

# Design of Grain Dryer

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**Abstract**— As per technical evolution taken into consideration, an effective advance system is required. Therefore, universal grain dryer through special drying arrangement is used to obtain perfect drying purpose. To reduce the man power in grain industry where drying is needed, this system is very useful. The sun drying or natural air drying is a conventional method to remove the moisture from the grain, as it takes much time, more space and more labour. In the dryer, the heated air from the blower is passed through grain -bed that means it passes through screw conveyor at the same time, the warm air at limited temperature provided and moisture is reduced from the grain. After that the dryer grain is to be transferred automatically in collector, the net separator is present in between collector and screw conveyor. If the grain become dry it can be protected from grain spoilage, it is portable unit so that it can be moved from one location to another location.

**Keywords:** Blower, Collector, Drying Process, Exhaust Fan, Grain Dryer, Heater, Screw Conveyor, Smps, Regulator

## I. INTRODUCTION

Grains are highly consumed in most countries of the world; however, they are cultivated annually and most times harvested once a year without guarantee of produce. This implies that in order to meet the ever-growing demand of grain consumption, most of the global production of maize, wheat, rice, sorghum and millet must be held in storage for periods varying from one month up to more than a year.

One of the major challenges facing grain storage is the moisture content of grain. High moisture content leads to storage problems because it exposes grains to fungal and insect problems, respiration and germination and to avert these problems farmers are faced with the issue of grain drying. The best theoretically and practically known problems in the drying of agricultural products are processes of the convection drying of particles of solids forming fixed beds, particularly the drying of grain.

On harvesting grain, the moisture content ranges from 16% to 28% (wb)

The longer the grain needs to be stored the lower the required moisture content will need to be, although a rule of thumb for seed states that the life of the seed will be halved for every 1% increase in moisture content or a 5°C increase in storage temperature.

## II. COMPONENTS

### A. ELECTRIC MOTOR

An Electric DC motor is a motor which converts electrical energy into mechanical energy.

The working of DC motor is based on the principle that when current carrying conductor is placed in magnetic field, it experiences a mechanical force and due to this conveyor belt is run.

### B. SCREW CONVEYOR

Conveyor is a carrying medium, it is used to carry the grain from one side to another side. The conveyor which is used in our project is made by galvanized sheet. It is flexible and the temperature cannot effect on material of conveyor.

### C. FAN AND HEATING ELEMENTS

Fan and heating element used to provide hot air to the grain. high speed RPM fan is used to provide the air in the machine & heating element is used to provide warm air into the machine.

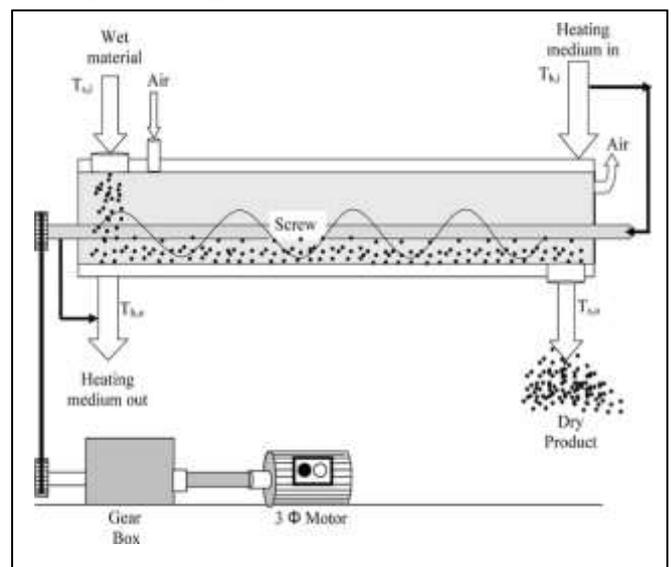
## III. WORKING METHODOLOGY

After harvesting the grain content more amount of moisture in it. That's why moisture content grain are not safe for storage and further processing purpose & it not give good market value. so to overcome this problem we are design this grain dryer for drying purpose.

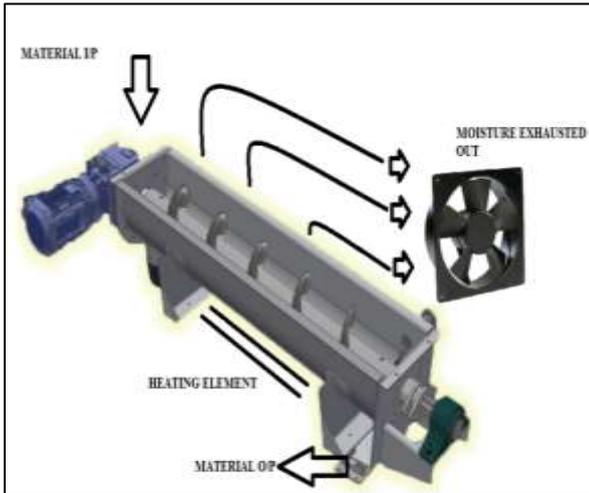
Firstly, moisture content grain is feeding in hopper then the grain is transfer on screw conveyor. And screw conveyor is rotated by using electric motor and roller. the grain is on screw conveyor is move from one position to another position at that time we are providing heating air at limited temperature by using heating element the grain is to be heated. And that's why the moisture is removed from the grain. After that the dry grain is to be transferred automatically.

