

# Paper Recycling and Paper Plate Forming Machine

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**Abstract-** Paper recycling and reusing paper is important because according to some reports about 15% of residual waste from institutes, schools, and universities is paper which is equal to 5-8 kg per week of waste paper. At least moderate amount of paper should be recycled for growth of our environment and should be reused for any kind of work like making paper cups paper plates or for printing banners etc. We are using the principles of green engineering for waste management i.e. It is better to treat waste by cleaning it up. Therefore, we are doing a fabrication of paper recycling machine and making paper plates by using spring loaded pressure. We are developing an easy way of recycling paper and reusing it, our main motive is to recycle paper which is collected in the bins of any institute.

In this project we are fabricating paper recycling & cup making machine. This project is specially designed for recycling paper by making slurry of paper and making paper cups using punch and die arrangement of the recycled paper. By using this we can produce paper plate form used paper. By using different shape of die we can produce different shape and size plate or cups. The current problem is that computer controlled paper cup making machine on the market are expensive and therefore not affordable for a developing economy. Our machine is affordable and size is comfortable to suit anywhere.

**Index terms-** paper waste, recycle paper, reuse paper

## INTRODUCTION

Paper in today's world is used in everyday life for many purposes so its use has been increasing. With this scenario most of this paper goes to landfills or other dumping yards, only limited amount is recycled. In order to solve the problem of sourcing raw material for paper production, it is better to develop technologies for sustainable recycling rather than sustainable forestry. Thus the main emphasis is to increase its recycling. Recycling and reuse is best

situation to reduce disposal problem. As the demand for paper has increased, paper producers are now forced to use waste paper as the raw material. Reforestation takes a long time and environmental pollution and cost of energy has increased. Waste management strategies are used to prevent fast depletion of natural resources, to avoid wastes being a threat to environment and human health and to transform wastes into an economic input and value. It is taken into consideration that natural resources and their capacity to renew themselves are limited, in the frame of sustainable development approach, social, environmental and economic effects of recycling under waste management come into prominence. Our machine is able to recycle paper which is waste of institute and found in dump yards the paper will be converted in to paper slurry then into paper cup or plate as per needed the this plate can be used for serving snacks or before making paper plate it can be used as chart paper.

## LITERATURE REVIEW

1. Dibakar bhattacharjee & muhammed kamrul islam (february 2014): - in this research paper the author mentioned importance of recycling that "recycling one ton of newsprint saves about 1 ton of wood while recycling 1 ton of printing or copier paper saves more than 2 tons of wood. So, the designing and fabrication of waste paper recycling plant is necessary"
- Therefore, a development will ensure that the source of raw material for paper Production is multiplied and also waste paper that could have constituted into wastes are Recycled for various productive purposes. So that is does not become a threat to environment.

2. Tawanda mushiri (january 2018): - in this research paper the author gives statement that “the improper disposal and ignoring the reutilization of paper (recycling) leads to environmental degradation in various ways such as landfills, used papers have become a menace leading to landfills and degrading the beauty of the campus.” Also suggests that fibers from the pulp of wood or other fibrous substances can be recycled between 5 – 7 times.
  - That means the paper we use for writing can be recycled more than once and can be reused several times.
3. Kudakwashe n. Masengere (March 2018): - in this paper author gives a statement that “the current problem is that current computer-controlled paper cup making machines on the market are expensive and therefore not affordable for a developing economy.” So, it is possible to come up with a low-cost effective solution.
  - Our machine is affordable and also comparably small in size that can be used anywhere. In-house waste can be recycled and reused very easily
4. Vignesh k porkala: - in this research paper author gives statement that “pressure machines are always more effective for the production of similar products. It is comparatively more economical for production”
  - By using different shape of die we can produce different shape and size cups or plates as needed.

### CONSTRUCTION

It consists of electric motor, container, pulley, cutters, 2 spur gears, 2 long shafts and punch, die mechanism. The container and motor is mounted on frame the motor is bolted with the container on frame. The container is used to keep the paper pulp for mixing. The pulley is mounted on shafts and connect with the motor through the belt and cutter are connect to the end of the shaft. When the motor starts rotating the shafts will also rotate with the help of pulley the cutter are mounted on a shafts and they mix the paper pulp inside the container. After paper pulp is mixed properly it will be drawn from the

container via slope provided at the bottom of container.

It also consists of punch and die mechanism in which paper pulp is kept to make a plate or cup with the help of punch and die. It is provided to give desired shape to the plate. A press is also provided to remove water from paper pulp to form a plate. The punch and die mechanism is fully mechanical having foot operated system, a retracting coil spring is provided on punch or press system to go back on its initial position after removal of force. When the pressure is applied on a paper pulp with the help of press it removes the water from a pulp then it is kept into the punch and die system to make a paper plate.

