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Sugar Cane Lifting Machine

[1.] Waghmode Rohit
Dept. Of Mechanical S. B. Patil College of Engineering Indapur, Pune, India

[2.] Virkar Kiran
Dept. Of Mechanical S. B. Patil College of Engineering Indapur, Pune, India

[3.] Waghmode Mahesh
Dept. Of Mechanical S. B. Patil College of Engineering Indapur, Pune, India

[4.] Kharat Akshay
Dept. Of Mechanical S. B. Patil College of Engineering Indapur, Pune, India

[5.] Proff. Adhapure Dipak U.
Project Guide Dept. Of Mechanical S. B. Patil College of Engineering Indapur, Pune, India

Abstract*—India is one of the major agricultural countries in the world. Maharashtra being a major sugarcane cultivating state had majority of labors for lifting of sugarcane manually, but that was the situation of 10- 20 years back. Today, as the demand of sugarcane products like sugar has increased, the cultivation of sugarcane is also increased. But as there has been a shortage of labors for the sugarcane lifting process, due to which sugarcane which is ready for lifting is left as it is in the field and dried which affects its quality & quantity of sugar content in it due to delay in supplying to the sugarcane industry. The process of lifting consists of cutting the cane from bottom, then cutting off its top leaves, making a bundle which consists of 10 to 15 canes each and then carrying it to the trucks and loading it. This entire process is time consuming and requires a lot of hard work and is tedious as it is done manually by labors. When we look at the world scenario, it is found that the fields of sugarcane are extremely huge compared to the Indian farms and hence they use machines for lifting instead of labors as it is not possible by the labors to harvest the farm quickly. Therefore, labors for lifting are very rare case. Therefore, it is seen that machines specially for sugarcane lifting have been built & used and they have worked out to be quite successful. There have been attempts made to make use of these harvesters in India, however, the attempts turned out to be unfavorable to the small size farms and land quality of our farms. Hence, till today also very few sugarcane harvesters are used for helping in the process even though need is arising due to scarcity of laborers and an increase in demand for a faster and more profitable output of farmers. In India agriculture has facing serious challenges like scarcity of agricultural labor, not only in peak working seasons but also in normal time.*

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I. INTRODUCTION

Chain type sugarcane-lifter was studied. The orthogonal and single experiments were conducted to study the following factors: advancing velocity vm, rotational speed of driven sprocket n, lateral-angle β of slideway and oblique-angle α of slideway. The mathematical models for the two evaluations index which contained lodging angle after lifting and different factors were constructed by using the method of mathematical statistics. And the parameters of the sugarcane-lifter were optimized.

Experiment of the finger-chain type sugarcane-lifter.

This project, the idea is to make the mechanization of small-scale Sugarcane harvesting machine. Different parts of a machine will be mounted on strong chassis. The wheels will be attached to this chassis so that it can be moved in the farm. The machine is pushed through the field manually to perform cutting action. The guides/ram is provided in front of machine to lift abruptly grown sugarcane. Ergonomics is given importance as it involves pushing action. The cutter is driven with the help of belt and pulley arrangement. The pulley is mounted on the shaft of the motor which drives another pulley and shaft arrangement to which cutter is.

Now the project mainly concentrates on designing a suitable operating system. To maintain simplicity and economy in the design the locally fabricated unit has been used.
Our project achieves higher safety, reduces human effort, increases the efficiency, reduces the work load, reduces the fatigue of workers and reduces maintenance cost.

Objective of the project

- ❖ Understand the basic principle of our project
- ❖ Describe the construction and working of variousparts of our project
- ❖ Development of the working model of our project

II. LITERATURE REVIEW

Abel Roy and et, al., they developed to design and fabricate semi-automated sugarcane bud chipping machine for agriculture, to reduce farmer's efforts and to increase production of agriculture products. In this machine two operations are carried out at a time. The operations that can be carried out on this machine are sugarcane inter node cutting and sugarcane bud scooping. In sugarcane inter node cutting operation, sugarcane is cut at its nodal part in small pieces and in sugarcane bud scooping operation eye bud is scoop out from the sugarcane for seedling purpose. This operation is mainly based on scotch and yoke mechanism. The inter node cutter and scooper are fixed to the free end of sliders. The rotation motion of the crank converts into reciprocating motion of sliders which intern separates the bud from the sugarcane. In conventional methods around four tons of sugarcane seed is required for one acre. If inter node cutting is performed, the seed requirement can be reduced to one and a half tons, whereas if scooping is performed, the seed requirement can be reduced to hundred kgs.

