



SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35.



- Accredited by NBA – AICTE and Accredited by NAAC – UGC with ‘A++’ Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai.

DEPARTMENT OF AUTOMOBILE ENGINEERING

COURSE NAME : 19MCE402 – AUTOTRONICS

IV YEAR / VII SEMESTER

Unit 4 – Engine Management System



ENGINE MANAGEMENT SYSTEM





- An Engine Management System (EMS), also known as an Engine Control Unit (ECU) or Engine Control Module (ECM), is a crucial component in modern internal combustion engines. Its primary function is to monitor and manage various aspects of the engine's operation to ensure optimal performance, fuel efficiency, and emissions control.
- key functions and components
- **Sensors:** The EMS relies on a network of sensors to gather data about the engine's operating conditions.



- **Mass Airflow Sensor (MAF):** Measures the mass of air entering the engine.
- **Throttle Position Sensor (TPS):** Monitors the position of the throttle valve.
- **Engine Coolant Temperature Sensor (ECT):** Measures the temperature of the engine coolant.
- **Oxygen Sensors (O2 Sensors):** Monitor the oxygen content in the exhaust gases to help optimize the air-fuel mixture.
- **Crankshaft Position Sensor (CKP):** Detects the position and speed of the crankshaft.
- **Camshaft Position Sensor (CMP):** Monitors the position and speed of the camshaft.



- **Actuators:** The EMS controls various actuators to adjust engine parameters based on the sensor data. These actuators include:
- **Fuel Injectors:** Dispense the precise amount of fuel into the combustion chambers.
- **Ignition Coils:** Control the timing and intensity of spark in the spark plugs.
- **Throttle Actuator:** Adjusts the position of the throttle valve.
- **EGR Valve (Exhaust Gas Recirculation):** Regulates the flow of exhaust gas into the intake manifold to reduce emissions.
- **Variable Valve Timing (VVT) Actuators:** Adjust the timing of the opening and closing of the engine's intake and exhaust valves.



- **Engine Control Strategies:** The EMS uses pre-programmed algorithms and control strategies to optimize engine performance under various conditions. These strategies take into account factors such as throttle position, engine speed, load, and temperature to determine the appropriate air-fuel mixture, ignition timing, and other parameters.
- **Diagnostic and Error Handling:** Engine management systems are equipped with diagnostic capabilities to monitor the health of the engine and emissions control systems. If a fault is detected, the EMS may trigger a warning light on the dashboard (check engine light) and store diagnostic trouble codes (DTCs) that can be retrieved using diagnostic tools.



- **Adaptive Learning:** Some modern EMS systems incorporate adaptive learning algorithms. They can adjust parameters over time based on the engine's performance and wear characteristics.
- **Communication Interface:** Many engine management systems are designed to communicate with other onboard control systems, such as the transmission control module, anti-lock braking system (ABS), and vehicle stability control systems.

Overall, the engine management system plays a crucial role in optimizing engine performance, fuel efficiency, and emissions control in modern vehicles.

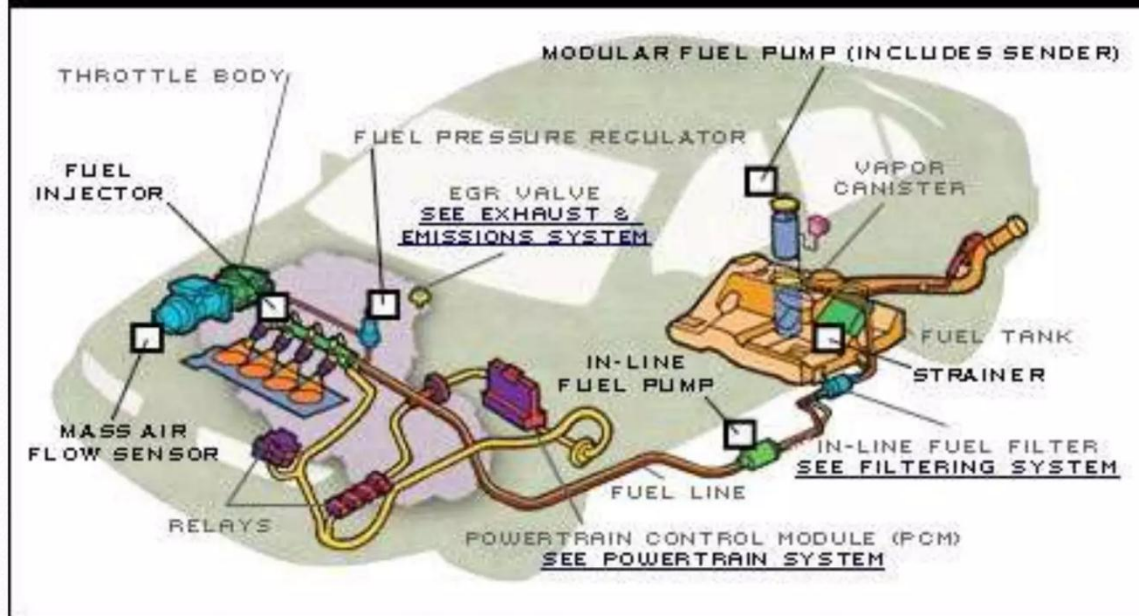


INTRODUCTION

- ❖ EMS is a type of electronic control unit that controls the running of an engine by monitoring the engine speed and ensure optimal engine performance .
- ❖ It also measures the exact quantity of fuel required to start a engine.



