
Bike Mechanism (How Bikes work)

The understanding of the different Bike mechanism is an important aspect for a rider to be more familiar with the bike and get adjusting to the different aspect of the Bike.

Let's look at the different mechanism of a Bike:

1. Working of Engine and Valve:

There are two types of engine commonly used in Motorbikes. They are Two Stroke Engine and Four stroke Engine.

Both the Engines come under the banner of "Internal Combustion (IC) Engine". In the two stroke engine, the working cycle is completed in two strokes of type piston or one revolution of the crankshaft. This is achieved by carrying out the suction and compression processes in one stroke (or more precisely in inward stroke), expansion and exhaust process in the second stroke (or more precisely in outward stroke).

In a four stroke engine, the working cycle is completed in four strokes of the piston or two revolutions of the crankshaft. This is achieved by carrying out suction, compression, expansion and exhaust processes in each stroke. The four stroke Petrol Engine Cycle also known as Otto Cycle requires four strokes of operation in the engine cylinder. The four strokes of a petrol engine sucking fuel-air mixture (petrol mixed with proportionate quantity of air in the carburetor known as charge) are described below.

* Suction or Charge Stroke: In this stroke, the inlet valve opens and pure air is sucked into the cylinder as piston moves downwards from the Top dead centre (TDC). It continues till the piston reaches its Bottom dead centre (BDC).

* Compression Stroke: In this stroke, both the valves are closed and the air is compressed as the piston moves upwards from the BDC to TDC. As a result of compression, pressure and temperature of the air increases considerably. This completes one revolution of the crank shaft.

* Expansion or Working Stroke: Shortly after the piston reaches the TDC (during the compression stroke), fuel oil is injected in the form of very fine spray into the engine cylinder, through the nozzle, known as fuel injection valve. At this moment, temperature of the compressed air is sufficiently high to ignite the fuel. It suddenly increases the pressure and temperature of the products of combustion. The fuel oil continuously injected for a fraction of

the revolution. The fuel oil is assumed to be burnt at constant pressure. Due to increased pressure, the piston is pushed down with a great force. The hot burnt gases expand due to high speed of the piston. During this expansion, some of the heat energy is transformed into mechanical work. It may be noted that during this working stroke, both the valves are closed and the piston moves from TDC to BDC.

* Exhaust Stroke: In this stroke, the exhaust valve is open as the piston moves from BDC to TDC. This movement of the piston pushes out the products of the combustion from the engine cylinder through the exhaust valve into the atmosphere. This completes the cycle and the engine cylinder is ready to suck the fresh air again.

It will be interesting to know that from the thermodynamic point of view, there is no difference between two-stroke and four-stroke cycle engine. The difference is purely mechanical.

Today all the major IC Engines of the world are running on the four stroke cycle.

2. The Transmission:

The engine converts the explosive energy to mechanical energy, through the reciprocating motion to rotary motion. The power developed from rotary motion is controlled by various systems in a bike. This system is known as the Transmission. The Transmission consists of the clutch, gear-box & final-drive chain all the way upto the driving wheel.

The clutch is a very important "Link" in the transmission of the bike. Its primary use is to allow the rider to engage and disengage the engine from the wheels. It also takes up most of the load and vibrations from the engine and does not allow it to pass onto the rest of the transmission.

After the clutch comes the gear-box. As the name suggests, a box having set of gears. It allows the rider to use the optimum amount of power from the engine as and how required. The main function of the gear-box is to reduce strain on the engine by supplying efficient power at required time. For Instance, the first gear is lowest and most sensitive gear, which helps in moving of a stationary bike without putting excessive load on the engine. On the other hand use of second gear requires relatively more acceleration and gives more strain on the engine and clutch. A lower gear serves two purposes. They serve as brake and also improve acceleration when required. For instance, while going downhill on a lower gear provides "Braking Power" and during uphill provides extra power.

The power transmission is by means of two chains. The primary chain is enclosed in the clutch case on the L.H.S. of the bike and runs in an oil-bath. The final or drive chain connects the gear-box to the drive-sprocket of the rear wheel. The drive-sprocket is coupled with the brake drum, which in turn is fit into the rear hub. There are 4 rubber blocks fitted between the drive-sprocket/brake-drum and the hub of the rear wheel, which act as efficient dampers, absorbing practically all the shocks of power and transmission units and have a very favorable influence on the life of chain as well as vital engine parts.