Ningappa H Kuri and Prof. Reddy Naik J presented the Sugarcane is a vegetative propagated Crop. In India, for conventional system of sugarcane cultivation, about 6 – 8 tones seed cane /ha is used as planting material, which comprises of about 32,000 stalk pieces having 2-3 buds. Cane cuttings with one, two or three buds known as sets are used as seed. This large mass of planting material poses a great problem in transport, handling and storage of seed cane and undergoes rapid deterioration thus reducing the viability of buds and subsequently their sprouting. One alternative to reduce the mass and improve the quality of seed cane would be to plant excised auxiliary buds of cane stalk, popularly known as bud chips. These bud chips are less bulky, easily transportable and more economical seed material. The bud chip technology holds great promise in rapid multiplication of new cane varieties. The left-over cane can be well utilized for preparing juice or sugar or jiggery. Despite of all these benefits of bud chips for rapid multiplication of new cane, a common problem many sugar cane farmers are facing in a developing country like India is affordable (low cost) bud chipping machine. The existing (traditional) tools used for bud chipping of sugar cane are unsafe, messy and need skill and training. The risk of injury is also too high. This necessitates the development of a bud chipping machine for sugar cane. In this direction, literature survey, patent search, market survey and concept generation were carried out. Different concepts were developed using concept generation. Among the different concepts developed, the best concept was selected based on concept selection strategy. The best concept was then prototyped using 25mm by 25mm hallow steel bar joined together by arc welding The punch torque tube was swaged to reduce the cross section of the tube. The punch tool was machined using lathe. The prototype was tested and the initial results indicated that equipment has reduced /totally eliminated the manual effort, as required for generating the sugar cane buds as comp traditional tools. The whole equipment is very compact and simple with additional safety measures.

Sanjay Patil and et. al., studied the entire requirements are being fulfilled through automatic system. The demand for reducing the wastage of sugarcane. So, the search of automatic system is completed by our project. One alternative to reduce the mass and improve the quality of seed cane would be to plant excised axillary buds of cane stalk, popularly known as bud chips. These bud chips are less bulky, easily transportable and more economical seed material. The bud chip technology holds great promise in rapid multiplication of new cane varieties. The problem of establishment and initial growth could be addressed by application of appropriate plant growth regulators and essential nutrients.

Patent (1501/MUM/2008) published Challenged by an engineer to make a machine that can remove buds from the sugarcane for the plantation purpose so as to minimize losses as well as time, money and seeds, Roshanlal came up with this implement. By pressing the handle, the unit removes the bud from the node of the sugarcane, which is then used for planting. As per CIAE (Central Institute of Agricultural Engineering, Bhopal) the technique is considered novel though they have suggested some ergonomic feasibility study. Slightly different kinds of chippers are reported from Tamil Nadu but this one seems low cost and efficient.

Maharashtra is one of the leading states in sugar and sugarcane production in India. Sugarcane industry in Maharashtra is second largest agro based industry next to cotton in which higher investment is made and has brought about desirable changes in social, economic, educational and political life in rural areas. In Maharashtra

the highest harvested cane yields by farmers for Adsali/pre-seasonal; Suru and Ratoon have been 269, 217 and 202 T/ha respectively. However, the average yield of the State is about 85T/ha. Thus, there is wide gap between the average yields and potential yield. This production potential can be achieved by adopting better irrigation water management and scientific crop production practices. The consumptive water needs of seasonal (one year) Sugarcane are between 1600 – 2000 mm in Maharashtra State depending upon agro climatic conditions. After effective rainfall, the annual net irrigation requirement is only 1200 to 1600 mm. Considering 20% field application losses, 1400 to 2000 mm is enough under surface irrigation condition. Farmer's water use is 3000 to 4000 mm. It shows enormous wastage of water resource. The excess application result in water logging and salinity in the farm.

