2021

CAR WORK

MECHANICAL WORKSHOP

MTE PROJECT REPORT

SUBMITTED TO:
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SUBMITTED BY
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DELHI
TECHNOLOGICAL
UNIVERSITY

PROJECT
REPORT

MOTIVATION

We are always fascinated by cars more importantly Tesla cars, a car that has changed the obsolete designs and is the future of our automobile industry. It is one of the projects that we were waiting to do some work on in the hope of learning more about cars and their internal mechanisms leaving no nook and corners untouched.

PROJECT BACKGROUND

We are living in a modern society where quality is compromised over quantity and therefore we developed the curiosity to do some research on some of the latest projects by great entrepreneurs.The seed of curiosity is developed in us by Professor Girish Kumar who encouraged us to do this project and learn more about these things.

GOALS & OBJECTIVES

01 Outlining all the key components of our projects

02 The car industries should work on more sturdy designs

03 Presentation to make the project more comprehensive

04 Procedures will be used to complete the project successfully

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July 2021

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CANDIDATE'S DECLARATION

We, (Parth Johri 2K20/B17/33, Dhruv Bihani 2K20/A17/09) students of B. Tech. hereby declare that the project Dissertation titled "Car Body" which is submitted by us to the Department of workshop practice, Delhi Technological University, Delhi in partial fulfilment of the requirement for the award of the degree of Bachelor of Technology, is original and not copied from any source without proper citation. This work has not previously formed the basis for the award of any Degree, Diploma Associateship, Fellowship or other similar title or recognition.

Place: Delhi

Date: 20/07/2021

Parth Johri
(2K20/B17 /33)
Dhruv Bihani
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CERTIFICATE

I hereby certify that the project Dissertation titled "Car body" which is submitted by Parth Johri , Dhruv Bihani (2K20/B17/33, 2K20/B17/44) Delhi Technological University, Delhi in complete fulfilment of the requirement for the award of the degree of the Bachelor of Technology, is a record of the project work carried out by the students under my supervision. To the best of my knowledge this work has not been submitted in part or full for any Degree or Diploma to this University or elsewhere.

Place: Delhi

Date: 20/07/2021

Mr. Girish Kumar
(Assistant Professor)
Supervisor

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ACKNOWLEDGEMENT

In performing our major project, we had to take the help and guidelines of some respected persons, who deserve our greatest gratitude. The completion of this assignment gives us much pleasure. We would like to show our gratitude to Mr.Girish Kumar. Mentor for major project. Giving us a good guideline for report throughout numerous consultations. We would also like to extend our deepest gratitude to all those who have directly and indirectly guided us in writing this assignment.

Many people, our classmates and team members itself, have made valuable comment suggestions on this proposal which gave us an inspiration to improve our assignment. We thank all the people for their help directly and indirectly to complete our assignment.

In addition, we would like to thank the Department of workshop practice, Delhi Technological University for giving us the opportunity to work on this topic.

I N D E X

Introduction

In 1908 Henry Ford began production of the Model T automobile. Based on his original Model A design first manufactured in 1903, the Model T took five years to develop. Its creation inaugurated what we know today as the mass production assembly line. This revolutionary idea was based on the concept of simply assembling interchangeable component parts. Prior to this time, coaches and buggies had been hand-built in small numbers by specialized craftspeople who rarely duplicated any particular unit. Ford's innovative design reduced the number of parts needed as well as the number of skilled fitters who had always formed the bulk of the assembly operation, giving Ford a tremendous advantage over his competition

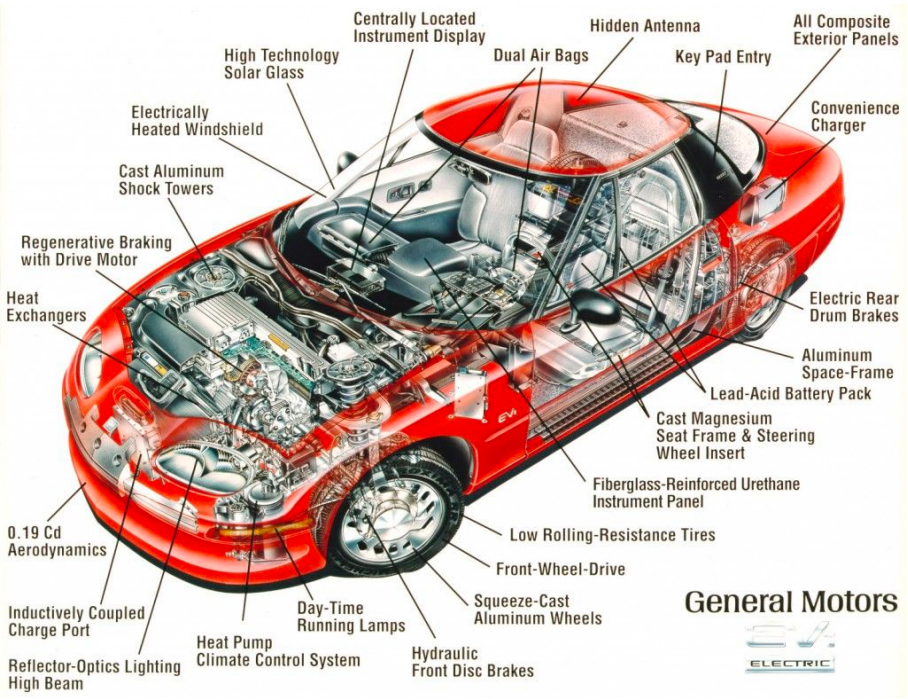
AUTOMOBILE

Automobile, by name auto also called motorcar or car , a usually four-wheeled vehicle designed primarily for passenger transportation and commonly propelled by an internal-combustion engine using a volatile.

2.1 AUTOMATIVE DESIGN

A modern car is a sophisticated technology system that uses a sub-system with specific design functions. Some of them contain thousands of components that have evolved in development such as electronic computers, high-strength plastics, and new alloys for steel and stainless steel. New technological advances were recognized as the key to successful competition. Research and development engineers and scientists are employed by all car manufacturers and suppliers to upgrade the body, chassis, engine, drivetrain, control systems, safety systems, and pollution control systems. The construction of vehicles is highly dependent on the intended use. Vehicles to be used on the road must be durable, have simple systems that are resistant to overcrowding and overheating in working conditions. On the other hand products designed for high speed, limited access routes require a lot of passenger options, increase engine performance and provide high speed, vehicle stability.

Stability depends largely on the distribution of weight between the front and rear wheels, the height of the gravitational center and its position in relation to the exhaust center when pressing the suspension elements of the vehicle, and the choice of wheels used for blasting.



Weight distribution depends largely on the location and size of the engine.The general practice of pre-installed engines is using the stability that is readily available on this list. The construction of aluminum engines and new production processes, however, has made it easier to get the engine in the background without compromising stability. Automobiles were used worldwide during the 20th century, and developed economies depended on them. The year 1886 is considered the year of the birth of the modern car when the German inventor Karl Benz granted his patent Benz Patent-Motorwagen. Cars became widely available in the early 20th century. One of the first cars to reach the masses was the 1908 Model T, an American car manufactured by Ford Motor Company. Vehicles were quickly adopted in the US, where they loaded wagons and animal carts, but it took longer to be accepted in Western Europe and other parts of the world.

BODY

The design of a car body is often divided into the number of doors, the layout of the seats and the design of the roof. The roof of the car is supported by pillars on each side of the body.The bodies of the cars are usually made of steel. Metal is mixed with various materials to improve its ability to form at deep depths without cracks or cracking in production machinery. The metal is used because of its common availability, low cost, and efficient performance. In some applications, however, other materials, such as aluminum, fiberglass, and carbon-fiber-reinforced plastic, are used because of their special properties. Polyamide, polyester, polystyrene, polypropylene, and ethylene plastic are designed for high durability, crack resistance, and resistance to harmful deformities. These materials are used for **body panels**.

