Fabrication of Paddy Drier Processor

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Abstract

There is an essential need to dry grain quickly and effectively after harvest and before storage to retain maximum quality, to attain a moisture content sufficiently low to minimize infestation by insects and microorganisms (bacteria, fungi, etc.), and to prevent germination. However, maturity of the crop does not always coincide with a suitably dry period. Furthermore, the introduction of high-yielding varieties, irrigation, and improved forming practices has led to the need for alternative drying practices to cope with the increased production, and grain harvested during the wet season as a result of multi-cropping. By using Paddy Drier Processor .In this process we remove dryness is removed by using the heat generation chamber. The hot air is being pumped with the help of the centrifugal pump to the hopper to remove the dryness of the paddy with the help of control value.
Keywords- Centrifugal blower, hopper, control value, applicator, heat exchanger, plate and shell heat exchanger, creo parametric 2.0

I. INTRODUCTION

Natural methods of drying make use of exposure of the wet grains to the sun and wind. Artificial dryers employ the application of heat from combustion of fossil fuels and biomass resources, directly or indirectly, and in both natural and forced conversion system. Paddy has high moisture content, up to 25%, when it is harvested. Moist paddy needs immediate drying after it is harvested to reduce its moisture content to 14% or less for milling or for safe storage, respectively. It has been modelled as a device that can reduce the moisture content of paddy to a safer limit so that it can be stored for a prolonged period without compromising the quality. A number of international aid agencies as well as the developing countries themselves have mounted programs to reduce postharvest losses. It has been modelled as a device that can reduce the moisture content of paddy to a safer limit.

II. SCOPE OF THE PROJECT

This proposal is a new step to the future, because at this 21st century people are looking for an easier method to do jobs. This drier is just put forward to reduce the human effort and to save the valuable time. By applying this method lots of time gets saved and more output is obtained. By this we can save more amount of paddy from infestation by insects and microorganisms (bacteria, fungi, etc.), and to prevent germination. By we can avoid the waste of paddy from dryness.

III. PROBLEM DEFINITION

In the present work, metal blower is used for air conditioning and ventilation purpose in naval defense application causes vibration and noise during its operation which causes mental imbalance to the people working near the blower on ship. Therefore reducing vibration from a source is very important and critical task. Hence the objective of the project is to reduce the vibration level produced by metal air blower. It can be effectively reduced by the modifying the shape of blades.

IV. COMPONENTS USED

The components used for the paddy drier is given below

A. Centrifugal Blower:

The motor is squirrel cage induction type, 2880 RPM: designed for 190 V/240 V Single phase 50 cycle AC power supply with A class insulation, impregnated with superior varnish. Motor is also high voltage tested to 2000 V. Lamination are made of high grade silicon on the steel sheets for longer life and better performance. The double sided sealed ball bearings are used to take heavy thrust and radial loads, and it gives prolonged trouble free life.

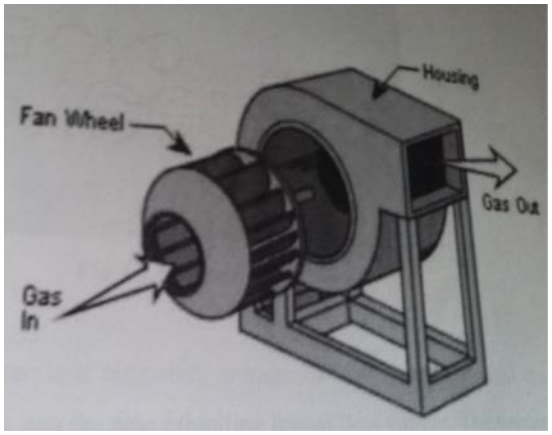

Fig. 1: Centrifugal blower

B. Hopper:

A hopper is temporary storage container used to store the grains flowing into the pipe exhibiting funnel flow pattern. The hopper used in this apparatus is made of PVC pipes and PVC reducers. The hopper has a capacity of 3 kg of paddy grains and is designed in such a manner so as to maximize the flow of grains into the pipe.

