Optimizing Fuel Consumption
In a fast evolving society, a reliable means of land transport is deemed a necessity. We, however, should bear in mind that with a constantly growing fleet of vehicles on our roads, fossil fuel consumption is also on the increase with more than 37% of energy consumed in the land transport sector, while our fuel import bill for this sector has reached Rs 9 billion.

This situation calls for attention, since we are all in a position to contribute positively in reducing energy consumption in this sector through simple changes in our habits.
Eco-driving is a term used to describe the efficient use of vehicles aimed at reducing fuel consumption; in other words, travelling the same distance to meet our needs can be done using less fuel.

Eco-driving involves a smart combination of smooth and safe driving style at low engine revolutions (< 3000 rpm) and low vehicle speed.

Through the application of eco-driving tips, drivers may reduce their fuel consumption by 10–15 %.

**Principles of Eco-Driving**

- **Reduce variations in speed** is an essential means to reduce fuel wastage. Indeed, sudden and repetitive acceleration and braking before reaching a traffic light, before intersections or in situations of heavy traffic flow are such practices that directly increase our fuel consumption while worsening degradation of the vehicle’s mechanical parts (brakes, tires, gearbox).

- **Drive smoothly, using the highest possible gear to maintain low rpm (revolutions per minute).** When accelerating, shift to a higher gear as soon as possible, which will lower the engine rpm, if possible before reaching 3000 rpm on your dashboard indicator (tachometer).

- **Avoid hard accelerations** as it drastically increases fuel consumption and bear in mind that the most fuel use occurs when you press the accelerator pedal, not so much during cruising.

- Verify weekly that the tyres are properly inflated as per the manufacturer’s recommendations. Under-inflated tyres create more rolling resistance and lead to increased fuel consumption. It also represents a safety risk.
Principles of Eco-Driving

Make use of the kinetic energy of your vehicle

While driving, the vehicle naturally builds momentum; this kinetic energy can be used to improve fuel efficiency by letting the car roll and driving at a steady speed whenever possible instead of braking and subsequently accelerating.

However, this should not be confused with coasting. Not only does this practice introduce a safety risk in making the car more prone to loss of control, it also allows fuel to flow to the engine in the neutral gear, despite common belief.

On the other hand, most modern cars are equipped with electronically-controlled engines (i.e. vehicles with electronic injection), which will not use any fuel when going downhill with the transmission engaged.

Maintaining a safe distance from the vehicle in front of you so that you can make maximum use of the vehicle’s momentum also allows you to regulate your speed when necessary without having to use the accelerator and brakes frequently.
Avoid using the air conditioner as much as possible

The air conditioner system uses energy from fuel to operate. By avoiding the use of your car air conditioner when waiting in your vehicle, you can reduce your fuel consumption drastically. You can prefer to park your vehicle in a parking space in the shade or you may get out of the vehicle and wait in a sheltered and ventilated location.

Another common practice that wastes fuel significantly involves turning on the air conditioner to its maximum level as soon as you get in a car which has been parked in the sun. You should rather consider lowering the windows for a few minutes to ventilate the car before switching on the air conditioner on an intermediate temperature setting.

You may also avoid the use of the air conditioner altogether when driving at a speed lower than 70km/h; lowering the windows instead can also spare fuel. Above 70km/h, however, it is preferable to raise the windows and turn on the fan or the air conditioner as required. At such speeds, the wind which enters the car exerts resistance on the vehicle, thereby requiring more energy.

Eliminate idling

Letting your engine run on idle is a common form of energy wastage, as fuel is being burnt while the vehicle is not running. You should rather start your car once you are done preparing yourself (fasten your seatbelt, adjust the rear view mirrors, etc…). Avoid warming up the engine for over a prolonged period. Idling wastes fuel and causes more wear and tear to the engine. The engine warms up quicker when you are moving.

If your vehicle has the idle start-stop feature, keep it activated. If your vehicle does not have this feature, shut off the engine if you are idling for more 20 seconds and you expect the idling to be maintained based on the traffic flow or traffic lights.

Optimise your car usage

Planning journeys and combining trips may help save on travel time and fuel consumption.

To achieve optimal use of your vehicle, you may prefer avoiding peak traffic hours, roads with work in progress and congested roads as far as possible.

Consider walking or cycling if you have to travel a short distance. Not only is it better for your own health, this will also reduce your fuel consumption and lengthen your vehicle's engine lifespan; the engine does not reach its optimum operating temperature on short trips, increasing wear and tear.

Taking the bus, metro or opting for car pooling instead of driving alone will help you save on your fuel bill.

Instead of driving to a location to attend a meeting, consider video conferencing as a viable means to optimise time and car use.
Factors to consider when purchasing a vehicle

Generally, the higher the engine capacity in cc, the higher the fuel consumption will be. Choose a car with an engine capacity taking into consideration lifetime cost of ownership (i.e. fuel cost, maintenance cost and other cost components that are recurrent over time compared to the vehicle’s expected lifespan). Thus, options to save costs include the choice of a model with an intermediate capacity engine or a more compact car altogether.

Favour vehicles which are more fuel efficient. Higher km/L or lower L/100 km indicate a more efficient vehicle. These figures are commonly available from manufacturers’ manuals or website or may be requested from the selling entities.
Adopt new technologies for fuel efficient driving

Consider new technology options such as electric hybrids, plug-in hybrid electric vehicles (PHEVs), and full electric vehicles.

