

Paper Bag Manufacturing Machine

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Abstract - Plastic is being used in a large amount in order to carry material but it has become a major element in polluting the environment. Hence government is encouraging the use of paper bag to reduce plastic pollution. Main aim of the project is to design a unit which can manufacture a paper bag from A4 size paper. Main focus of the project is on reuse of waste papers for manufacturing paper bags instead of using recycled papers which contribute to reduce the material cost. Traditional manual method of paper bag manufacturing is switched into semi-automatic system which would be helpful for a mass production and reduce the production time. Aim is to manufacture an eco-friendly paper bag to reduce the use of plastic.

Key Words- Paper bags, Plastic pollution, Semi-automatic, Mass production, Eco-friendly.

1. INTRODUCTION

Plastic kills a large number of wildlife every year. One of the major impacts is on marine life. To avoid the harmful effects of Plastic Bags, a viable alternative is Paper Bag. Paper bag is being used but on a very small scale. Conventional paper bags require a special paper which increases the overall cost of the Paper Bag. This is the main cause due to which the use of Paper Bag is less. The initial investment is high in conventional paper bag machine. So, it cannot be used for small scale production. All these problems are solved in the presented machine. A machine whose initial cost is less, which does not require any special paper, which can be used for small scale production, is developed. Even the government is trying to reduce the impact of plastic bags.

The paper bag can be manufactured using regular sized newspaper to reduce cost of paper bag. Once the bag is used, it can be recycled. The environmental impact of plastic bag: danger to wildlife, especially to marine life, plastic bag can be mistaken as a food by animals. This can cause the death of variety of animals especially marine. If this is swallowed, animals can cause to death from starvation or infection. To save the animals revolution is necessary.

PROBLEM STATEMENT

To reduce the plastic pollution in the environment and make the environment eco-friendly we are developing a paper bag manufacturing machine.

1.1 LITERATURE REVIEW

Harish A [1] proposed a low-cost, portable paper-bag making machine designed to produce paper-bags and minimize the usage of plastic bags for a clean and safe society. The system being semi-automatic is capable of producing single-size paper-bags from the local newspaper. The project has been implemented by making use of micro-controllers, IR sensors, a robotic arm, a 2wheeled robot and DC motors unlike previous attempts using PLC and servo-motors. The system can be deployed in small-scale industries or homes for producing paper-bags and we believe it can reduce the usage of polythene bags.

Vivek Mahesh Naik [2] Plastic, although considered as one of the greatest inventions by virtue of its use in carrying things but has become a major element in polluting the environment. Plastic bags are known for their carcinogenic gas release after burning in air, for choking of sewage lines during monsoon season and the harmful effect on aquatic life. The government is promoting the use of paper bags to reduce plastic pollution. The project aims at designing a model of paper bag manufacturing unit, which would manufacture paper bags from A4 size educational sheets also commonly known as assignment papers (21.7 X 28.8 cm).

Jay Ganesh Tripathi [3] This study is concerned with While plastic bags have been very widely used, there has been a recent shift to paper bag products because of their cost and the fact that they are environmentally-friendly. "Fashion always changes with standard paper bags". So, demand for paper would go on increasing in times to come. In view of the paper industry's strategic role for the society and also for the overall industrial growth it is necessary that the paper industry performs well. The government has completely delicensed the paper industry with effect from 17th July 1997. The paper grocery bag is an American innovation and was designed in 1883. It's made from craft paper – the word 'craft' coming from the German language meaning 'strong'. Kraft paper is known for its strength and coarse texture. Its strength lends to its reusability.

Subramanian Senthilkannan Muthu [4] Today there are varieties of comments prevailing among people who use Plastic and Paper bags for their shopping needs. A few people support Plastic bags with their own justifications and others support Paper bags. This is a hot topic of today and arguments are going up and down to deduce which one is

better in terms of environmental impact, but some people abstain from this issue by choosing the other option of going with reusable bags. This exploratory study is attempted to infer the environmental concerns made by these bags.