PROCESS OF MAKING A CAR

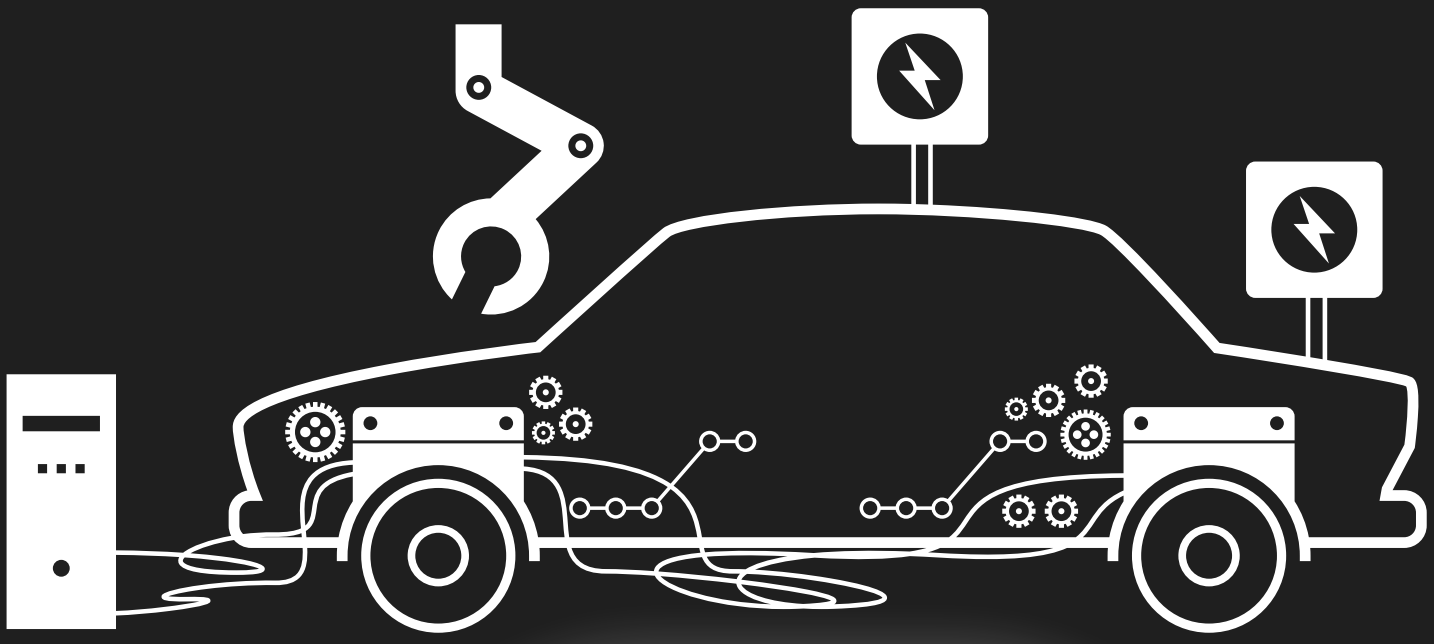
The process of making a car can be roughly divided into

1. **STAMPING**
2. **WELDING**
3. **PAINTING**
4. **ASSEMBLY**
5. **INSPECTIONS**

which takes about **17-18 hours** in total.

(It varies according to the number of cars made by a factory.)

When we consider that each car is made of about **30,000** parts, each of which takes time to produce, the time it takes to build a car is quite long



VEHICLE BODY CONSTRUCTION

Vehicle body – is most expensive part of a car. Vehicle body could be the main supporting structure or its particular element.

The Vehicle Body of modern car consist of: **engine section, saloon, trunk.**

Vehicle body is the main supporting structure of a vehicle, to which all other components are attached. Truck uses a separate frame as chassis.

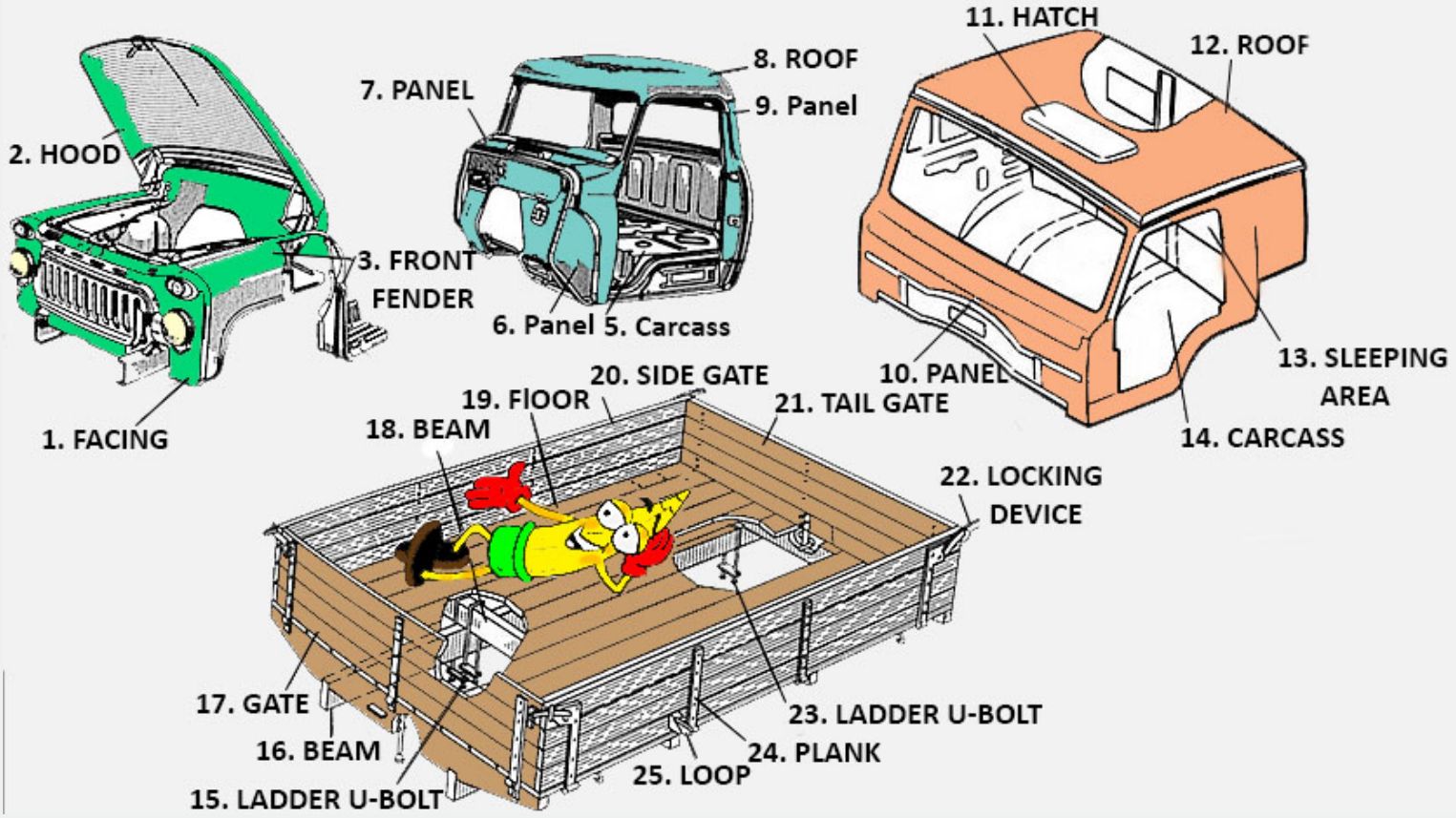
Vehicle body is designed for carry the goods (a truck) or for carriage of passengers (passenger car). There are some kinds of vehicle body which differ in: by purpose (trucks, passengers, cargo-passenger, special) and by construction (skeleton, half-skeleton, non-skeleton).

