

## Pneumatic Vulcanizing Machine for Tyres

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**Abstract:** *In the modern world, tyres have become an important part of our daily routine. Whether be it buses, cars or two-wheelers, they have a very vital role in moving vehicles. And tyres are available in wide range of shapes and sizes – as per the requirements and applications of each and every vehicle. For different terrains, different types of rubber tyres are used of different composition, and with that, comes different types of problems which needs new and advanced solutions.*

### 1. Introduction:

#### The Need of Vulcanization:

Vulcanization is the process which is used to scale down the rubber particles to smaller size without deforming or altering its shape and size. It is also used to prevent future deformation in the rubber.

It gives good tensile strength and durability and extensibility. It has a very impressive resilience – that it can retain its original shape and size after deforming load is applied and removed.

Some of the Advantages of Vulcanization –

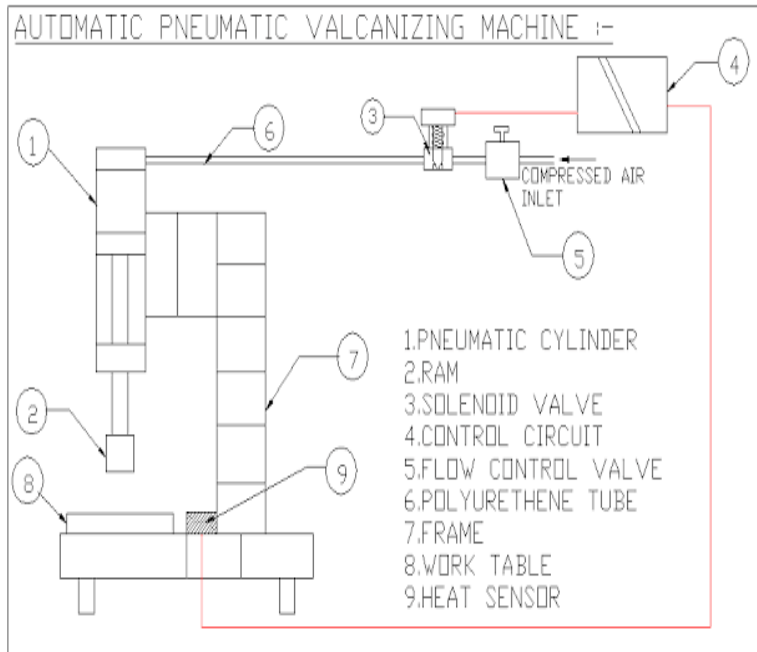
1. It has excellent tensile strength.
2. It possesses low water absorption tendency.
3. Vulcanized rubbers are highly resistant to oxidation.
4. It is also very highly resistant to wear and tear.

In our project, we have fabricated a machine that could be used to vulcanize varying rubber tubes' specifications and dimensions to get optimal temperatures required or desired as per the varying sizes of these tubes that are to be vulcanized.

The machine which is fabricated herein, consists of SSR relay, temperature controller, a heating plate, a pneumatic pump, an insulating material and a pneumatic cylinder.

## 2. Working Principle:

The fig. 1 shows the line diagram of the working of the pneumatic vulcanizing machine.



**Figure 1. Line diagram of vulcanizing machine**

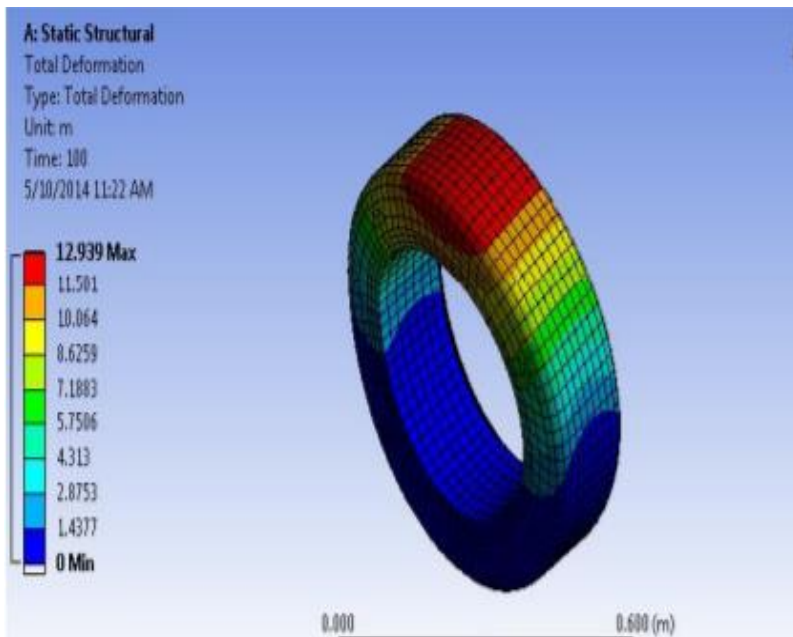
- The Vulcanizing machine works with the help of pneumatic Single Acting cylinder.
- The piston is connected to the moving vulcanizing Dies. It is used to the small size of heating process between the two rubber materials. The machine is portable in size, so easy transportable.
- This is an era of automation where it is broadly defined as replacement of manual effort by mechanical power in all degree of automation. The