The two common grocery bags of today – Paper & Plastic bags are compared in this study. Two imperative measures – the total amount of energy used by a bag to get it manufactured and the number of pollutants emitted during the manufacturing phase of a bag - are chosen as data for Life Cycle Inventory (LCI). To arrive at a clear state of conclusion with respect to the environmental impact made by these two bags, the life cycle impact assessment (LCIA) study was accomplished. The evolution of Life Cycle Assessment (LCA) study from the data available on this context is the crux of this study. The Eco-indicator 99, damage-oriented method for LCIA in SIMA PRO 7.1 tool is used to assess the environmental impact made by these two grocery bags.

D. Kristiansen [5] This paper addresses the possible drainage and collapse of closed flexible cages in sea-based fish farming. A closed flexible cage is a floating bag structure containing water that is enclosed from the ambient water. Possible density stratification in typical fjord locations can cause buoyancy-driven discharge from the containment if damages occur under special operational conditions. The discharge may in turn cause drainage and collapse of the closed flexible cage. A combined structural and hydrodynamic model was developed to study the process of drainage and collapse of a floating closed flexible bag structure. Scaled physical model experiments with buoyancy-driven drainage of a hemispherical bag structure were conducted and compared with results from numerical simulations. A good comparison was observed for the flexible deformations and the drainage time. The main characteristics of the drainage process and performance of the numerical model are discussed. Implications from the present results on the design of closed flexible cages are suggested. To the best of the authors' knowledge, the present study is the first to consider the drainage and collapse of a floating flexible bag containment structure through both numerical and experimental methods.

1.2 PAPER BAGS

The global environment is changing day by day. Now it has become a challenge to live due to the fact that every nation is trying to develop their countries without taking into consideration the environmental impact of degradation and pollution of agricultural lands.



Fig -1: Sample Paper Bag

More factories are being established and harmful chemicals and materials are being used in the production process. People are using bags made of plastic, which are environmentally dangerous products, for their daily needs, for shopping purposes as a result of which, the environment and agricultural lands are thereby being polluted. Paper bags have traditionally been presented in this paper as the environment-friendly option when compared to plastic bags. Before the introduction of jute bags, paper bags were the most commonly used. The natural fibers of the paper and the renewable resource used has a positive image, as the increase in the volume of the paper bags, likely to be sent to the landfill, has now taken over a new role in the recycling options which are firmly established. It has been scientifically proven that paper bags are not harmful to the environment as compared with plastic bags.

The available alternative to plastic bags:

Jute bags

Jute bags are biodegradable containers made from a plant fiber called jute. They are usually used to store material and holding grocery. Heavy duty jute bags or sacks are used for packaging agricultural commodities.

Biodegradable Plastic Bags

The generation of biodegradable plastics has considered as an alternative to the toxic producing traditional plastic bags. This provides the same environment-friendly positive image of natural fibers and bio-degradability that paper or jute bags possess. Thus, the need to stop using non-biodegradable plastic bags has increased. This has helped to decrease the widespread use of traditional plastics whilst simultaneously it also increases the market potential of the new generation of biodegradable plastic products for a much broader global usage. Although biodegradable plastic bags are marketed as an environmentally friendly option, they may probably cause similar but further environmental problems.

Paper Bags

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2. DESIGN AND CALCULATIONS

Motor

Voltage = $V = 12V$

Current = $I = 5Amp$

Speed = $N = 60 RPM$

Power = $P = V \cdot I = 12 \cdot 5 = 60W$

$T = 9.549 Nm$

Belt & Pulley

From design data book V. B. Bhandari page no. – 13.12

V Belt – Z type of belt

$D_1 = 50mm, D_2 = 85mm, N_1 = 1440rpm$

We know that, $D_1 / D_2 = N_2 / N_1$

$N_2 = 847.06rpm$

From table no. 13.25, $L = 405mm, C = 407mm$

We know that, $\alpha = \sin^{-1}(r_1 - r_2 / C)$

$$\alpha = 2.4677$$

$\theta = 180 - 2 \cdot \alpha = 175.0646$

We know that $T_1 =$ Tension on tight side

$T_2 =$ Tension on slack side

$T_1 / T_2 = e^{(\mu\theta / \sin \beta)} = 4.1618$

$T_1 = 4.1618 T_2$

$P = (T_1 - T_2) \cdot V$

Where $V = \pi \cdot D \cdot N / 60 = 3.77m/s$

$746 = (4.1618 T_2 - T_2) \cdot 3.77$

$T_2 = 62.58N$

$T_1 = 260.46N$

Shaft

Material of shaft = M.S.