PARTS OF VEHICLE BODY TO BE CONSTRUCTED

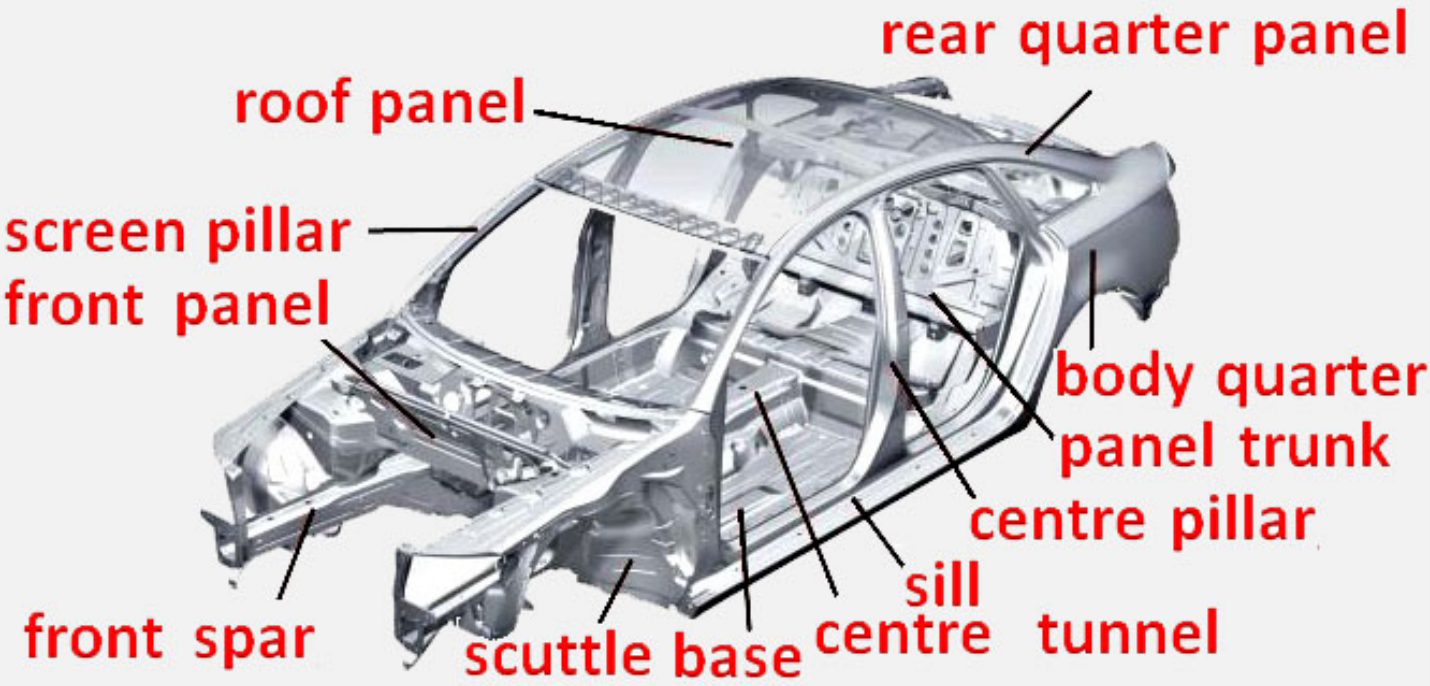
1 – FRONT SPAR
2 – FRONT PANEL
3 – SCREEN PILLAR
4 – ROOF PANEL
5 – REAR QUARTER PANEL
6 – BODY QUARTER
7 – PANEL TRUNK
8 – CENTER PILLAR
9 – SILL
10–CENTRE TUNNEL
11 – BASE
12 – SCUTTLE

BODY CONSTRUCTION

TRUCK BODY CONSTRUCTION



CAR BODY CONSTRUCTION



THE DIFFERENT STYLES OF CAR BODY TYPES

Sedan/Compact Sedan

SUV/Compact SUV (Sports Utility Vehicle)

Hatchback

Crossovers

Limousines

Station Wagon/ Estate Cars

MPV (Multi-Purpose Vehicle)

Pick-up trucks

Mini Vans

Coupe

Convertibles/ Cabriolet/ Spyder

COMMONLY USED AUTOMOTIVE MATERIALS

Mild Steel: Mild steels are easy to form, which makes them a top choice for automotive parts manufacturers using cold stamping and other dated manufacturing processes. They have a maximum tensile strength of 270 MPa.

High Strength Steel (HSS): High strength steels use traditional steels and remove carbon during the baking cycle. This means softer steels can be formed, then baked into harder metals. Typical tensile strength grades range from 250 to 550 MPa.

High Strength Low Alloy (HSLA): HLSAs are carbon manganese steels strengthened with the addition of a micro alloying element such as titanium, vanadium, or niobium. These have a tensile strength up to 800 MPa, and can still be press formed.

Advanced High Strength Steel (AHSS): Advanced high strength steels generally yield strength levels in excess of 550 MPa. They are composites made of multiple metals, then heated and cooled throughout the manufacturing process to meet a part's specifications.

Ultra High Strength Steel (UHSS): These follow similar properties as AHSS, but maintain strength levels of at least 780MPa.

Boron/Martensite: Martensite is the hardest and strongest form of steel, but it's also the least formable. It shares properties with boron, which has a tensile strength of around 1,200 to 1,800 MPa. These are usually combined with softer steels to form composites.

Aluminum 5000/6000 (AL 5000/6000): 5000-series aluminium is alloyed with magnesium. 6000-series aluminium contains both silicon and magnesium which forms magnesium silicide and makes the aluminium alloy heat-treatable.

Magnesium: Magnesium is an attractive material for automotive use because of its light weight. When alloyed, magnesium has the highest strength-to-weight ratio of all structural metals.

Carbon Fiber Reinforced Plastic (CFRP): CFRPs are extremely strong, light plastics which contain carbon fibers to increase strength. They are expensive to produce but will have a growing demand in the future automotive industry as costs are reduced.

STAGES OF MANUFACTURING OF A CAR

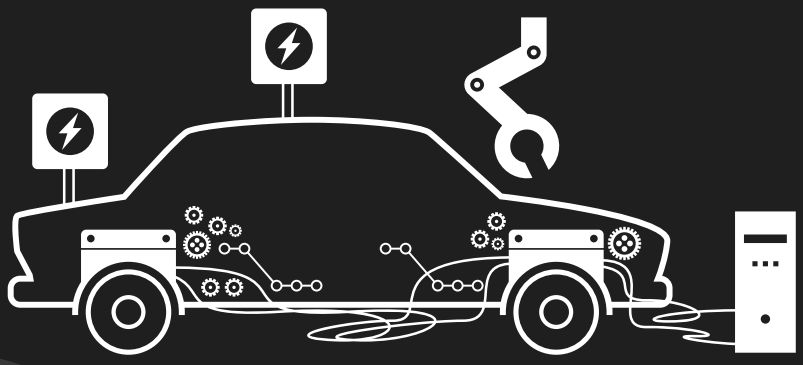
The stages of manufacture of a car are broken down into several stages of which the following are the main lines:

Stamping is the beginning of a vehicle's manufacturing process and involves converting the raw materials received in the form of steel sheets into body parts.

Sheet metal is the second step in the manufacturing process and involves joining the sheet metal and aluminum parts together to form the box.

Painting, the third step in the manufacturing process, aims to protect the body against corrosion and give it its final appearance. To seal the vehicles, putty is applied to each vehicle.

Assembly is the last step in the manufacturing process. At this stage are assembled and mounted the mechanical elements, the driving position, mirrors and the interior trim of the vehicle.



Raw Materials

Although the bulk of an automobile is virgin steel, petroleum-based products (plastics and vinyl) have come to represent an increasingly large percentage of automotive components. The lightweight materials derived from petroleum have helped to lighten some models by as much as thirty percent. As the price of fossil fuels continues to rise, the preference for lighter, more fuel-efficient vehicles will become more pronounced.

