

# USING ANSYS SOFTWARE TO DESIGN A MODEL OF A WASHING MACHINE DRUM TO EXAMINE THE STABILITY AND PERFORMANCE

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**Abstract**— In this project a Washing Machine Drum is built and analysed in ANSYS. The analysis is mainly concerned with an evenly distributed load at a constant angular velocity. The load is applied with the help of lead plates instead of clothes. The three dimensional model of the Drum is created using the ANSYS software. The model is imported to ANSYS 17, where the boundary conditions, loads and constraints are given and the analysis is made. We are designing a washing machine drum using recycled plastic. Nowadays washing machine has two types of drums inner drum and outer drum. Both the drum is made of drum materials namely steel or plastic. And the drum paddles are made of polycarbonate and the drum paddle plays an important role in the lifting and turning of clothes during washing. We are designing a washing drum using recycled plastic (PET) and to check the stability and performance of the designed washing machine.

*Index Terms*- PVC pipe, Ansys Parametric 3D modeling, Washing Machine Drum

## I. INTRODUCTION

Diabetes Washing machines are commonly used in almost every home worldwide. These appliances make it easy to clean clothing; a process that time ago was heavy and unpleasant. The performance of these machines is based on the rotation of the clothes inside a cylinder while they are mixed with water and some kind of cleaning powder or soap. It is not hard to imagine that the load of these clothes, when they are soaked in water can create big reaction forces in the cylinder when they are rotating. This situation makes it very important to calculate accurately and for safety side the mechanical characteristics of the cylinder mentioned and the tripod that transmits the turning forces to the cylinder. Nowadays washing machine plays a vital role in our modern technology. Using Ansys Parametric 3D modeling software We will design a washing machine drum based on angle of rotation and dynamics. That will make our cost more efficient and in other hands. After designing the washing machine in Ansys software we will check its stability and performance.

## II. RELATED WORK

Just “Design and fabrication of a simple low-cost washing machine suitable for washing polyethylene materials”,1995,

In this paper they have designed a low cost washing using polyethylene materials. They have made a washing machine by locally available materials. They propagates that polyethylene materials which are Non-Biodegradable products and they have planned to design a washing machine using this materials.

Emagbetere eyere, “Design and development of a low-cost washing machine suitable for polythene materials”,2017, In this paper They have designed a washing machine drum using polythene materials. Using of this polythene materials have produce a low cost and washing can be done in short period of time 0.02 kg in 2 minutes and 0.05 kg in 4 minutes. And the whole construction provides a low cost compared to other washers.

Gravious instructables “PVC pipe washing machine drum paddl”,2017, In this paper they says that using of PVC Drum paddle will reduce the cost and compare to the normal drum paddle it is a strong material. During washing normal paddle come off from the clips.

## III. PROBLEM DEFINITION

The major problem facing nowadays is the cost of the washing machine .A normal washing machine cost upto 20000.A normal people cannot afford upto this much prize and the drum rate will be too much higher. And the drum will not wear that much stress. The replacing of washing machine drum will done frequently.

## IV. EXISTING METHODOLOGY

Nowadays washing machine has two drums inner drum and outer drum. Normally we all see the inner drum where we load our clothes. When we switch on washing machine the drum starts to rotate and usually 2 to 5 gallons (8 to 19 liters) of water. Drum is made of plastic and some is made of steels. Which has more weight? And when it rotates us face a major issue is noise. Pulsators are generally utilized in high-productiveness washing machines, which have low tide consumption than conventional models and have high spinning preferences. Progressive preferences efficiently wring water from the garments, thereby reducing the drying time. Normal washing machine drum consists of a inner drum and outer drum for example if the drum is made of steel. First they will make a long steel plate and cut into their required length and after several coating they will fold it to make a

cylinder. After that they will fit the mouldings on the back side of the drum.

This is the process for inner drum. For the outer drum process it is same as that. After all the process have completed they will fit inner drum into outer drum. This is the process for manufacturing drum.

### V. PROPOSED METHODOLOGY

In our model the drum will be made of reused plastic which will be more cost efficient than the existing product and it lasts long. And the plastic forms a smooth surface for rolling. In the drum paddle minute brushes are situated where the cloths are washed finely. Water enters into the drum in initial and in final stages it will minimize the use of water. Centrifugation is the tack used in washing machines to squeeze out water from wet clothes while drying. This is because in centrifugation the result or wet clothes are simply spinner really fleetly and because of this the water comes out really freely and either the clothes are dried. Our new GRUNDIG Recycled PET drum for clothes washers is a plastic drum made of reused plastic jugs. It's intended to save energy by lessening the creation of unsafe plastic containers. As each drum is made of 60 of these reused PET plastic bottles. Though it regularly dwells in our kitchens, it's abnormal to think about our clothes washer as a kitchen apparatus. In any case, clothes washers like the models that house our new GRUNDIG Recycled PET Drum, are significantly something other than contraptions that clean our garments. It's a scope of imaginative, cutting edge home apparatuses intended to help make the cutting edge of sustainable homes. It's an elevated assertion, however it holds water. All around the world, the normal family today utilizes roughly 3,353 kWh of energy each year, thus the energy saved from the primary period of creation of the Recycled PET drum likens to the yearly energy utilization of roughly 1,700 homes. By reusing these PET plastic. In our methodology it is same as the manufacturing of normal drum because plastic is



more flexible than steel.