According to Torsional Rigidity, Diameter of shaft is given by

$$D = \left(\frac{584 \cdot Mt \cdot L}{G \cdot \theta} \right)^{0.25}$$

Where, $Mt = 9.549 Nm$

$L = 1000mm$

$G = 78 \cdot 1000 MPa$

$D = 16mm$

Next standard size available in market = 20 mm

Bearing Selection

We select the deep groove ball bearing having dimensions as

$d = 20mm, D = 52mm$

Bearing Designation = 6304

2.1 CAD

CAD is known as Computer Aided Design. It is used to create a design, modify as per requirement, analyse, or optimize a design. It is helpful to improve the productivity of design, quality of design can be improved, communication through documentation is possible, and database for manufacturing can be created. CAD gives output in the form of electronic file which can be printed, machining or other manufacturing operations. The term Computer-Aided Design and Drafting (CADD) is also used.

In electronics it is used as Electronic Design Automation (EDA). In mechanical system it is known as mechanical design automation (MDA) or computer- aided drafting (CAD), which consist of process of creating a drawing with the help of computer software.

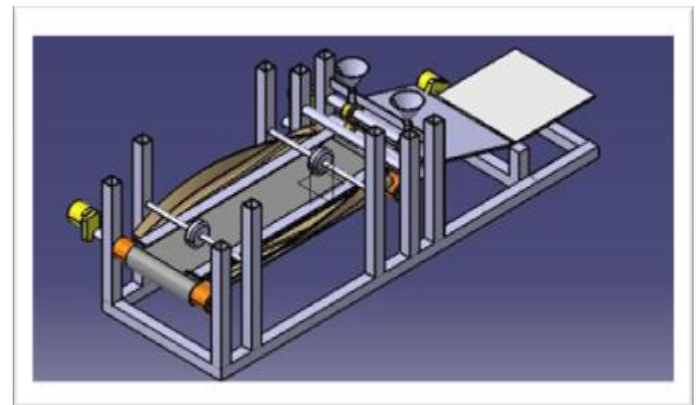


Fig -2: CATIA Model of Paper Bag Manufacturing Machine

3. WORKING

As the machine is semi-automatic, one operator is required for the operation. A conveyor belt is the carrying medium of a belt conveyor system which is being used to carry a paper. In this paper bag machine, rollers and sheet is used to support a paper. This system is consisting of gluing mechanism and folding mechanism.

Gluing mechanism is fitted on the top of two rollers, as the paper moves from conveyor it gets folded by the means of folding sheet. Then it passes through rollers carrying glue on its surface. As this paper further moves ahead it comes onto the sheet which is having a folding mechanism. This glued paper gets folded with the help of folding mechanism and result into a paper bag. This bag is manually collected to punch and to fit eyelet and lace.

4. SCOPE

The current automation of belt conveyor and other mechanism is by DPDT switch, this could be changed to micro-controller and Arduino programming operated.

The positioning of paper at the right position could be achieved by installing light sensors.

Currently, only assignment papers are used as a raw material for making a paper bag. However, it could be made flexible as to take newspapers and other waste papers as raw material.

5. CONCLUSION

Plastic is non degradable and harm our environment, aquatic life and human health which has an alternative as a paper bag which is eco-friendly. The waste papers such as news paper or assignment papers also can be used as a raw material for this sized machine which reduces material cost. This machine is portable and compact and can be used for a mass production. This machine is used to make the paper bags having good quality so that it will diminish the use of all types of plastic bags.

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