



BAT

BASIC AUTOMOTIVE TECHNOLOGY

The background of the slide is a collage of various automotive components, including gears, shafts, and bearings, rendered in a light gray, semi-transparent style. A prominent diagonal graphic element, consisting of a red stripe and a black stripe, runs from the top-left corner towards the bottom-right corner, partially overlapping the background image.

BASIC AUTOMOTIVE TECHNOLOGY



**DIMENSIONS &
WEIGHTS**



ENGINE



TRANSMISSION



CHASSIS



BRAKES



TYRES



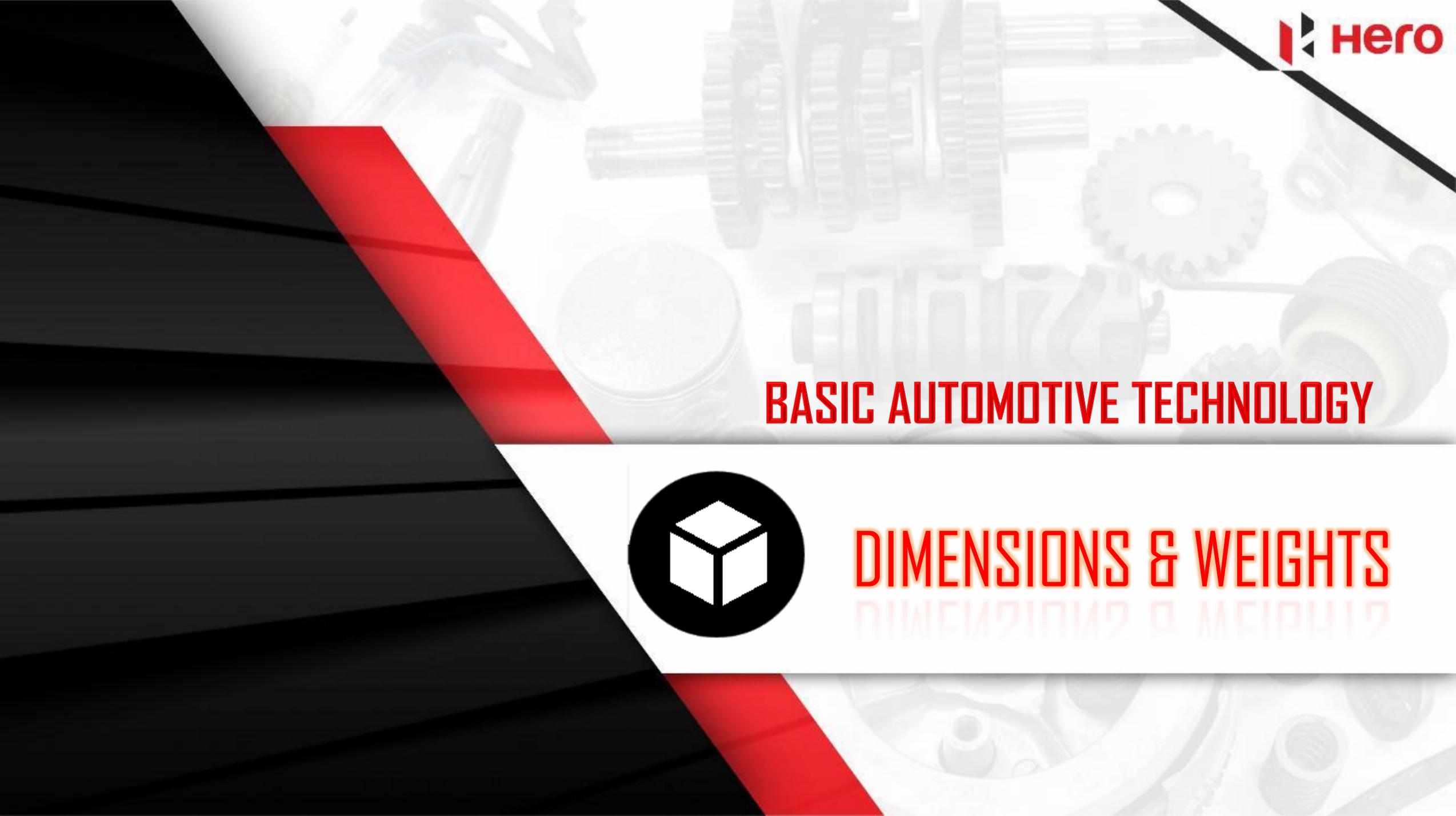
SUSPENSION



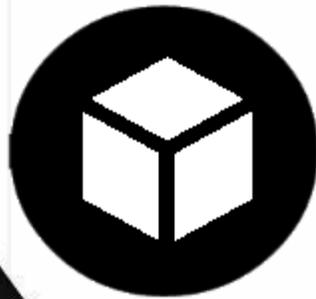
HMCL TECHNOLOGY



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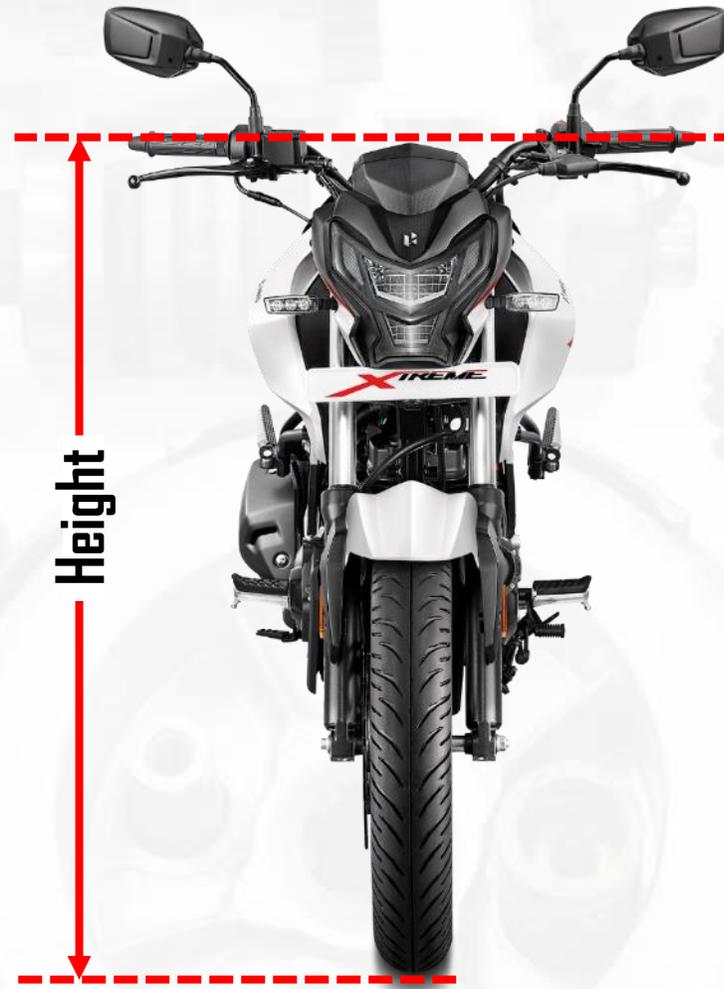
BASIC AUTOMOTIVE TECHNOLOGY



DIMENSIONS & WEIGHTS

HEIGHT

The distance from the ground to the visor



SADDLE HEIGHT

It is the height from the lowest point of the vehicle's seat to the ground



GROUND CLEARANCE

It is the distance between the ground to the lowest point of the vehicle



Ground Clearance

WHEELBASE

Wheelbase is the distance between the centers of the front axle and rear axle



LENGTH

Distance from tip of front tyre to the tip of rear mud flap



WIDTH

The total width of the bike is from one tip of the handle bar to the other tip of the bar



KERB WEIGHT

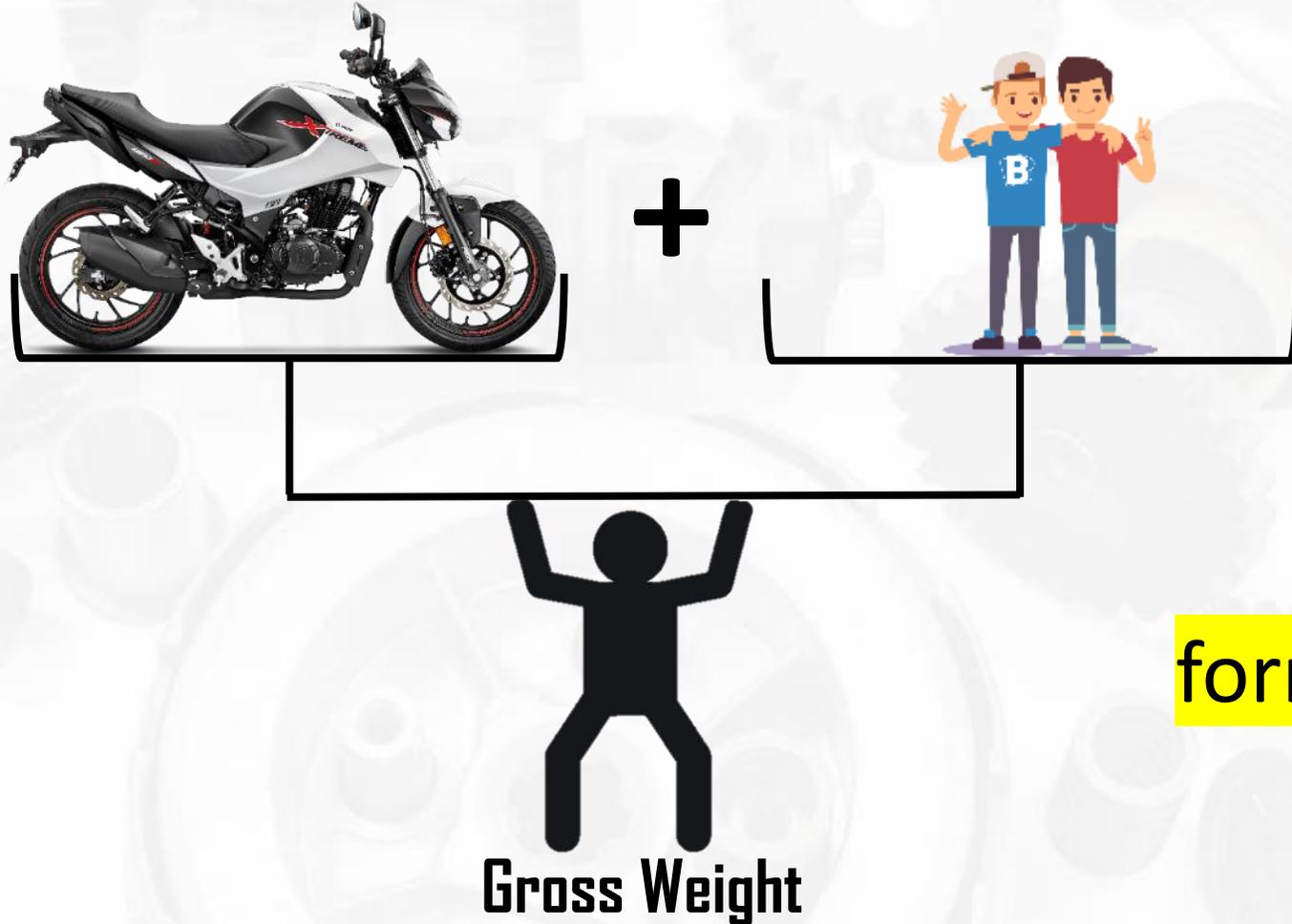
Kerb weight is the weight of the two-wheeler with fuel, engine oil and charged battery, but without passengers



