An Investigational Study on Automatic Grain Dryer & Review

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Abstract— The main behind the paper is to study and examine the different papers designed for manufacturing of grain drying machine. As we all know that as technology is advancing, everything in the world is changing. Most of the things around the world is automated and so as machines. Machine are designed and manufactured in such a way that they are full automatic without human interventions. Another main reason for designing such machine is the environmental changes and climate fluctuations which is adversely affecting the surrounding and humans**.** . Earlier it used to be that the rain fall in rainy season, hot weather in summer season, cold weather in winter season. But now the weather changes any time because of this the grain gets damaged or get spoiled. so we are trying to design a mechanism which is for the purpose remove moisture from the grain to give the good quality of grain, can be suitable for long time storage, further process & selling to market.

The paper focuses on drying of grains which have moisture content or one can say removing the moisture content from grains and storing for much time. It will definitely give the advantage where drying due to sunlight is not possible. Literature survey has been done to design a new concept for the project

❖ INTRODUCTION

India is a large agricultural country at a low level of agricultural mechanization particular, mechanical grain drying capacity cannot keep pace with the increase in grain production. At present, only about 30% of wet grain in state depots is mechanically dried; the rest has to be sun dried. All grain retained at farm level for consumption by farmers is sun dried. Drying is a phase in after harvesting in which moisture content is reduced to a suitable level for safe storage. Drying reduces moisture content of an Indian economy as 65-70% of the population depends on product to a level below which deterioration does not agriculture for employment and livelihood. Open sun drying is the most commonly used method to preserve agricultural products like grains, fruits and vegetables in most developing countries. The aim of this process is to lower the moisture in order to guarantee conditions favorable for storage or other processing of the product. An awareness of availability of dryers and of their use and advantages in drying food grain for better storage and marketing is lacking among crop growers. The preservation of agricultural produce by drying is a long established technique. The drying time required in the open sun for these crops ranges from 5 to 45 days depending upon the crop to be dried. India produces about 260 million tonnes of food grains per year. The major components of production are 95 million tonnes of wheat, 105 million. tonnes of rice, and 18 million tonnes of pulses, Cereals (Anon. 2015). Annual postproduction losses by crop in India, expressed as a percentage of total production, are estimated to be as follows: wheat, 8%; pulses, 9.5%; and all food grains, 9.3%. Drying reduces the potential impact of loss causes such as that of premature and unseasonal germination of grain and infestation by insects and fungi (FAO, 1994) Thus, drying helps the farmers to secure and vegetables are high.

❖ LITERATURE SURVEY

1. Design, Development and Performance Testing Of A New Natural Convection Solar Dryer

Dilip R. Pangavhane 1, R.L. Sawhney 2, P.N. Sarsavadia

In this paper we have studied that the Mechanical drying of agricultural products is an energy consuming operation in the post-harvesting technology. Greater emphasis is given to using solar energy sources in this process due to the high prices and convection solar dryer consisting of a solar air heater and a drying chamber was developed. This system can be used for drying various agricultural products like fruits and vegetables. In this study, grapes were successfully dried in the developed solar dryer. The qualitative analysis showed that the traditional drying, i.e. shade drying and open sun drying, dried the grapes in 15 and 7 days respectively, while the solar dryer took only 4 days and produced better quality raisins. 2002 Elsevier Science Ltd. All rights reserved.

2. Simulation Model For Predict Drying In the Automated Grain Dryer

V. K. Ngunzi, S. W. Mugucia, G. M. Kituu1 and U. N. Mutwiwa

This paper we have studied that the research was carried out with the objective of developing a simulation model for controlling moisture content and temperature in the grain drying chamber. Mathematical modelling of deep bed grain drying, consisting of three sets of equations- mass balance equation, drying rate equation and energy balance equation was developed. A visual basic computer program was

developed to simulate the grain drying. Data simulated by the program was compared with actual experimental data. From the simulated results it was observed that there was a strong correlation between moisture content and drying time for both simulated and experimental data (R_2=0.929 and 0.894 respectively for simulated and actual data). I n addition there was a strong linear correlation between simulated and experimental moisture content (R_2=0.989). The decrease in moisture content with time was exponential. Besides, temperature and moisture content were reducing with time while air humidity was increasing for both simulated and experimental data. The developed simulation model can be used to predict drying in the automated grain dryer. With the automation of the drying system, controlling of the drying

