SNS COLLEGE OF TECHNOLOGY

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DEPARTMENT OF AUTOMOBILE ENGINEERING

COURSE NAME : 19AUB204 – AUTOMOTIVE ELECTRICAL AND ELECTRONICS ENGINEERING

II YEAR / IV SEMESTER

Unit 4 – Sensors and Actuators

Topic : Manifold Pressure Sensor

MANIFOLD PRESSURE SENSOR

- The manifold pressure sensor, also known as the manifold absolute pressure (MAP) sensor, is a key component in the engine management system of modern vehicles, especially those with fuel injection systems.
- The primary function of the manifold pressure sensor is to measure the pressure inside the intake manifold of the engine.
- This pressure reading provides valuable information to the engine control unit (ECU) about the engine's operating conditions.

COMPONENTS

- **Sensing Element:** The sensing element is the core component of the MAP sensor responsible for measuring intake manifold pressure. It may consist of a silicon diaphragm with strain gauges or a piezoresistive material that deforms in response to changes in pressure. The deformation generates an electrical signal proportional to the pressure.
- **Housing:** The sensing element is housed within a protective casing made of plastic or metal. The housing provides mechanical support and protection against environmental factors such as temperature, moisture, and vibration.

COMPONENTS

- **Vacuum Port:** The MAP sensor has a vacuum port that connects directly to the intake manifold. This port allows the sensor to measure the pressure inside the intake manifold, which varies based on engine load, throttle position, and atmospheric conditions.
- **Electrical Connector:** The MAP sensor is equipped with an electrical connector that allows it to interface with the vehicle's wiring harness. The connector typically contains multiple pins for transmitting sensor signals (e.g., voltage output) to the ECU and receiving power for sensor operation.

COMPONENTS

- **Wiring Harness:** The wiring harness connects the MAP sensor to the vehicle's electrical system. It carries sensor signals and power from the ECU to the sensor and may include shielding to protect against electromagnetic interference.
- **Mounting Hardware:** The MAP sensor is mounted securely to the engine or intake manifold using mounting hardware such as screws or bolts. Proper mounting ensures accurate pressure measurement and prevents sensor movement or misalignment.

PRINCIPLE USED

- The sensor typically utilizes a sensing element, such as a silicon diaphragm with strain gauges or a piezoresistive material, which deforms in response to changes in pressure.
- This deformation generates an electrical signal proportional to the pressure, which is then sent to the ECU for engine management.

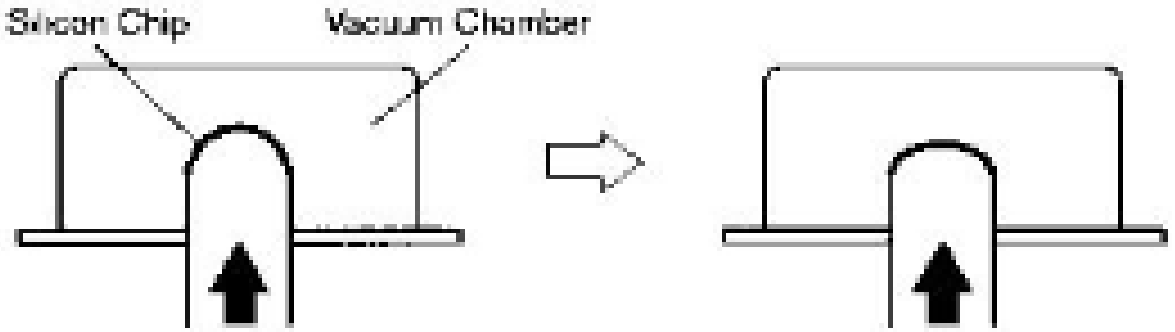
WORKING

- The MAP sensor is typically mounted on or near the intake manifold of the engine.
- It contains a sensing element, often a silicon diaphragm with strain gauges or a piezoresistive material, which deforms in response to changes in pressure.
- As the pressure inside the intake manifold changes due to engine operation, the sensing element deforms accordingly.
- The deformation of the sensing element generates an electrical signal proportional to the pressure.
- This signal is typically a voltage output, which varies linearly with changes in manifold pressure.

WORKING

- The voltage output increases as the pressure inside the intake manifold increases and decreases as the pressure decreases.
- The voltage signal from the MAP sensor is sent to the engine control unit (ECU). The ECU processes this signal along with other sensor inputs to determine the engine's operating conditions, such as load, throttle position, and engine speed.
- Based on the pressure data from the MAP sensor and other inputs, the ECU adjusts various engine parameters to optimize performance, fuel efficiency, and emissions.
- This includes controlling fuel injection timing, ignition timing, and turbocharger boost pressure (in turbocharged engines).

WORKING


Silicon Chip
Vacuum Chamber
Intake Manifold Pressure
High Pressure
Wide Open Throttle
Intake Manifold Pressure
Low Pressure Idle

ADVANTAGES AND DISADVANTAGES

ADVANTAGES

- Real time measurement
- Direct Indication of Engine load
- Enhanced Engine performance

DISADVANTAGES

- Potential for sensor failure
- Dependency on vacuum system
- Complex Diagnosis

APPLICATIONS

- Fuel Injection control
- Ignition timing control
- Turbocharger and Supercharger control
- Emission Control

THANK YOU !!!