

Thermoelectric Generators

GENTHERM 
GLOBAL POWER TECHNOLOGIES

Power where you need it.®

www.GenthermGlobalPower.com

THE WORLD'S LEADING MANUFACTURER

Gentherm Global Power Technologies (GPT) is the world's largest supplier of thermoelectric generators. A vertically integrated manufacturer with an ISO 9001 registered QA program in place, GPT has over 40 years of experience in the engineering, manufacturing and installation of remote power systems.

The company established in 1975 to commercialize the unique lead telluride thermoelectric generator technology developed by the 3M Corporation in the 1960s for the Apollo space program. Based on this initial technology, GPT has developed a product line of thermoelectric generators using high quality, field proven components which has resulted in the company's worldwide recognition for economic and reliable remote power solutions.

Our Mission:

To offer the best alternative for remote industrial power sites:

- Creating solutions that are simple to use
- Environmentally friendly
- Requiring minimal maintenance
- Around the world with local service support....if it's ever needed



CORE VALUES

Pride and Ethics

- We behave ethically, are passionate, and take pride in all we do

Customers

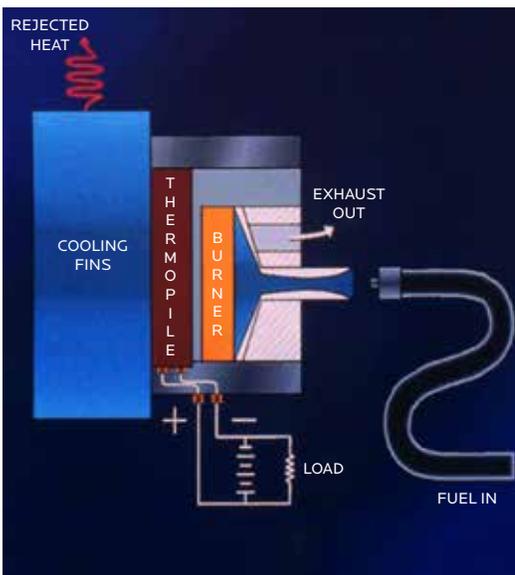
- We genuinely care about the success of our customers
- We get energized by technical challenges presented by customers

People

- We are dedicated and loyal to the GPT team
- We are respectful of others and want all of us to succeed

Community

- We are part of a positive environment at work, home and community
- We enjoy our work-life mix and have fun together



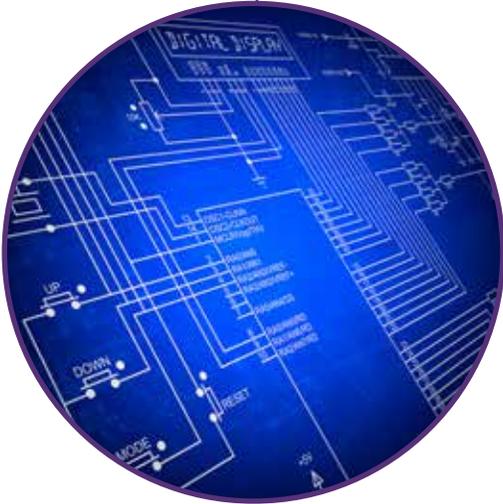
The three main parts of GPT's solid state generator: a burner, the thermopile and cooling fins

TEGs: SIMPLE, INNOVATIVE TECHNOLOGY

Our legacy product line of thermoelectric generators, convert heat directly into electricity. As heat moves from a gas burner through a thermoelectric module, it causes an electrical current to flow.

The heart of a GPT thermoelectric generator is a hermetically sealed thermoelectric module (thermopile) which contains an array of lead-tin-telluride semiconductor elements. This durable module provides a chemically stable environment for the thermoelectric materials which ensures a long service life. On one side of the thermopile, a gas burner is installed, while the opposite side is kept cool by aluminum cooling fins or a heat pipe assembly. An operating generator maintains a temperature of approximately 540°C on the hot side and 140°C on the cold side. The heat flow through the thermopile creates steady DC electricity with no moving parts.

Gentherm Global Power Technologies (GPT) Leadership



Systems Engineering

In addition to supplying thermoelectric generators, Gentherm Global Power Technologies (GPT) can provide complete turnkey power systems for both hazardous (Class 1, Division 2) and non-hazardous locations including:

- power conditioning for any DC or AC voltage output
- gas pressure reduction systems
- battery banks (NiCad, VRLAS, etc.)
- alarm monitoring and control
- peripheral equipment

Customer Support

GPT takes pride in providing high levels of customer service and support. Knowledgeable sales staff, backed by GPT's Integrated Systems Engineering group, are capable of providing full technical support in the selection and sizing of components for remote power supplies. As well, post-sales support is provided by GPT's Customer Service representatives on a world-wide basis. This service includes telephone hotline support and field support for installation, commissioning and troubleshooting.