3. Design and Evaluation of Solar Grain Dryer with a Back-up Heater

K.S. Tonui, E.B.K. Mutai, D.A. Mutuli, D.O. Mbuge and K.V. Too

The aim of the study was to design and construct a solar grain dryer integrated with a simple biomass burner using locally available materials. This was to address the limitations of the natural sun drying for example drying exposure, liability to pests and rodents, over-dependence on sun and escalated cost of mechanical dryers. This became beneficial especially in reducing post-harvest losses as well as helping in the preservation of agricultural product. The dryer is composed of solar collector, drying chamber, back-up heater and airflow system. The design was based on the study area of Mau summit located in Nakuru County, Kenya. The average ambient conditions were 26°C air temperature and 72% relative humidity with daily global solar radiation incident on horizontal surface of about 21.6 MJ/m^2/day. A minimum of 3.77 m^2 solar collector area was required to dry a batch of 100 kg maize grain in 6 h with natural convection from the initial moisture content of 21% to final moisture content of 13% wet basis. A prototype dryer designed was fabricated with minimum collector area of 0.6 m^2 and used in the experiment. Forced convection was employed to reduce drying time. The thermal efficiencies of the solar and solar assisted dryer were 39.9 and 57.7%, respectively. The back-up heating system improved the efficiency of the dryer by 17.8% and reduced drying time substantially.

4. Overview of Grain Drying and Storage Problems in India

Javed Ali, Aaushi Sharma and Poonam Rani*

In this paper we have studied that India produces about 150 million tons of food grains per year and production is rising due to higher cropping intensities and the introduction of high-yielding varieties. However, annual post production losses are 10%, which means that about 15 million tons of food grains are lost during harvesting, threshing, and storage. So these losses can be minimized by a drying operation that can preserve grain. In India, 70% of the grain stored is sun dried which is not a best method to drying crops. Farmers use sun drying due to the non-availability of dryers within their reach; high initial capital investment required. So my main concern is to provide farmers a modern drying-cum-storage complex for drying crops and their proper storage. An awareness of availability of dryers and of their use and advantages in drying food grain for better storage and marketing is lacking among crop growers. This paper describes the use of various types of dryers in the Indian food industry and the efforts of research and development organizations to devise dryers suitable for individuals or small groups in the rural population. And what can be done to minimize the losses of food grain with the help of various scientific drying method or different scientific storage structures.

5. Grain Sorting Apparatus

Satoru Satake, Tokyo; Yasuharu Mitoma

In this paper we have studied that the grain sorting apparatus includes a conveyor belt mechanism for conveying grains. fed by a feed mechanism onto a conveying surface separately from each other at an upstream region with respect to a conveying direction, to a downstream end so that the grains are discriminated and sorted by a discriminating mechanism and a sorting mechanism when dropping from the downstream end along a predetermined path. the belt mechanism being disposed so that the con vying surface thereof declines as going downstream with respect to the conveying direction to prevent the grains being carried by the belt mechanism from rolling toward the upstream direction on the conveying surface of the belt mechanism. It is therefore possible to prevent the grains from rolling on the conveying surface of the conveyor belt mechanism toward the upstream direction relative to the conveying surface of the conveyor belt even when a conveying velocity of the conveyor belt mechanism is high.

6. Grain Drier

Pietro Fasano, Strada San Martino

In this paper we have studied that grain drier comprising a plurality of horizontal convisor belts arranged one above another in staggered relationship so that grain delivered to one end of the upper conveyor belt will drop onto the lower conveyor belt when it gets to the other end of the upper conveyor belt and will then travel along the lower conveyor belt in opposite direction before being discharged. Hot air is supplied by a hot air generator through conduits to a position below and along each of the conveyor belts, passes upwardly through the conveyor belts which are formed of wire mesh and through the grain thereon and is extracted through discharge conduits from above the conveyor belts. The flow rate and temperature of the hot air may be varied. Heat from the

extracted air may be recovered and recycled into the hot air generator. Also heat from the dried grain may be recovered and reconducted by means of a blower fan through a conduit onto the incoming fresh grain.

7. Grain Drying Apparatus And Process

James F. Buffington

In this paper we have studied that process for drying grain in which the grain is first heated to drive off a portion of the moisture as it passes along a conveyor, and the heated and partially dried grain is then discharged into a holding or steeping bin where the moisture in the centre of the kernels migrates to near the surface and the temperature becomes sub statically uniform throughout. The grain is then discharged onto a second belt where the grain is first heated to drive off a substantial part of the moisture remaining in the grain and then is cooled before it is discharged from the apparatus. Air is used to cool the grain before it is discharged and this partially heated air is utilized in both grain heating operations.

8. Automatic Control for Maintaining Equilibrium Temperature/Moisture between Stored Grain and Atmosphere

Sylvester L. Steffen

A method and apparatus for maintaining equilibrium of temperature and moisture between grains stored in a grain bin and the surrounding atmospheric air. A grain temperature sensor and an air temperature sensor are

Connected to a comparator circuit which compares the relative temperatures. When a predetermined temperature differential between the grain and the atmospheric air is exceeded, the comparator circuit switches on an activating circuit which, in turn, completes an electrical circuit to the fan motor. When the fan is running, outside air is circulated through the grain to bring the temperature and moisture of the grain and the outside air back into an approximately equilibrium condition, plus or minus an allowable temperature differential. When the temperature differential between the grain and the atmospheric air is reached, the fan motor is turned off. When the temperature of the atmospheric air rises above a predetermined level, a cut-out device will disable the actuating circuit to thereby prevent outside air from being circulated through the grain. Under these conditions, the grain may be held in a cured state for and almost indefinite length.

