



REDHAWK
ENERGY

Innovative Solutions for Your Critical Power Needs

Application Note

ZERO Maintenance, Reliable Power for Critical Wayside Requirements

Free-Piston Stirling Engines



RedHawk Energy Systems, LLC

10340 Palmer Rd., S.W.
Pataskala, OH 43062

Ph: 740-964-4000
Fx: 740-927-6017

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Background

Gas/diesel generators are widely used for mid-to-high power generation for remote railroad wayside applications (control points, interlockings, telecom base stations, etc.) due to their high power, mass market availability and low initial cost. What's often overlooked is the on-going maintenance needs and associated costs to keep gas/diesel generators operational. You have to change the oil every 25-100 hours, rebuild the engine or even replace the generator entirely after 1,000 to 3,000 hours of service.

Wouldn't it be nice if there is a power generating solution that could run intermittently or continuously for 60,000+ hours with little to no maintenance? Pioneered in space, Free-Piston Stirling Engines (FPSE) are designed to do just that, providing reliable electrical power supply to the most demanding and mission-critical locations.

How It Works?

Free-Piston Stirling Engine (FPSE) generators can transform virtually any heat source (propane, natural gas, ethane, biogas) into electricity. Once heat is applied to the FPSE the heat exchangers maintain a temperature differential across the engine causing the helium to shuttle back-and-forth inside the engine, expanding and contracting. The oscillating helium drives the linear reciprocating motion of the piston, which by means of an integral linear alternator, directly converts the reciprocating motion of the piston into electrical power.

FPSEs have fewer moving parts than traditional kinematic Stirling engines, and no direct-contact points that cause wear and require lubrication. FPSEs are truly a maintenance-free technology that offers long-life performance.

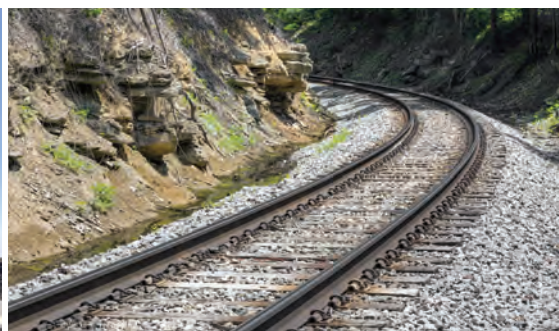
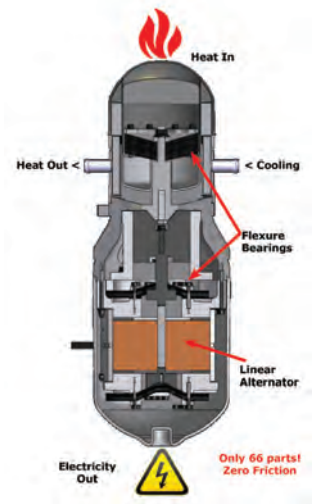
Proven Longevity

Free-Piston Stirling Engines have unparalleled reliability. Over the past two decades, space agencies have tested multiple engines. Free-Piston Stirling Engines have demonstrated a world record for heat-engines by running in excess of 110,000 hours (more than 12 years) of cumulative undisturbed operation!

*Qnergy's PowerGen Free-Piston Stirling Engines are conservatively estimated to provide 60,000 hours of service life.



Gas/diesel generators need frequent oil changes (every 25-100 hours) and have an overall design life of 1,000 to 3,000 hours.



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Rail Applications

Prime Power (Remote Off-Grid)

Suitable as a prime power generator for remote off-grid locations where a standard utility power connection is unavailable and/or too costly. The PowerGen is capable of cycle charging or running continuously.

Backup Power

Can be used as a backup power system for locations with AC utility power connection. A transfer switch can signal the PowerGen to start and provide power during an AC power outage. Unlike some other power generation technologies (ex: fuel cells), the PowerGen has no start/stop cycle limitations.

Hybrid Power

Well suited to provide supplemental power to new or existing solar & wind systems. During periods of insufficient solar or wind production (ex: storms, winter months), the PowerGen can be signaled to start and provide charging power. Fueling requirements can be reduced as the PowerGen is only called upon periodically.



The PowerGen can be easily integrated with new or existing power infrastructure including solar & wind, batteries, rectifiers, etc.

PowerGen Advantages

Variety of Fuel Sources

Can operate seamlessly with a variety of fuel supplies including propane, natural gas, ethane, bio-gas, as well as multiple associated gas streams at differing caloric values.

ZERO Maintenance

The PowerGen has few moving parts and no direct contact points that cause wear and lubrication (no oil changes).

Multiple Output Configurations

By means of its flexible and modular design, the PowerGen can be tailored to provide a broad range of power output architectures (standard 120/240 VAC, 24/48VDC optional via PIP Interface) to meet the electrical requirements of each specific site load.

Long & Simple Operating Life

The PowerGen uses advanced combustion capabilities to quietly and efficiently transform fuel into steady, dependable power from 1.2kW to 5.6kW. Unlike other technologies (ex: fuel cells, generators) there is no reduction in life for multiple start-stops or continuous operation. Design life for the PowerGen is conservatively estimated at 60,000 hours.



Flexible and efficient fueling



ZERO Maintenance



Qnergy PowerGen Free-Piston Stirling Engines
PowerGen 1200 (1.2kW)
PowerGen 5650 (5.6kW)

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ZERO Maintenance, Remote Power for Critical Wayside Requirements

Proven Deployment

RedHawk Energy is the leader in the development and deployment of Free-Piston Stirling Engines to the rail signaling and communications market. Since 2017, we've deployed Qnergy's PowerGen Stirling Engine Generators to rail customers across North America looking for reliable prime and backup power.



Pilot test site with major class I railroad. PTC location where existing solar & wind system couldn't meet daily demand until the PowerGen was installed in June 2017.



Test site with major railroad in Alaska. PowerGen is used to daily cycle charge a 48V battery bank at a remotely located telecom location along the wayside.



The PowerGen is an ideal solution for remote sites like this helicopter-only location!

About Us

RedHawk Energy Systems, LLC is a value-added manufacturing subsidiary of the Arthur N. Ulrich Company. Since the early 1980's, we've helped commercial and industrial customers tackle their critical prime and back-up power challenges with innovative solutions ranging from a few watts to several kilowatts. Over the years RedHawk has been a leader in the deployment of advanced energy systems (solar & wind, fuel cells, thermoelectric generators, stirling engines and more) for rail wayside power requirements.

Our customers include virtually every Class 1 railroad in North America, shortline railroads, transit agencies, mid-stream, upstream and downstream oil & gas companies, telecommunication companies, shipping companies, government agencies, Fortune 500 & 1000 corporations and many others.

Check us out on the web - <http://www.redhawkenergy.net>

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