3. The Electricals:

The main components of an electrical system in the bike are the Battery, Alternator/Dynamo/ Generator/Magneto and Ignition/High-Tension Coil(s). The main function of the system is to provide ignition in the form of a spark to the compressed air+fuel mixture in the cylinder. A battery provides either 6 volts or 12 volts current. But a voltage thousands times higher is needed to create a spark from the spark plug, which can ignite the air+fuel mixture. It's the high tension coil (Ignition coil) which boosts low voltage current of the battery and provides upto 30,000 volts to the spark plug. A small spark is generated at the distributor, which is converted to a high voltage current, which flows to the spark plug and finally ignites the air+fuel mixture. A contact breaker and rotor, inside the distributor, ensure correct sequence of current to the plug while a condenser attached to the contact breaker serves as a capacitor that minimizes the damage to the contact breaker. Another part, which is at the heart of the electrical system is the Alternator/Dynamo/Generator/ Magneto. This provides a charge to the battery by generating a current. As the generator output increases with the engine speed a control unit (Cut-out/Regulator) is provided to regulate the output. This unit prevents the damage to the generator unit and protects the battery from over charging/discharging. The stored energy of battery is used for different purposes such as: ignition, horn, lights etc....

To retain the standard energy of the battery it needs periodical maintenance like check up of specific gravity, cleaning of terminals, applying a thin film of petroleum jelly or pure Vaseline (not grease) to keep terminals and connections from corrosion and sulphation etc...

4. Brakes:

There are two different types of brakes used in bikes, namely: Drum Brakes & Disk Brakes. The Drum Brake has an aluminum/steel/iron drum to which the wheel is attached. The drum and wheel rotate together. The brake shoe plate is bolted on to the chassis and inside the drum lie the brake shoes,

which have brake liners on them. The brake liners are either riveted or moulded onto the brake shoes.

When the brake pedal is depressed, a cam (placed between the brake shoes) rotates such that the brake shoes move towards the drum. When the brake shoes grip the rotating drum, the rotating wheel locks/stops.

The Disk Brake has a metal disk instead of a drum fitted to the wheel and the calipers are bolted on to the chassis/shock-absorber pipe. The calipers have pistons and brake pads. The disk brake has to be operated hydraulically. The brake fluid and the actuating cylinder (brake-oil sump) are fitted on the handle bar of the bike. When the brake lever is pressed a non return brake valve operates and sends the brake fluids to the caliper and the piston, the caliper operates thereby forcing the brake pads to move towards the disk and produce the friction which allows you to slow down or stop.

The usual arrangement on a good bike is front disk brake and rear drum brake.

5. Suspension System:

The Front suspension consists of a telescopic fork with hydraulic dampers. It is the straight slider type with two cylindrical coil springs. Steel cover tubes protect the suspension elements. The rear suspension operates on a circular path. The pivoted rear swing arm is sprung by two cylindrical coil springs and fitted with hydraulic dampers. The suspension dampers are protected by chromium plated steel covers.

6. The Wheels and Tyres:

The Tyres have two functions. First, they are air-filled cushions that absorb most of the shocks caused by riding on bad roads. Therefore they reduce the effect of the shocks. Second, the tyres grip the road to provide good traction; Good traction enables the bike to accelerate, brake and make turns without skidding. There are two types of tyres available, the inner tube type and the tubeless type.

In the inner tube type tyre, both the tube and tyre are mounted on the rim. The tube is like a hollow rubber doughnut. It is inflated with air after it is installed inside the tyre and the tyre is put on the wheel rim. The inflation causes the tyre to resist any change of shape.

The tubeless type tyre does not have an inner tube. Instead, the tubeless

tire is directly mounted on the wheel rim so that the air is retained between the rim and the tyre.

DTSSI Technology

DTS-Si' (Digital Twin Spark-Swirl induction) technology. The new engine with swirl induction is expected to give an amazing mileage of 109 km per liter under ideal (standard) test conditions, which is higher than the mileage the current 100cc motorcycles offer.

Bajaj Auto and Hero Honda have been trading punches for the last few months. Not literally, of course, but more on a figurative sense, contesting whether the demand for bikes in the 100cc segment is declining and whether the 100cc+ segment, including the 125cc category, will be the new choice for entry-level bike buyers.

Hero Honda thinks that the 100cc segment is not headed southward and Bajaj opines that the segment will stagnate and eventually decline since bike buyers will graduate to the bigger-engined category just above the entry-level.

But with a 100cc bike in its portfolio, Bajaj's proclamation that it will exit the current entry-level segment was rather bold and must have been backed by a breakthrough that it must have managed and which it is focusing on for its future bikes. That in-house technological research and development effort that was being widely speculated about was finally unveiled late last week.

Based on DTS-Si technology, the new engine is expected to give good mileage without compromising on performance.
The technology

In a conventional single-spark-plug-equipped combustion chamber, the rate of combustion is relatively slow. The spark plug, usually situated at one end of the combustion chamber, ignites the air-fuel mixture and the ensuing flame spreads like a slowly inflating balloon. There is an inevitable delay for this inflating balloon to reach the furthest part of the combustion chamber. So, there are pockets of poor combustion within the chamber and, overall, the combustion is slow and inefficient.

