

“Arduino Based Paper Cutting Machine”

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Abstract - This project is centered on the design and fabrication of an Automatic paper cutting machine making use of some locally found materials. Paper is one of the majorly used material in our day to day activities in taking information's down necessary information's, it is very important that there is a machine that can handle it at a domestic level to give the desired form for various use. The machine is made up of a motor, an arduino board, plastic materials, blade, and belt. The machine also uses code which is programmed on the arduino board which helps to set the length of cut and the slider which hold the blade slides to cut the paper. The machine is tested and the output is evaluated.

Key Words: Paper Cutter, Arduino, Slider, Roller

1. INTRODUCTION

In the world economy generally over the years has enjoyed the grand massive results of technological advancement in various sectors most especially in the usage of materials and recycle of scarce material. Industries and firms have continuously devised innovative plans to keep customers at arm's length with the introduction of new technology, products and services that would help make life easier to people in general. As a result of this upshot, urban areas have appreciably expanded with rapid increase in population resulting in a high percentage of goods consumed per area which leads to recycling of materials. Goods after been put to use, are often times wrongly disposed or rather poorly managed, bringing about several hazardous effects in the environment and the ecosystem at large.

Wastes are materials that are not prime products (that is products produced for the market) for which the initial user has no further use in terms of his own purposes of production, transformation or consumption, and of which he wants to dispose. Wastes may be generated during the extraction of raw materials, the processing of raw materials into intermediate and final products, the consumption of final products, and other human activities. Waste includes all the items that people no longer have any use for, which they either intend to get rid of or they have already discarded. All daily activities, therefore, gives rise to a large variety of different waste flows from different sources.

2. Problem Statement

Papers are product primarily used for writing, taking records and documentations of information. It also can be processed into a thinner and flexible paper known as tissue paper which can be used for cleaning and sanitary. It is sold in

leaves i.e. 40 leaves 80 leaves, Higher Education of different sizes and length which is usually protected by a hard cover. Most modern paper in the developed world is designed to decompose septic tanks, whereas some other are not.

3. OBJECTIVE

The objectives of this project are to

- Design a paper cutting machine that would cut paper into different sizes as pleased;
- Fabricate the paper cutting machine;
- Evaluate the performance of the developed paper cutting machine.
- Provide secondary income streams for development or management companies.

4. LITERATURE REVIEW

Paper was in use, dating back to the 6th century AD, in early medieval China, a nation which invented paper in 105CE. Even during early 14th century, a huge quantity of paper used to be produced for use in the Emperor's court. Although paper had been known as a wrapping and padding material in China since the 2nd century BC, the first documented use of all paper related material in human history dates back to the 6th century AD, in early medieval China. During the early 14th century, it was recorded that in modern-day Zhejiang province alone there was an annual manufacturing of paper and toilet paper amounting in ten million packages of 1,000 to 10,000 sheets of paper each and the paper produced at this moment were big roll of papers called scroll which are usually stressful to carry around.

During this period, papers produced were large and long which leads to irregular tearing away of some parts of the paper. During the Ming Dynasty (1368-1644 AD), it was recorded in 1393 that an annual supply of 720,000 sheets of paper (two by three feet in size) were produced for the general use of the imperial court at the capital of Nanjing. From the records of the Imperial Bureau of Supplies of that same year, it was also recorded that for Emperor Hongwu's imperial family alone, there were 15,000 sheets of special soft-fabric of paper and toilet paper made, and each sheet of paper and toilet paper were even perfumed.

According to Timothy Hugh Barrett, paper played a pivotal role in early Chinese written culture, and a "strong reading culture seems to have developed after its introduction despite political fragmentation". Indeed, the introduction of paper had immense consequences for the book world. It meant books would no longer have to be circulated in small section or bundles, but in their entirety. Books could now be carried by

hand rather than transported by cart. As a result, individual collections of literary works increase in following centuries. According to Endymion Wilkinson, one consequence of the rise of paper in China was that it rapidly began to surpass the Mediterranean empires in book production. During the Tang dynasty, China became the world leader in book production. In addition the gradual spread of Woodblock printing from the late Tang and Song further boosted their lead ahead of the rest of the world.

5. METHODOLOGY

The Automatic paper cutting machine design was developed with focus on the key issues addressed in the design specification. The design was done using Autodesk Inventor Computer Aided Design (CAD) software. Autodesk Inventor is a powerful CAD package allowing easy, but concise models to be created in such a way that the user is encouraged to properly constrain their creations ensuring there are minimal issues later in the design process. Computer aided design is the use of computer system to assist in creation, modification, analysis or optimization of design. It also refers to as system in which a graphic, display device and a program design analysis system which allows product design and drafting to be accomplished in an interactive mode (Adejuyigbe, 2002). It allows complete assemblies to be created with options to create animations, useful when demonstrating how a product functions. Further, technical drawings are quick and easy to create from parts and assemblies.

