

# Unit 6 Body Materials:

## 1. Steel

The manufacture of steel has improved a great deal. Different parts and areas of a car need different types of steel. Steel is the main materials in manufacturing door panels, the chassis of the car, and the support beams. It is also used in exhaust pipes and mufflers in the car. High tensile steels are used for bolts and nuts which will be subjected to heavy load. The thickness of Steel sheet varies between 0.08mm to 1.5mm. This type of sheet metal is mostly used in vehicle body construction. However, it is mostly used on the frame of the car because of its strength. This means that it has a better ability to absorb impact and that is responsible for the heavyweight and support of the cars.

On modern cars, most of the weight comes from steel. In 2007, for example, the average car contained 1,090 kilograms of steel, and the average pickup truck or SUV used nearly 1,360 kilograms.

## 2. Aluminum

Among other metals, the light-weight and durability of Aluminium make it perfect for specific car parts. It is also malleable, making it a common material in car production. In 1970, it only accounted for 2% of the total components of a car; today, it makes up to 15% of the total car parts. Aluminium offers the ideal engineering solution: Its density is one-third that of steel and satisfies the torsion and stiffness requirements of an automotive material. However, aluminium by weight is about five times more expensive than steel.

Most of the aluminum penetration has been in transmissions, engine blocks, and wheels, largely as castings with some forgings and extrusions. The wrought aluminum sheet penetration, however, is limited to A/C units and a few closure panels for the car body. Simply stated, it is proven that aluminum can be used to replace steel, iron, and copper for various parts in a car. In all cases, this substitution reduces weight without reducing performance, but in most cases cost increases significantly.

The only way aluminum can displace steel with any significance is when aluminum sheet replaces steel as the primary material in the chassis or the body of the car. During the past decade, vehicle manufacturers have repeatedly attempted to assess the status of aluminum vehicles. New types of alloys and advanced production techniques have been tested. Interest has been focused mainly on testing suitable joining methods. The Honda NS-X was the first (and only) aluminum vehicle made in a limited production run. The Audi A8 is another latest example of a luxury, low-volume all-aluminum space frame design car.

## 3. Plastic

Plastics are challengers to steel because of their prominence in car manufacturing. They are malleable and still strong enough to hold the structure in shape.

Plastics constitute almost half of the total car parts, dashboard, gauges, dials, switches, air conditioner vents, door handles, floor mats, seat belts, airbags and many other parts are all made from different types of plastics. The durability, versatility, and lightweight characteristics of plastics make them the ideal materials for different parts.

#### **4. Rubber**

Rubber produces engine mounts, hoses seals wiper blades, and belts. Like plastic, rubber is also cheap, durable, and flexible.

Therefore, it can function in a wide array of parts, and it will also handle heat well in case the car heats up. What most people do not know is that a large percentage of the rubber produced makes automobile parts.

In addition to the all-important tires, parts such as wiper blades, engine mounts, seals, hoses and belts are also made from rubber. As with plastic, it's a very durable, cheap and flexible material that has a wide array of uses in automobiles.

#### **5. Glass**

Currently, glass is used in navigation screens, back-up camera lenses, and mirrors in the car. It helps the driver have a clearer view of what they are doing and where they are going. The windshields are made of laminated glass. Glass lamination assures users of the highest safety levels, especially in the event of a crash.

Lamination involves putting a thin layer of vinyl between two glasses. This ensures that there is not shutter when the glass is crushed.

#### **6. Fiberglass**

Fiberglass is made of small thin strands of glass. It is mostly air and not glass. When the glass is woven in these small sheets and resin painted on it, smaller lighter things can be made.

Fiberglass offers a lot of benefits in the automotive industry. It is non-corrosive, so it helps replace steel in areas where steel can get easily corroded.

Fiberglass is fireproof. In case of accidents, users can get out of the car uninjured. It can be used in front bumpers, doors, roofs, casings, and the wheels.

#### **7. Lead**

Lead is an excellent metal because it is heavy and helps to balance the automobile. That is why most of the wheels are made of lead, aluminum, and parts of fiberglass. The battery is also made of lead, which allows it to maintain safe temperatures even when the car is heating up.

## **8. Magnesium**

The body, structure, and some engine parts are made of magnesium. It has been used in these parts since 1930. It is excellent because it is 75% lighter than steel and 33% lighter than aluminum. However, it is only used in small areas so as not to throw off the balance of the vehicles.

### **Car materials are getting greener (eco-friendly)**

Eco-friendly materials used in automobiles must include environmentally friendly elements in at least one part of the completion process, from raw materials to manufacturing. It is imperative to reduce carbon dioxide emissions by changing some raw materials or introducing new technologies into the production process. Of course, the durability and safety of the vehicle must also be ensured. All of this is never easy. Nevertheless, the auto industry is striving to reduce carbon emissions from the entire life cycle of an automobile - from raw materials to manufacturing processes to disposal - following the global trend of 'carbon neutral.' Achieving carbon neutrality is no longer an option; it is a necessity.

Eco-friendly materials play the most significant role in achieving this carbon neutrality. Because plants - natural raw materials - absorb carbon dioxide during growth, they offset some of the carbon footprints of the car's life cycle from the beginning of its production. In other words, the higher the proportion of eco-friendly interior materials or raw materials used, the more advantageous it is to reduce carbon dioxide and volatile organic compound emissions. At the same time, the automobile industry is actively using recycled materials and is paying attention to 'vegan leather,' considering not only environmental issues but also ethical issues.

Accordingly, global automakers place sustainability as their top priority and are expanding the use of eco-friendly materials. For example, Mercedes-Benz filled the interior of its recently unveiled all-electric concept car, the Vision EQXX, with sustainable lightweight materials. The door handle is made of bio-steel fiber, which is stronger than steel and biodegradable, and artificial leather made from mushrooms and cactus is used for the seat. The floor mats are also made from recyclable bamboo fiber. Mercedes explains that the carbon footprint of artificial leather is reduced by about half compared to genuine leather. For reference, Mercedes-Benz plans to raise the percentage of recycled materials made by upcycling waste fishing nets and plastic bottles to an average of 40% by 2039.

BMW also emphasized its commitment to using eco-friendly materials by unveiling the pure electric concept model 'BMW i Vision Circular' made using only 100% recyclable materials at IAA Mobility 2021. Since the Circular is made of recycled materials such as steel, plastic, rubber, and

glass used in the interior, as well as the steel that makes up the body, all parts can be recycled even after the car is no longer used. In addition, each part was assembled without using adhesives, and some parts were manufactured using a 3D printing process to minimize parts discarded during the manufacturing stage. The BMW Group plans to significantly reduce carbon emissions by expanding the use of recycled plastics, natural fibers, bio-plastics, and vegan leather, both inside and outside vehicles. Some manufacturer's cars eco-friendly material they used for particular part is as under.