Pilot Program to Install Microturbine at the Anderson Building

Purpose: To install a Microturbine at the Anderson Building
(est. cost to install $150,000)

1. WE Energies	$50,000.
2. Focus on Energy (administered by MSOE)	$50,000.

Direct Benefits:
Serves as the Building's Emergency Generator
Saves capital Dollars
Reduces cost of electricity during peak demand periods by on site electricity generation

Microturbine is more beneficial than a generator:
1. Is more efficient than conventional generator 79% Vs approx. 39%
2. Utilizes heat recovery
3. Is more efficient than powerplant electricity
4. Is low maintenance (air bearings)
5. Shaves off expensive "peak" energy use periods
6. Relieves excess demand on the electric grid during energy alert periods
7. Fits into our overall load management strategy
8. Increases our staff's knowledge and technical facility respecting energy

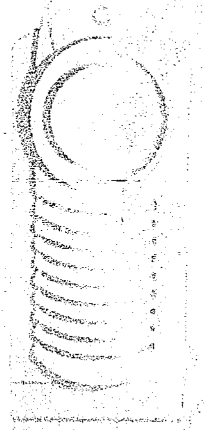
Helps the academic community by:
1. Student have access to this innovative energy technological initiative in real time through the Internet
2. Our site is a model for students research projects
3. Students will have tours to observe the microturbine in operation
4. Students will have the opportunity to review an integrated load management program

Power when and where you need it. Clean and simple.

Members

Capstone

A clean, fuel-flexible, reliable power source on or beyond the power grid.



Find a Distributor

Datasheets and Downloadable Documents

Applications

-- Select an Application --

2000 FT Energy Global Awards Defining Excellence

CAPSTONE TURBINE CORPORATION REGISTERED TO ISO 9001 FILE NUMBER A9549

What's New

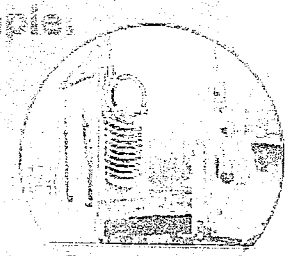
06.15.02
(External) NYPA Lauds C30s at Sewage Plant

05.17.02
(External) Danish Cheese Factory Uses C60 CHP

04.30.02
2002 Q1 Results

04.18.02
Alliant's Protsch Joins Capstone Board

04.03.02
(External) FuelCell/Capstone Hybrid Garners Patent for FCE



Case Study

Capstone MicroTurbines can save you money through the strategy of generating power onsite during peak periods. "Peak shaving" lowers the amount you take from the grid when utility charges are at their highest. Reduce your electricity bills and reduce strain on your community's utility system. Peak shaving with the Capstone MicroTurbine is a true win-win.

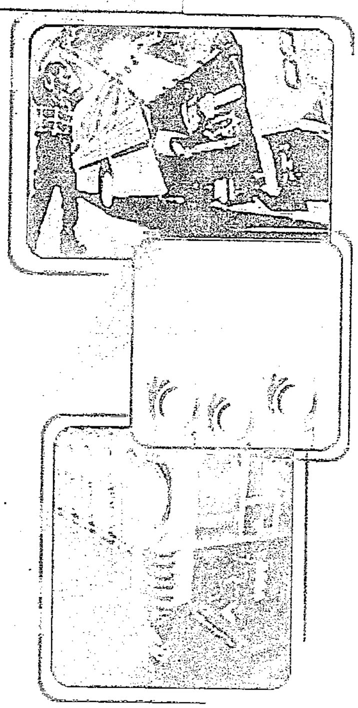
more

Technology

Benefits

Virtual Technology Tour

Datasheets and Downloadable Documents



Our flagship product is the Capstone MicroTurbine power generation system.

It's about the size of a refrigerator and generates 30 kilowatts of electricity - enough to power a small business.

The Capstone MicroTurbine is based on the same technology as a jet engine - but integrates patented air bearing and proprietary software with state-of-the-art electronics. The result: a versatile, reliable, environmentally beneficial solution for power generation that is virtually maintenance-free.

We began developing this new microturbine concept back in 1988. By December 1998, when Capstone began shipping its first commercial units, we'd placed more than 130 testbed units throughout Canada, New Zealand and the United States.

Since then, the Capstone MicroTurbine™ has amassed more than 1.5 million hours of rigorous testing and commercial operation in a wide range of applications and geographic environments.

