SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35.

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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 : Speed Sensor

SPEED SENSOR

- A speed sensor is a device that measures the speed of an object or system.
- It detects motion and translates it into an electrical signal, which can then be used for various purposes such as controlling speed, monitoring performance, or providing feedback.
- Speed sensors are utilized in a wide range of applications including automotive vehicles, industrial machinery, aerospace, and even in consumer electronics like fitness trackers.
- They come in various types, such as Hall effect sensors, magnetic sensors, optical sensors, and more, each suitable for different environments and requirements.

COMPONENTS

- **Sensing Element**: This is the core component that detects the motion or speed of the target object. It could be a magnet, a coil, a photoelectric cell, or any other device sensitive to motion.
- **Signal Conditioning Circuitry**: In many cases, the raw signal from the sensing element needs to be conditioned or processed to make it suitable for further processing or interpretation. This circuitry might include amplifiers, filters, or other electronics.

COMPONENTS

- **Output Interface**: The processed signal needs to be transmitted or made available for use by other systems or components. This could be an analog voltage or current signal, a digital signal, or a communication protocol such as PWM (Pulse Width Modulation) or SPI (Serial Peripheral Interface).
- **Housing or Enclosure**: Speed sensors are often installed in harsh environments where they may be exposed to dust, moisture, vibration, or extreme temperatures. A protective housing or enclosure helps to shield the sensitive components from these external factors.

COMPONENTS

- **Mounting Mechanism**: Depending on the application, the speed sensor may need to be securely mounted to the object whose speed it is measuring. This could involve brackets, screws, adhesive, or other mounting hardware.
- **Power Supply**: Most speed sensors require power to operate. This could be provided by batteries, an external power supply, or by harvesting energy from the environment (e.g., through magnetic induction or vibration).

PRINCIPLE USED

- The Hall effect is a physical phenomenon where a voltage difference, known as the Hall voltage, is generated across an electrical conductor when it is subjected to a magnetic field perpendicular to the current flow.
- This effect is utilized in Hall effect sensors for various applications such as measuring magnetic fields, detecting motion, and determining position or speed in devices like automotive sensors and industrial equipment.

WORKING

- The speed sensor detects the motion of the target object by measuring changes in a physical quantity such as magnetic field strength, light intensity, or electrical resistance.
- For example, in a Hall effect sensor used in automotive applications, a magnet attached to a rotating component generates a magnetic field that is detected by the sensor.
- Once the motion is detected, the sensor generates a corresponding electrical signal. This signal could be analog (such as voltage or current) or digital, depending on the sensor type and application.