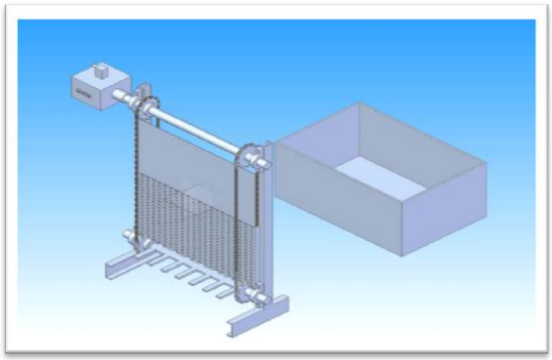
III. BLOCK DIAGRAM

Construction & Working of Project

Parts used in the project

- Chain and chain sprocket mechanism
- Battery 12 Volt D.C.
- Motor 12 Volt D.C. 23 Rpm
- Collecting mechanism
- Supporting frame
- Bucket

Diagram of the project



Working of the project

The sugar cane lifter machine is designed and manufactured by using gear changing and shaft coupling principle. It consists mainly DC geared motor, shafts, bearings, sprocket and chains. Construction materials are easily available, creates employment (construction and maintenance), simple to construct.

The devices are place across Sugar cane lift so that only sugar cane through lower grids, are lifted by teeth which is connected to chain. This chain is attached by gear driven by motor. When motor runs the chain starts to circulate making teeth to lift up. the sugar cane are lifted by teeth and are stored in trolly.

Design and design consideration of the project

Introduction:

Project design may be defined as the iterative decision making activity to create a plan or plans by which the available resources are converted, preferably optimally, into systems, processes or devices to perform the desired functions and to meet human needs. In fact project design has been defined in many ways but the simplest ways to define project design as

"An iterative decision making process to conceive and implement optimum systems to solve society's problems and needs."

Project design is practical in nature and must be concerned with physical reliability, or economic and financial feasibility Design is essentially a decision-making process. If we have a problem, we need to design a solution. In other words, to design is to formulate a plan to satisfy a particular need and to create something with a physical reality.

Basic concept of project design:

Decision making comes in every stage of design. Consider two cars of different makes. They may both be reasonable cars and serve the same purpose but the designs are different. The designers consider different

factors and come to certain conclusions leading to an optimum design. Market survey gives an indication of what people want. Existing norms play an important role. Once a critical decision is made, the rest of the design features follow. For example,once we decide the engine capacity, the shape and size, then the subsequent course of the design would follow. A bad decision leads to a bad design and a bad product.
Design may be for different products and with the present specialization and knowledge bank, we have a long list of design disciplines e.g. ship design, building design, process design, bridge design, clothing or fashion design and so

Types of project design:
There may be several types of design such as
1. Adaptive design
This is based on existing design, for example, standard products or systems adopted for a new application. Conveyor belts, control system of projects and mechanisms or haulage systems are some of the examples where existing design systems are adapted for a particular use.
2. Developmental designs
Here we start with an existing design but finally a modified design is obtained. A new model of a car is a typical example of a developmental design .
3. New design
This type of design is an entirely new one but based on existing scientific principles. No scientific invention is involved but requires creative thinking to solve a problem. Examples of this type of design may include designing a small vehicle for transportation of men and material on board a ship or in a desert. Some research activity may be necessary.

- **Types of design based on methods**

4. Rational design:
This is based on determining the stresses and strains of components and thereby deciding their dimensions.
5. Empirical design:
This is based on empirical formulae which in turn are based on experience and experiments. For example, when we tighten a nut on a bolt the force exerted or the stresses induced cannot be determined exactly but experience shows that the tightening force may be given by P=284d where, d is the bolt diameter in mm and P is the applied force in kg. There is no mathematical backing of this equation but it is based on observations and experience.
4.1.4 Factors to be considered in project design
There are many factors to be considered while attacking a design problem. In many cases these are a common-sense approach to solving a problem. Some of these factors are as follows:
(a) What device or mechanism to be used? This would decide the relative arrangement of the constituent elements.
(b) Material
(c) Forces on the elements
(d) Size, shape and space requirements. The final weight of the product is also a major concern.
(e) The method of manufacturing the components and their assembly.
(f) How will it operate?
(g) Reliability and safety aspects
(h) Inspectibility
(i) Maintenance, cost and aesthetics of the designed product.

