FABRICATION OF PEDAL OPERATED GRAIN CLEANER

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Abstract:-In the developing world, powered grain cleaners exist, but they are impractical in rural regions because of electricity are expensive or unavailability.The objective is to develop a low cost, pedal powered machine that is designed using readily available parts. Innovation is its simple design using bicycle components, which is easy to operate and without using electricity. Methodolgy involved here using pedal operated and vibrating mechanism cleaned variety of grain is collected leaving chaffs, lighter impurities and stones present in the grains

Keywords:pedaling, vibration, grain cleaner.

I.INTRODUCTION :-

Agriculture is the backbone of Indian Economy. Agriculture [1] is basically an energy conversion industry farm is an energy consumer and a producer, because with the use of the different energy inputs, energy output as a crop production is available.Almost all the food, feed, fibre and fuel commodities go through a number of postharvest processing operations such as cleaning, grading, separation, drying, storage, milling, food processing, packaging, transport and marketing before it reaches to the consumers. Agricultural processing is directed towards conservation of produce and value adding to make the material more readily usable,consumable and economically more remunerative[3].

Harvested grain (threshed / shelled / dried) needs further processing to get rid of various types of contaminations or undesirable matter, viz., inert material, common and grains of noxious weeds, other crop/variety grains, damaged grains and/or off-size grains. Cleaning and grading result in reduced bulk of the material, high value products, safe and longer storage, more out-turn of better quality milled products.

Improper cleaning usually result in grain loss. Cleaning helps to reduce bulkiness during subsequent post harvest operations. To remove straw pieces, unfilled grains and other foreign materials, cleaning and winnowing can be done manually, using wind energy or with the use of machines. Traditional winnowers like the winnowing basket and wooden boxes with perforations are used also motorized grain cleaners using electric power are in use.

Cleaning removes unwanted materials like straws, chaff, weed seeds, soil particles and rubbish from the grain. It improves grain storability, reduces dockage during milling, gives good quality milled and improves the milling output. It also reduces insects, pests and disease infestation.

A. Objectives

1.To meet the new machinery that is used to perform different grain cleaners in the field of agriculture.
2. The main objective of the project work is to get the cleaned variety of grain.
3. To use sustainable and profitable production methods without using electricity.
4. Focusing on the quality of agricultural products,
5. Improving food grain quality

II. LITERATURE SURVEY

One of the best example is developing new method of cutting leaves technology by mastering information and communication technology (ICT) skills and knowledge [8]. Among the efforts to develop the agriculture sector, attempts have been made to encourage technology adoption among farmers, particularly in terms of activities such as agro-based website surfing. Website surfing enables agrobased entrepreneurs to seek related information, products and services.Research conducted by Sadaf et al. (2006) stresses that encouragement to utilize ICT is important due to the fact that much of the agriculture community still relies on traditional means such as neighbors, family and other farmers, in order to get agriculture information. According to Barton (2003), websites provide farmers with the facilities to communicate with other farmers, extension officers and agencies across long distances. In addition, websites are the most popular online services for farmers, and are cheaper than telephone usage. we can improve production rate to increase yields, grain quality and economics[4].

The national policy, which aims to reduce dependency on unskilled foreign labour, encourages the agriculture and agro-based industry to adopt capital and management-intensive agricultural engineering or mechanization technologies. A study conducted by Truong (2008) which focused on cutting leaves adoption of technology in the Mekong Delta was chosen as the backbone of this study discussion as Mekong. Delta is a very well-known and successful paddy area development in the region and it is a hope that similar success can be adopted in other areas in the region. Truong (2008) shows that there are some technologies that benefit both farmers and the industry.

III PROBLEM DEFINITION

A.In the literature survey the identified different problems in the present situation Problems facing by the small grain grower while cleaning the grains are small grain grower cannot afford for high price machineries which is economically higher cost of the grain cleaning machine ranges from 65 thousand to one lakh based on specifications and features.

Using electric power source like fans for blowing there is a scarcity of electric power in rural areas.

Using wind blowing sometimes no constant wind power for continuous winnowing
Using wind blowing method continuous standing at right angles (90°) from the direction of wind is more fatigue to a person and also dust particles affect the health.

B. Requirement Definition

This is the most important stage of the design process. This stage includes the clear status of the actual Problem. It is important to know the customer needs and analyze the marketplace to produce a list of requirements necessary to produce a successful product.

1)Concept development: In the concept development phase, the needs of the target market are identified, alternative product concepts are generated and evaluated, and one or more concepts are selected for further development and testing.