Design

Introducing a new model of automobile generally takes three to five years from inception to assembly. Ideas for new models are developed to respond to unmet pubic needs and preferences. Trying to predict what the public will want to drive in five years is no small feat, yet automobile companies have successfully designed automobiles that fit public tastes. With the help of computer-aided design equipment, designers develop basic concept drawings that help them visualize the proposed vehicle's appearance. Based on this simulation, they then construct clay models that can be studied by styling experts familiar with what the public is likely to accept. Aerodynamic engineers also review the models, studying air-flow parameters and doing feasibility studies on crash tests. Only after all models have been reviewed and accepted are tool designers permitted to begin building the tools that will manufacture the component parts of the new model.

PROCESSES USED IN CAR MANUFACTURING

BENDING

In bending, force is applied to a sheet metal workpiece to produce curvature of the surface. Bending is generally used to produce simple curved surfaces rather than complex ones.

A mechanically operated press drives a punch against sheet metal, forcing it into a simple die with enough pressure to produce a permanent change in the metal's shape. The amount of pressure is important. If not enough pressure is applied, the metal can simply spring back into its original shape. If too much is applied, it can break.

DRAWING

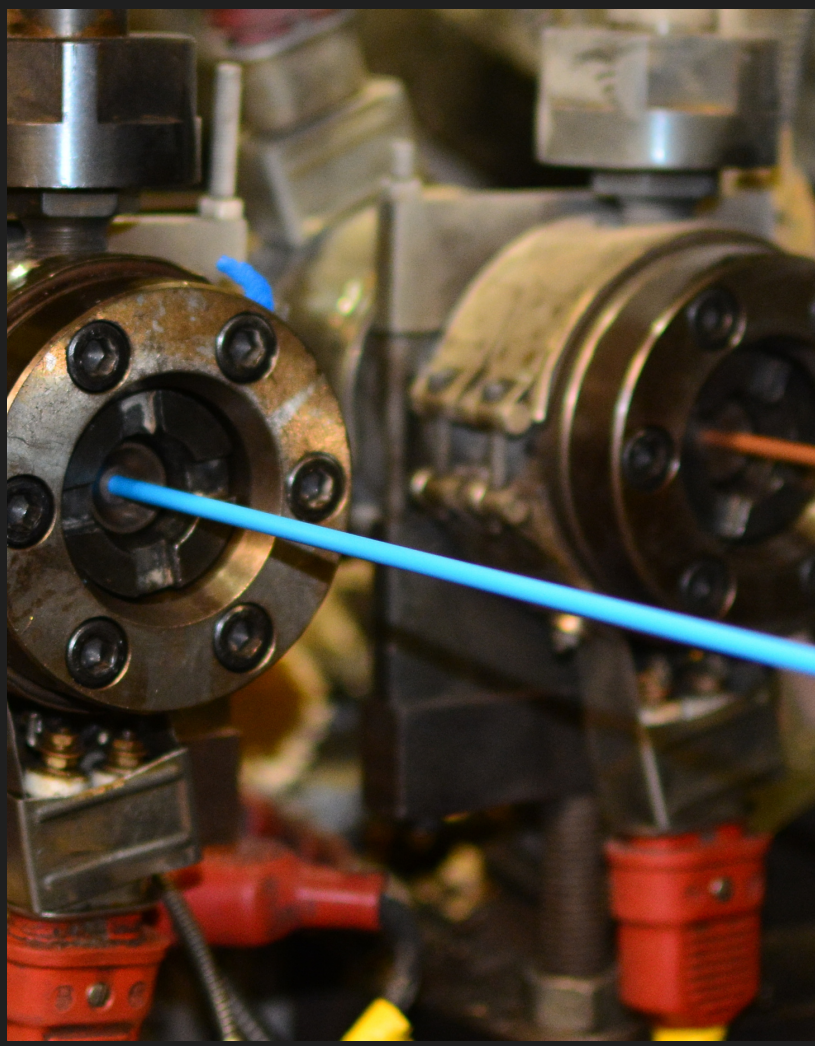
In the drawing, the sheet metal is forced against a die that has been cut into the three-dimensional, often curved shape that the sheet metal is to take on. In effect, the die is used as a mold for the metal. This technique can produce relatively complex shapes. Once again, pressure is applied to the workpiece using a hydraulically or mechanically operated punch. There are a number of dangers involved, not so much to people (since the process is largely mechanized) but to the metal itself. It can crack from too much pressure or wrinkle from its interaction with the die. Lubricant can be used to make the metal slide more smoothly against the die, avoiding the possibility of wrinkling. Alternatively, the wrinkled edges can be trimmed from the metal in a separate operation. This method is commonly used to make auto body parts and fuel tanks.

STAMPING

In stamping, a device called a stamping press is used with a series of dies to cut and form metal into various shapes. This is commonly used to make auto parts such as hubcaps and fenders.

EXTRUSION

Extrusion can be used to produce long metal objects, such as rods and tubes. The metal workpiece is forced into a die with a hole in the opposite end. The metal is extruded through the hole to form the shape. Extrusion can be used to manufacture important parts of a car's drive train or the anchors that hold seatbelts in place.



FORGING

The forging process uses a hammer or press that is essentially a mechanized version of the hammers used by ancient blacksmiths. The metal is hammered against a surface that serves as an anvil. It can be hammered repeatedly so as to form complex shapes. This can be used as an alternative to the drawing process.

The Manufacturing Process

Components

1 The automobile assembly plant represents only the final phase in the process of manufacturing an automobile, for it is here that the components supplied by more than 4,000 outside suppliers, including company-owned parts suppliers, are brought together for assembly, usually by truck or railroad. Those parts that will be used in the chassis are delivered to one area, while those that will comprise the body are unloaded at another.

Chassis

2 The typical car or truck is constructed from the ground up (and out). The frame forms the base on which the body rests and from which all subsequent assembly components follow. The frame is placed on the assembly line and clamped to the conveyer to prevent shifting as it moves down the line. From here the automobile frame moves to component assembly areas where the complete front and rear suspensions, gas tanks, rear axles and driveshafts, gearboxes, steering box components, wheel drums, and braking systems are sequentially installed.

An off-line operation at this stage of production mates the vehicle's engine with its transmission. Workers use robotic arms to install these heavy components inside the engine compartment of the frame. After the engine and transmission are installed, On automobile assembly lines, much of the work is now done by robots rather than humans. In the first stages of automobile manufacture, robots weld the floor pan pieces together and assist workers in placing components such as the suspension onto the chassis.