The Digital Twin Spark-ignition (DTS-i) technology that Bajaj developed a few years ago and has incorporated in many of its current engines, takes care of the slow rate of combustion in a simple but novel way. The cylinder head is equipped with two spark plugs, instead of the usual one. By

generating two sparks at either ends of the combustion chamber, (approximately 90° to the valve axis) the air-fuel mixture gets ignited in a way that creates two flame fronts and, therefore, a reduction in flame travel of the order of 40 per cent is achieved. A fast rate of combustion is achieved leading to faster rise in pressure. The obvious outcome of this is more torque, better fuel efficiency and lower emissions.

While that sounds logical and simplistic, TVS Motor claims that the same effect is achieved by employing a single spark plug with differential sparking cycles.

Swirl induction

The DTS- i is the mother technology for the latest Digital Twin Spark–Swirl induction or DTS-Si technology.

Thanks to DTS-i, a fast rate of combustion and, therefore, the resulting fast rate of pressure rise, is harnessed by optimally positioning this pressure. Bajaj R&D observed that when burning lean air-fuel mixtures, the two plugs provide rapid combustion, but at light loads, opportunity exists to further improve the combustion quality. Usually under such conditions, the quality and concentration of the air-fuel mixture will vary from one area to another within the combustion chamber. However, combustion efficiency in lean air-fuel mixture conditions can be further improved by generating high turbulence in the combustion chamber.

Bajaj R&D says that combustion chambers having low turbulence give rise to propagation of a flame front, which is akin to that of a gradually expanding balloon. This results in a slower rate of combustion and thus slower rate of pressure rise. The end result is lower efficiency.

When high turbulence is generated and combustion takes place, the surface of the ballooning flame front fragments itself, with projection like fingers, and this increases its surface area, thereby improving combustion further.

Bike Maintenance

The bike should be maintained and serviced thoroughly to keep it in a good running condition as you would want it to be. Here are some maintenance tips that will help you prolong the life of your Dear Bike.

1. Tyres: Regularly check the tyre condition and air pressure. Optimum air pressure in the tyres of the bike is important for maximum road grip, stability, riding comfort and longevity of the tyres. Properly inflated tyres give you the best combination of handling, tread life, and riding comfort. Generally, the under-inflated tyres wear out unevenly and greatly affect the handling and even get heated up fast. Under inflated tyre can also cause wheel damage. When checking the tyre air pressure make sure to examine tyre treads & sidewalls for wear, damage & foreign objects.

Some tyres are unidirectional. That means they need to be fitted in a particular direction only. Whenever the tyre is removed and put back in case of puncture you must ensure that the arrow mark on the tyre is in the same direction as that of forward rotation of the wheel.

2. Engine Oil : The Engine oil in your bike plays an important part in preserving smooth running of the bike. Maintain a correct engine oil level is very necessary. Engine oil increases the life of the engine to a great extent and minimizes the blow by gases by sealing the clearances within engine and improves the engine's power.

In order to check the level of the engine oil, the vehicle should be on main stand. Check the engine oil level using the dipstick or it can be viewed from outside if a looking glass is provided. The engine oil level should be maintained between the upper and the lower level marks of the dipstick. In case it is needed, top up the engine oil up to the upper level on the dipstick. Replace the engine oil if it is due for replacement

3. Throttle : In the throttle maintenance part inspect the cables. Check for smooth rotation of the throttle grip from the fully open to the fully closed position. Check at full left and full left and full right steering positions. Inspect the condition of the throttle cable from the throttle grip down to the carburetor. If the cable is kinked, chafed or improperly routed, it should be replaced or rerouted. Standard throttle grip free play is approximately 2-6 mm of grip rotation.

4. Drive Chain : Check the Drive Chain condition for slackness. If it's slack then tighten it and lubricate if necessary. The service life of the drive chain is dependent upon proper lubrication and adjustment. Poor maintenance can cause premature wear or damage to the drive chain and sprockets. The drive chain should be checked and lubricated as part of the pre-ride inspection under severe usage, or when the motorcycle is ridden in unusually dusty areas, more frequent maintenance will be necessary. Regular adjustment and lubrication as per the maintenance schedule would ensure high performance and longer life.

5. Battery Maintenance : Your motorcycle battery needs periodical maintenance to ensure a long and trouble free life. You should check the electrolyte level against the top and bottom markings on the battery shell. Always top up with distilled water whenever required. Also check for any leakage from battery. It should be clean and free from any leakages. In case of non use of motorcycle, battery should be kept fully charged and electrolyte level should be at Top mark.

6. Front & Rear Brakes : This should be the very first thing that one have to check when starting a bike. See to that, when the brake is applied, an arrow, fixed to the brake arm, moves toward a reference mark on the brake panel, if the arrow aligns with the reference mark on full application of the brake, the brake shoes must be replaced. Brake pad wear depends upon the severity of usage, the type of riding and road conditions. Generally, the pads will wear faster on wet and dirty roads. Inspect the pads at each regular maintenance interval.