

THE EFFICIENCY OF THE PORTABLE VULCANIZER*

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Abstract

The portable vulcanizing device is designed with a flatter assembly having associated structures such as a base assembly, heater assembly that cooperatively and communicably engage with each other. The Vulcanizer assembly is operated with 220 volts. If the inner tube is then to vulcanize, a patch is then placed covering the punctured part and place the inner tube to the heater plate with paper or foil to protect the tube, using the handle press until the lever arm is lock by the plate lock, swivel the switch to on position till indicator lights on, wait until the indicator lights go off, and wait for ten minutes to cool the inner tube, unlock the lever arm and remove the inner tube. Check the inner tube by inflating and submerge it in water to check for leak, return the interior to the exterior and inflate the tire at 30 Psi.

Introduction

Tires are an indispensable part of a vehicle. If the tire is punctured or deflated one needs to either replace it with a spare tire or have to be vulcanized shop. There are two types of tires used for vehicles; the tube tire and the tubeless tire. Tubeless tires are a pneumatic tire that does not require an inner tube because the casing and wheel rim an airtight seal. They are preferred for utility vehicles because they need lower maintenance. A tire with inner tube tires requires an inner tube that is needed to be vulcanized once it is punctured. They are commonly used for motorcycles and bicycles and heavy-duty vehicles.

Statement of the Problem

This study aims to determine the efficiency of the portable vulcanizer in terms of electricity and quality specifically it aims to:

1. Compare the existing electric portable vulcanizer in its electric consumption.
2. Prove that portable vulcanizer cooked faster than that existing units.
3. Withstand the pressure of manufactures specification for tire pressure.

Significance of the Study

The innovator/researcher owns bicycles and motorcycles which prompted him to develop a vulcanizing device for his consumption. He first developed a vulcanizer made of a tin can but since it is dangerous because the heating element used was unprotected so instead used a flat iron, shops are using a flat iron as the heating element but without housing which makes the operator exposed to danger because of the exposed wire connected to it and they have to plug and unplug it during operation to control the heat. There is no safety switch on the unit so there is the possibility that the plug corrodes and the tendency to be electrocuted is very high.

Some other vulcanizing shops here in Laoag City and other towns still use the old method of using pistons as the flatter and diesel fuel for heating the patch. If diesel fuel is burned on open-air black smoke is produce and pollutes the environment. Other shops use Flat iron wherein heater only is used and uses screw

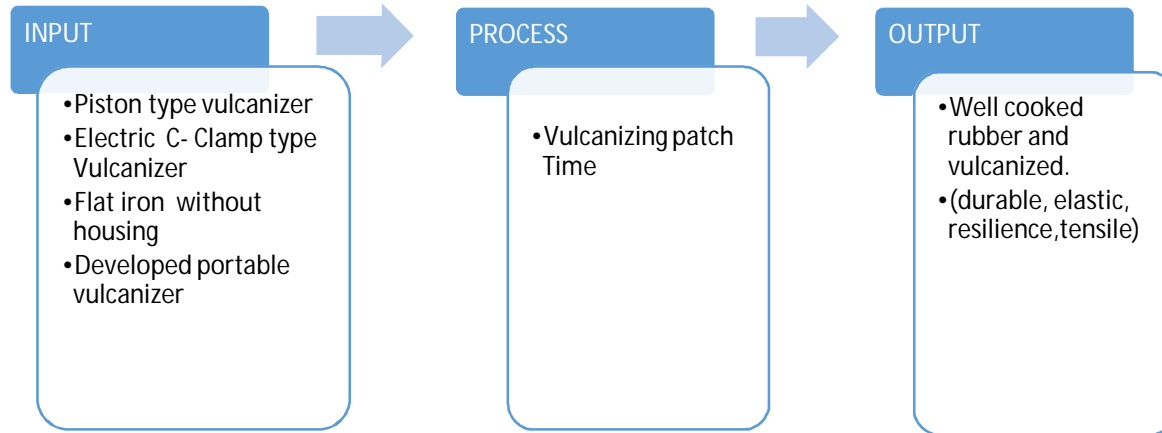
type clamp to press the rubber for vulcanizing. This method is very dangerous because once the open wire connected to the heater is accidentally touched electrocution may result. The unit has no automatic switch that could result in overheating furthermore there is a greater chance of electrical malfunction on the unit which could result in an electrical short circuit during operation. Other shops use electric vulcanizing which is the screw type. This type is now available in the market but these are more expensive for the average earner.