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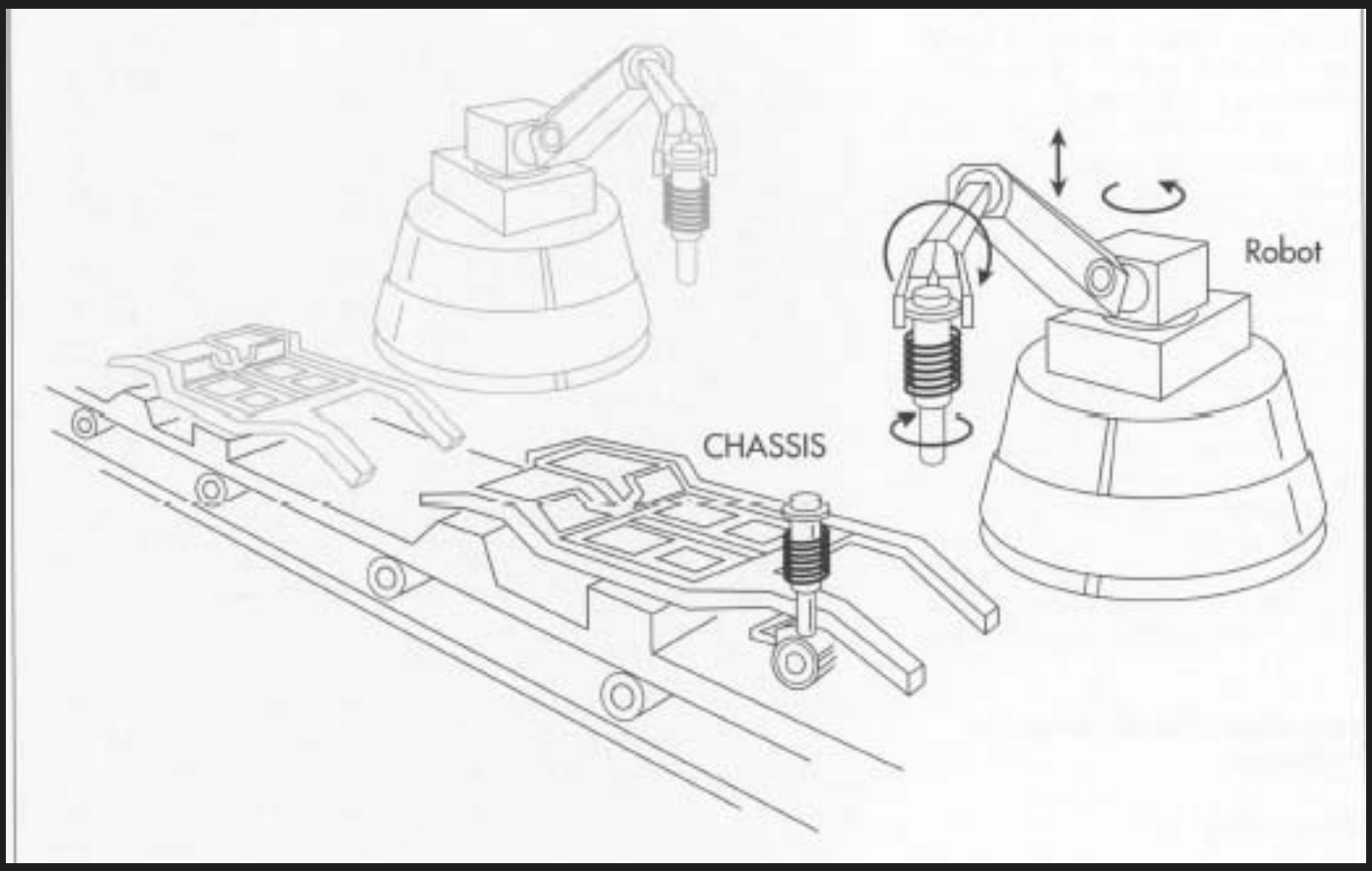
a worker attaches the radiator, and another bolts it into place. Because of the nature of these heavy component parts, articulating robots perform all of the lift and carry operations while assemblers using pneumatic wrenches bolt component pieces in place. Careful ergonomic studies of every assembly task have provided assembly workers with the safest and most efficient tools available.



Body

4 Generally, the floor pan is the largest body component to which a multitude of panels and braces will subsequently be either welded or bolted. As it moves down the assembly line, held in place by clamping fixtures, the shell of the vehicle is built. First, the left and right quarter panels are robotically disengaged from pre-staged shipping containers and placed onto the floor pan, where they are stabilized with positioning fixtures and welded.

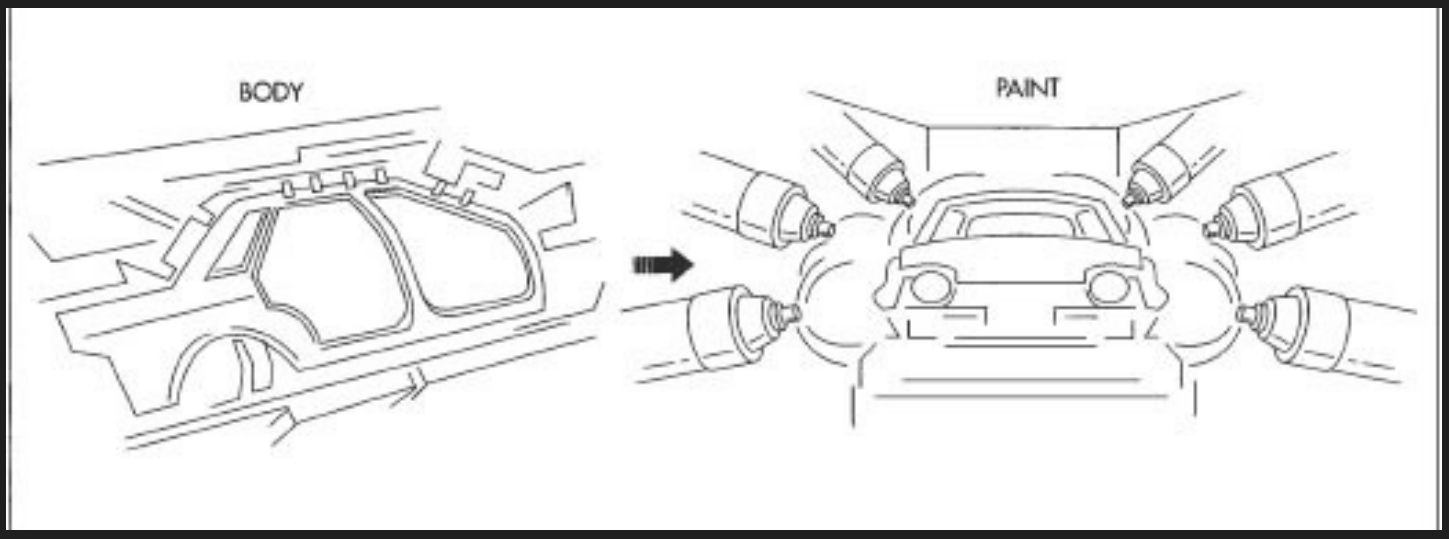
5 The front and rear door pillars, roof, and body side panels are assembled in the same fashion. The shell of the automobile assembled in this section of the process lends itself to the use of robots because articulating arms can easily introduce various component braces and panels to the floor pan and perform a high number of weld operations in a time frame and with a degree of accuracy no human workers could ever approach. Robots can pick and load 200-pound (90.8 kilograms) roof panels and place them precisely in the proper weld position with tolerance variations held to within .001 of an inch. Moreover, robots can also tolerate the smoke, weld flashes, and gases created during this phase of production.

6 As the body moves from the isolated weld area of the assembly line, subsequent body components including fully assembled doors, deck lids, hood panel, fenders, trunk lid, and bumper reinforcements are installed. Although robots help workers place these components onto the body shell, the workers provide the proper fit for most of the bolt-on functional parts using pneumatically assisted tools.

Paint

7 Prior to painting, the body must pass through a rigorous inspection process, the body in white operation. The shell of the vehicle passes through a brightly lit white room where it is fully wiped down by visual inspectors using cloths soaked in high-light oil. Under the lights, this oil allows inspectors to see any defects in the sheet metal body panels. Dings, dents, and any other defects are repaired right on the line by skilled body repairmen. After the shell has been fully inspected and repaired, the assembly conveyor carries it through a cleaning station where it is immersed and cleaned of all residual oil, dirt, and contaminants.

8 As the shell exits the cleaning station it goes through a drying booth and then through an undercoat dip—an electrostatically charged bath of undercoat paint (called the E-coat) that covers every nook and cranny of the body shell, both inside and out, with primer. This coat acts as a substrate surface to which the topcoat of colored paint adheres.



The body is built up on a separate assembly line from the chassis. Robots once again perform most of the welding on the various panels, but human workers are necessary to bolt the parts together. During welding, component pieces are held securely in a jig while welding operations are performed. Once the body shell is complete, it is attached to an overhead conveyor for the painting process. The multi-step painting process entails inspection, cleaning, undercoat (electrostatically applied) dipping, drying, topcoat spraying, and baking.

9 After the E-coat bath, the shell is again dried in a booth as it proceeds onto the final paint operation. In most automobile assembly plants today, vehicle bodies are spray-painted by robots that have been programmed to apply the exact amounts of paint to just the right areas for just the right length of time. Considerable research and programming have gone into the dynamics of robotic painting in order to ensure the fine "wet" finishes we have come to expect. Our robotic painters have come a long way since Ford's first Model Ts, which were painted by hand with a brush.

