Central Tire Inflation System (CTIS)

TEAM M012

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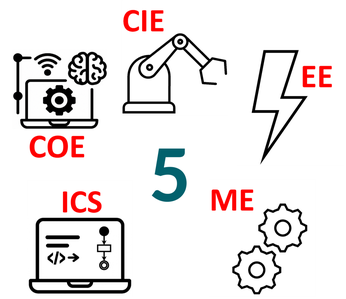


Introduction

• Problem Statement

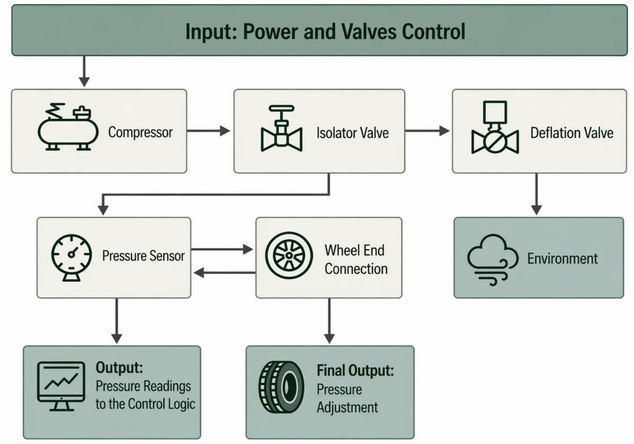
Tire pressure directly affects safety, traction, handling, fuel efficiency, and tire life, especially in mixed-terrain driving. Yet most drivers still have to stop and adjust tire pressure manually, which is inconvenient and can be unsafe. Existing CTIS solutions are mainly designed for military or heavy-duty vehicles, not everyday SUVs and pickup trucks. This project addresses that gap by developing a retrofit CTIS that can monitor and adjust tire pressure in real time while driving.

• Objective

Our goal is to develop a practical add-on Central Tire Inflation System for SUVs and pickup trucks that do not include factory CTIS. The system continuously monitors tire pressure, automatically inflates or deflates as needed, and provides clear in-cabin pressure readings and alerts. It is designed to improve traction, handling, and performance across changing terrains while reducing the need for manual pressure adjustment and maintaining safe, reliable operation.

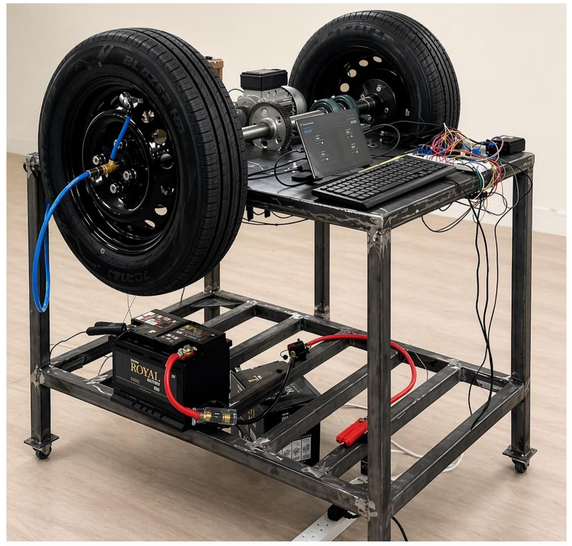
Prototype Design

• CTIS Components Diagram



Constraints	Specifications	
Turning angle of ±45°	Rotary inserter speed 40+20km/h	18→32 psi in ≤6 min
0–60 °C operation	Out of range requests rejection	±1 psi accuracy
Fuse Clearance 150mm from positive	8– 40 psi Pressure range	compressor overheating protection
a bandwidth of 115200 bit/s	<4psi difference between tires	connection-loss safe state
brownout protection	Save operating power 800-1300 w	Safety control reaction within 500ms
	Electronics operation within 0-60 °C	500ms safe command response

• Final Prototype Assembly



User Interface

Testing & Validation

- Maximum Tire speed with 71 km/h
- Embedded safety reaction within 500 ms
- Steady pressure accuracy within ±0.73 psi
- Power consumption rate of 1160w
- logical control prevent overheating +80°C

Prototype Testing Video⟶

Conclusion

- In conclusion ,This project shows that a practical retrofit CTIS for SUVs and pickup trucks is feasible. The final design integrates pneumatic, electrical, control, and user-interface subsystems into one system that improves safety, performance, and convenience across changing terrains.