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(57) Abstract :
ADAPTIVE FLOW-CONTROLLED VARIABLE GEOMETRY TURBOCHARGER WITH REAL-TIME ENGINE PERFORMANCE OPTIMIZATION ABSTRACT The invention is an advanced system designed to enhance engine efficiency, torque, and fuel economy by dynamically adjusting turbine vane geometry based on engine conditions. The system incorporates a variable geometry turbocharger (VGT), an adaptive flow control module, and a real-time control unit that processes data from a comprehensive sensor array monitoring exhaust gas temperature, pressure, and engine speed. Using a feedback loop mechanism, the system optimizes airflow and boosts pressure in real-time, ensuring precise air-fuel mixture control for improved combustion. Integration with engine management systems allows seamless communication, enabling adaptive turbocharger adjustments that reduce emissions and enhance responsiveness. The system further incorporates machine learning to refine performance based on historical data, multiple performance modes for flexibility, and additional features like electric actuators and cooling mechanisms for reliable operation under varying conditions. This innovative turbocharger system is ideal for both performance and fuel efficiency optimization.

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