10 Once the shell has been fully covered 1 V with a base coat of color paint and a clear topcoat, the conveyor transfers the bodies through baking ovens where the paint is cured at temperatures exceeding 275 degrees Fahrenheit (135 degrees Celsius). After the shell leaves the paint area it is ready for interior assembly.

Interior assembly

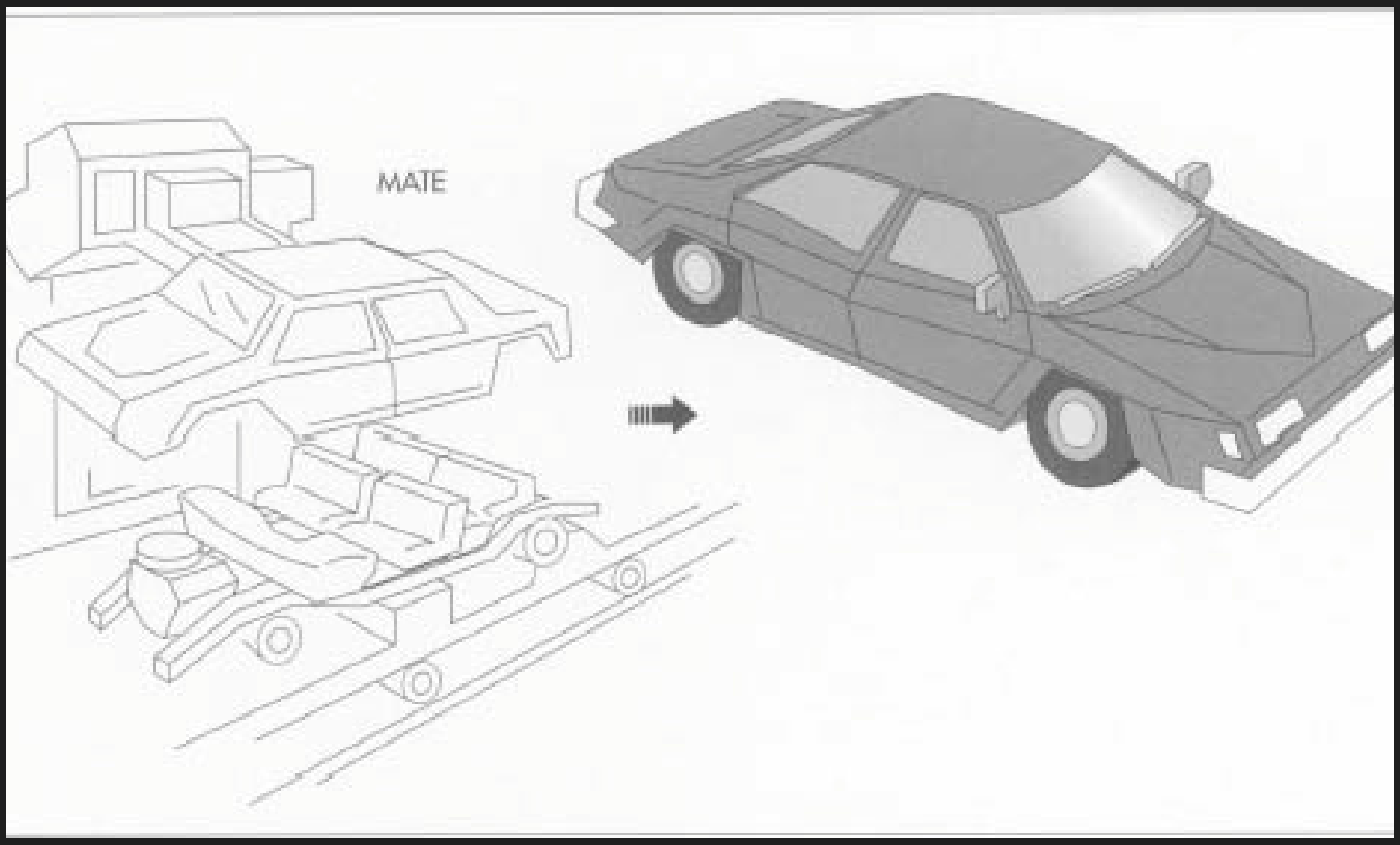
11 The painted shell proceeds through the interior assembly area where workers assemble all of the instrumentation and wiring systems, dash panels, interior lights, seats, door and trim panels, headliners, radios, speakers, all glass except the automobile windshield, steering column and wheel, body weatherstrips, vinyl tops, brake and gas pedals, carpeting, and front and rear bumper fascias.

12 Next, robots equipped with suction cups remove the windshield from a shipping container, apply a bead of urethane sealer to the perimeter of the glass, and then place it into the body windshield frame. Robots also pick seats and trim panels and transport them to the vehicle for the ease and efficiency of the assembly operator. After passing through this section the shell is given a water test to ensure the proper fit of door panels, glass, and weatherstripping. It is now ready to mate with the chassis.

Mate

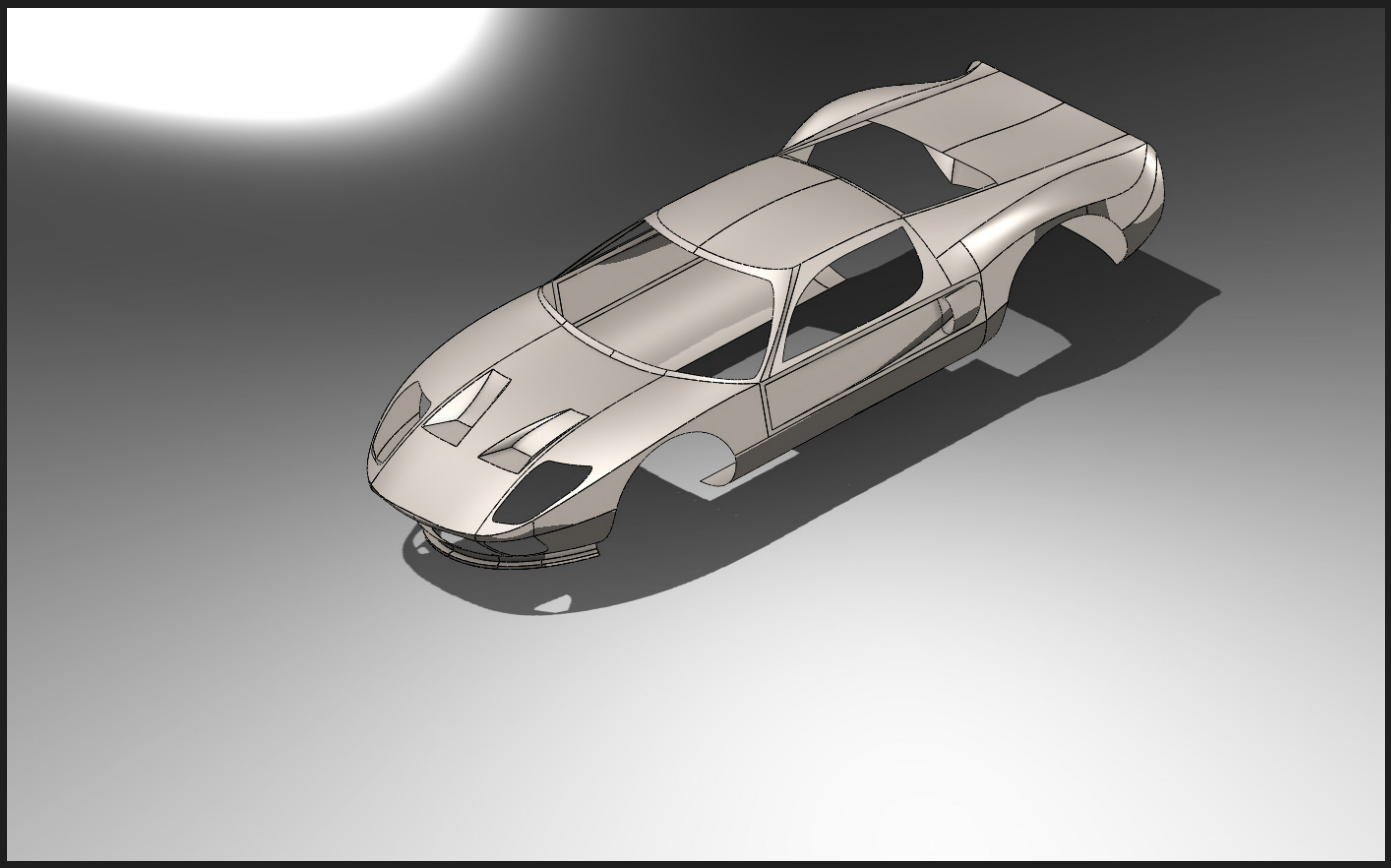
13 The chassis assembly conveyor and the body shell conveyor meet at this stage of production. As the chassis passes the body conveyor the shell is robotically lifted from its conveyor fixtures and placed onto the car frame. Assembly workers, some at ground level and some in work pits beneath the conveyor bolt the car body to the frame. Once the mating takes place the automobile proceeds down the line to receive final trim components, battery, tires, antifreeze, and gasoline.