operation remains an essential part of the system although with changing demands on physical input as the degree of mechanization is increased.

### 3. Tests on Ansys:

Before creating or fabricating any machine or a new invention, there are some pre-requisite testing that are required.

Herein, you can find some of the Ansys testing and simulations done as follows:



**Figure 2. Total Deformation Simulation**

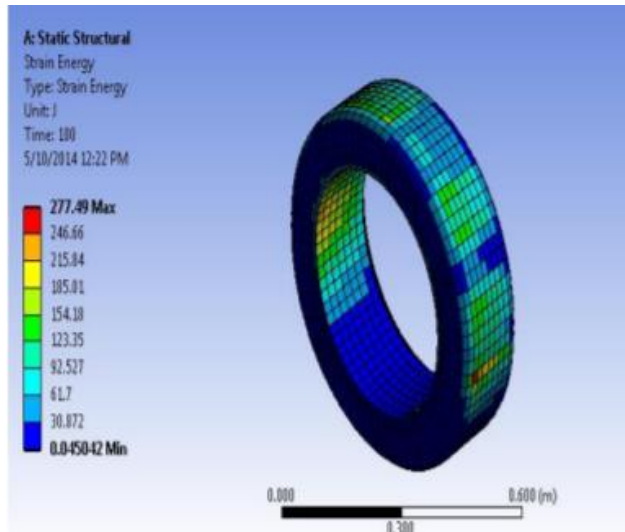


Figure 3. Strain Energy Analysis

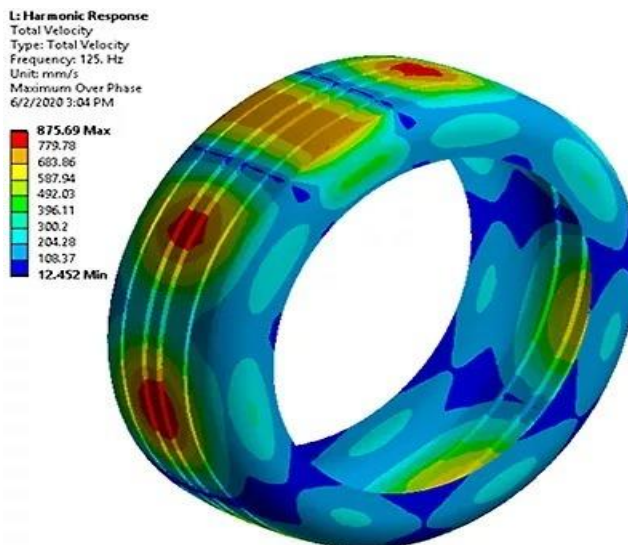


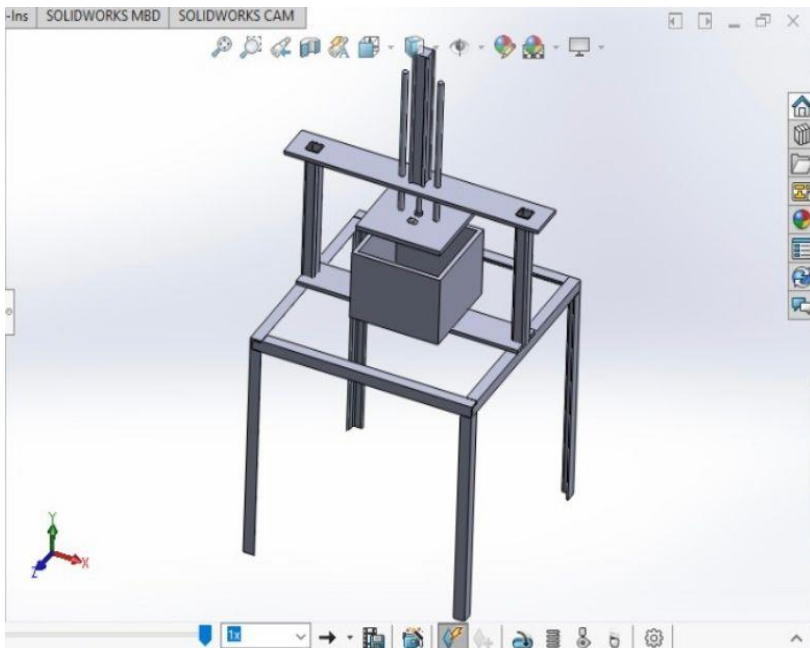
Figure 4. Total Velocity Simulation

In fig. 2, shows the amount of deformation on a static structural tyre with the varying load. And as per the simulation, it can be seen that the most deformation resistance could be seen at the top most part of the tire.

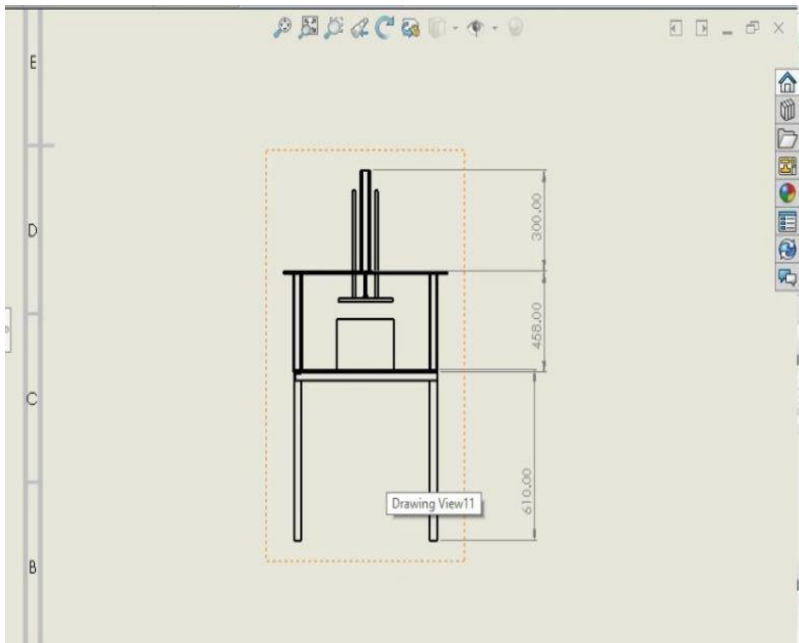
Fig. 3 shows the simulation of strain energy (in Joules) effected on the surface of the tire. The strain energy helps

Fig. 4 depicts the harmonic response with respect to total velocity (in mm/sec) which has a frequency constant of 250Hz. It shows the amount of heat that is generated while it is in motion and the varying effect with total velocity changes.

#### 4. Design of Machine:



**Figure 6. Isometric View of the Machine**



**Figure 7. Front View of the Design**

Herein, in Fig. 6 shows the isometric view of the machine that is fabricated.

## 5. Design Specifications:

1. Fabrication Material – M.S. Steel
2. Pneumatic – 6 each stock, 150-300psi air operated
3. Compressor – 12V – 5A, operated compressor.
4. Heating Plate – 150 \* 150
5. Heater Size – 100 \* 100
6. Temperature Coil – 230V AC
7. Temperature Sensor – J Type sensor.

## 6. Observation Table:

**Table 1. Observation Data Collected Through the Experiment.**

No.	<u>Temp.(in °C)</u>	<u>Pressure (in psi)</u>	<u>Duration (in sec)</u>

## 7. Conclusion:

The machine that we built has given more precise efficiency and heating effect compared to manual vulcanizing machine.

The optimal temperature is obtained through this machine and also it helps in maintaining the temperature throughout the vulcanizing process.

## 8.Acknowledgement:

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