Kerb weight

GROSS WEIGHT

Gross weight is the maximum allowable weight on the vehicle including the rider, passenger and cargo



formula

Gross Weight



**DIMENSIONS &
WEIGHTS**



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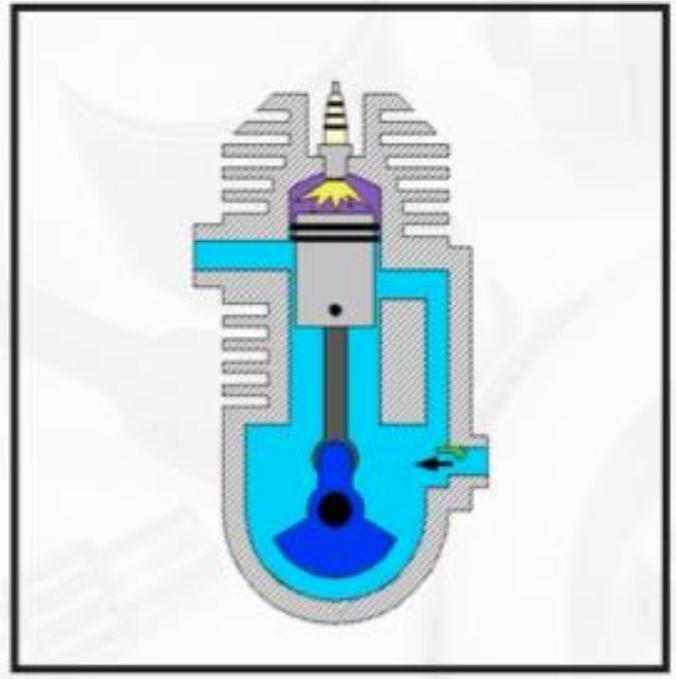


ENGINE

ENGINE

Two Types of Engines

Two Stroke
Two Stroke



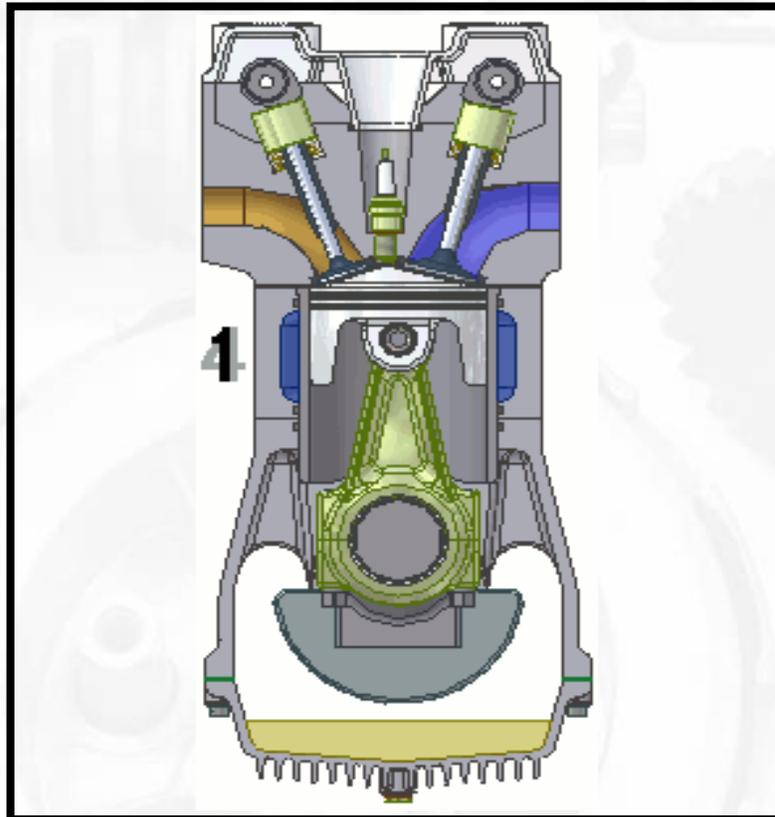
Four Stroke
Four Stroke





ENGINE

FOUR STROKE





WORKING OF FOUR STROKE ENGINE

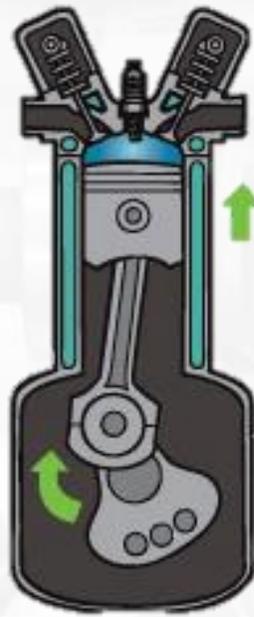
A four-stroke engine uses four different strokes to complete one cycle



1

INTAKE

In the 1st stroke, intake valve opens and sucks in the air-fuel mixture



2

COMPRESSION

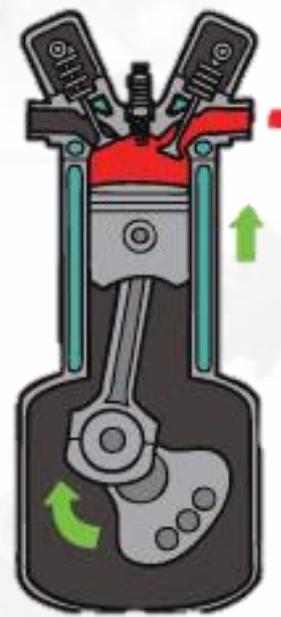
In 2nd stroke, intake valve is closed and compresses the air-fuel mixture



3

POWER

In the 3rd stroke, spark plug gives off a spark to ignite the air fuel mixture



4

EXHAUST

In the 4th stroke, exhaust valve is opened for the burnt gases to move out



BENEFITS OF FOUR STROKE ENGINE

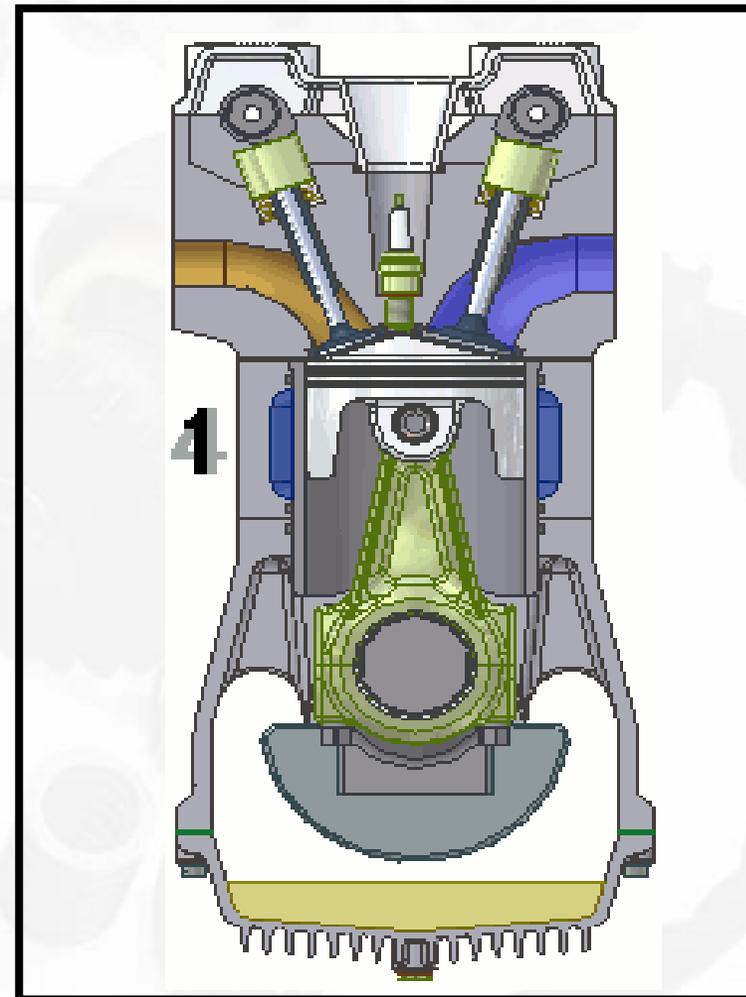
Durable

Clean emissions

Powerful

Higher Torque

Fuel efficient





ENGINE DISPLACEMENT CC (CUBIC CAPACITY)

Engine displacement is the volume swept by piston from TDC to BDC inside the cylinders of an engine