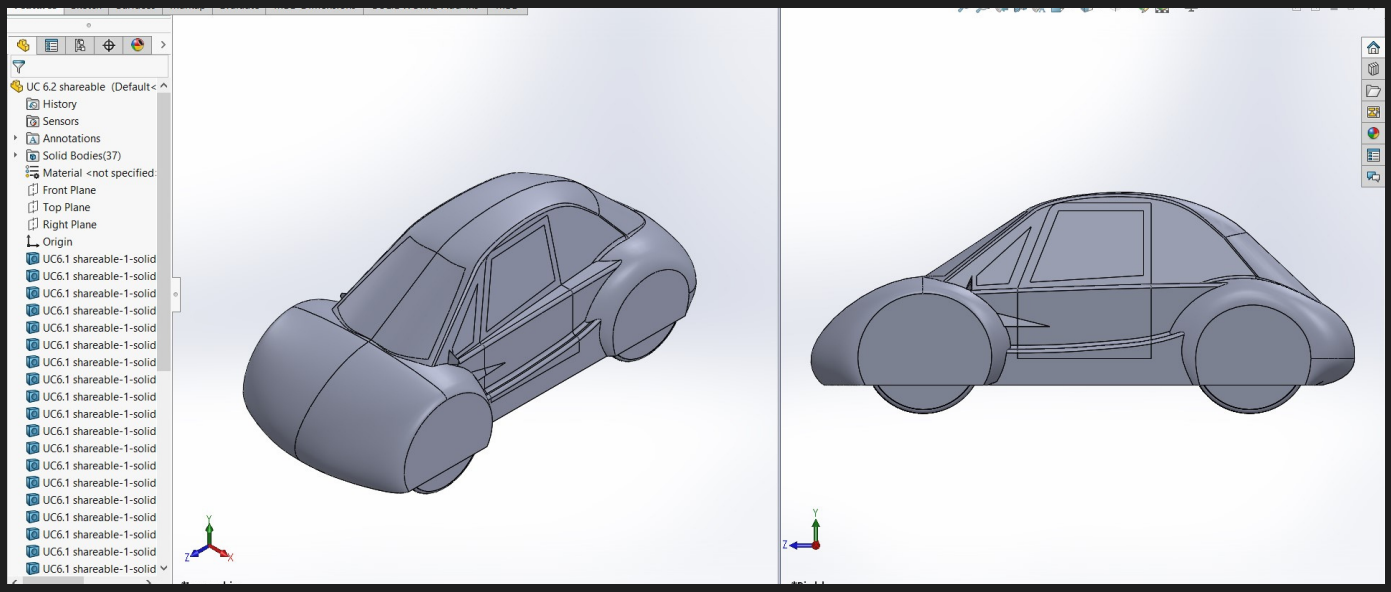
14 The vehicle can now be started. From here it is driven to a checkpoint off the line, where its engine is audited, its lights and horn checked, its tires balanced, and its charging system examined. Any defects discovered at this stage require that the car be taken to a central repair area, usually located near the end of the line. A crew of skilled trouble-shooters at this stage analyzes and repair all problems. When the vehicle passes the final audit it is given a price label and driven to a staging lot where it will await shipment to its destination.



The body and chassis assemblies are mated near the end of the production process. Robotic arms lift the body shell onto the chassis frame, where human workers then bolt the two together. After final components are installed, the vehicle is driven off the assembly line to a quality checkpoint.

3D DESIGN OF CAR BODY DESIGNED BY US IN SOLID WORKS





10. INNOVATIVE CAR DESIGN

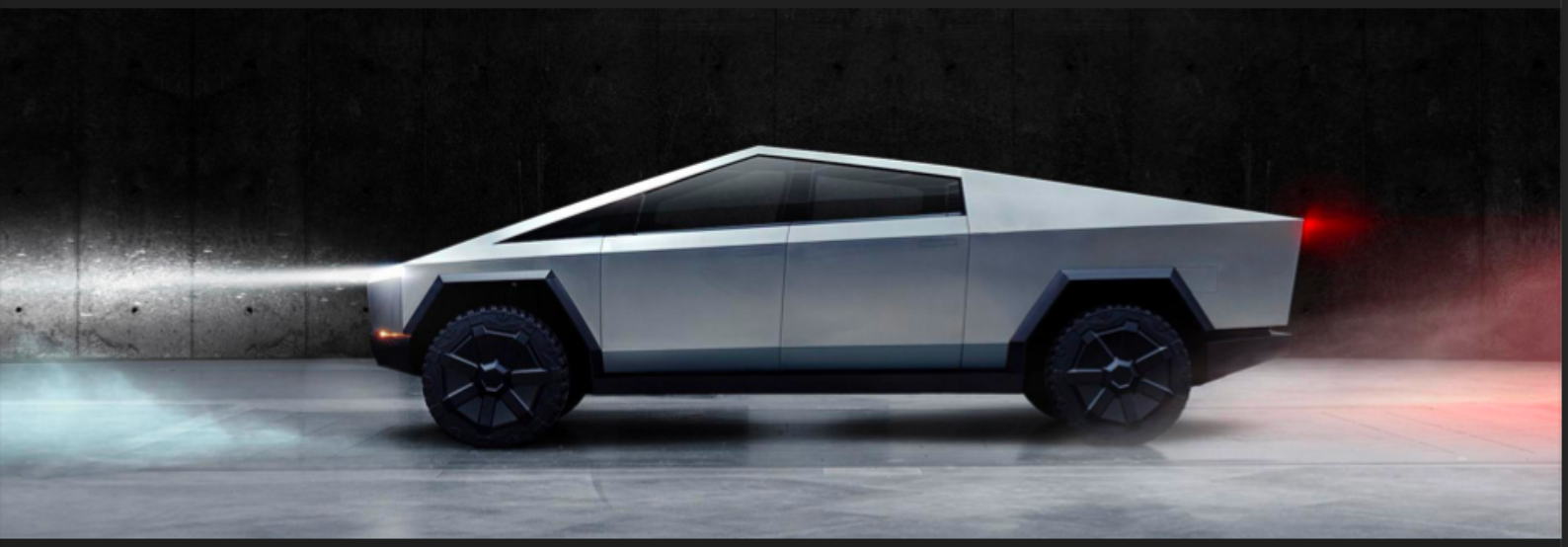
CYBERTRUCK

In the modern-day automobile market, we have many innovative designs as the development of science leads to the revolutionary new car body. for example, Elon musk Tesla launch a Cyber truck, an electric-powered car that is going to attract many customers in modern days.

1. It consists of unbreakable glass
2. Autopilot standards are added

The cyber truck is built with ultra-durable and hard 30X Cold – Rolled Stainless steel structural with a speed of 0-60 mph.