FUEL & ENGINE MANAGEMENT SYSTEM



Resource : <http://www.economymufflerandbrake.com/>



Key Points of EMS

- Electronic Fuel Injection System
- Air Induction System/Control
- Fuel Delivery System/Control
- Electronic Control System
- Electronic control unit
- Fuel Injector sequential
- Air flow sensor
- Air temperature sensor
- Throttle Position sensor (TPS)

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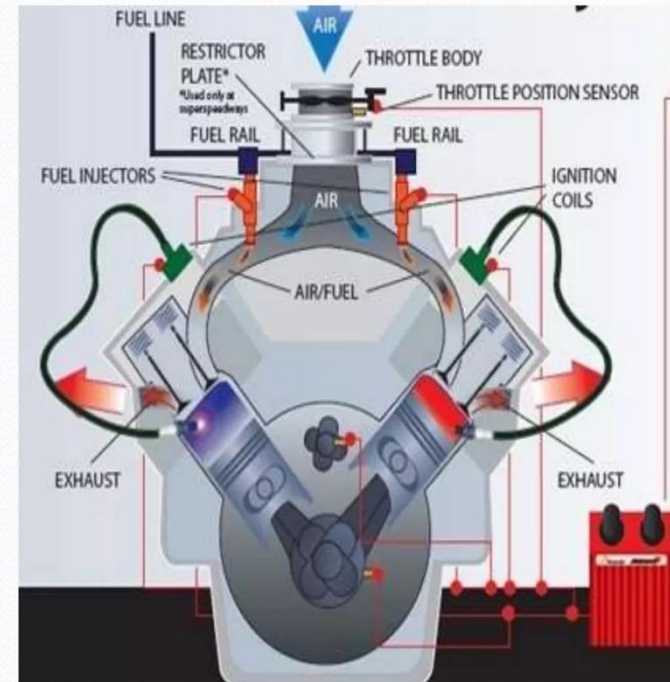


- Temperature sensor
- Oxygen sensor
- Idle air control valve(IACV)
- MAP sensor
- Knock Sensor
- Engine Speed Sensor
- Engine Oil Sensor
- Crankshaft sensor
- Camshaft Sensor and Multi-point fuel injection



Electronic Fuel Injection System

- ❖ Determine the amount of fuel to inject into the engine and when to fire the spark plugs.
- ❖ Achieve the most horsepower with the least amount of Fuel

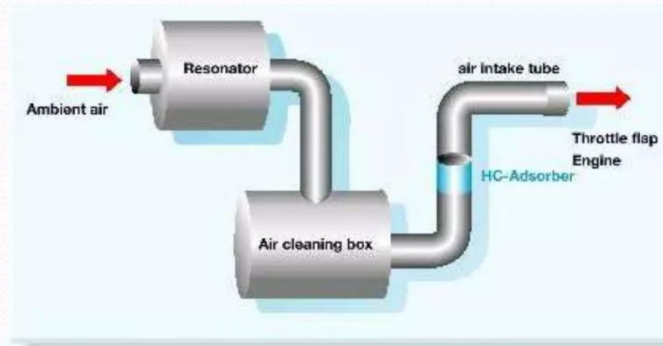


Resource :<http://www.mrn.com/>



Electronic Fuel Injection System

Filter and measure the air flow into the engine





Fuel Delivery System/Control

It helps to measure;

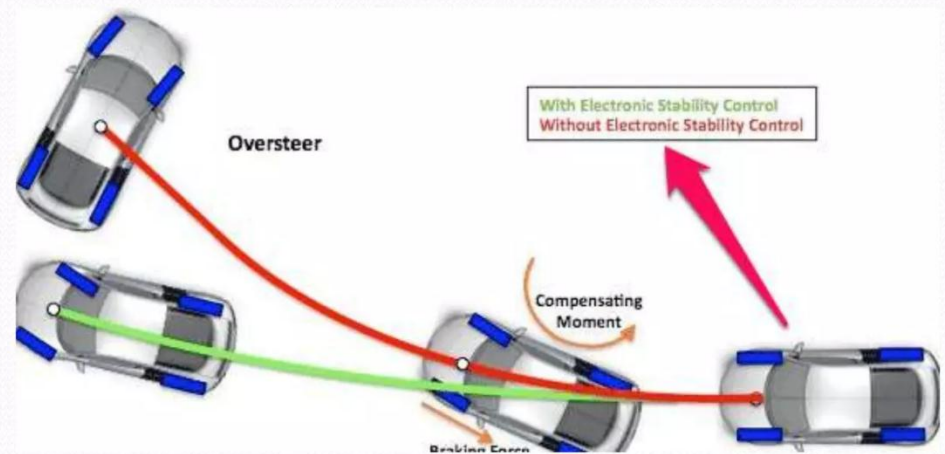
- Fuel Efficiency.
- Emission Performance
- Engine Tuning and many more.





Electronic Control System

It helps to inject the correct amount of fuel at correct time and speed





Electronic Control Unit

- It controls more than one electric systems and sub-systems in a motor vehicle.
- It helps in regulating and maintaining the amount of fuel and air the engine needs to increase horsepower.





Fuel Injector Sequential

- It's a type of multi-port injection system in which injection valve will open just before the cylinder intake valve opens.
- It has the fast response time when the driver makes a quick change.





Thank You !