Capstone MicroTurbine™

CAPSTONE C60
High Pressure
Natural Gas

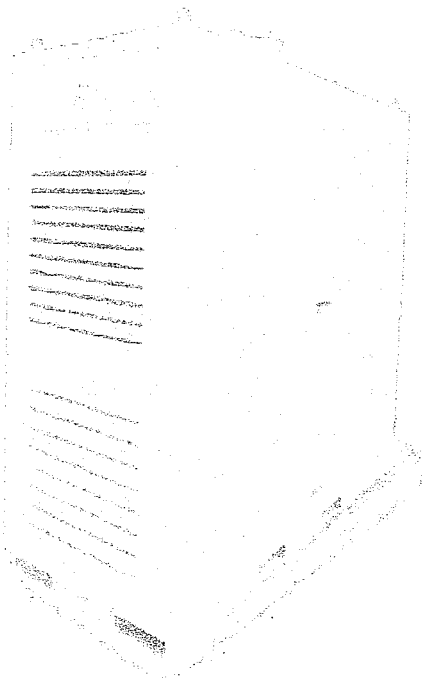
The Product

Features

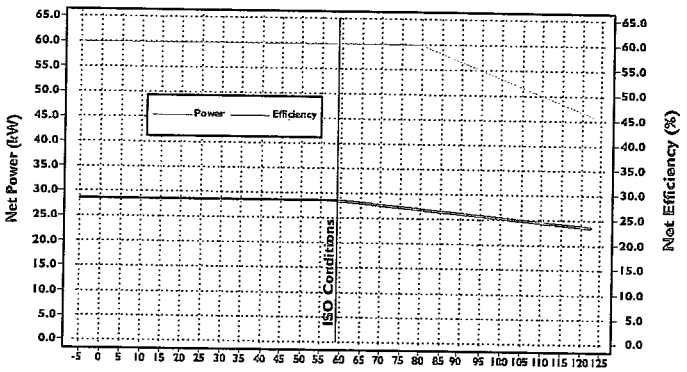
- Load-following 0-60 kW
- 360-528 VAC, 50/60 Hz
  (Stand-alone 360-480 VAC, 10-60 Hz)
  3-phase, 3- or 4-wire wye (4-wire for stand-alone)
  100ARMS/phase max continuous
- Grid-connect and/or stand-alone
- Maintenance-free air bearings
- No liquid lubricants
- No liquid coolants
- Digital power controller
- Built-in display and user interface
- Built-in protective relays
- Built-in MultiPacking of 2-20-units
  (unlimited via grid connect)

Benefits

- Ultra-low emissions
- Minimal maintenance
- Direct2Grid™ interconnection
- No fluid storage, changes, disposal
- Uncontaminated exhaust heat for CHP
- Phase-to-phase balance (0-100%) on stand-alone units
- Small footprint
- Vibration-free, quiet operation
- Easy indoor/outdoor/rooftop siting
- Zero hardware arraying (up to 1.2 MW)
- Optional remote monitoring



C60 Net Power and Efficiency at Ambient Temperature, Sea Level



Compliances

UL 1741
UL 2200
IEEE 519
CEC Rule 21
NYPSC DG
EPA Exempt
CA AQMD Exempt
WY DEQ Exempt
NEMA 3R / IP 14
Others*

Full-Load Specifications @ ISO Conditions (15°C / 59°F @ sea level)

Performance	Power	Efficiency (LHV)	Heat Rate (LHV)
Natural gas (75-80 psig)**	60 kW net (+0/-2)** 83 kVA max @ 480 VAC	28% (± 2)	12,900 kJ (12,200 Btu) / kWh

Emissions:

NO_x	<9 ppmV @ 15% O_2 (<0.49 lb/MWh)

Intake/Exhaust

Fuel flow (natural gas-HHV)	849,000 kJ/hr (804,000 Btu/hr)
Exhaust gas temperature	305°C (580°F)
Mass flow	0.49 kg/s (1.07 lb/s)
Total exhaust energy	571,000 kJ/hr (541,000 Btu/hr)

Dimensions
H: 2108mm (83")
W: 762mm (30")
D: 1956mm (77")

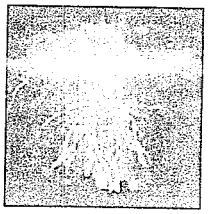
Weight
758 kg (1671 lb)
Add 363 kg (800 lb) for stand-alone

Sound
70dBA @ 10 m (33 ft)
65dBA @ 10 m (33 ft) (mult)
CE L_{WA} 99 compliant

* See www.microturbine.com/compliance for detail
**Without gas compression option. Inlet 0.5 psig with external fuel gas booster.

Fuel heat content: 36.1 to 42.1 MJ/m³ (970 to 1130 Btu/scf) HHV; natural gas, methane.
The manufacturer reserves the right to change or modify, without notice, the design or equipment specifications without incurring any obligation either with respect to equipment previously sold or in the process of construction. The manufacturer does not warranty the data on this document. Warrantied specifications are documented separately.