2)Concept selection: Concept selection is the activity in which various product concepts are analyzed and sequentially eliminated to identify the most promising one. Concept se- lection is the process of evaluating concepts with respect to customer needs and other criteria, comparing the relative strengths and weakness of the concepts and selecting one or more concepts for further investigation, testing or development.

3)Concept screening and concept scoring: There are two stages of concept selection, first stage is called Concept Screening and the Second Stage is called Concept Scoring. Each is supported by decision matrixes, which are used to rate, rank and select the best concept. Concept screening, rough initial concepts are evaluated relatives to a common reference concept using the screening matrix. Concept scoring is used when increased resolution will better differentiate among competing concepts.

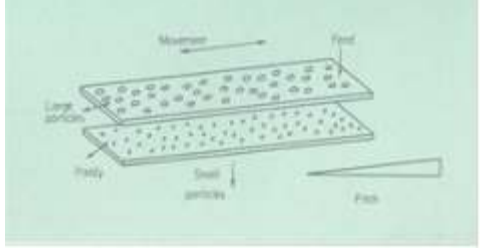
4)Detail design: In this stage of the design process, the chosen concept design is designed in detail with all dimensions and specifications. The designer should also work closely with manufacture to ensure that the product can be made.

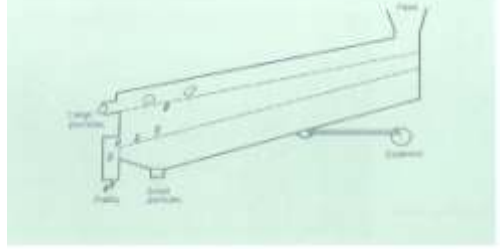
5) Testing and Refinement: The testing and manufacturing phase involves the construction and evaluation of preproduction versions of the product. Prototypes are tested to determine whether the product will work as designed and whether the product satisfies the user or key customer needs

IV. METHODOLOGY

The main aim of the project work is to get cleaned variety of grain without using electricity.the mechanism involved in the work is using pedal operated and vibratory mechanism.

The sieve can be made of wire mesh on perforated sheet metal. Moving the sieve in a back-and-forth direction moves the materials, permitting smaller particles to fall through the openings and larger particles to remain on top. Without movement little separation would occur. A basic single-screen cleaner performs only one separation. For example, the screen could be designed to separate materials or particles. Larger the grain, A second screen could be designed to separate particles smaller than grain, such as sand. The two-screen cleaner is obviously more useful because two screens can be used in the same horizontal space, and the cleaner can accomplish two separations





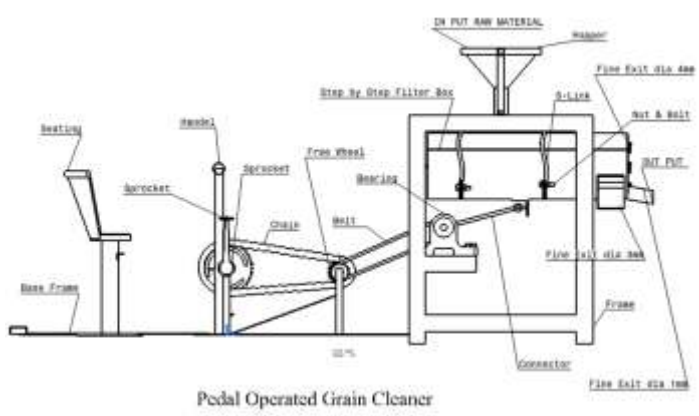
A. List of materials

Parts	Qty	Materials
Structural frame	1	MS
Peddle	1	HSS
Chain & sprocket	1	M.S
Bearings	3	MS
Belt	1	Synthetic Rubber

B. Operation

The force is applied on the main shaft using pedals to drive the sprockets, two different diameter sprockets are connected to each other using chain mechanism that gives rotary motion, the pulley is mounted on the driven sprocket, and thus in-turn is connected to the other pulley. Connecting rod is adjusted to that as the pedaling is done rotary motion is converted into reciprocatory motion thus inturn through eccentric bolts which converts to linear motion thus back and forth action takes place to the tray the sieves on the top of the tray collects the heavier dust particles like stones on the top sieve and lighter impurities based on sieve size mud particles are collected at the second sieve and cleaned variety of grains are collected on the other side.