Engine
Displacement



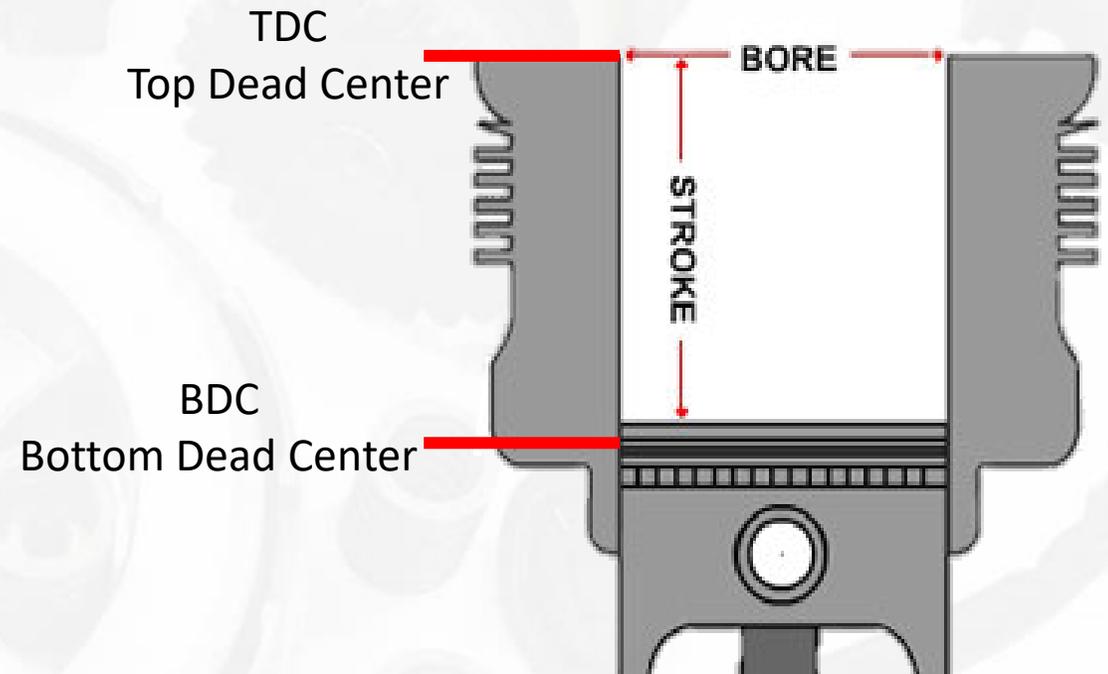
Horsepower



Torque



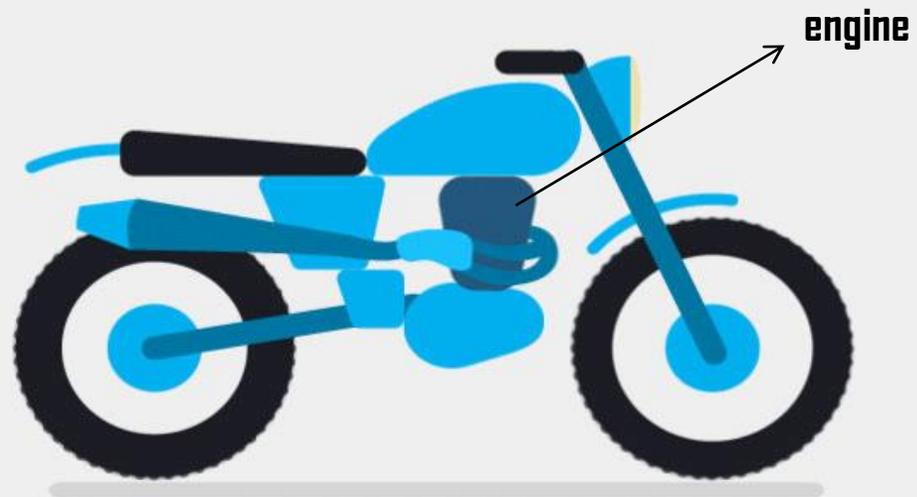
Fuel consumption





POWER OF AN ENGINE

Engine power is the maximum force that an engine can generate



The power output of an engine provides better top speed of the vehicle



ENGINE TORQUE

Torque is the rotational force produced by the engine. It is also known as pulling power of an engine.

High torque



Better Pick-Up and Better Up-hill Climb





ENGINE TERMINOLOGIES

bhp

bhp stands for "Brake Horse Power", which is a unit to measure the power of engine at the crank.

kW (kilo Watt)

kW is the SI () unit to measure engine power.

PS

PS is the German name for Horsepower – "Pferdestärke"

Nm

Nm is known as "Newton meter" and it is the measuring unit of engine torque, also known as rotational force generated by engine.

rpm

rpm means "Revolutions per Minute" of crankshaft of engine.

What is advantage of peak power at higher rpm?

Having higher rpm increases the vehicle's performance and peak power is attained later.

What is advantage of peak power at lower rpm?

Having lower rpm increases the engine life and max. power will be attained earlier.



CONVERSION OF SI UNITS

How to convert power in bhp to kilowatts?

bhp to kW conversion formula

One mechanical brake horsepower is equal to 0.745699872 kilowatts:

$$1 \text{ hp} = 745.699872 \text{ W} = 0.745699872 \text{ kW}$$

Convert 100 kW to bhp:

$$P_{(\text{hp})} = 100 \text{ kW} / 0.745699872 = 134.102 \text{ hp}$$

EXERCISE:-

Convert; 47 bhp = 35 kW



CONVERSION OF SI UNITS

How to convert power in PS to bhp?

PS to bhp conversion formula

One metric horsepower is equal to 0.98632 bhp

1 PS = 0.98632 bhp

Convert 100PS to bhp:

$100\text{PS} \times 0.98632 = 98.63 \text{ bhp}$

EXERCISE:-

Convert; 30 PS = bhp

Q1) What is the measurement from the lowest point of the motorcycles seat to the ground called?

- (a) Wheelbase (b) Saddle Height (c) Length (d) Ground Clearance

Q2) Kerb weight is the total weight of the two-wheeler with fuel, battery and passengers ?

- (a) True (b) False

Q3) If the engine displacement increases than _____ increases?

- (a) Power (b) Torque (c) Fuel Consumption (d) All of the above

Q4) Which part of the vehicle is responsible for generating power?

- (a) Carburetor (b) Gear box (c) Engine (d) Brakes

Q5) Distance from the ground to the visor is called _____ ?

- (a) Width (b) Saddle height (c) length (d) Height

Q6) The 2nd stroke closes the intake valve and compresses the air-fuel mixture ?

- (a) true (b) false



FUEL SYSTEM

FUEL INJECTION (Fi)

It is a system that injects the fuel directly into the inlet manifold which ensures controlled amount of air fuel mixture in the combustion chamber





BENEFITS OF FUEL INJECTION (Fi)

- ✓ Very effective in controlling pollution
- ✓ No need to change settings to ride at different altitudes
- ✓ Hassle free cold start



ENGINE COOLING SYSTEM

AIR COOLED



It uses oncoming air directly to cool the engine

Eg: Xtreme 160R BSG, Glamour BSG

OIL COOLED



It uses a separate oil cooler to cool the engine oil

Eg: Xpulse 200 BSG, Xtreme 200S

FORCED COOLING



Similar to Air Cooled with attached fan. It allows the engine to cool faster as the fan provides constant air flow

Eg: Destini 125 BSG, Maestro Edge 125 BSG



**DIMENSIONS &
WEIGHTS**



ENGINE



TRANSMISSION



CHASSIS



BRAKES



TYRES



SUSPENSION

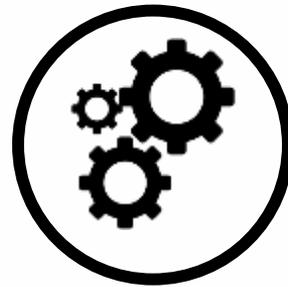


HMCL TECHNOLOGY



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BASIC AUTOMOTIVE TECHNOLOGY



TRANSMISSION (GEARBOX)

TRANSMISSION (GEARBOX)

MANUAL TRANSMISSION (MT)

Transmission assists the engine to deliver power to the wheels.

Motorcycle transmission delivers power to the rear wheel through a series of components which includes clutch, gears and a chain drive.

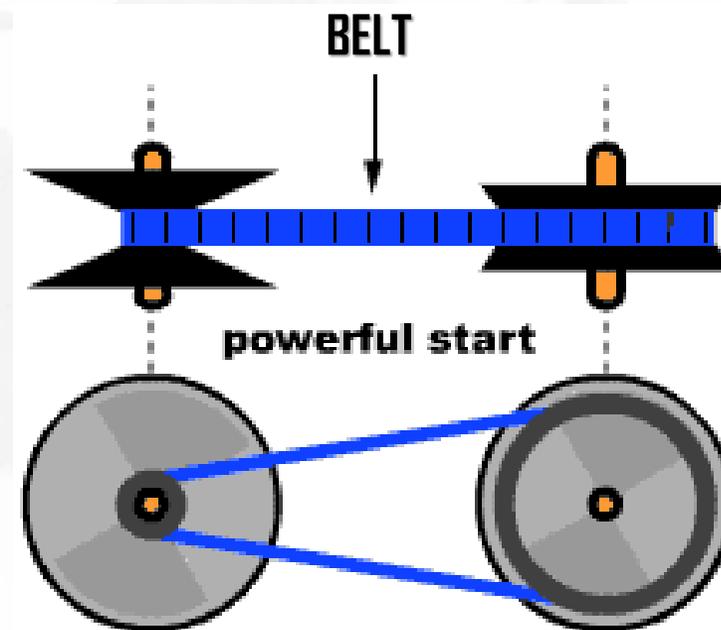
Manual Transmission helps in choosing the required torque at the right time by changing the gears.



