



SNS COLLEGE OF TECHNOLOGY

Coimbatore-35

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DEPARTMENT OF MECHATRONICS ENGINEERING

19MCE402 – AUTOTRONICS

Topic: Airbag & Role of MEMS in Airbag systems



AIRBAGS



Working of Airbags:

Airbags are a critical safety feature in modern vehicles, designed to protect occupants during a collision by rapidly deploying and providing a cushioning barrier between the individual and the vehicle's interior. The deployment of airbags is triggered by sensors that detect specific conditions associated with a collision. Here's an overview of how airbags work:

- 1. Crash Detection:** Accelerometers and other sensors within the vehicle continuously monitor changes in acceleration and deceleration. When these sensors detect a sudden deceleration indicative of a collision, they trigger the airbag system.
- 2. Signal to Inflator:** The sensor sends a signal to the airbag control unit, which, in turn, activates an igniter or an electrically initiated device within the airbag module.
- 3. Ignition of Propellant:** The igniter ignites a propellant, typically a mixture of chemicals such as sodium azide and potassium nitrate. This chemical reaction produces a burst of nitrogen gas.



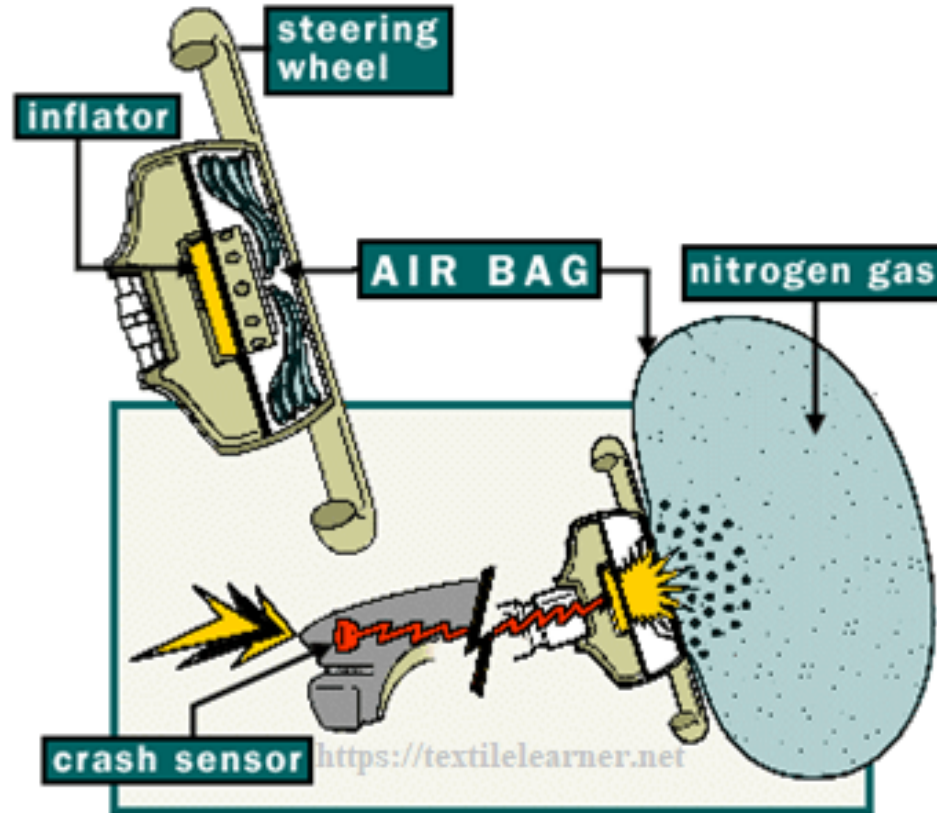
AIRBAGS



- 4. Rapid Inflation:** The rapidly expanding nitrogen gas fills the airbag, causing it to deploy in a fraction of a second. This quick deployment is crucial for ensuring that the airbag is fully inflated and able to provide protection before the occupant makes contact with the vehicle's interior.
- 5. Cushioning Effect:** The inflated airbag acts as a cushion, absorbing the force of the occupant's forward motion and reducing the risk of injury, particularly to the head and chest.
- 6. Deflation:** After deployment, the airbag quickly deflates through venting ports to allow for a controlled and gradual release of gas. This helps prevent injury from the force of the airbag itself.



AIR BAGS





Role of MEMS in Airbag Systems:



Microelectromechanical Systems (MEMS) play a crucial role in the functioning of airbag systems. MEMS sensors, such as accelerometers, are essential components that detect the forces associated with a collision and initiate the airbag deployment.