### Working

Paper recycling and paper reuse machine:- this machine can be used anywhere when needed. In the process of recycling the paper is mixed with water in a ratio of 5:7 then the blades which are in the container make a slurry of paper and water. This slurry of paper is then transferred to the pressing machine where the excess water is removed from the paper mesh and a circular shape is formed this can be used as a chart or further in a mechanism this paper is pressed in a punching machine and a plate is formed any type of plate or cup can be formed as per the shape of die and punch.

Container: - It is used to store and mix the paper with water to make a slurry of paper. There is a mixing chamber in it where the paper is mixed using blades the paper cuts down and forms a slurry. Two rods on which blades are fixed are inside the container. The rotation speed of the blade is 200 rpm for perfectly mixing paper.

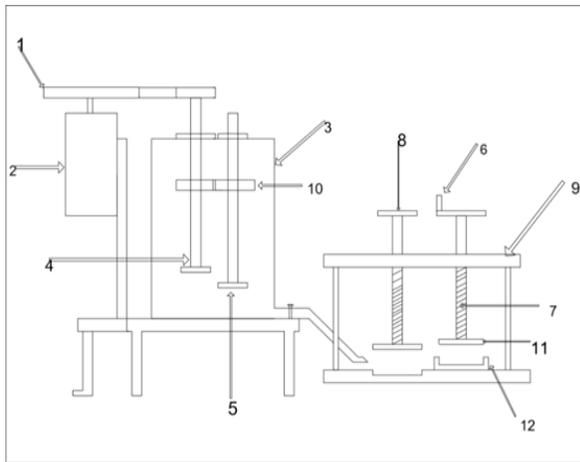
Motor: - 1/2 hp motor is used for the purpose of rotating the blade to reduce the rpm of the motor we are using pulley of 5" and 11". By this the speed is reduced. And torque is as required.

Paper pressing and punching machine:- we have combined the two machines of pressing and punching in the pressing machine the paper slurry will be filled and pressed using a foot lever to remove the excess water present in the paper slurry. After removing the water from slurry the paper which is wet will be transferred to a punching machine and plate shape will be formed by applying pressure.

### COMPONENTS

1. Set of Pulley
2. Motor
3. Container
4. Cutter Shaft
5. Cutter
6. Handle
7. Compressible Spring
8. Pressing Mechanism
9. Frame
10. Gear
11. Punch
12. Die

### BLOCK DIAGRAM



### METHODOLOGY

- Finding problems in society  
We found the problem in society of recycling and reusing i.e. Paper is only used once after use it is thrown away which leads to pollution of soil.
- Collecting research papers  
We collected several research paper and gain information about paper recycling its ration density and also about paper plate making machine which are automated and are expensive we not only reduced the price but also the size of the machine.
- Making model in cad software  
We made model in cad software for better understanding.
- Fabrication of model

We fabricated two machine in one which are mixing and forming which is affordable and small in size

- Analysis of different component of project  
Different component like blade punch press are analyzed using different load.
- Assembly of machine components  
All the components are assembled for final machine which is recycling paper and making paper plate of recycled paper.
- Testing of projects  
Project is tested under various conditions for proper working for different weight of paper slurry.

### CONCLUSION

Paper recycling can be used separately and the recycled paper can be used in institute for notice. Our machine can be used in institute cause 15% of waste of institute is paper. Machine is capable of recycling paper and reuse the paper by making paper plate of recycled paper which can be used for serving snacks and for other uses the plate which is used also can be recycled gain up to three times. Which in turn can increase forestation and decrease the rate of deforestation this can help the further generation for living. Recycling and reusing paper should be done on a large scale to save trees.

### REFERENCES

- [1] Vikram Daandekar et-all (2014).Twin roll press pulp washing (INDIA).
- [2] Metin Yılmaz (2016), Recycling costs: A research in the waste paper industry (TURKEY).
- [3] Wahistrom, P.I. 1970. Paper Machine, Pulp and Paper Technology 2nd ed. Litton Educational Publishers.
- [4] R.A. Venditti et-all (2016), Natural Surfactants for Flotation Deinking in paper recycling, UoG, Mexico.
- [5] Procarton, Recovery and recycling Available at:<http://www.procarton.com/sustainability/sustainability/environment/recovery-and-recycling/>
- [6] Hart, P. W., & Rudie, A. W. (2012). The Bleaching of Pulp. Norcross: TAPPI PRESS

- [7] Pulp Paper Mill. (2015, February16). Retrieved from <http://www.pulppapermill.com/pulp-screening/>
- [8] Venditti, R., Paper Recycling Technology and Science, North Carolina StateUniversity, Forest Biomaterials Department.
- [9] Meyers R.A., Encyclopaedia of Physical Science and Technology, Vol. 9, 14, and 15, Second Edition, Academic Press, London, 1992.
- [10] Sinnott R.K., Coulsons and Richardson's Chemical Engineering, Vol. 6, Third Edition, 1994.
- [11] Perry R. H., Green D. W., Perry's Chemical Engineers Handbook, Sixth Edition, McGraw-Hill, USA, 1984.