Applying the concept of using the same technology with that of the electric heating element of the flat iron which is efficient and safe for the operator, the innovator came up with the portable vulcanizing unit that is safe, portable, handy, and easy to use. The skeleton prototype was fabricated but it did not have an automatic lock, the Portable Vulcanizing unit, came out very useful.

Materials and Method:

The developed portable vulcanizing unit is a heating device that comprises seven support structures namely: vulcanizing unit base; semi-auto-open device mechanism; vulcanizing arm; tensioner spring; locking mechanism; vulcanizing mica heating element; and heat sensitivity switch that's combined with swivel switch for applying and controlling the temperature, during the heating process and switch off if it reaches the temperature set on the swivel during the vulcanization operation. The unit could be evaluated through the process of Input-Process-Output (IPO).

Conceptual Framework



Review of Related Literature

There are two types of tire, the tubeless and those requiring inner tubes, the tubeless tire is designed in such a way that the air pressure is sealed within the rim of the tire casing. When an inner tube (interior) is used, the air is contained within the tube, while the outer casing (exterior) serves to protect the tube and absorb the road shocks. (Felizardo Y. Francisco Automotive Drive Train and Chassis Unit.

To vulcanize means to heat the rubber under pressure. This molds the tire into the desired form (Crouse-Anglin Automotive Mechanics Tenth Edition) the method and ways of several vulcanizing shops in Ilocos Norte and other towns used a piston as the platter and served as the furnace and diesel fuel used for burning and heating these and these produce black smoke/smog which pollutes the environment and is hazardous to the operator. As the smoke coming out from the engine is poisonous

like unburned Hydrocarbon (HC), carbon monoxide (CO), Oxides of nitrogen (NO_x), Oxides of Sulphur (SO_x), and Ozone (O₃). (W.J. deKryger, 1986)

The Discovery of Vulcanization

Goodyear thought that rubber might be improved by processing it with other substances. As Goodyear was displaying a mixture of rubber and Sulphur, the piece slipped from his hand into the fire. When he looked it out he found to his amazement that the mass has charred without melting. Goodyear named this process of combining rubber with Sulphur by heat "vulcanization". The efficiency of Portable Electronic Vulcanizer, Eduardo Zeta Ramis.

Methodology

The study was conducted to prove the efficiency of the developed Portable Vulcanizer. The made caparisoned observation the existing vulcanizing units to the "Prototype portable Vulcanizing unit as to Heating Time to cook the rubber with the patch on its base. Base on the output the researcher compared the prototype portable vulcanizing unit to other existing units such as Piston type, electric C-Clamp type Vulcanizer, Flat iron without housing as to the time, quality, and the required inflation of 30 Psi.

The conceptual framework used is the IPO; the Input, Process, and Output. For its Input, the different types of vulcanizing units existing and used in shops like the Piston type, the C-Clamp type, the Flat iron-type without housing, and the

Developed portable vulcanizing unit. These are all observed in the process of vulcanizing the rubber tube the time in cooking and outputs were all tested to determine if it passes the standard specification set by the manufacturers.

Scope and Limitation

This study is limited to the vulcanizing unit used in Vulcanizing shops located here in Laoag City Ilocos Norte, these samples are the piston type which is the old ones since the 1970s, and the exposed flat iron without safety device and the screw type which is available in the market.

Definition of terms

Vulcanizer. A heating device is used to cook a patch and pressed it so it can be united with the rubber to be vulcanized.

Piston-type vulcanizer. A vulcanizer type that used scrap piston used as the flatter and the heating device by putting diesel fuel on the hollow part.

Electric C-Clamp Type. A vulcanizing device that uses a screw to press the patch and rubber and uses special heating metal as flatter.

Portable. Handy or easily carried or moved around.

