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# Fabrication of Hybrid Composite Automotive Dashboard

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**Abstract:** This paper express the prototype production and assembly of automotive dashboard that replace a steel which is laminated by rubber for old model of PEUGEOT automobile vehicles dashboard by hybrid composite material of false banana fiber and sisal fiber by their weight ratios of 25% false banana fiber and 75% sisal fiber, comingling randomly and [0/90$^0$] fibers orientation by hand lay mechanism using GP (General Purpose) resin as binding material. The activities which is done in this thesis work are modeling of PEUGEOT automobile vehicles dashboard using Solid Work 2017, and prototype fabrication by using hybrid composite for demonstration purpose.

**Keywords:** Dashboard, False Banana, hand lay-up, mechanical properties.



## INTRODUCTION

During designing the vehicle spare parts, the main considerable things are there fuel efficiency and emission. Automobiles today are over 63% irons and steel in weight [7, 12]. These have their own demerits like emission, as weight increase indicates. More than 75% fuel utilization imparts to vehicles weight. [2], and by reducing the weight by 20% can improve 12 – 14 % fuel consumption [18, 23 and 25].

Natural fibers have more merits to environmental issues like biodegradability and carbon decisive, because they suck up high carbon di oxide relative to their product. In terms of material properties, natural fibers can replace the synthetic ones, for reduction of weight i.e. they can reduce up to 40 %, beside this they can increases stiffness, bending resistivity and ductility [10].

The pillar things used in automotive industries or design of vehicle spare parts minimization of fuel consumption and reduction of weight. The best technology to achieve this idea, use of plyometric that conjugate with composite materials, which can effectuate more specific strength and high impact energy absorption. So, by using this plyometric conjugation with composite materials, reduction of weight and fuel consumption attained [35].

Using natural fibers as reinforced for composite materials come to be broad brimmed for numerous automotive spare parts and structures because of their high specific strength modules and high damping capacity. If composite materials are used for automotive, reduction of weight, noise sound and vibrations are eradicated. Beside this they have the tendency to resist fatigue and corrosion [37, 23].

According to some researchers, natural fibers are convectional and more attention to be used in automotive practical application in recent years both for vehicle components such as seat backs, underbodies, door trim panels, interior parts and etc. when compare and contrast the two types of composite i.e. synthetic and natural fibers, natural fibers have some merits over synthetic fibers like minimum cost, less weight, bio degradability, simple manufacturing process, machinability and etc. [19].

Compressively, in the modern advancement of automotive bodies major evaluations are on aluminum and steel. Beside this, plastics families like PVC are used in automotive internal parts. The standard requirements are eco friendliness and standard strength for automotive that full fill the standard conventional goals. [11, 29] developing Country most of the situation the body and spare part of Automotive was purchased/imported from abroad like dashboard, pumper, right and left doors etc. These imported materials are heavy in weight, expensive and have a great impact on the environment [2].

The problems mostly shown on the vehicle's dashboard are, when the vehicle model is old model vehicle so it's difficult to get accessory of this model. When the vehicle dashboard become old degrade, bigger the cracks, the out gassing forms a waxy film on the inside glass that distorts their visibility and difficult to remove [10].

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The vehicle dashboard also affected by fog (contains air on its surfaces), they can also smell out gassing, which is part baddish aroma. In intense year-round sunlight here makes outgassing a persistent problem. The automobile vehicles dashboard simply scratched proof. Day time veiling glare in automobiles caused by dashboard reflectance and when the dashboard assembly is installed a vehicle; the heating and cooling cycles produce a different thermal expansion of the port of plastic material and of the metal part of hybrid supporting structure [10].

Natural fiber composite material selection for natural fibers RPCs by using the software called Analytical Hierarch Process (AHP) for determining the most suitable NFs for vehicle dashboard. Depending on mechanical and Physical properties. The test was conducted, Flax 36% + epoxy , Flax 36%+ vinyl ester , Kenaf 60%+ PP , Kenaf 85% + PP and Flax 36% + PE . After a systematic steps to assist the designer or material engineers from those listed it provide that Kenaf 60% + PP is the most appropriate composite material because it exhibit good tensile strength [25].

Regarding to fiber orientations**,** the effect of an angle - ply orientation on tensile properties of Kevlar and glass with epoxy resin as an adhesive composite. Three play orientations was compared 0˚/90˚, 45˚/45˚ and 30˚/60˚ for study. As this study concluded, 0˚/90˚ angle orientation exhabit remarkable mechanical property of tensile strength relative to others [14].

Some experimental research explained that, for a hybrid composite, which made up of false banana fiber and sisal fiber comingling together by their weight ratio using general purpose resin as binder. In this study uses three samples, [50% to 50%], 75% to 25%] and [25% to 75%], false banana fibers to sisal fibers respectively. A sample which have [25% to 75%] exhibit excellent tensile strength [10].

From those literatures above vehicle dashboard can manufactured from hybrid composite of false banana fiber and sisal fiber by selecting [$0/90^0$] fiber ply orientation which exhibit good tensile strength result because vehicle dashboards are subjected to tensile load also, in general tensile strength shows a [25 % to 75 %] have shown excellent tensile strength because of this reason selected this sample [10].