- **What device or mechanism to be used:**

This is best judged by understandingthe problem thoroughly. Sometimes a particular function can be achieved by a number of means or by using different mechanisms and the designer has to decide which one is most effective under the circumstances. A rough design or layout diagram may be made to crystallize the thoughts regarding the relative arrangement of the elements.
1. Material:
This is a very important aspect of any design. A wrong choice ofmaterial may lead to failure, over or undersized product or expensive items. The choice of materials is thus dependent on suitable properties of the material for each component, their suitability of fabrication or manufacture and the cost.
2. Load:
The external loads cause internal stresses in the elements and thesestresses must be determined accurately since these will be used in determining the component size. Loading may be due to:
1. Energy transmission by a project member.
2. Dead weight.
3. Inertial forces.
4. Thermal effects.

5. Frictional forces.

Steps in project design

Project Design or mechanical design is primarily concerned with the systems by which the energy is converted into useful mechanical forms and of mechanisms required to convert the output of the project to the desired form. The design may lead to an entirely new project or an improvement on an existing one. Thus, project design is the production or creation of the right combination of correctly proportioned moving and stationary components so constructed and joined as to enable the liberation, transformation, and utilization of energy.

The basic procedure of project design (Mechanical Project Design) consists of a step-by-step approach from given specifications of functional requirement of a product to the complete description in the form of blue prints of the final product. The following steps are involved:

First Step:

In the very first step a complete list of specifications for the functional requirement of the product is to be prepared. The requirement may include, for example:

(a) Output capacity;
(b) Service life;
(c) Cost;
(d) Reliability; etc.

In consumer products, in addition appearance, noiseless operation, and simplicity in control are important requirements. Depending upon the type of product, various requirements are given Weight age and a priority list of specifications is prepared.

Second Step:

After a careful study of the requirements the designer prepares rough sketches of different possible mechanisms of project and depending upon the cost competitiveness, availability of raw material, and manufacturing facilities, the possible mechanisms are compared with each other and the designer selects the best possible mechanism for the product

Third Step:

In the third step of the design procedure a block diagram is to be prepared which showing the general layout of the selected configuration. In this step designer specifies the joining methods, such as riveting, bolting, and welding to connect the individual components. Rough sketches of shapes of individual parts are prepared.

Fourth Step:

- After selecting the required or deciding the configuration of mechanism /project in third step above. The design of individual components of the selected configuration is to be done in this step. It consists of the following stages:
- Determine the forces acting on each component;
- Selecting the proper material for the component depending upon the functional requirement, such as strength, wear, rigidity, hardness and bearing properties etc.
- Determine the likely mode of failure & select the criterion of failure like, yield strength, ultimate strength, deflection etc.
- Determine the geometric dimensions of the components using suitable factor of safety and modify the dimensions from manufacturing considerations. This stage involves the detailed stress analysis.

Fifth Step:

The last stage in design process is to prepare the blue prints of assembly andindividual component. On these drawings, the material of the components, dimensions and tolerances, surface finish and machining methods are specified.

The designer prepares two separate lists of components

- Standard components to be purchased directly from the market;
- Special components to be projects in the factory;

Thus, the project design or mechanical design process is a systematic step-by-step approach from known specification to unknown solution

Planning for project design

Project design is the chronological verticalstructure of the various phases or steps together from the project

analysis to the retirement of the product. Thus, Project of design includes the following steps:

(i) Feasibility Study:

The aim is to produce a number of feasible and useful solutions.Here the alternatives are assessed in stages. The first stage is made on the basis of common sense. Many of the broad solutions may not be worth consideration. Considering technical feasibility some of the solutions can be eliminated. The last stage is the economic assessment. Systematic technical, economic, social and legal considerations provide a rapid convergence towards the useful solutions.

(ii) Preliminary Design:

Feasibility study yields a set of useful solutions. The aim inthis phase is to choose the optimal solution. To do this, criterion of optimization must be explicitly delineated. The chosen alternative is then tested and predictions are made concerning its performance.

(iii) Detailed Design:

The purpose of the detailed design is to produce a completeproject description of a tested and producible design for manufacture. A detailed design includes manufacturing drawings with tolerances. Planning for Manufacturing- A procedure sheet is to be made which contains asequence of manufacturing operations that must be performed on the component. It specifies clearly the tooling, fixtures and production projects. This phase may include planning, and inventory control, quality control system, the fixing of standard time and labor cost for each operation.

(iv) **Planning for Distribution, Use of the Product:**

The success ofa design depends on the skill exercised in marketing the product. Also, the user-oriented concern such as reliability, ease of maintenance, product safety, and convenience in use, aesthetic appeal, economy and durability must meet. The product life considering actual wear or deterioration, and technological obsolescence must be planned.