## IV. DESIGN OF PROJECT

### A. Proposed Design



B. ISOMETRIC VIEW



Breath = 56.5 cm  
Height = 91.5 cm / 3 Ft.

Cylindrical Housing,  
The volume of the cylinder,  $V = J r^2 h$   
 $R = 75\text{mm} = 0.075 = 0.005$   
 $H = 910\text{mm} = 0.91$   
 $V = 3.14 \times 0.005 \times 0.91$   
 $V = 0.142 \text{ m}^3$

Velocity of Screw Conveyor,  
Pitch of Auger (S) = 0.076mm  
Velocity of Auger,  $V = S \times J J$   
 $= 0.076 \times 3.14$   
 $V = 0.23864 \text{ m/s}$

Torque,  
 $P = \frac{2JNT}{60}$   
P = Power = 250 watt  
N = Speed = 100 rpm  
T = ?

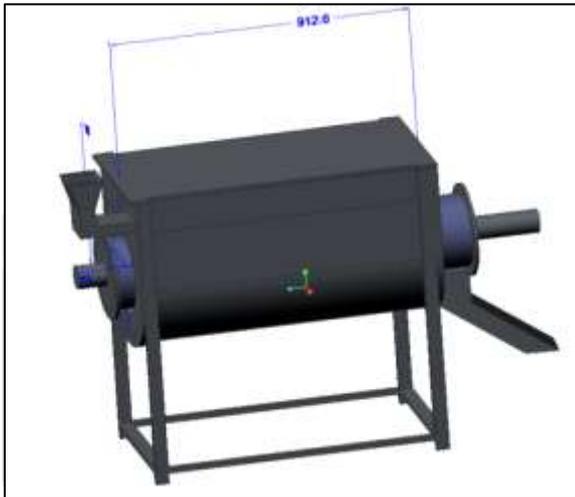
$$250 = \frac{2 \times 3.14 \times 100 \times T}{60}$$

$$15000 = 6.28 \times 100 \times T$$

$$15000 = 628 \times T$$

$$T = 23.88 \text{ N.M/S.}$$

C. CAD DESIGN



V. PRINCIPLE OF OPERATION

Due to economic consideration, the machine was designed to load a trailer/silo with average size of 2.68 m<sup>3</sup> within 15 minutes with the help of an operator. The granular materials to be conveyed are fed into the hopper at the lower end (when at an inclined position), the materials are then moved through the driven transmission via an electric motor positioned at the feeding end by the rotational effect of the auger and discharge the materials at the upper end through the outlet port. An adequate clearance between the auger blade and the housing (Barrel) was considered in the design to avoid clogging and breakage of grain kernels. A V-belt and pulley was designed for the transmission components to ensure appropriate operational speed of conveyance. For effective operation, the materials to be conveyed are expected to be at safe moisture level to prevent clogging which usually hinder the performance of the transmission unit and the electric motor.

VI. CALCULATIONS

Dimeter Of Screw Conveyor = 6 inch  
Length Of Screw Conveyor = 3 Ft.  
Chamber Dimensions ,  
Length = 77.5 cm

VII. OBSERVATION TABLE

Grains are uses as Wheat,  
Moisture content  
Wet basis  $m = W_m / W_m + W_d \times 100$   
Dry basis  
 $M = W_m / W_d \times 100 = m / 100 - m_x \times 100$   
 $W_m$  = Wait of moisture  
 $W_d$  = Wait of dry material.

Sr. No.	Weights Of Grains	Weight Of Moisture	Output Weight At Temperature = 70*	Time Taken To Discharge In Sec
1.	2000	200	2100	180
2.	1950	200	2050	170
3.	1850	200	1950	150

VIII. MATERIAL USED

Name Of Component	Quantity	Specification
Screw Conveyor	Diameter- 6inch Length- 3 foot	Move Semi-Solid Materials.
Heating Elements	12V 200W	NA
Exhaust Fan	1	NA
Electric Motor	1	Output Power:250watt 300RPM
Pedestal Bearing	1	Model Number: UCP 205 Material : Cast Steel.

Shaft	3 Inch	Mild Steel (Hollow pipe).
Outer chamber	1	Galvanized Iron.

#### IX. ADVANTAGES

- 1) After harvesting the moisture is present in the grain & if moisture is presents in the grain it become spoilage for that we deign a grain dryer to remove moisture content from grains.
- 2) For the purpose of removing moisture from grain less time and space is required.
- 3) The grain dryer we have design is economical for farmer.
- 4) The grain can be get protected from spoilage due to moisture present in the grain.
- 5) The grain dryer is not dependent on weather condition so that it can work in any season.
- 6) For the process of drying of grain less worker is required.
- 7) Better control over a temperature and moisture content over a sun drying.
- 8) It is portable unit, it can move from one location to another location.

#### X. APPLICATIONS

- 1) This system is useful in grain industry for drying purpose of grain.
- 2) This system can be work as de-humidifier.
- 3) This can also applied for home drying system.
- 4) The dry grain, it can be easily acceptable in market & it gives good value in market.

#### XI. CONCLUSIONS

From this paper we have conclude that the government warehouse has grain storage in bulk quantity it is very hard task to store much of quantity & that to dried so the project will ultimately help the government as well as farmer so that they may not face the loss. The project is prevent the grain from spoilage by removing moisture from grain within less time, less space, & less labour. The machine is portable so it is move from one location to another location so it beneficial for farmers.

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