CONTINUOUSLY VARIABLE TRANSMISSION (CVT)

WORKING

- CVT is a gearless transmission
- It uses a belt between two conical pulleys
- The speed depends upon the two pulleys which move from lower radius to higher radius (vice versa)



ADVANTAGES

Compact design

Stepless acceleration

Easy city riding

TWO TYPES OF TRANSMISSION IN HERO

MANUAL

AUTOMATIC

FOUR SPEED

FIVE SPEED

CVT



There are 4 gears present that are used to drive the bike



This transmission consists of 5 gears and is an upgrade over 4 speed transmission



It can change speed through a continuous range of effective gear ratios



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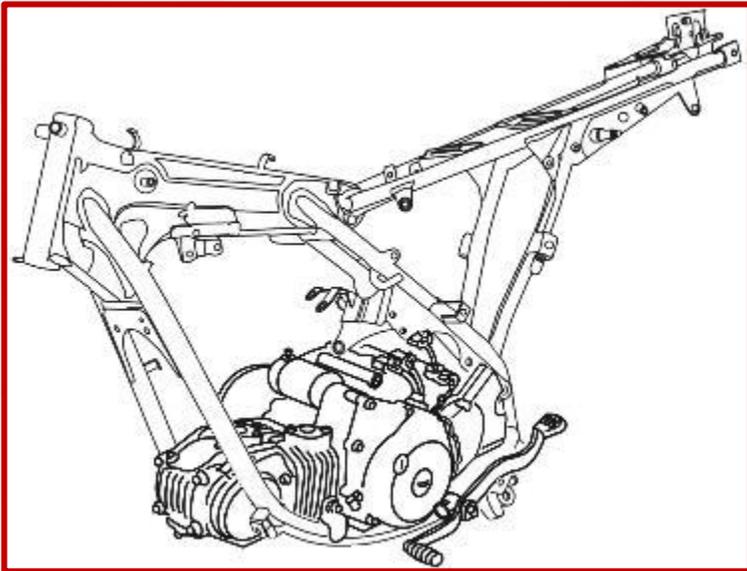


CHASSIS

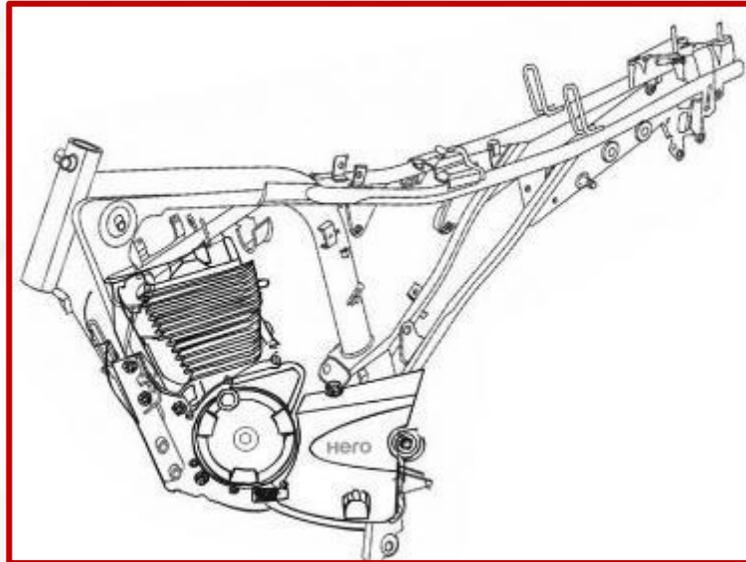
CHASSIS

TYPES OF CHASSIS

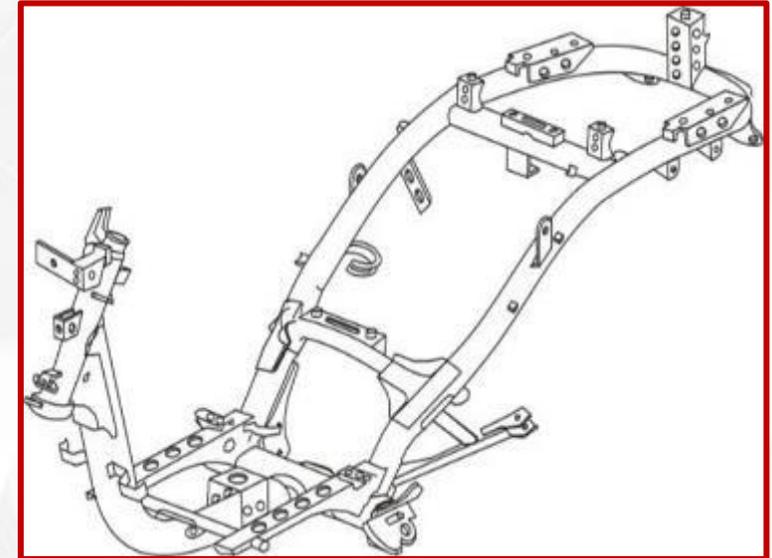
DOUBLE CRADLE FRAME



DIAMOND



UNDERBONE



DOUBLE CRADLE FRAME

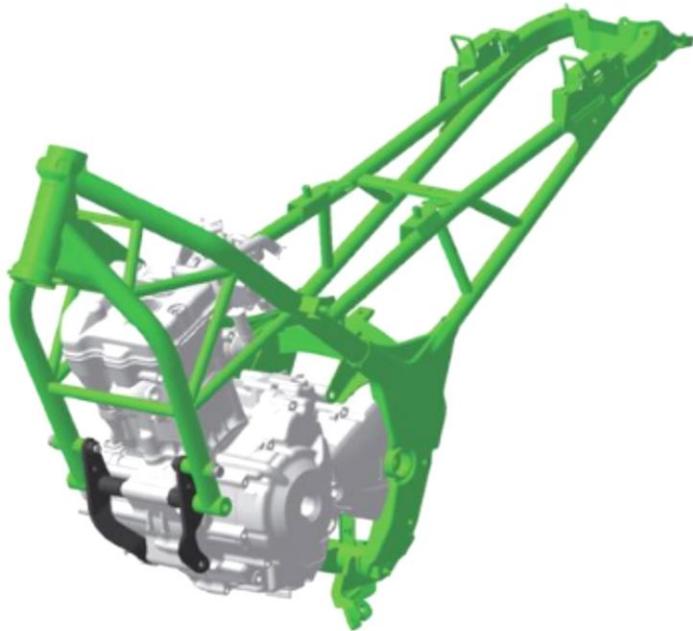


A double-cradle chassis is rigid and strong

They are cost effective to manufacture

Glamour and Super Splendor use double cradle chassis

DIAMOND FRAME



The Diamond Frame of the motorcycle gets its name from its diamond shape

It is lighter in weight and mostly used in racing motorcycles.

Xtreme 160R BSG and Super Splendor BSG use Diamond Frame chassis



UNDERBONE FRAME



These frames have a reinforced member that connects the steering head to the rear section.

These type of frames give space between the handle and the seat.

It is most commonly used in scooters and mopeds

Destini 125 BSG and Pleasure+ BSG use underbone frame chassis

Q1) Which chassis is used in Destini 125 BS6?

- (a) Double Cradle (b) Single Cradle (c) Underbone (d) Diamond Chassis

Q2) Xtreme 160R uses continuously variable transmission ?

- (a) true (b) false

Q3) Super Splendor BS6 is the only bike of hero that has a diamond frame ?

- (a) true (b) false

Q4) Motorcycle transmission delivers power to the rear wheel through _____ ?

- (a) Clutch (b) Gears (c) Chain (d) All of the above

Q5) Xpulse 200 BS6 uses _____ type of Engine.

- (a) Air Cooled (b) Forced Cooled (c) Oil Cooled (d) None of the above

Q6) The only drawback of CVT is that while accelerating it produces some jerks ?

- (a) True (b) False



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BRAKES

BRKVES

BRAKES

Brakes are used for slowing or stopping a moving vehicle, typically by applying pressure to the wheel



TYPES OF BRAKES

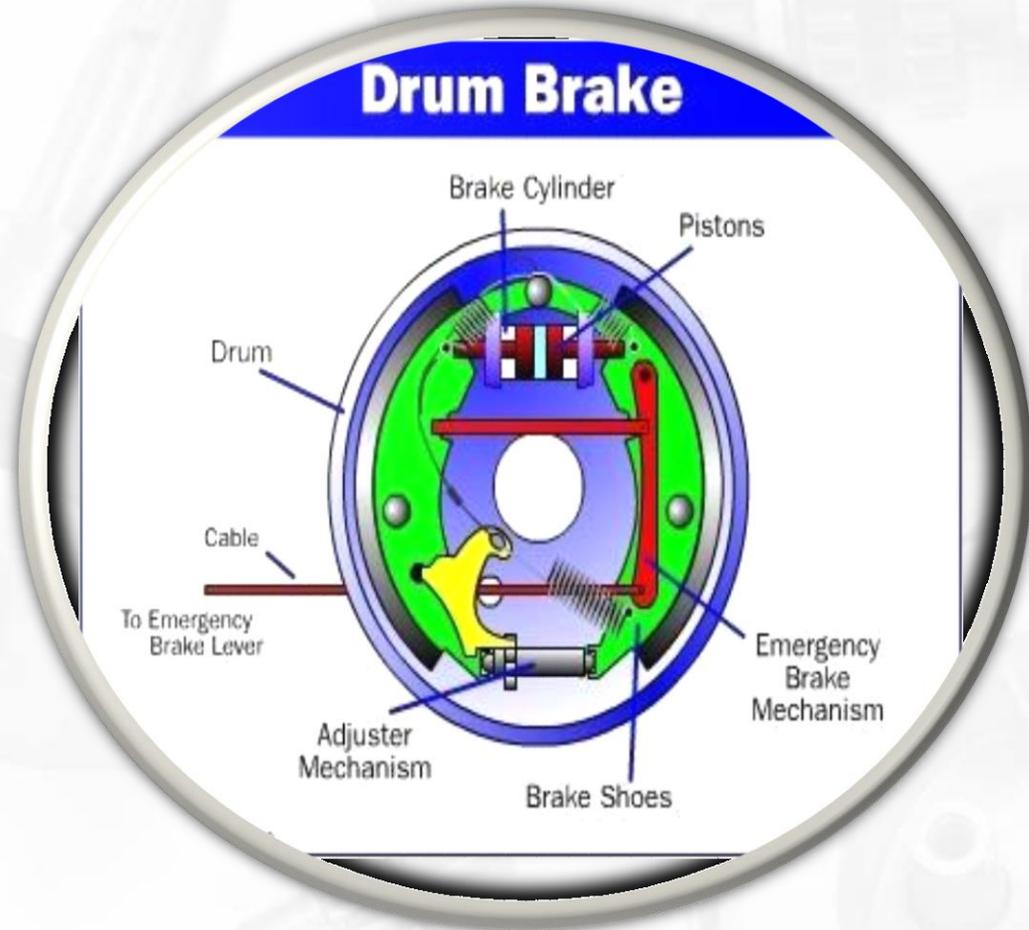
DISC BRAKE



DRUM BRAKE



DRUM BRAKE



It is a type of brake in which brake shoes press against the rotating inner wall of the drum of a wheel.

Drum brakes are cheaper.

Example: Splendor+ BSG and HF Deluxe BSG.