There is no doubt Cyber truck is a futuristic mobile.



The cyber truck uses very hard metal to ensure proper shielding, the material used is Ultra – Hard 30 X Cold – Rolled Stainless -steel structural.

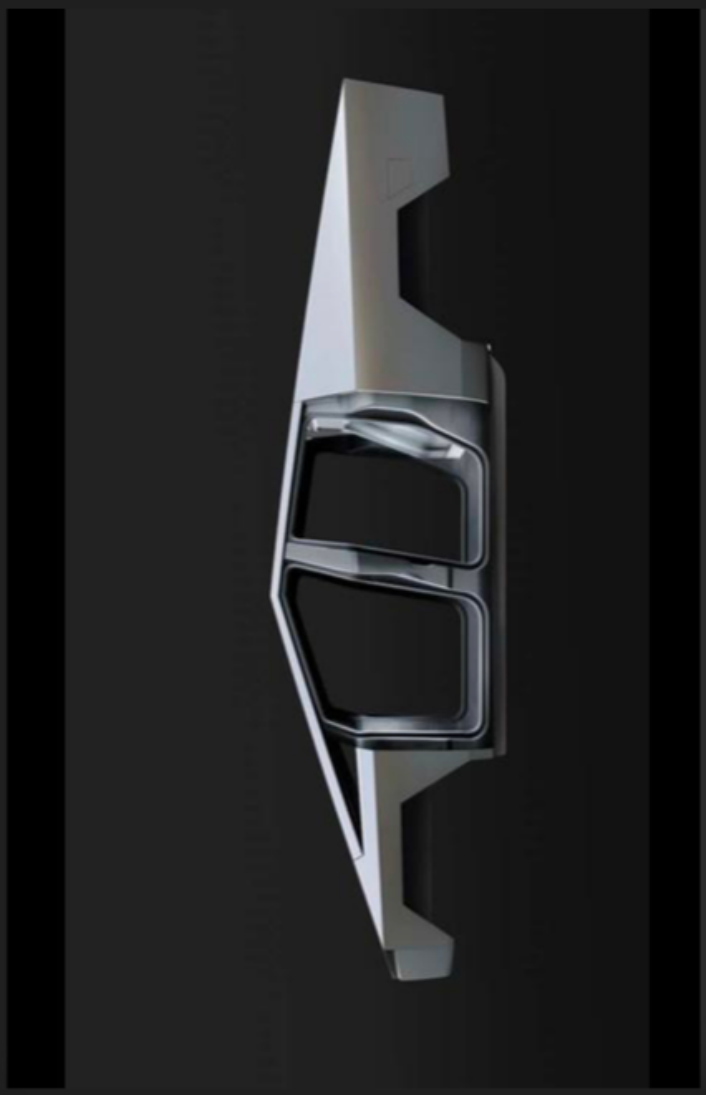
1. The Tesla Cybertruck is so loaded that the car is almost a hidden box of hidden features.

2. The Tesla Cybertruck is fitted with three seats in the front, or center, which serves as a small jumping seat. As can be seen in the ride videos, this middle seat actually folds it into a large armchair. Interestingly, this armrest center has doubled as a warehouse. It also has three cups mounted directly on the back seat of the middle seat, and a switch holder ("junk cubby") next to random knick-knacks.

3. While its exterior has no future, is violent on the outside, the interior of Tesla Cybertruck is actually quite acceptable. As they get into the car, passengers are greeted by the interior of the cave and a large glass roof that will be a great option for those who like to camp in their car. The rear seats are also fitted with a light bulb inside the sides, which illuminates the back of the truck passengers. The lights are also white, offering an additional future, such as Tron on the outside of Cybertruck.

4. The Tesla Cybertruck has a large center armrest in the back that looks doubled as support for additional equipment. The electric-powered van already has a 6.5-meter bed, which is great, but for those who wish to pull the heaviest load, the armrest center can fold down and work as a pass of more than 6.5 meters.

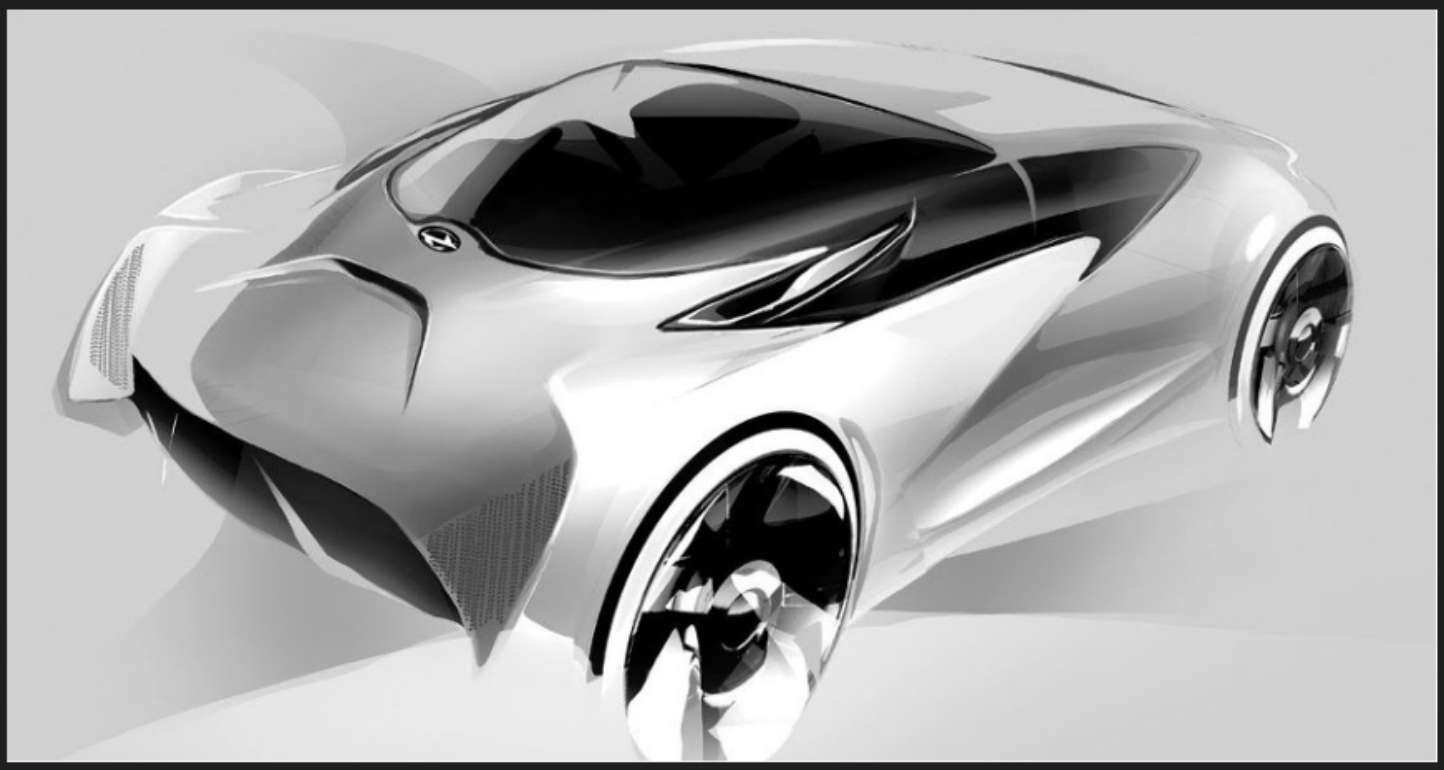
5. Among Cybertruck's smartest features is its solar visor, which contrasts with the A-Pillar. This would be especially helpful when considering that the van has large air protection that could close the already growing Model X window to full size.



Hard sheet used in Cyber Truck

Innovative Design to watch for

As the market is expanding automobile industry wants an edge over another supplier so there are some unique ideas which are going to face for the franchise in future



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