Fig. pedal operated grain cleaner



Pedal Operated Grain Cleaner

Fig. Principle view of proposed model

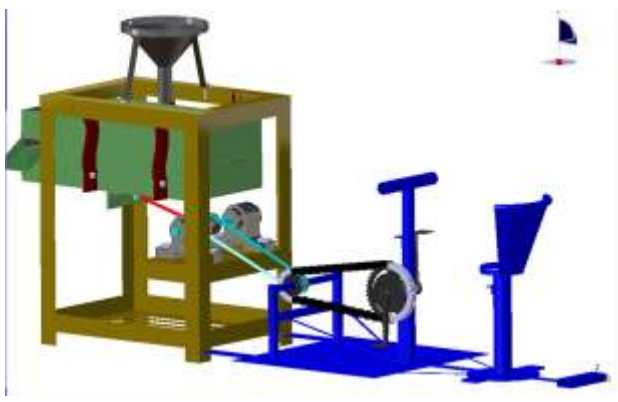
Space consideration: Sometimes high strength materials have to be selected because the forces involved are high and the space limitations are there.

Cost: As in any other problem, in selection of material the cost of material plays an important part and should not be ignored. Sometimes factors like scrap utilization, appearance, and non-maintenance of the designed part are involved in the selection of proper materials.

VII. DESIGN SPECIFICATIONS

The CAD models are generated for the selected concepts and the modeling software CATIA V5 R20 is used for the 3D CAD [7] generation. Following are the 3-D models of individual components

The below figure shows the proposed 3D model of pedal operated grain cleaner



V. Design Calculations

Velocity of grain discharge,

4V²[sin?/B+15.{ρ⅓ * μ ⅜*ρ/*d⅝ } g] =

4V²[sin30/572.55+15*(721⅓ * 1 ⅜*) / 0 65 1=2.81 *

V³=5.978*10¯4

V=0.0842 m/sec

Pulley-vee belt design:

Diameter of the driver(D2) = 50 mm
Diameter of the follower(D1) = 150 mm
Center distance of the drive(C) = 2m

Length of the belt, L=2C+Π/2(D1+D2)+(D1+D2)/4*C
L=2(2)+3.14(0.15+0.05)+(0.15+0.05)/4*2
L=4.8m

Thus length of the vee-belt is taken to be as 5m.

Chain & Sprocket design

Transfer power(torque) from one location to another. From driver: peddles, driven: conveyor belt

1.) # of sprocket teeth, N1 (smaller sprocket) > 17 (unless low speed < 100 rpm.) Hence smaller sprocket N1 is taken as 14 teeth.
2.) Speed ratio = n1/n2 ≤7, Thus speed ratio is found to be 3.14
3.) 30 x Pitch Length < Center Distance < 50 x Pitch Length
4.) Angle of contact of chain on smaller sprocket > 120°
5.) # sprocket teeth, N2 (longer sprocket) < 120
Speed ratio of pulley=D2/D1=150/50=3
Center to center distance 500mm
Longer sprocket z1 is 44 teeth
Smaller sprocket z2 is 14 teeth

VI.RESULTS

Table: Feeding rate and percentage of cleaned grain

Soya grain	cleaned grain	Uncleaned grain	Broken grain	Percentage cleaned
500	400	30	70	80
1000	650	100	250	65
1500	850	150	500	57
2000	900	300	800	45
Avg	700	245	405	62

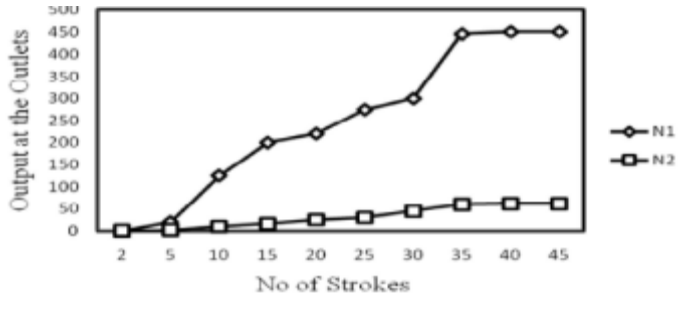


Fig.Plots of output at outlets against no.of strokes

Where, N1 =no. of grains at grain outlet
N2=no. of stones at stones outlet.

Thus, efficiency of cleaned variety of grain is found to be 82-85.

VII. CONCLUSION

The final outcome from this project work is that cleaned variety of grain is obtained. in this project work we are also calculating the mass flow rate theoretically, and also the pedaling rate with vibrations in rpm. Thus 82-85% of cleaned variety of grain is obtained by using pedal operated grain cleaner.

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