- 1. Accelerometers:** MEMS-based accelerometers measure changes in acceleration and deceleration. These tiny devices can detect the abrupt changes in motion indicative of a collision.
- 2. Sensor Precision:** MEMS accelerometers offer high precision and sensitivity, allowing them to accurately sense even minor changes in acceleration.
- 3. Reliability:** MEMS sensors are chosen for their reliability and durability, making them well-suited for automotive applications where they need to operate under varying conditions and withstand mechanical stress.



Role of MEMS in Airbag Systems:



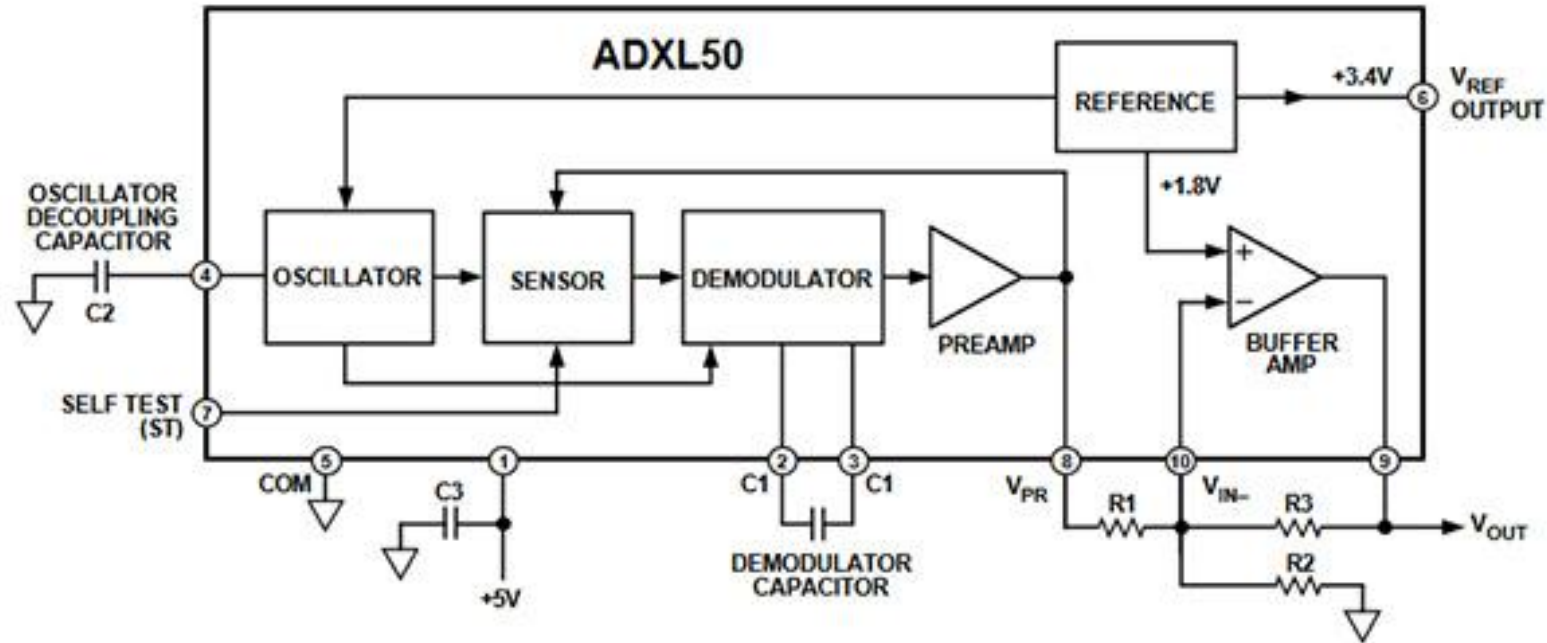
4. Integration: MEMS sensors are small and lightweight, facilitating easy integration into the airbag control unit. Their small size is advantageous for placement within the confined spaces of the vehicle.

5. Cost-Effectiveness: MEMS sensors are cost-effective to manufacture, contributing to the widespread adoption of airbag systems in modern vehicles.

MEMS sensors, particularly accelerometers, are integral to the safety and effectiveness of airbag systems. They provide the crucial data needed to detect a collision and trigger the rapid deployment of airbags, enhancing occupant protection during a crash.



Role of MEMS in Airbag Systems:





Thank You