Manufacturing process of the project

Introduction

Manufacturing is the backbone of any industrialized nation. Manufacturing and technical staff in industry must know the various manufacturing processes, materials being processed, tools and equipment for manufacturing different components or products with optimal process plan using proper precautions and specified safety rules to avoid accidents. Beside above, all kinds of the future engineers must know the basic requirements of workshop activities in term of man, machine, material, methods, money and other infrastructure facilities needed to be positioned properly for optimal shop layouts or plant layout and other support services effectively adjusted or located in the industry or plant within a well planned manufacturing organization.

The complete understanding of basic manufacturing processes and workshop technology is highly difficult for anyone to claim expertise over it. The study deals with several aspects of workshops practices also for imparting the basic working knowledge of the different engineering materials, tools, equipments, manufacturing processes, basic concepts of electro-mechanical controls of machine tools, production criteria's, characteristics and uses of various testing instruments and measuring or inspecting devices for checking components or products manufactured in various manufacturing shops in an industrial environment. It also describes and demonstrates the use of different hand tools (measuring, marking, holding and supporting tools, cutting etc.), equipments, machinery and various methods of manufacturing that facilitate shaping or forming the different existing raw materials into suitable usable forms. It deals with the study of industrial environment which involves the practical knowledge in the area of ferrous and non-ferrous materials, their properties and uses. It should provide the knowledge of basic workshop processes namely bench work and fitting, sheet metal, carpentry, pattern making, mould making, foundry, smithy, forging, metal working and heat treatment, welding, fastening, machine shop, surface finishing and coatings, assembling inspection and quality control. It emphasizes on basic knowledge regarding composition, properties and uses of different raw materials, various production processes, replacement of or improvement over a large number of old processes, new and compact designs, better accuracy in dimensions, quicker methods of production, better surface finishes, more alternatives to the existing materials and tooling systems, automatic and numerical control systems, higher mechanization and greater output.

Manufacturing is derived from the Latin word manufactus, means made by hand. In modern context it involves making products from raw material by using various processes, by making use of hand tools, machinery or even computers. It is therefore a study of the processes required to make parts and to assemble them in machines. Process Engineering, in its application to engineering industries, shows how the different problems related to development of various machines may be solved by a study of physical, chemical and other laws governing the manufacturing process. The study of manufacturing reveals those parameters which can be most efficiently being influenced to increase production and raise its accuracy.

Manufacturing process of the project
Advantages, Disadvantages and Application of the project

- **Advantages of the project**

- Production cost is very low.
- No need of purchase special machine.
- It is mainly very useful to hold the lengthy plate (1.5 feet) in particular position.
- Its operated and manufactured is simple.
- It is compact and portable.
- It can be efficiently used.

- **DISADVANTAGES**

- Small vibration occurs due to wire brush wheel attachment.
- In order to avoid vibration, the machine should be properly foundation with the floor.

Application of the project
Our project should use for following various applications like as:

- It is used almost in all types if sugar (large, small& medium).
- This machine is mainly used in cleaning system.
- Project to use this in efficient way to control the lifting of sugar and with regular filtration of sugar.
- This device is suitable to hold flat type (maximum length 5 feet).

Future Scope of the project

In this project the proposal concept is to replace the manual work in sugar cane cleaning by automated system. Now a day's even through automation plays a vital role in all industrial applications in the proper lifting of sugar cane from industries and commercials are still a challenging task. Sugar cane lifting are using for the lifting and unfortunately sometimes there may be loss of human life while cleaning the blockages in the sugar cane lifting. To overcome this problem and to save the human life we implement design "automatic sugar cane lifting system". We designed our project to use this in efficient way to control the lifting of sugar cane and with regular filtration of sugar cane, clearance of gaseous substance are treated separately and monitor the lifting of frequent manner.

IV. CONCLUSION

Our project is successfully implemented for Automation is a technology concerned with his application of mechanical, electronic and computer-based systems to operate and control production. This system is used to operate automatic sugar cane lifting equipment. This project may be developed with the full utilization of men, machines, and materials and money. Also, we have followed thoroughly the study of time motion and made our project economical and efficient with the available resources. This system was Designed, fabricated successfully and also tested. It works Satisfactorily. We hope that this will be done among the most versatile and interchangeable one even in future. Thus, we can able to obtain to operate automatic sugar cane lifting equipment

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