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ECOLOGICAL OPTIMIZATION OF INTERNAL COMBUSTION ENGINES

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Annotation

Although electric vehicles are on the rise, internal combustion engines (ICEs) remain dominant in global transportation. This article explores ecological optimization methods, including fuel modification, exhaust gas recirculation, and hybrid system integration to reduce emissions and improve efficiency.

Keywords

Internal combustion engine, emissions, eco-efficiency, fuel optimization, hybrid technology

Main Text

The ecological optimization of internal combustion engines is essential for reducing their environmental footprint. Modern strategies involve using cleaner fuels (bioethanol, hydrogen blends) and advanced catalytic converters to minimize harmful emissions. Exhaust gas recirculation (EGR) systems and variable valve timing (VVT) technologies help optimize combustion temperature and reduce NOx formation.

Hybridization offers another path toward ecological efficiency. Integrating small electric motors for regenerative braking and torque assistance reduces fuel consumption and CO_2 emissions. Simulation-based design using digital twins allows real-time optimization of combustion parameters, resulting in up to 15% better fuel economy.

References

1. Heywood, J. B. (2021). *Internal Combustion Engine Fundamentals*, 2nd Ed. McGraw-Hill.
2. Zhao, F. (2023). “Advanced Engine Control Strategies,” *Energy Conversion and Management*, 289, 118007.
3. European Automobile Manufacturers’ Association (2024). *Sustainable Mobility Report*.