DISC BRAKE



It consists of a disc attached to the wheel which helps the vehicle to slow down by pressing the brake pads against the disc

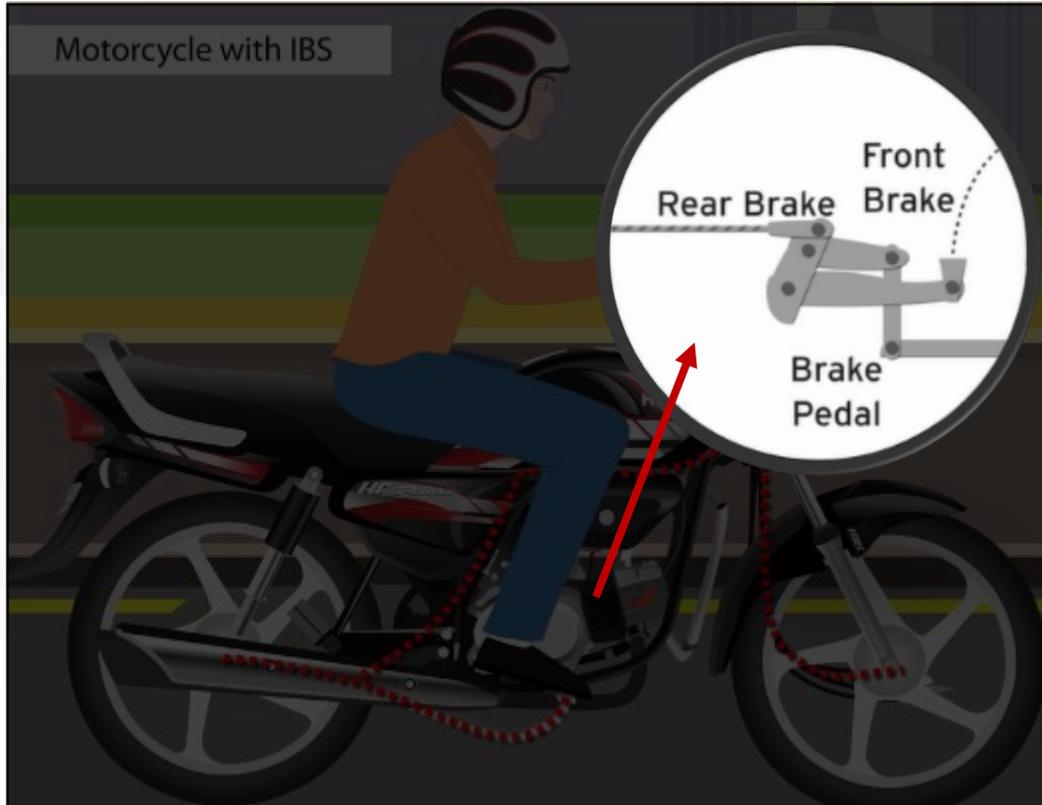
It is an efficient braking system

The life span of disc brake is more as compared to drum

It cools down easily as it is located outside the wheel

Note:- Disc brakes are more efficient than drum brakes, as they deliver more braking power

INTEGRATED BRAKING SYSTEM (IBS)



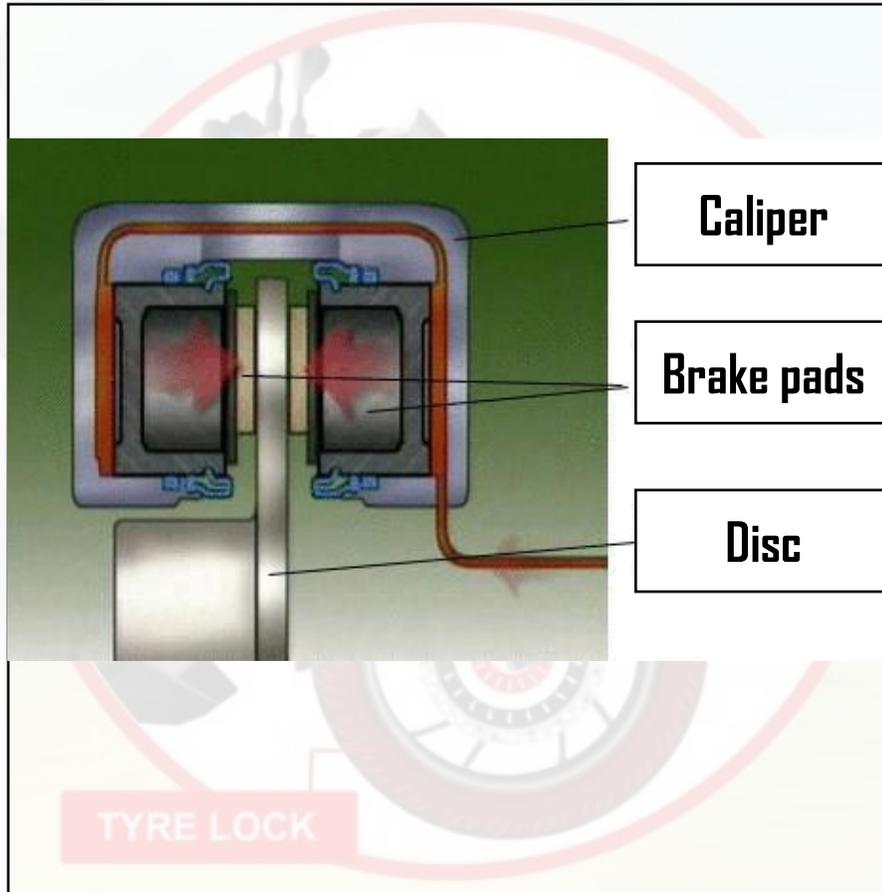
Rear and Front brakes are applied simultaneously, when the rear brake paddle is pressed

This prevents two-wheeler from skidding in case of sudden braking

All Hero Vehicles with engine capacity less than or equal to 125cc.

e.g. Splendor+ BSG, Glamour BSG, Pleasure+ BSG, etc.

ANTI-LOCK BRAKING SYSTEM (ABS)



ABS is a safety system

It prevents the wheels from locking up during sudden braking

ABS operates by continuously engaging and disengaging the brakes

Hence, the vehicle will not skid or slip and the vehicle can be steered to safety

e.g. Xtreme 160R BS6 & Xpulse 200 BS6



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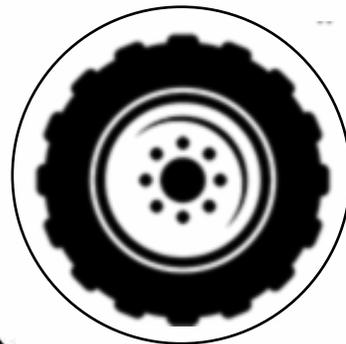


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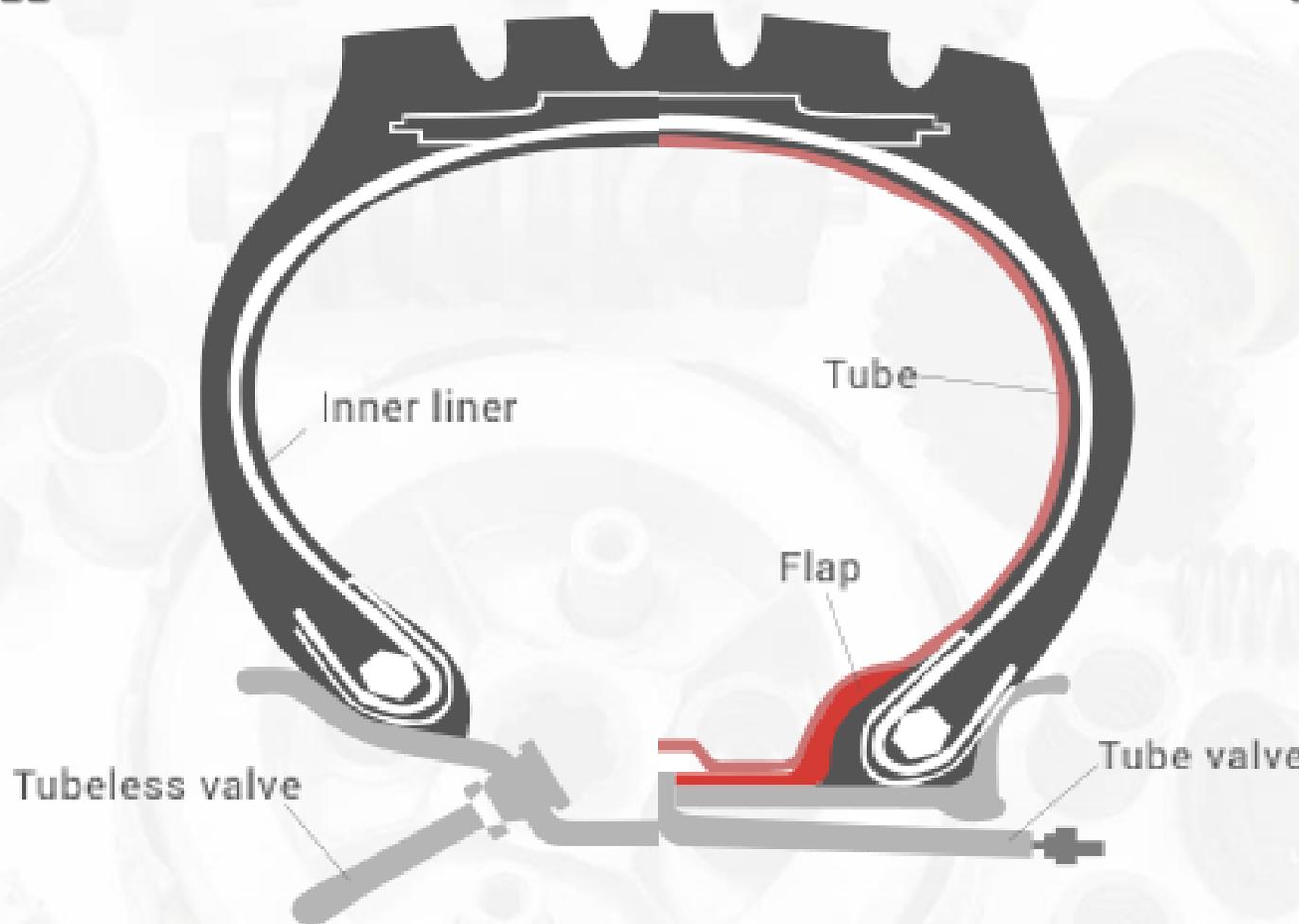
TYRES

LIKE?