Internal Combustion Engines Vehicles (ICEV)

As the name suggests, fuel such as gasoline, diesel, liquefied natural gas, liquefied petroleum gas or ethanol is burnt in this type of engine to generate power to move the vehicle using pistons and valves.

While ICE vehicles are still the most widely commercialized type locally, the average efficiency of such vehicles is less than 30%. This means that only 30% of the energy from the fuel consumed is converted to mechanical energy or movement; the other 70% goes to the atmosphere as heat and as friction in the vehicle’s mechanical parts.

Furthermore, it should be noted that most modern vehicles are fitted with a catalytic converter, since the engine emits exhaust gases made up of mainly carbon dioxide.

The catalytic converter converts carbon monoxide to carbon dioxide and nitrous oxides to nitrogen. From an environmental perspective, nitrous oxides are a key contributor to acid rain while carbon dioxide leads to global warming.

Hybrid Electric Vehicles (HEV)

Hybrid Electric Vehicles (HEVs) are powered by both an internal combustion engine and an electric motor, which uses energy stored in batteries. Modern hybrid vehicle usually start and run at low speeds using the electric motor. When more power is needed, the ICE engine kicks in and only then fuel is actually consumed.

The interesting aspect of HEVs is that they allow for recovery of energy when in motion. Kinetic energy (for a moving vehicle) which would have been lost as heat is instead used to recharge the internal battery through a process called regenerative braking. In this process, the deceleration feeds a system that converts movement to electricity, which is fed back to the batteries.

Furthermore, it is worth noting that an electric motor is much more efficient than an ICE and provides maximum torque at start thus making it better suited for stop and go traffic. Moreover, the electric motor can supplement the internal combustion engine during heavy acceleration and thus allow for the use of a smaller internal combustion engine. The battery is also used to drive the air conditioner and other electrical systems and thus reduce engine idling when the vehicle is stopped. Together, these features result in better fuel economy without sacrificing performance.

Full hybrids

Full (or Strong) hybrids have large batteries and powerful electric motors, which can power the vehicle for short distances and at low speeds without the need of the ICE. These vehicles cost more than mild hybrids due to the higher capacity battery, larger electric motor and more rugged drive train but provide better fuel economy benefits.

Mild hybrids

Mild hybrids also use a battery and electric motor. However, as compared to a full hybrid the electric motor, a mild hybrid cannot power the vehicle without the ICE. The electric motor in a mild hybrid serves only to assist the ICE and helps the ICE restart with improved efficiency. Thus the mild hybrid system helps saves fuel by shutting off the ICE when the vehicle is idling, braking or cruising. These vehicles generally cost less than full hybrids but provide less fuel economy benefit than full hybrids.
Plug-in Hybrid Electric Vehicles (PHEV)

A plug-in hybrid electric vehicle as the name suggests, can be plugged in to main supply to charge its internal electric batteries whereas a hybrid electric vehicle cannot be plugged in to charge the battery.

Plug-in hybrid vehicles take the use of electric motors in general purpose cars a step further. It provides added flexibility with regard to the energy source where an external source of electricity may be used to charge the batteries and thus allow the user to forego the use of fuel as needed. PHEV thus allows for the use of electricity from renewable energy sources to power the vehicle which is not possible for a HEV.

It basically moves the full hybrid concept closer to that of a full-electric vehicle through the use of larger capacity on-board batteries and thereby provides much better electric-only range than may be expected from a full hybrid.

The fuel consumption of PHEVs depends on the distance driven between battery charging intervals. For example, if the vehicle is never plugged in to charge, fuel economy will be about the same as a similarly sized hybrid electric vehicle. If the vehicle is driven a shorter distance than its all-electric range and plugged in to charge between trips, it may be possible to use only electric power.

HEV and PHEV vehicles are highly suitable for traffic situations where a lot of stop and go is encountered.

Electric Vehicles (EV)

All-electric vehicles (EVs) have an electric motor instead of an internal combustion engine. The vehicle uses a large traction battery pack to power the electric motor and must be plugged in to a charging station or wall outlet to charge. Because it runs on electricity, the vehicle emits no exhaust from a tailpipe and does not contain the typical liquid fuel components, such as a fuel pump, fuel line, or fuel tank.

It should be borne in mind that while the vehicle itself does not emit any exhaust gas it needs to be charged from mains supply. If the vehicle is charged from mains supply which uses electricity generated by power plants using fossil fuels such as coal and fuel oil, the electric vehicle will most probably lead to the same level of pollution as a conventional car.

The main limitation of electric vehicles is the distance that they can cover on one full charge. Manufacturers, however, are improving the performance of their vehicles in this field.

Charging time is also another consideration as fast chargers may not be widely available. Normal charging takes around 5-8 hours. Low availability of charging points and the use of proprietary charging plug formats by each vehicle manufacturer are also constraints that should be considered about EVs.

EVs are however much quieter, and therefore provide a more comfortable and relaxing driving experience. EVs have instant torque and often have a direct-drive mechanism, which means that the required amount of power is delivered in an efficient manner while mitigating mechanical losses. This also means that you’ll get an instant response from the car as soon as you hit the accelerator, making these vehicles ideal for city driving.

Batteries used in full hybrid, plug-in hybrid or electric cars are guaranteed by major vehicle manufacturers to last for 8-10 years or 150 000 km whichever comes first.

Reliability of batteries
Ministry of Energy and Public Utilities

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