### Meshing



Figure 2: Motor

Figure 3: Outer Drum



Cross section the whole drum is finished by little tetrahedral pieces considered components that share regular focuses called hubs. Ansys proposes a worldwide component size and capacity to bear coinciding. The size is just a normal worth, real component sizes may fluctuate starting with one area then onto the next relying upon calculation. It is prescribed to utilize the default settings of lattice for t he underlying run. For a more exact arrangement, utilize a more modest component size.

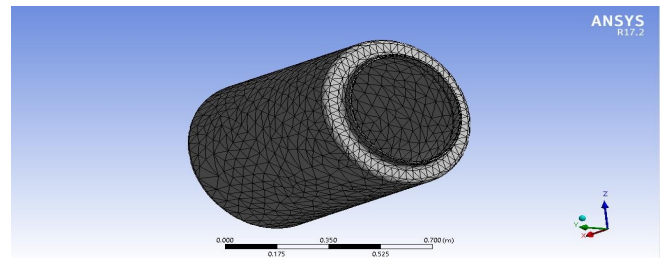


Figure 4: Meshing

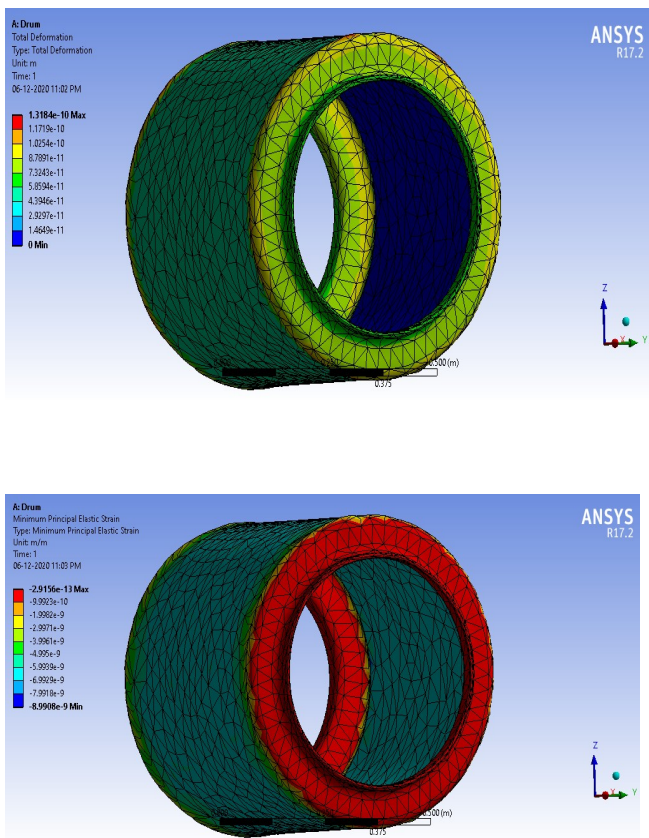
### VI. MATERIAL PROPERTIES

Table 1: Material Properties of PET

S.no	Property	Value
1.	Density	1.80g cm <sup>-3</sup>
2.	Young's Modulus	3100MPa
3.	Poisson's Ratio	0.43
4.	Coefficient of Thermal Expansion	0.00023C <sup>-1</sup>
5.	Zero-Thermal-Strain Reference Temperature	22C
6.	Bulk Modulus	7.381E+09Pa
7.	Shear Modulus	1.0839E+09Pa
8.	Tensile Yield Strength	1.57E+08Pa
9.	Compressive Yield Strength	1.28E+08Pa
10.	Tensile Ultimate Strength	1.72E+08Pa
11.	Compressive Ultimate Strength	1.42E+08Pa

### VII. RESULTS

The Total Deformation, Equivalent Stress, Equivalent Elastic Strain, Strain Energy, Shear Elastic Strain, Elastic Strain Intensity, Minimum Principle Elastic Strain, Maximum Principle Elastic Strain, Maximum Shear Elastic Strain, Vector Principle Elastic Strain, Equivalent Total Strain, Normal Stress, Middle Principle Elastic Strain, Middle Principle Stress are given below,



**Figure 6: Ansys Output**

### VIII.CONCLUSION

We are designing a washing machine drum using recycled plastic PET (polyethylene tere phthalate) in ansys software, and to check its stability and performance.

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