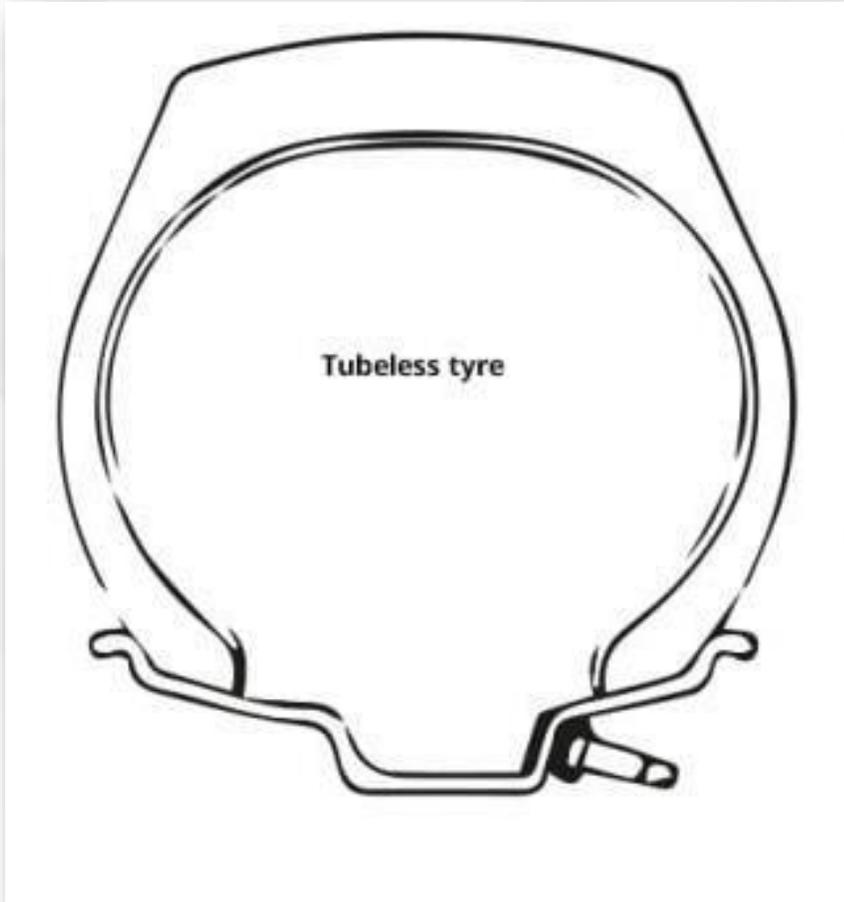
TYPES OF TYRES

TUBELESS

TUBE



TUBELESS TYRES



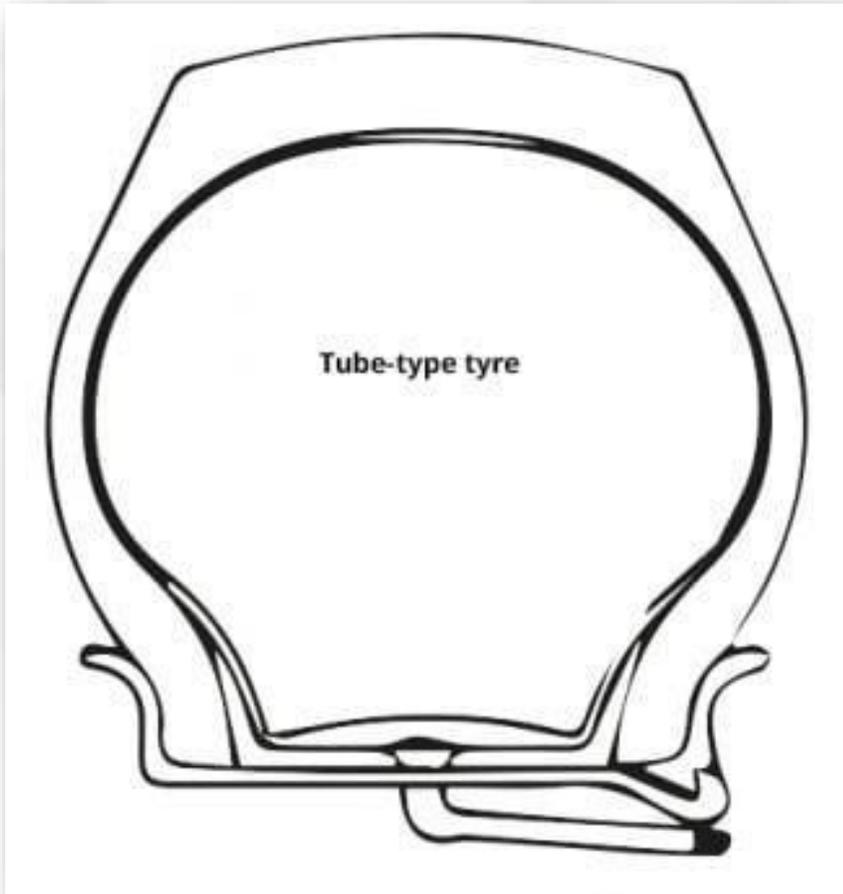
In tubeless tyre, the tyre itself forms an air tight seal with the rim and the valve is directly mounted on the wheel.

In case of a puncture, the air leakage is slower. As air can escape only through the point of puncture; it gives sufficient time to the rider to control the vehicle

Hence, it increases the safety and convenience for the rider

The puncture repairing process of a tubeless tyre is very simple compared to a tyre with tube.

TUBE TYRES



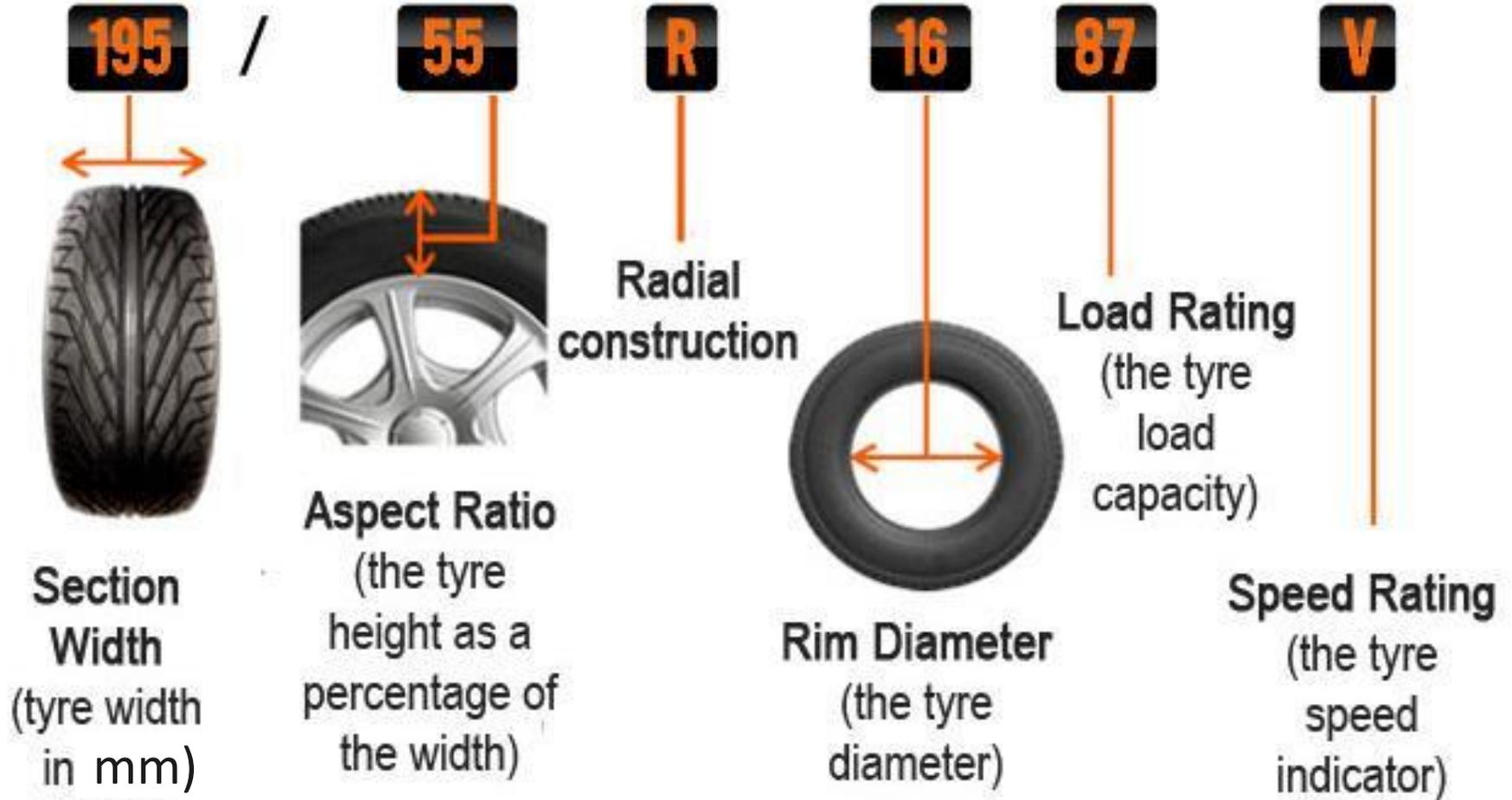
Tyres with tube are a relatively old technology

The tube tyres are the tyres which have a separate inner tube placed inside them.

If tube tyre is punctured, it deflates immediately, and the vehicle may fall while riding

Repair cost of tube tyre is less as compared to tubeless tyre. But, repair time is higher than to tubeless tyre

TYRE NOMENCLATURE



$$\text{Aspect Ratio} = \frac{\text{Section height (H)}}{\text{Tyre width (W)}}$$

Q1) Which of the following have disc brakes ?

- (a) Xtreme 160R BSG (b) Splendor+ BSG (c) Destini 125 BSG (d) HF Deluxe BSG

Q2) Disc brakes are always better than drum brakes?

- (a) true (b) false

Q3) In case of a puncture, tube tyre takes less time to repair as compared to tubeless tyre ?

- (a) True (b) false

Q4) In (195/55 R 16 87 V) what does 'V' stand for ?

- (a) Construction Type (b) Speed Rating (c) Grade Rating (d) Load Rating

Q5) In (195/55 R 16 87 V) what does '16' stand for?

- (a) Tyre Width (b) Tyre Height (c) Rim Diameter (d) Tyre Diameter

Q6) When tubeless tyre is punctured the tyre does not deflated and it will still run for some time?