Training

Scheduled training courses are conducted throughout the year at GPT's facility in Calgary. These courses are a combination of hands-on maintenance procedures and classroom technical training. GPT's training staff can also provide onsite customized training programs anywhere in the world.

When To Specify GPT TEG'S

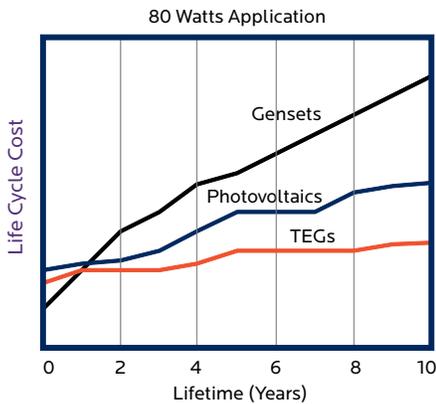
- Load requirements from 5 to 5,000 watts
- Critical application requiring highly reliable power
- Low maintenance is required
- Long life is important
- Extreme climatic conditions (hot, cold, wet, dry) exist
- Remote or unattended location
- Lowest life cycle cost

How Thermoelectric Generators Stack Up

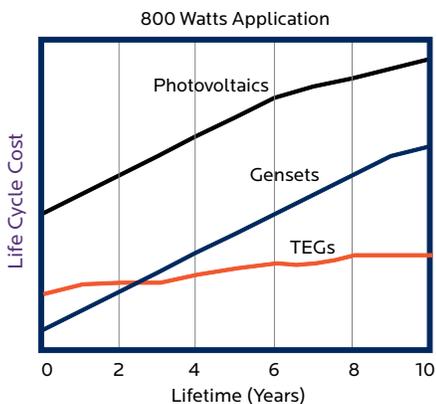


100 watt system
cathodic protection, Louisiana, USA

LIFE CYCLE COST COMPARISON



LIFE CYCLE COST COMPARISON



COMPARED TO THE POWER GRID...

RELIABILITY: Power grid reliability can be a concern in many countries, particularly in developing countries where the reliability is often below the requirements of many applications. The installation of a GPT Thermoelectric Generator is a common solution for customers requiring highly reliable power for automation, cathodic protection, and telecom applications.

COST: Even in developed countries with a reliable grid infrastructure, the capital cost and service charges associated with running grid lines to a remote location can be prohibitive. In such cases, the installation for a thermoelectric generator to meet local power requirements is often a more cost effective solution.

COMPARED TO GENSETS...

MAINTENANCE, RELIABILITY: While the capital cost of diesel or natural gas gensets is typically lower than that of a thermoelectric generator, the requirement to have a skilled technician perform regular maintenance on the gensets results in greatly increased operational costs, increased downtime and overall reduced reliability. When the complete life cycle costs, including all operational costs, are compared, the thermoelectric generator has lower operational costs and is more reliable.

COMPARED TO PHOTOVOLTAICS...

LIFE CYCLE COST AND PERFORMANCE: Although properly sized photovoltaic systems have shown promise in providing low power solutions in areas with high solar insolation, solar users are increasingly turning to thermoelectric generators because of problems with reliability, short battery life and theft.

GPT's Thermoelectric Generators have a 20-year design life and require minimal maintenance over the life of the system. An equivalent photovoltaic system would require 20-year life batteries - the cost of batteries alone can be as much as the thermoelectric generator. Studies have shown that when the capital cost of a photovoltaic system is based on medium life batteries (i.e. 10 years), the true life cycle cost of the solar system is much higher than that of a thermoelectric generator, due to the high cost of battery replacement and higher maintenance costs. Theft and vandalism have not been a concern with GPT systems, which are small and unobtrusive, and can be mounted inside security shelters if required.

Reliability, Low Maintenance, Long Life



2000 watt system
well site, Peru



1000 watt system
Offshore, Gabon

AT WORK AROUND THE WORLD

In more than 55 countries around the world, GPT's Thermoelectric Generators are providing reliable, cost-effective power for critical operation located in remote areas.

GPT's generators range in output size from 15 to 550 watts, and are ideal for numerous applications requiring power up to 5,000 watts. Applications include power for remote control and monitoring of oil or gas pipelines and production facilities, power for navigational aids, telecommunications systems and cathodic protection pipelines, and well casings.

Producing power by the direct conversion of heat into electricity, GPT's solid-state generators have no moving parts, which translates to many significant advantages in remote locations or whenever power supply is considered critical.