Fig. 2: Hopper

C. Control Value:

The control of grains into the drier is to control using a ball valve which can be adjusted accordingly. At half opening the discharge is 220kg/hr and ranges to 500kg/hr at ¾ valve opening. The ball valve is then fitted to the specially designed profile cut pipe which enables suction in the hopper and easily facilitates the grain flow. There is square cut opening provided on the top part of the hopper and covered with a strainer sealed at the edges.

Fig. 3: Control value

D. Applicator:

One of the major challenges posed in the designing of the paddy drier is the connection between the hopper and the blower. These two are connected using a PVC T-joint in which the hopper is connected in the middle using applicator. The bottom section of the applicator is cut open as shown in the picture. When this pipe is lowered into the t-joint it blocks the main pipe mid-way.

Fig. 4: Heat applicator

E. Heat Exchanger:

There are types of heater they are direct heater and indirect heater. In direct heater the fuel is burnt in situ with the drying air so that the products of combustion pass through the drying bed with the air. Heaters of this type are less expensive and more energy efficient; indirect heaters the combustion air does not come into contact with the drying air and a heat exchanger is used to raise the temperature of the latter. Depending on the type of heat exchanger as much as 25% heat may be lost.

TYPES,

1) Plate heat exchanger.
2) Plate and shell heat exchanger.

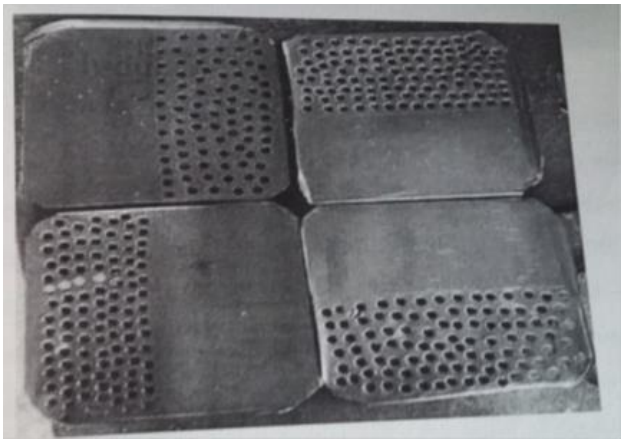

Fig. 5: Heat exchanger

V. DESIGN CALCULATION

Inlet pressure =1.013bar
1mm of water
Column =9.80665 Pascal
51mm of WC =0.050013bar
Outlet pressure =0.05bar
When pressure decreases velocity increases;
P*1/α*v
Velocity increases Air flow increases;
HP =(T*rpm)/5250
T = 1.8229Nm
HP =
Volume(CFM)*Head(of water)/6356*mechanical efficiency of fan
Efficiency of fan =3.14%
Inlet dia d1 =152.4mm
Orifice dia d2 =101.5mm
Coefficient of orifice meter

=0.62
Energy meter constant c
=60rev/Kw-hr
Area of inlet a1 = 2
=0.1814m2
Area of orifice = 2
=8.107*10-3m2
Actual flow rate (Va)
=Cda1a2 (2gH1)1/2/a12a22
Where,
Cd =Coefficient of discharge
a1,d1=area & dia of inlet in m2
a2,d2=area & dia of outlet in m2
H =Difference in pre load of air
Pressure =ρa*H2*ρ N/m2
Inlet power = (h*3600)/t
Where,
n=no of revolution of energy meter
c=energy meter constant
t=time taken for 5 revolution of energy meter
Outlet power = pd*vd/1000 KW
Delivery(Q) = Cda1a2 (2gH1)1/2/a12a22
=84.137m3
Where,
h1=30.2cm
h2=29.4cm
h1-h2=0.8cm
Pm=13600 kg/m3
Pa=1.293kg/m3
Va=0.22797m3/s
Delivery pressure, Pd=Pa*g*H2
h2=(h3-h4)ρw/ρa*150
h2=191.8m
Pd=ρagH2
Pd=1.293*9.81*191.8
Pd=2432.88N/m2
Input power, P1=3n*3600/c*t
Where,
ε̇ = 1
c = 60
t = 67 sec
P1 = (3*1*3600) / (60*67)
=2.686
Output power = pava / 1000
= 2432.88*0.2279/1000
= 0.5544Kw
Efficiency = output/input*100
= 0.5544/2.68*100
ε̇ = 20.68%

