Cool Energy 25 kW ThermoHeart® Engine Specifications

Engine Type: 4-thermal-cycle, 8-piston kinematic Stirling engine of a single-acting alpha configuration, charged with clean nitrogen gas. The ThermoHeart Engine provides a modular, low-maintenance platform for conversion of mid-grade, 150—400 °C heat streams from diverse sources into electrical energy.

General: For broad application in pollution control, industrial processes, solar thermal, coffee roasting and remote energy generation (adding ~10% to genset efficiencies.) 25 kW engine can be ganged for larger applications. Thermal to electrical conversion efficiencies up to ~30% (chart below).

Pilot Engines: Taking orders, Q1 2019. [Pilot engines currently available for testing at HQ in Boulder, CO.]

Thermal Energy Delivery Mode: The ThermoHeart Engine receives thermal energy via a circulating heat transfer fluid (HTF) such as Duratherm 630, and rejects thermal energy via a water-glycol mixture. These circulating fluids create a temperature differential in the Stirling engine that is converted into mechanical rotation of a shaft driving an alternator to generate electricity. Commercially available heat exchangers such as shell & tube may be used to deliver thermal energy into the HTF and reject thermal energy from the cooling fluid.

Electricity Output Mode: The alternator generates 3-phase alternating current (AC) of a voltage and frequency determined by engine speed which is controlled by a variable frequency drive electrically connected to the output leads of the engine. When connected to the electrical grid, the engine will operate at 600 rpm, the speed that produces the maximum electricity.

Electricity Output Voltage (Engine): 120Vac @ 200rpm, 360Vac @ 600 rpm

Electricity Output Voltage (Inverter): Programmable by location, 3-phase minimum 360Vac

Electricity Output Frequency (Inverter): Programmable by location, 50Hz or 60Hz

Electricity Output Power (Inverter): Determined by engine operating conditions, max. 25 kW

Operating Temperature of Hot HTF: Minimum 150 °C, Maximum 400 °C

Flow Rate of Hot HTF: Minimum 100 lpm, Maximum 400 lpm

Operating Temperature of Cooling Heat Rejection Fluid: Minimum -5 °C, Maximum 45 °C

Flow Rate of Cooling Heat Rejection Fluid: Minimum 100 lpm, Maximum 400 lpm

Service Interval: 20,000 operating hours for which the bearings and seals have been designed.

Engine Charge Pressure: 10 bar to 40 bar

Operating Speed: Determined by engine charge pressure, maximum 600 rpm.

Engine Weight: 4 tonnes (8,800 lbs.)

Engine Diameter (including cooling water connections): 1.68 meters (52")

Engine Height (base to HTF flange connectors): 2.72 meters (105")

Hot Side Inlet Temp, °C	Oil Flow Rate, L/min	Hot Side Outlet Temp, °C	Input Heat Rate Required, W	Rejection Heat Rate Required, W	Gross Generator Output Power, W	Generator Gross Thermal to Electrical Conversion Efficiency
150	115	131	53,891	51,041	2,850	5.3%
150	170	137	54,110	51,080	3,029	5.6%
150	250	141	54,252	51,107	3,145	5.8%
150	380	144	54,356	51,127	3,229	5.9%
200	115	180	60,482	52,083	8,399	13.9%
200	170	186	60,690	51,997	8,693	14.3%
200	250	191	60,829	51,941	8,888	14.6%
200	380	194	60,930	51,902	9,027	14.8%
250	115	229	67,066	53,655	13,410	20.0%
250	170	235	67,272	53,533	13,739	20.4%
250	250	240	67,406	53,454	13,951	20.7%
250	380	243	67,502	53,399	14,103	20.9%
300	115	277	73,658	55,723	17,935	24.3%
300	170	285	73,849	55,584	18,265	24.7%
300	250	290	73,980	55,502	18,478	25.0%
300	380	293	74,074	55,444	18,630	25.2%

Table 1: *Expected performance from ThermoHeart Engine, based on measured prototype results.*

Based in Boulder, Colorado, Cool Energy is a privately held certified B-Corp, backed by angel and venture capital investment and has received $2.7M in SBIR grants from the National Science Foundation, the Department of Energy, and the Environmental Protection Agency. Cool Energy is currently selling pilot engines and raising its Series C round of capital to launch volume manufacturing.

For more information, please contact info@coolenergy.com or 303-442-2121.

About Cool Energy, Inc.:
Cool Energy is a privately held corporation, based in Boulder, Colorado.

To date, Cool Energy has been backed primarily by angel and venture capital investment and has received several SBIR grants from the National Science Foundation, the Department of Energy, and the Environmental Protection Agency. Cool Energy is a certified B Corporation. Cool Energy is currently raising its Series C round of capital for the purposes of beginning volume manufacturing.

For more information about the company, please contact Sam Weaver, CEO at spweaver@coolenergy.com or 303-442-2121.

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