Vulcanize. A process of combining rubber with Sulphur by heat "vulcanization"

TYPES OF VULCANIZER


Piston type Vulcanizer	The Piston type Vulcanizer is the first type of vulcanizer used in a shop in the early 80ths
Electric C-Clamp Type	The Electric C-Clamp type uses electric power of 220 Volts commercially and used on shops.
Flat Iron without Housing	The flat iron type without housing is an improvised vulcanizer that uses electric power of 220 Volts which is used on other shops.
	The developed portable Vulcanizer assembly is operated with 220 volts with 1 KW. POWER

TABLE 1. The Average Heating Time of the Four Different Types of Vulcanizing Unit

Vulcanizing unit type	Average Heating Time	Vulcanized tube tire
Piston type(diesel fuel)	507.2 seconds	Well-Vulcanized
Electric vulcanizing screw-type .400 kw.	458.8 seconds	Well-Vulcanized
Electric flat iron without housing 1kw.	88.8 seconds	Well-Vulcanized
Developed Vulcanizing unit 1 kw.	36.6 seconds	Well-Vulcanized

Table 1 shows the observation time in heating the patch base from the method and ways of all the types used in this study. The piston-type or the old type form of vulcanizing processed the greatest time to heat the patch and since the fuel used is diesel and produces black smoke this pollutes the air and contribute to the thinning of the ozone layer, all three electric vulcanizing uses 220 volts and with the same wattage but of differences in the time of heating the patch in which the Portable Vulcanizing unit that is developed possesses the least time in heating.

TABLE 2. Test Results of the Vulcanized Exterior/application

Vulcanizing unit type	An inflated vulcanized tire with the exterior at 30 Psi.	Passed through manufacturers specification
Piston type(diesel fuel)	Withstand test pressure	Passed
Electric vulcanizing screw type 1 kw.	Withstand test pressure	Passed
Electric flat iron without housing 1kw.	Withstand test pressure	Passed
Developed Vulcanizing unit 1 kw.	Withstand test pressure	Passed

Base from table 2, it shows that all vulcanizing unit possesses the same output and that all rubber tire that is vulcanized withstand the 30 PSI pressure set by manufacturers.

TABLE 3. Electric Consumption of the 3 Types of Vulcanizing Unit

Vulcanizing unit type	Average heating time in an hour and kilowatt used	Electric consumption
Piston type(diesel fuel)	0.14089 hour	n/a
Electric vulcanizing screw type 0.4 kw.	0.12744 hour (0.400 kilowatt)	Php 0.59683
Electric flat iron without housing 1kw.	0.02467 hour (1.000 kilowatt)	Php 0.28884
Developed Vulcanizing unit 1 kw.	0.01017 hour (1.000 kilowatt)	Php 0.11907

The table shows the difference in the electric consumption of all three electric types of vulcanizing units, basing it on the value of kilowatt-hour set at Ilocos Norte where every kilowatt-hour used is equivalent to Php 11.708125. The electric Vulcanizing screw-type cooked the rubber for 0.12744 hour consumes Php 0.59683. The other type which is the flat iron without housing which cooked the rubber for 0.02467 hour consumed Php 0.28884. And the Portable Vulcanizing unit

that is developed which cooked the rubber for 0.01017 hour consumed Php 0.11907. Based on the results on the electrical efficiency of all-electric vulcanizing units the developed unit possesses the most efficiency in electric consumption.

Results and Discussion

Results show that the developed portable vulcanizing unit is efficient since it can perfectly vulcanize inner tube for bicycles and motorcycles like the other vulcanizing units and passed the test inflation of 30 Psi which manufacturers set. Shows that it can perfectly vulcanize the inner-tube of motorcycle and bicycle with the same cooked output and base on the observation time of heating it provides lesser time in which the three units that used electricity including the utility model have the same wattage. And all of the samples have the same output which is a well coked and well-vulcanized rubber tube.

Conclusion and recommendations:

Based on the above results, since the developed vulcanizing unit consumes lesser time in heating the patch than the other existing vulcanizing units it then consumes lesser consumption in electricity, and since the unit performs well in cooking the rubber just like the other existing unit and it inflates with the exterior at 30 Psi, the develop portable vulcanizing unit is said to suitable in a shop and household. Three have the same wattage hence the project suitable to be used in shops and useful to the household with several bicycles and motorcycles.

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