HIGH RELIABILITY:

Solid-state design ensures trouble-free operation and the most reliable power supply system available.

LOW MAINTENANCE:

One to two hours a year is a pro-active maintenance schedule.

COMPETITIVE PRICE:

Extremely competitive capital and operating costs for systems up to 5,000 watts.

LONG LIFE:

Hermetically sealed thermopile has a 20-year design life.

EASY INSTALLATION:

Typically requires less than a day to install and commission.

CONTINUOUS OPERATION:

Field-proven, GPT's systems operate unsheltered in all climates and weather conditions and are not affected by salt spray, bird droppings, or airborne contaminants.

The Preferred Remote Power Source



FEATURES OF GPT'S THERMOELECTRIC GENERATOR

- Operate on natural gas, propane or butane
- Hermetically sealed power unit with a 20-year design life
- Burner system constructed from high-temperature nickel alloys
- Stainless steel cabinets
- Automatic spark ignition
- Automatic safety shutoff

OIL & GAS INDUSTRY

Gentherm Global Power Technologies's (GPT) Thermoelectric Generators are used for a variety of remote power applications in the oil and gas industry primarily because they have proven to be the most reliable power source available for the rugged demands of the industry.

Cathodic Protection

Use: to provide electrical current to prevent corrosion in pipelines and producing oil and gas wells.

GPT's Thermoelectric Generators are the perfect match for the unattended, continuous power requirements of impressed current cathodic protection systems in pipelines and well casings. With high reliability, low maintenance requirements, and minimal gas consumption, GPT generators have negligible operating costs.

SCADA

Use: for remote instrumentation, automation, and communication.

Pipeline operators and oil and gas producers are increasingly using Supervisory Control And Data Acquisition (SCADA) systems for monitoring, measuring, and controlling equipment in the field. GPT's Thermoelectric Generators are being used to power remote telemetry units, gas analyzers, and metering equipment as well as for routine operating functions and emergency shutdown.

Offshore Operations

Use: to provide primary power for unmanned platforms and backup power on manned platforms for critical communications and emergency shutdown systems.

For offshore oil and gas operators, the ultimate test of equipment operation is in the harsh and highly corrosive offshore environment. GPT's generators pass this rigorous test - in terms of reliability, low maintenance and safety, including operating in hazardous (Class 1, Division 2) environments.



Telecommunications
150 watt system
remote radio repeater tower, USA

TELECOMMUNICATIONS INDUSTRY

Gentherm Global Power Technologies (GPT) generators are the obvious choice for an increasing variety of tasks in the rapidly growing telecommunications industry, including:

- VSAT terminals
- Point to point microwave links
- Point to multi-point systems
- Cellular and PCS
- Radio/television rebroadcasting systems
- Military communication systems
- Fiber optic links
- Mobile radio repeaters
- Emergency services communication
- Security and surveillance

As the telecom industry's reliability requirements approach 100%, GPT's generators are becoming the reliable and cost-effective power supply solution of choice. Also, as many telecom applications involve remote sites, the proven performance of GPT's generator technology is essential. The low maintenance requirements of GPT's generators are a distinct advantage as site visits can be reduced to coincide with the annual preventive maintenance cycle of the telecom equipment.

DIVERSE INDUSTRIAL USES

GPT thermoelectric generators are also being used as the power source solution for many other remote applications, such as environmental monitoring, navigation aids, buoys, airstrip landing lights, and lighthouses.



GlobalSolarHybrid
50 watt
environmental fish and wildlife monitoring system

Operation & Maintenance

The key operational feature of GPT thermoelectric generators is the minimal maintenance requirement associated with the products solid state design. Recommended maintenance of one to two hours per year is all that is required to check the power output and ensure a clean fuel supply by cleaning and/or changing the orifice and fuel filter. Consumables for recommended maintenance are typically less than one percent of the capital cost per year.

A history of innovation and performance in the commercialization of advanced technology.

Gentherm Global Power Technologies - GPT (Formerly Global Thermoelectric) was established in 1975 to commercialize the thermoelectric generator technology originally developed for the Apollo Space Program. Today, GPT is the world leader in the manufacturing and distribution of thermoelectric generators for use as remote power sources. The company produces a range of generators, from 5 to 550 watts, that use heat to directly produce electrical power for applications requiring up to 5,000 watts. The generator operates on natural gas, propane, or LPG to provide highly reliable and cost effective remote power solutions for many applications including the telecommunications and oil and gas industries.

GPT operates manufacturing, applications engineering, and production engineering facilities in Bassano, Alberta. Its head office, engineering, and research and development facilities are located in Calgary, Alberta, Canada. Sales and marketing activities are conducted worldwide.



Power where you need it.®

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