6. DESIGN OF THE FRAME OF THE MACHINE

The frame of the machine is made from plastics of dimension (4100mm × 2200 mm) and also comprises of flexible wood for stability in design model. The plastics are constructed into half of a box-like structure that has stands. The mass of materials used for the frame is determined thus:

The density of the material is given by the equation below:

$$\rho = m / V \dots\dots\dots(1)$$

Mass of materials used in making the length and breath Materials used:plastic

Mass:5000g

Dimensions:(500mm by 400mm)

Length = 410 mm

Breadth = 220 mm

Thickness = 2 mm

Height = 80mm

Outer Volume = outer length × outer breadth × height (or thickness)

Inner volume = inner length × inner breadth × height (or thickness)

Outer volume= (410 × 220 × 80) = 7216000mm³

Inner volume= (406 × 216 × 80) = 7015680mm³

Actual volume = 7216000mm³ - 7015680mm³ = 200320mm³

Converting to metres = 200320mm³ = 0.00020032m³

Density = Mass × volume

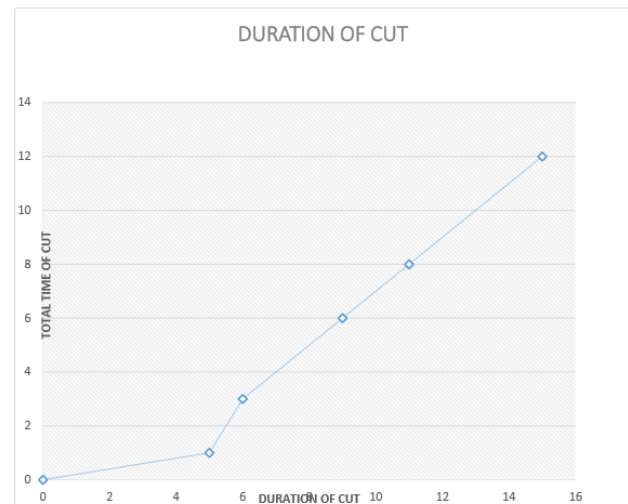
= 5 × 0.00020032

= 0.0010016kg/m³

7. RESULTS

The results obtained from the design analysis of the component parts of the machine shows that the design functioned as intended. The primary aim of this project work

is to design a digital paper cutting Machine. The result obtained from the tests carried out on the paper cutting machine is tabulated in relation between lengths of cut to duration of cut in seconds.



8. DISCUSSION OF RESULTS

From the evaluation results as shown on the graphs above, it is seen that there is variation in the time taken to cut different length of paper and significantly the time taken to cut an A4 paper is actually higher than other sizes. The efficiency of the machine after performance evaluation was carried out is 70%. Also, from the evaluation results, it can be concluded that the longer the time of rotation of the roller, the longer the size of the paper.

9. CONCLUSIONS

This project work successfully designed an Automatic paper cutting machine which can be used to cut paper into various sizes as required i.e. into textbook sizes exercise books etc. The design fulfils all of the major design criteria, as identified by the team. The paper cutting Machine will allow the production of different sizes for use. Additionally, the team constructed a working prototype of the proposed design. This prototype demonstrates that the design produced is viable and capable of meeting the required outcomes and producing the desired output. The prototype also shows that Paper Cutting Machine can be fairly easily and inexpensively constructed, using limited tools and technical knowledge.

REFERENCES

1. Abdu Rahaman, A. A. and Kolawole O.M. 2006. "Traditional Preparations and Uses of Toilet in Nigeria". <http://www.Ethanoleaflets.com/Leaflets/Kolawole.htm>. Retrieved on 26/11/10.
2. Adewumi, B.A.2007. "Effect of Some Crop Parameters on the Performance Characteristics of a Manually Operated Plantain Chipping Machine". Botswana Journal of Engineering, 16(2):23 – 28.
3. Butkarev, A.A. 2007. Design of optimal (energy – efficient) roasting systems. Steel in Translation.37: 756-763.
4. Bhattacharya, S. 1995. Kinetics of hydration of raw and roasted corn semolina. Journal of Food Engineering.25: 21-30.
5. Castello, B. 2006. "Complete Guide to Bananas". Retrieved on February 9, 2007 from <http://www.banana.com>

6. Ellegard, A. 1996. "Cooking Fuel Smoke and Respiratory Symptoms among Women in Low – Income Area in Maputo". *Environment Health Prospects*. 104(9):980-985.
7. Fellows, P.J 2000. *Food Processing Technology; Principles and Practice* 2nd ed; Wood Head Publishing Company: Cambridge, UK.1: 26-29, 343, 348.
8. FAO. 2010. "Maize, Roots, Plantains and Bananas in Human Nutrition". Retrieved from <http://www.fao/docrep.htm> on 15th January, 2010.
9. Gupta, C.P. 2003. *Engineering Heat Transfer*. Mechanical Engineering Department, University of Roorkee, India.
10. Hailstorm, B and Skgoldbrand, C (1983): *Heat and Mass Transfer in Solid Foods*: In S. Izunfuo, W and V.O.T. Omuaru. 2006. "Effect of Ripening on the Chemical Composition of Plant Peels and Pulps (*Musa paradisiaca*)". *Journal of the Science of Food and Agriculture*. 45(6):333-336.
11. Jimoh, A.K., O.S. Adeniran, S.A. Adebisi, and S.A. Biliaminu. 2008. "Effect of Food Processing on Glycemic Response to White Yam (*Discorea rotundata*) Meals". *Diabetologia Croatica*. 37(3): 67 -72.
12. Jha, S.N. 2005. Mathematical simulation of roasting of grain. *Journal of Food Engineering*. 71: 304-310.
13. Karababa, E. 2004. Physical properties of popcorn kernels. *Journal of Food Engineering*. 72: 100-107.
14. Laria, J., E. Meza, M. Mondragon, R. Silva and J.L. Pena. 2004. Comparison of overall water uptake by corn kernel with and without dissolved calcium hydroxide at room temperature. *Journal of Food Engineering*.67: 451-456.