CAPSTONE TURBINE CORPORATION
www.microturbine.com



Microturbine Diagram & Schematic

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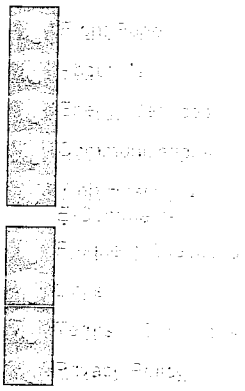
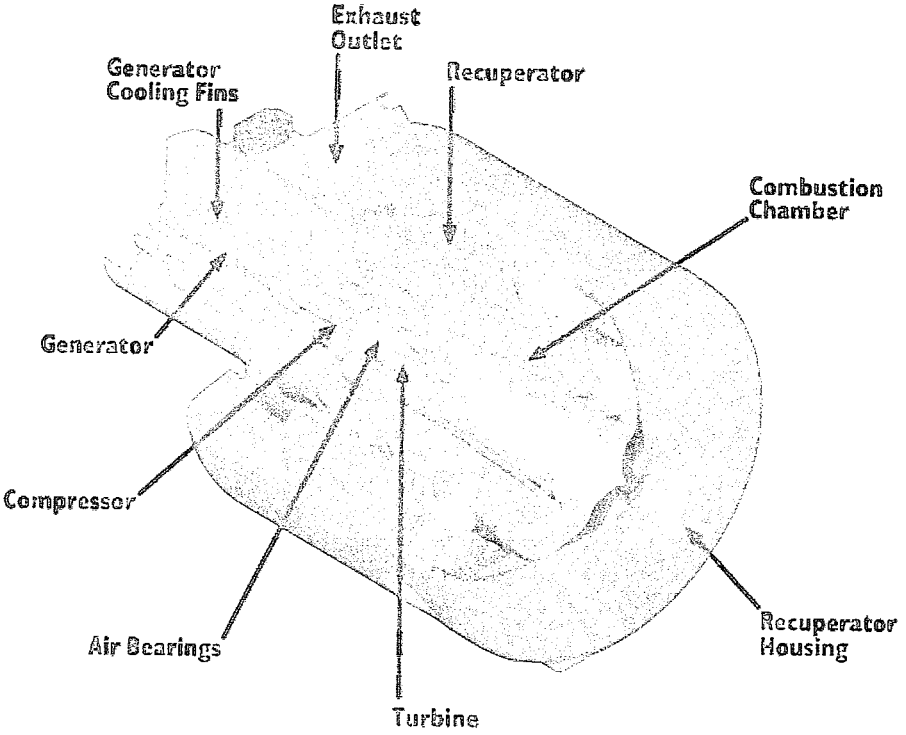


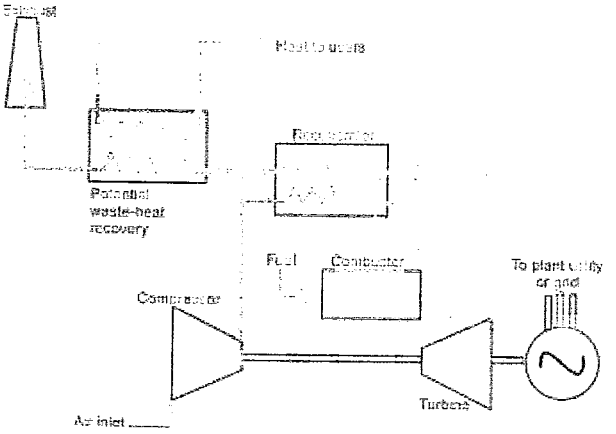
Piedmont Energy & Communications Group, Inc.

Microturbine Diagram

Capstone Microturbine



Microturbine Schematic



Click here to return

- Maximum Up-Time

  The simplicity of the Capstone design produces maximum reliability. With an air-cooled prime mover/generator consisting of just one moving part, the opportunities for failure are minimized – for example, high pressure natural gas and propane units have achieved 99.9% up-time. And with built-in protective and diagnostic protocols constantly monitoring system operation, problems can be pre-empted.

- Scalability

  Integral MultiPac features enable from 2 to 10 units to be operated as a single system, for up to 300 kW output. Communications, control, and power output are from a single point at the master unit. This feature is functional in both grid-connected and stand-alone modes of operation. If one unit in the system fails, the others will increase their outputs to compensate. This same functionality will be available in a 60 kW unit later this year, along with additional scalability beyond 10 units. This model, as well as next generation products above 100 kW, will incorporate air bearings and air cooling, in keeping with Capstone's tradition of ultra-low emissions and minimal maintenance designs.

- Outage Protection

  Operate in parallel with the utility grid, utilizing built-in control algorithms for load following, peak shaving, or time of use operation, or completely separate from the utility grid in stand-alone mode. In the event of a grid failure, the optional dual mode controller (DMC) senses the power interruption, disconnects the MicroTurbine from the grid, and reconfigures the system for stand-alone operation, automatically bringing the local loads back up. When grid power returns, the process is reversed and the loads re-connect to the utility. All of this occurs without end-user intervention.

- The Capstone MicroTurbine system is suitable for applications ranging from remote locations to city centers, delivering clean, high quality power from a wide variety of fuels, with superior safety and emissions. It offers the best value for clean and reliable small-scale power production. . Features including maintenance-free air bearings, the lowest emissions of any non-catalyzed fossil fuel combustion, and digital power conversion combine to produce the optimal small-scale generator.