



EXHAUST-BASED GENERATOR SYSTEM FOR INTERNAL COMBUSTION ENGINES SET TO IMPROVE FUEL ECONOMY

Today's efficiency of internal combustion engines is between 28% and 34%. Up to 40% of the energy in the fuel delivered to the engine is lost in the exhaust gas and emitted into the atmosphere.

Demand for ThinGap's Turbo Generator is expected to be driven by the original equipment manufacturer's (OEM) need for marked improvements in engine efficiency to meet the new requirements for increased vehicle fuel economy (mpg):

- New regulatory requirements dictate the automobile manufacturers to raise their sold vehicle fleet fuel economy (CAFE) by 40% in steps over the next 10 years.
- Higher fuel prices will move vehicle fuel economy up in the ranks of competitive marketing tools.

The prevailing share of increases in vehicle fleet fuel economy has to come from incremental improvements to the internal combustion engine.



The Turbo Generator will recover a significant portion of exhaust gas energy in the form of electric energy. That electric energy is available to directly increase vehicle fuel economy by a variety of methods:

- Supply electric power to the vehicle's electrical system, allowing the use of smaller alternators or no alternators.
- Drive engine accessories electrically that are currently crankshaft driven (e.g. coolant pump, power steering pump and air conditioning compressor), without increasing the alternator size.
- Directly drive the flywheel motor of semi-hybrid vehicles.
- Supplement the energy supply to the battery system of full hybrid vehicles, thereby reducing the required on-time for the internal combustion engine.

Market Positioning:

ThinGap Automotive's innovative technology generates power up to extremely high rotational turbine speeds, making the direct drive Turbo Generator a space-efficient and cost-effective solution. This is the first turbine generator that fits into the engine compartment of passenger cars, SUV's and pick-up trucks and can be installed in these vehicles under assembly line mass production conditions.

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