- (a) true (b) false



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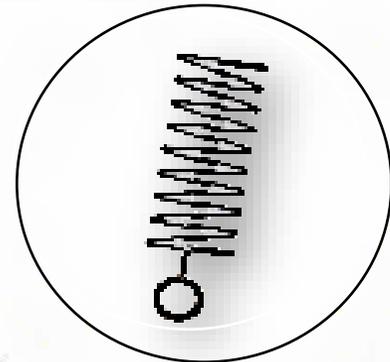


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BASIC AUTOMOTIVE TECHNOLOGY



SUSPENSION

SUSPENSION

Suspension is a system installed in vehicles to reduce the impact of uneven roads and make the ride comfortable



TYPES OF SUSPENSION

FRONT SUSPENSION

REAR SUSPENSION

Telescopic Hydraulic Shock Absorbers

Bottom Link Suspension

Monoshock Suspension

Dual Shock Absorbers



TELESCOPIC HYDRAULIC SHOCK ABSORBERS



Most motorcycles today use telescopic forks for the front suspension

The forks are hydraulic shock absorbers

It reduces the impact of jerks on uneven roads

BOTTOM LINK SUSPENSION



Bottom link spring loaded suspension improves vehicle handling and braking

An example of bottom link suspension is Hero Pleasure

MONOSHOCK SUSPENSION



Better cornering stability

Allows high swingarm travel

Easy to tune and adjust

Better handling and rideability

DUAL-SHOCK ABSORBER



Can support heavier loads

Reduces impact of bumps

Gives a smoother ride on rough terrain

Q1) Hero Xtreme 160R BS6 has bottom link suspension.

- (a) True (b) False

Q2) Bottom link suspension is used in _____.

- (a) Motorcycle Front (b) Motorcycle Rear (c) Scooter Front (d) Scooter Rear

Q3) Which of the following type of suspension can be easily tuned and adjusted?

- (a) Dual-Shock (b) Monoshock (c) Telescopic Forks (d) Bottom Link

Q4) Suspension is a system installed in vehicles to reduce the impact of uneven roads and make the ride comfortable?

- (a) True (b) False

Q5) "Better cornering stability" is a feature of _____?

- (a) Dual-Shock (b) Monoshock (c) Telescopic Forks (d) Bottom Link



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SIDE STAND INDICATOR



Most of the time, people use side stand instead of main stand as it is convenient

Absence of Side Stand Indicator can lead to accident

It warns the rider to remove the side stand and keeps the rider safe

IDLE STOP START SYSTEM (i3s)



More savings



This technology is developed & patented by Hero.

Activates when kept idle for some time

This system automatically switches off the engine while idling

Better Fuel efficiency during heavy traffic & red lights

E.g. Glamour BSG, Super Splendor BSG, Passion Pro BSG, Splendor iSmart BSG, Splendor+ BSG, HF Deluxe BSG, Destini 125 BSG & Maestro Edge 125 BSG.

MOBILE CHARGING PORT



Mobile Charging Port helps to charge the mobile phone on the go

New generation bikes/scooters comes with mobile charging port facility

Service Reminder



Indicator reminds Periodical Maintenance Service

Added convenience as no need to memorize schedule service intervals

AIR FOIL LEG GUARD

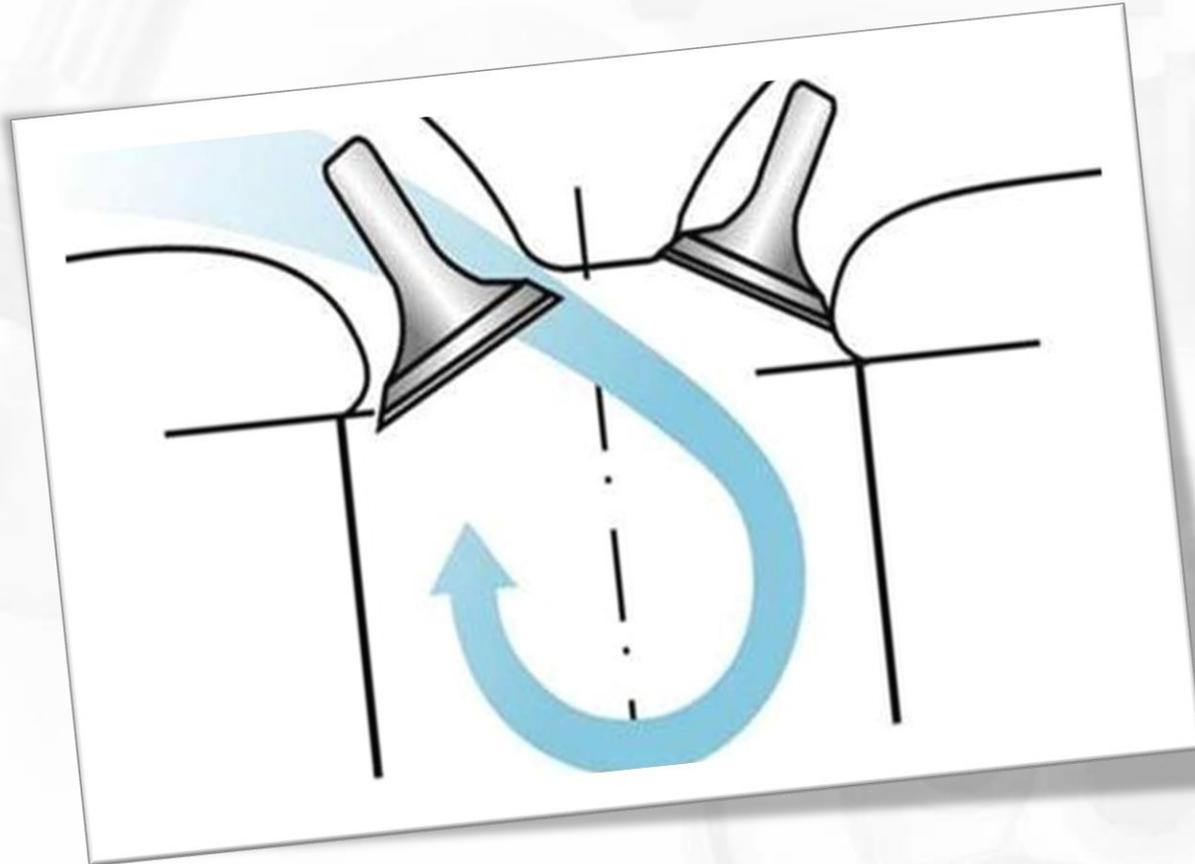


Stylized Airfoils with added safety to the rider

Air foil provides improved aerodynamics

Enhanced fuel efficiency & Stylish looks

ADVANCED TUMBLE FLOW TECHNOLOGY (ATFT)

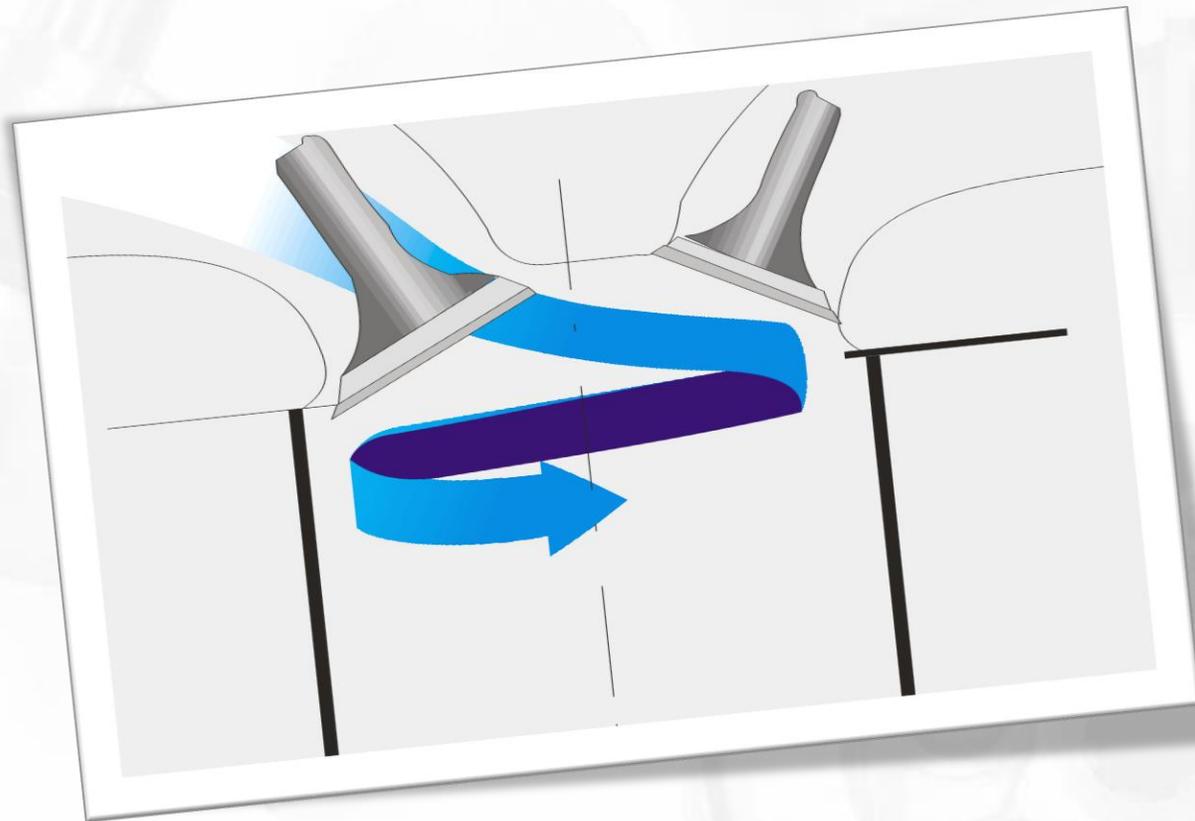


It is a design optimization in the engine, which induces "a tumbling motion" in the air-fuel mixture when it enters the combustion chamber

Vertical mixture turbulence for better combustion

Low fuel consumption, Cleaner exhaust, Improved Drivability

ADVANCED SWIRL FLOW INDUCTION SYSTEM (ASFS)



ASFS allows uniform "air + fuel" mixture to "Swirl" into the combustion chamber in the engine

Uniform combustion of fuel

Better fuel economy

Cleaner emissions

PROGRAMMED FUEL INJECTION (Fi)



Right amount of fuel is sprayed with accurate spark timing ensuring complete combustion

Better combustion and no wastage of un-burnt fuel

Environment friendly, Better ride-ability

ADVANCE PRO-SERIES DIGITAL VARIABLE IGNITION (APDV)



APDV
IGNITION SYSTEM

APDV combines the highest optimal performance levels

Offer better and efficient combustion of fuel

Gives Better Pick-up & Excellent Fuel Efficiency

FULLY TRANSISTORIZED IGNITION SYSTEM (FTIS)



FTIS optimizes the spark timing which helps in cold start of engine by increasing voltage and reducing time in ignition coil.