❖ ENGINEERING DESIGN AND CONCEPT FROM LITERATURE SURVEY

The paper focus on the prototype a project which can we be used for drying the grain. The main aim behind the project is to remove moisture content from grain which can be stored for long time.

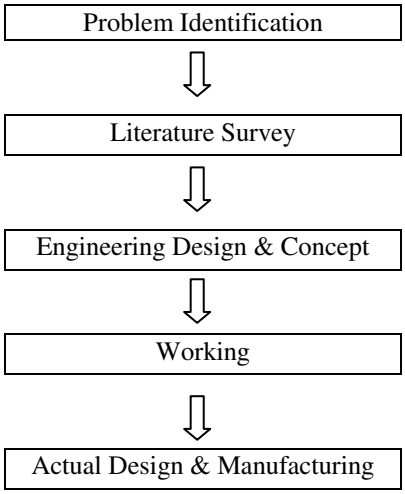

FIG. FLOW CHART FOR THE PROJECT

❖ FUTURE WORKING OF THE PROJECT

This invention relates to a grain drier, particularly for all type of grain, operated by warm air of variable temperature to permit normal drying of the grain as well as recovery of the heat used for drying the grain. This drying process is unique for removing moisture from the grain. It is different from conventional grain drying process. The conventional method i.e. sun drying or natural air drying it is time consuming process, it require more space & labor. We all known after harvesting the moisture are present the grain. If moisture present the grain it is not suitable for long time storage further process and not give the value for grain in market. to overcome this problem we can trying to design a grain dryer. The moisturizer grain is feeding in the hopper after that the grain is to be transferred on the conveyor belt. The grain is to be move with the help of conveyor belt at the same time the warm air is provided by using heating element & fan. After that the grain is transferred to next conveyor then moisture is reducing from the grain. And the dry grain is collect in collector through the net separator. Net separator is used to remove unwanted particle & dust from the grain. Finally, it is an object of the invention to provide a drier to remove moisture from the grain.

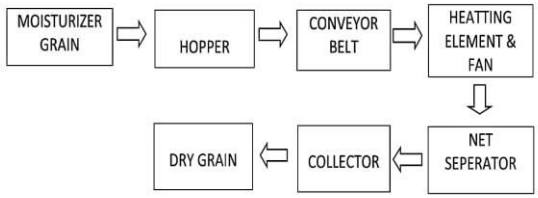

FIG. PROCESS DIAGRAM

❖ APPLICATION IN DIFFERENT WAYS

The main applications are that it can be used in Rice mill, flour mill to remove moisture from the grain also used in food industry for drying purpose. Grains are more easily dried and give the good quality of grain and can be kept in safe storage. The dry grain, it can be easily acceptable in market & it gives good value in market. The government warehouse has grain storage in bulk quantity it is very hard task to store much of quantity & that to dry so the project will ultimately help the government as well as farmer so that they may not face the loss especially during monsoon season. Due to unexpected rainfall, rainstorms the grain becomes wet and due to this the grain will become spoil and we prevent grain from spoilage by using our grain dryer.

It is further an object of the present invention to provide a grain drier which can also be used for drying other agricultural products such as fruit, vegetables, tobacco, coffee, tea, cocoa, silk cocoons as well as granular minerals of any type.

❖ DISCUSSION AND CONCLUSION

We study some research paper mentioning above from that we conclude the moisturizer grain is not suitable for long time storage, further process, and selling to the market. The traditional method for removing moisture from grain is to natural air dying or sun drying. Only 30% grain is to be dried with the help of mechanically & remaining with the help of sun drying or natural air drying. It takes lots of time, more space & labor for drying the In India approximate 260 million tones food grain produce yearly anon(2015). The Indian government buys food grain from the farmer but due to not proper space to store the grain so it is stored in open space. Food Corporation India (FCI) & State Warehousing Corporation hold storage capacity only 90 million tones whereas remaining food storage facility in open sky or open space. Due to unexpected rainstorms & bad whether condition it spoil the grain. Earlier it used to be that the rain fall in rainy season, hot weather in summer season, cold weather in winter season. But now the weather changes any time because of this the grain gets damaged or get spoiled. so we are trying to design a mechanism which is for the purpose remove moisture from the grain, it can be suitable for long time storage, further process, & selling to market.

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