to the sieve aperture, the mesh size of the sieve itself, the amount of material on the surface of the sieve, the direction of movement of the sieve, the rate of material movement, etc.

#### 6. APPLICATIONS

- It can be used for cleaning of wheat and Rice.
- It is low cost as well as portable machine to use

#### 7. CONCLUSION

The Emceka-Gompper magnetic separator is part of a magnetic plant consisting of a magnetic machine, seed mixer, dashboard and elevator. The components of the magnetic machine are a pouring basket and two magnetized rollers. The rollers are powered by an electric motor of 1.5 kW and 1430 rpm. The magnetic machine separates seeds and ingredients exactly dosed amounts of 120 kg. The seeds are moistened - either with special oil or water - and mixed with fine iron powder. Iron dust fits into all depressions and rough surfaces (Emceka - Gompper,

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dust are being separated as waste. The input quantity of cleaned alfalfa seed lots was 1000 kg. Before the cleaning using a magnetic separator, seed samples of 50 g were taken to determine the amount of dodder seed. A rough manual analysis of the seed was performed.