In addition, it can fire through partially fouled or deteriorated spark plugs.

XSENS TECHNOLOGY



A smart sensor technology that automatically adjusts vehicle performance depending upon riding conditions.

List of sensors:

- Throttle Position Sensor
- Manifold Absolute Pressure Sensor
- Oxygen Sensor
- Crank Position Sensor
- i3s Switch
- Bank Angle Sensor
- Side Stand Sensor
- Side Stand Engine Kill Sensor
- Vehicle Speed Sensor
- Start Switch
- Clutch Switch
- Neutral/ Brake Switch
- Kill Switch
- Engine Oil Temperature Sensor
- Intake Air Temperature Sensor

**Total number of sensors varies as per selected model*



XSENS TECHNOLOGY

A smart sensor technology that automatically adjusts vehicle performance depending upon riding conditions.

<u>Sensors OR Switches</u>	<u>Benefit</u>
Throttle Position Sensor	Precisely controls the change in fuel supply whenever you twist the throttle thus, it Accelerates Quickly.
Manifold Absolute Pressure Sensor	More Safety & Comfortable as it measures atmospheric pressure entering the Engine thus, ensuring optimum Fuel - Air ratio.
Oxygen Sensor	Gives More Mileage as it detects if engine is running on lean or rich air-fuel mixture.
Crank Position Sensor	
i3s Switch	Enhances Convenience as it shuts the motorcycle when idle and restarts it upon a press of the clutch. This helps in better fuel economy.



XSENS TECHNOLOGY

A smart sensor technology that automatically adjusts vehicle performance depending upon riding conditions.

<u>Sensors OR Switches</u>	<u>Benefit</u>
Bank Angle Sensor	Enhances safety as it cuts off fuel supply whenever the bike bends beyond 45 Degree.
Side Stand Sensor	More Safety as it blings the red light on the dashboard of the vehicle when the Side Stand is open.
Side Stand Engine Kill Sensor	Enhances Safety & Convenience as the engine will not start if side stand is open.
Vehicle Speed Sensor	Enhances Safety by Warning when you are riding at overspeed.
Start Switch	Provide convenience for the rider with its Electric Start.



A smart sensor technology that automatically adjusts vehicle performance depending upon riding conditions.

XSENS TECHNOLOGY

<u>Sensors OR Switches</u>	<u>Benefit</u>
Clutch Switch	More Safety as the bike will run at a constant speed at any gear and not stop suddenly.
Neutral/ Brake Switch	More Safety & Convenience as it'll neutral the vehicle when the rider wants.
Kill Switch	Provide convenience to the rider with the help of an electric start.
Engine Oil Temperature Sensor	Enhances trust as it indicates if the temperature of engine oil in a vehicle is just too high.
Intake Air Temperature Sensor	Enhances trust as it monitor's temperature of air entering the engine, providing better start

AUTOSAIL

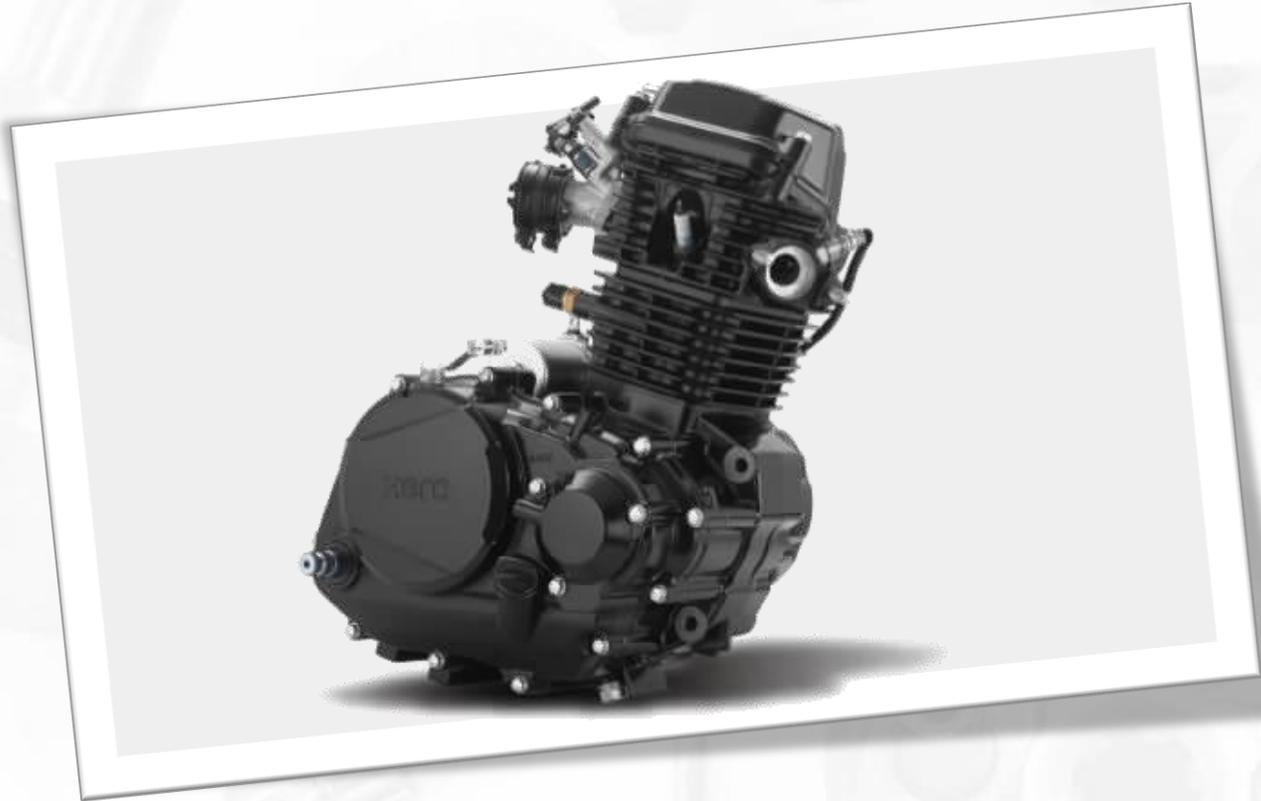
The logo for 'autosail' is displayed within a white rounded rectangle. The word 'auto' is in black lowercase letters, and 'sail' is in red lowercase letters. A blue circuit-like graphic with horizontal lines and a vertical line on the right side is positioned behind the text.

Enhanced convenience by providing smoother ride in city traffic:

- It allows vehicle to continue running in different gears without stalling even if throttle is Zero
- Motorcycle will run simply by releasing the clutch lever
- Minimum vehicle speed at 0% throttle opening in different gears:
 - 1st Gear = 4-6 kmph
 - 2nd Gear = 9-11 kmph
 - 3rd Gear = 14-16 kmph
 - 4th Gear = 18-20 kmph

e.g. All Motorcycles more than or equal to 110cc.

Torque on Demand (TOD) Engine



TOD Engine provides high torque at low & medium rpm.

So, to increase vehicle's speed, you don't need to use clutch & change gear repeatedly.

Enhances Convenience, Better Pick-up & More Mileage

5-Speed Gearbox



5-speed gearbox provide additional 5th gear for rider, which results in:

- **Less vibration while riding on same speed as of 4-speed gearbox**
- **Improved fuel efficiency due to less vibrations of engine**
- **5th gear also increases the top speed of gear box**

e.g. Super Splendor BS6, Glamour BS6, Xtreme 160R BS6, Xtreme 200S & Xpulse 200 BS6

Q1) Which among the following has a monoshock suspension ?

- (a) Destini 125 BSG (b) Splendor+ BSG (c) Xtreme 160R BSG (d) Glamour BSG

Q2) i3s technology is used to warn the driver to remove the side stand ?

- (a) true (b) false

Q3) _____ helps in improving cold starting engine due to faster voltage rise and collapse time in the ignition coil ?

- (a) APDV (b) FTIS (c) CCVI (d) PGM-fi

Q4) Which type of suspension offers better cornering stability ?

- (a) Telescopic Hydraulic (b) Bottom link (c) Monoshock (d) Dual shock absorbers

Q5) i3s technology is patented by which company?

- (a) Honda (b) Yamaha (c) Bajaj (d) Hero

Q6) The full form of ASFS is "automatic swirl flow induction system"?

- (a) true (b) false

Q1) Distance between the center of the front and rear wheel is _____.

- (a) Wheelbase (b) Ground clearance (c) Saddle height (d) None of the above

Q2) A four-stroke engine uses four different strokes of piston to complete two operating cycle ?

- (a) true (b) false

Q3) What are the advantages of having CVT Transmission?

- (a) compact design (b) Stepless Acceleration (c) Both A & B (d) None of the above

Q4) What is the full form of APDV ?

- (a) advanced pro series digital variable ignition (b) automatic pro digitally variable ignition
(c) automatic power digital variation (d) None of the above

Q5) Which type of chassis is used in Super Splendor?

- (a) single cradle (b) double cradle (c) diamond (d) underbone

Q6) What is the full of IBS?

- (a) Interval braking system
- (b) Intense braking system
- (c) Integrated braking system
- (d) Internal braking system

Q7) In (195/55 R 16 87 V) what does '195' stand for?

- (a) Section width
- (b) Section length
- (c) section height
- (d) none of the above

Q8) In Hero bikes _____ prevents the wheel from locking during intense braking.

- (a) IBS
- (b) EBD
- (c) i3S
- (d) ABS

Q9) What does ASFS stands for?

- (a) advanced swirl flow induction system
- (b) advanced swing flow induction system
- (c) automatic swirl flow ignition system
- (d) automatic swirl flow injection system

Q10) _____ is a digital electronic fuel injection system for internal combustion engines ?

- (a) CDI
- (b) Programmed Fi
- (c) CCVI
- (d) ATFT

Thank You