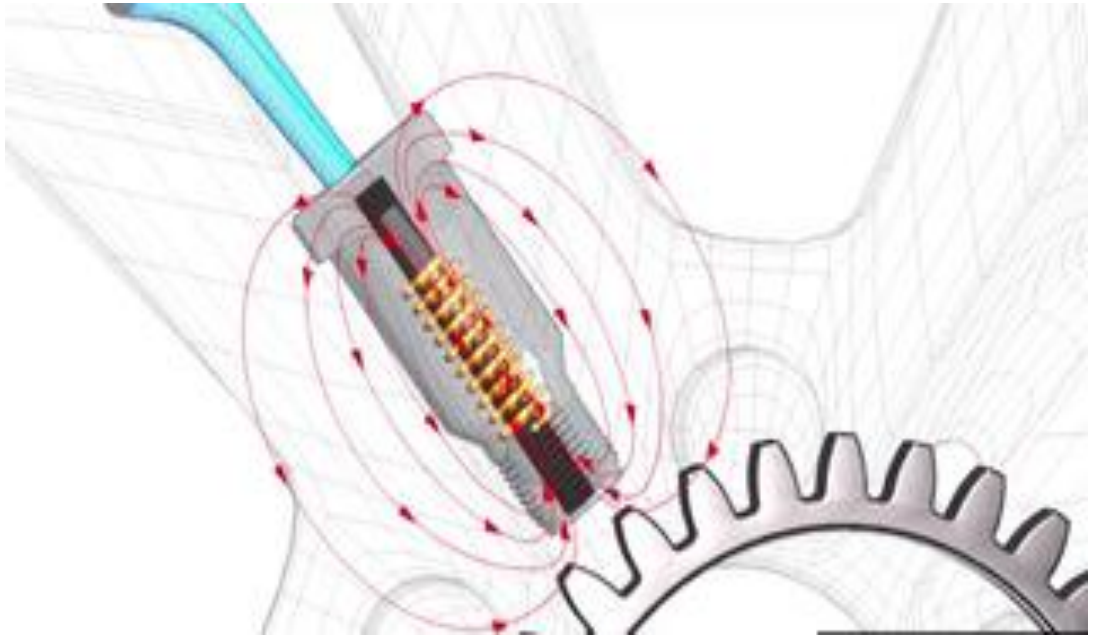
WORKING

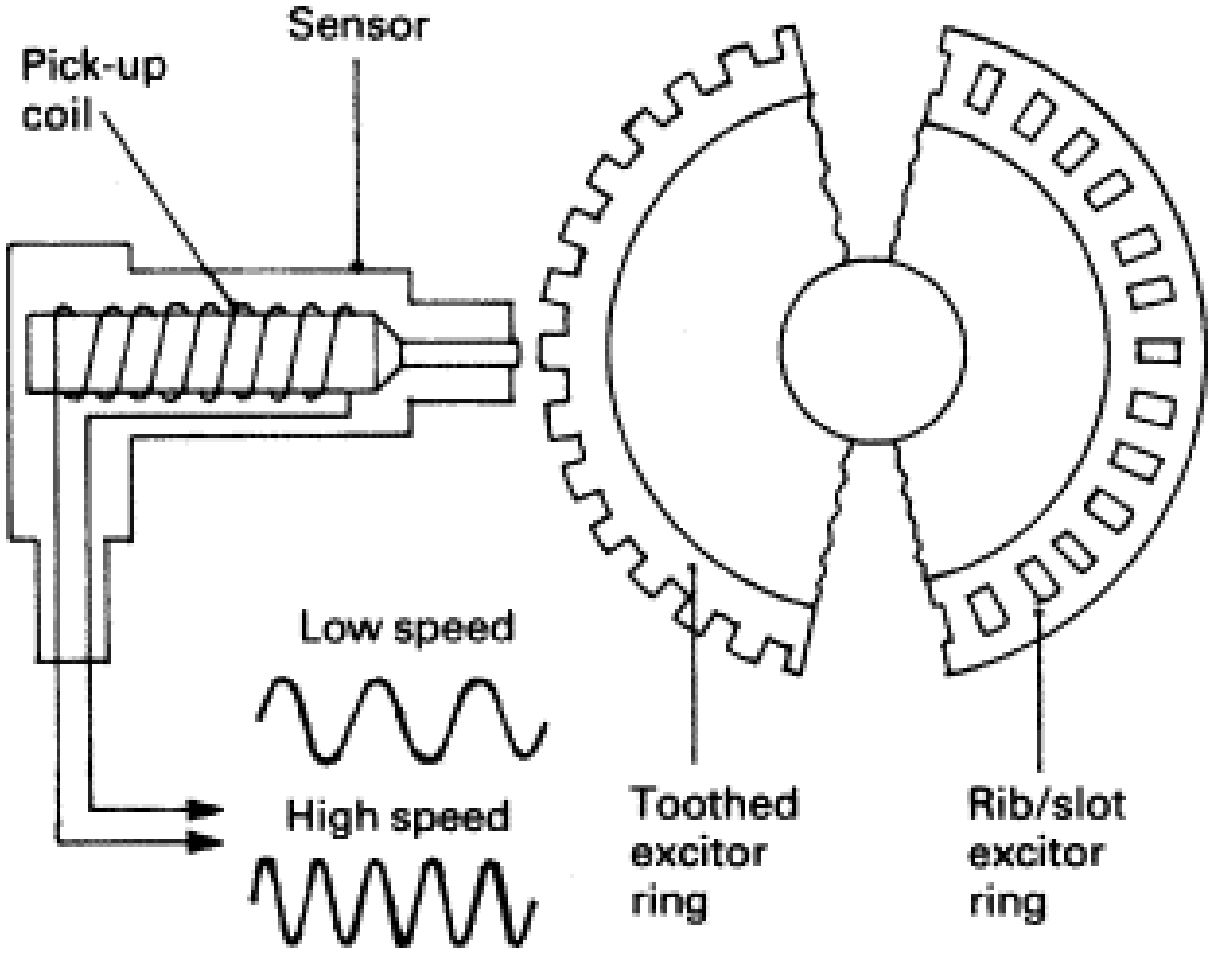
- In many cases, the raw signal from the sensor needs to be conditioned or processed to remove noise, amplify weak signals, or convert analog signals to digital.
- This processing may be done using built-in electronics within the sensor itself or by external circuitry.
- The processed signal is then outputted by the sensor.
- This output could be used for various purposes such as controlling the speed of a motor, displaying speed information on a dashboard, or triggering alarms in case of abnormal speeds.

WORKING

- Some speed sensors may require calibration or adjustment to ensure accurate measurements.
- This could involve setting certain parameters such as sensitivity or threshold levels, either manually or automatically through a calibration process.
- The output from the speed sensor is typically integrated with other control systems or components within the larger system.
- For example, in an automotive application, the speed sensor output might be used by the engine control unit (ECU) to adjust fuel injection timing or by the anti-lock braking system (ABS) to prevent wheel lock-up during braking.

WORKING




Sensor
Pick-up coil
Low speed
High speed
Toothed excitor ring
Rib/slot excitor ring

ADVANTAGES AND DISADVANTAGES

ADVANTAGES

- Precision
- Real time monitoring
- Safety Enhancement

DISADVANTAGES

- Cost
- Sensitive to
- Safety Enhancement

APPLICATIONS

- **Anti-lock braking systems (ABS):** Monitoring wheel speed to prevent skidding during braking.
- **Traction control systems (TCS):** Monitoring wheel speed and adjusting engine power or applying brakes to prevent wheel spin.
- **Cruise control systems**: Maintaining a constant vehicle speed set by the driver.
- **Transmission control:** Monitoring vehicle speed for gear shifting and torque converter lock-up control.

THANK YOU !!!