VI. CONDITION FOR DRYING

A temperature of 430 C is recommended for drying the paddy for seeds this can be achieved with shade drying. Higher temperature can lead to physicochemical disorders in the grain. Paddy should not be dried too fast. The drying process should be slow and uniform to maintain quality. Paddy gives up surface moisture easily and quickly, but holds moisture in the center of the grain longer. Different studies show that the postharvest loss. If surface moisture is removed to rapidly, the outer layers contract and the high temperature used for drying causes expansion that result in more internal stress. This is done between drying periods and permits the moisture within the grain to equalize. Paddy may be dried for 1 hour, and then tempered for 6 or more hours before drying again. Tempering also increases drying efficiency and is commonly used with fast, high-air-temperature drying.

A. Why Mechanical Drying?

In order to maintain the quality of harvested paddy, mechanical dryers are needed, especially in the rainy season when sun drying is often not possible. The conventional drying techniques used by farmers are field drying, sun drying, flat bed drying which consume lot of labour and cost. However, some conventional mechanical dryers with kerosene burners as heat source, those were in use in the region in past, need around 10-15 litters of kerosene for each ton of paddy. Further, prices for kerosene are steadily increasing and therefore is not economical and environment friendly. Husk separated from the rice can be used as alternative heat source.

VII. NEW PROPOSED DESIGN

In the drying process heat is used to evaporate the moisture from the grain and moving air to carry away the evaporator moisture. The drying rate is determined by the grain, its initial moisture, temperature, and variety. The rate is also affected by air temperature, relative humidity, and volume of air passing through the grain. The drying method, type of dryer, and efficiency of the equipment also affect the rate of drying. However, too high an air temperature may cause checking of grain which in turn cause breakage during milling and reduced outturn. Air with relative humidity has the ability to absorb more moisture and dries the paddy faster. The equilibrium moisture content is depends primarily on the relative humidity, but it varies to a lesser degree with air temperature. These relations in the temperature ranges found in most-tropical-countries. The higher the initial moisture content of the grain, the longer will take to dry. In general, the higher drying air temperature, the faster the drying rate. Air with high relative humidity dries slowly, if at all. Air with low relative humidity has the ability to absorb more moisture and dries the paddy faster. Too high an air temperature may cause checking of the grain.

Table - 9.1: Parameter investigated

S.No	*Item*	*Temp (^0C)*	*Initial weight (grams)*	*Final weight (grams)*	*Time (sec)*
1.	*Paddy*	*39*	*200*	*160*	*123*
2.	*Paddy*	*70*	*280*	*250*	*36*
3.	*Wheat*	*39*	*200*	*160*	*131*
4.	*Wheat*	*70*	*280*	*160*	*50*

VIII. WORKING

The grins are initially stored to the hopper that and are let into the main pipe through which high velocity air is blow by the centrifugal air blower. The amount of paddy flowing through the hopper is controlled by a ball valve. Once the grain fall into the main pipe it is below away by the high velocity air flow and are re circulated back into the hopper. A heating element is also placed in the inlet of the centrifugal blower to increase the temperature of air.

Fig. 6: Mechanical paddy drier

IX. CONCLUSION

A mechanical vacuum assisted paddy drier was developed which can be easily fabricated. The technology can be used in the drying coir and other seeds such as wheat, etc. The drier can also be used for transportation, winnowing and even broadcasting paddy. This project "standardized" paddy dryer, which showed good drying capacity, quality, and drying cost. The extension activities have also been successful with the installation of one fully operational unit from the user's money. The advantages of this project stemmed from a real need a priority in the production sector.

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