

Advanced Two-Stroke Generator

US-Semi is working with Herndon Development, LLC to license, test and commercialize Herndon's patent pending integrated engine/generator; a design made possible by the same advances in power semiconductor switching and control systems used in AC Locomotives and Numeric Control machine tools.

The Herndon generator is an extremely efficient, very lightweight modular system designed to run on a clean-burning, dense, low-pressure, low-cost, renewable and safe fuel — an ethanol and water mixture where methanol may be added as denaturant and nitromethane to provide oxidant.

Specifically, the design is a scalable, direct-injected, adiabatic, two-stroke linear free-piston engine. The configuration includes a novel valving system designed to eliminate volumetric losses inherent in conventional two-stroke engines and to provide revolutionary improvement to output, efficiency and pollution reduction. A low thermal expansion, low thermal conductivity ceramic combustion chamber retains heat for ignition. Timed electronic injection provides precise ignition control.

The linear generator connects through an electronic control system to ultra-capacitors and batteries; buffering the output to load. Generator and capacitor/battery bank may be combined for peak output.

The engine runs at one speed only, on or off, like a thermostat and furnace or pressure switch and air compressor. This allows for maintained highest efficiency and an extremely simple engine control system. A fixed dimension coupled resonant intake and exhaust system provides altitude compensation supercharge. The engine always runs unthrottled, without restriction, for highest volumetric efficiency.

The potential is an engine with record high end-to-end conversion efficiency.

By converting the available energy to power, the need for a cooling system is eliminated. There are no fans, fins, water pumps, radiators or hoses. Since all loads are taken directly by the generator system, there is no energy-robbing mechanical drive. Moving components are supported by air bearings and magnetic suspension, lowering friction losses and eliminating the need for oil. Only two regular maintenance items remain — air and fuel filters.

Because ancillary systems are eliminated, the total system is extremely lightweight and reliable. Independent of fuel tank and capacitor/battery bank, a 30kw unit, portable by one man, is possible.

The engine design is configured as independent, back-to-back, synchronized piston/cylinder pairs to eliminate vibration. Multiple pairs can be added in a modular form, incrementally, for applications requiring more power than the basic engine design. Additional engines are connected to a shared electrical bus making for extremely high reliability and graceful failure.

Low-cost, high-volume automated production and assembly are made possible by the system's simple geometry. Applications include hybrid automobiles, trucks and locomotives, aircraft auxiliary power and fixed and portable full-time emergency power for ships, buildings, homes, hospitals and industry.

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