## MATERIALS

Generally, all materials which are used for preparation of hybrid composite for prototyping of Automotive dash board works are tabulated in Table 1.

**Table 1.** Materials used for the production of hybrid composite from FBF and SF.

| S. No | Materials | Unit | Quantity |
|---|---|---|---|
| 1 | False banana fiber (FBF) | kg | 06 |
| 2 | Sisal fiber (SF) | kg | 06 |
| 3 | Epoxy resin | kg | 12 |
| 4 | Hardener (catalyst) | kg | 06 |
| 5 | Sodium hydroxide | mg | 150 |
| 6 | Wax (mold releaser) | kg | 1.5 |
| 7 | Distilled water | lit. | 10 |
| 8 | Stir sticks | pcs | 02 |
| 9 | Glove | pcs | 60 |
| 10 | E- glass | kg | 02 |
| 11 | Rag | pcs | 01 |
| 12 | Safety glass | kg | 03 |

## METHODOLOGY

Generally, methodology flow chart for preparation of hybrid composite shown in Figure 1

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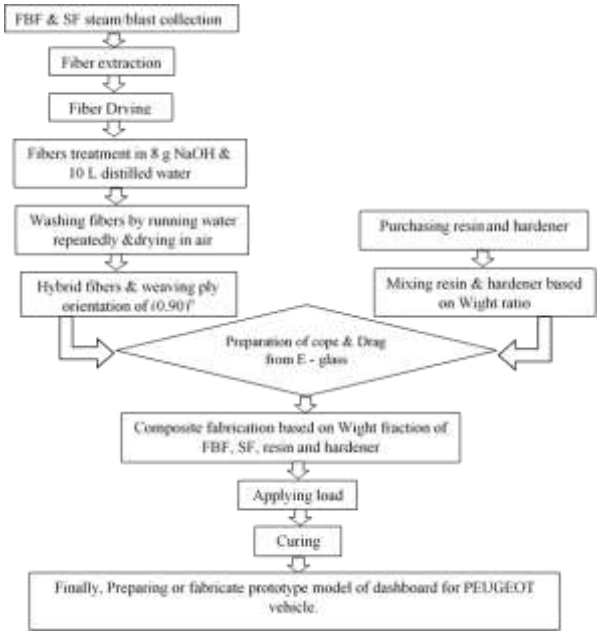


**Figure 1.** Methodology chart for preparation of hybrid composite of FBF and SF.

**PRODUCTION OF VEHICLE DASHBOARD FROM HYBRID COMPOSITE OF FALSE BANANA FIBER AND SISAL FIBER**

According to [10] reported that, the result obtained from the mechanical properties laboratory tests of tensile strength concluding that the best sample to manufacture vehicle dashboard using $(0,90^0)$ degree with Hybrid composite of false banana and sisal fiber with 25% to 75 % respectively are selected.

Generally, to manufacture the PEUGEOT model vehicle dashboard in this thesis work follows manufacturing procedure listed below:

- Preparing the cope and drag parts from the original dashboard by using E-glass fiber because synthetic fibers have good surface finish relative to natural fibers.
- By arranging the FBF and SF according to the desired weight ratio then co-mingle together randomly by fiber - fiber and woven by $(0, 90)^0$ for relative to the area dashboard.
- Mix the GP resin with hardener (catalyst) with appropriate ratio and stir to gather for 15 minutes.
- Clean and add mold releaser on the internal surface of cope and drag parts then accession (add) the mixed GP resin with hardener (catalyst) slightly on the mold then macadamize the plane woven on the mixed GP resin after that again accession (add) the mixed GP raisin at the top surface of the woven and then place cope on and up load a heavy materials for compression and wait for 24 hours for curing time.
- Finally, release the up loaded heavy materials and the replaced PEUGEOT model vehicle dashboard is manufactured then to get good surface finish rubbing the surfaces by sand paper after that clean and paint by Spray the replaced dashboard by black color paint because of to reduce glare reflection to the driver and tilt the dashboard in some angle to change the direction of reflection out ward from the driver.

**Figure 2.** Cope molds for manufacturing of PEUGEOT model vehicle dashboard.

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Dashboard during painting

Dashboard before paint

Dashboard after painting

Dashboard modeled by Solid Work 2017

**Figure 3.** Prototype of PEUGEOT model vehicle dashboard fabrication

## CONCLUSION

Based on the tensile, compression, bending, density and water absorption properties experiment data results including material preparations in literature review [10] and prototype manufacturing process for the advancement increases of vehicle internal and external bodies using hybrid composite has been discussed by simple mechanism of hand layup was introduced the following conclusions are drawn.

The in cross composite of vehicle dashboard fabricated by using different operations such as cutting, waving etc. The mechanism used to making this automotive dashboard is hand lay-up by compression method using mount load on the cope part. In this material the qualities such as visual attractiveness, mechanical properties, water absorption, less density, less cost and simple manufacturing process are increases its acceptance and consider its categorize under advanced material. Finally, this thesis achieve its goal which don't emanates from the ministry of transport legislation proclamation and criteria's that designated to vehicle dashboard.

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