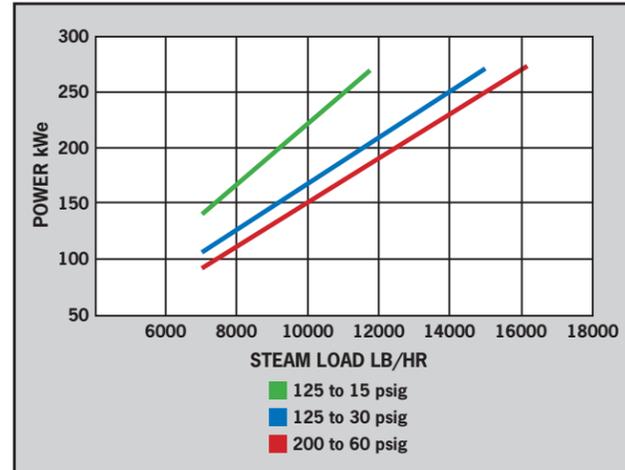


Energent Microsteam® Turbine Power System Technical Overview



High Efficiency Radial Outflow Turbine

- 80% at pressure ratio 2.5:1
- 70% at pressure ratio 5:1

Erosion Resistant Alloy Construction

- Tolerant of poor-quality steam
- **Titanium alloy rotor**
- Stainless steel nozzle

High Efficiency Epicyclic Gearbox

- 97% at 300 kWe shaft

High Efficiency Induction Generator

- 96% at 275 kWe

Quiet Operation

- 85 dBA untreated acoustically

34" x 42" x 78" Vertical Shaft

- **Installs through standard door**
- Installation in congested equipment rooms



The Cryogenic Industries Group of Companies

ACD Cryo • ACD • CI-China • CI-Houston • CI-Korea
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 Cryoquip-China • Cryoquip-East Coast • Cryoquip-Europe
 Cryoquip-Malaysia • Energent • PCS • Wittemann

PLC Control System with Color Panel Display

- Single-button startup
- Automatic synchronization
- Approved interconnection
- **Unattended operation**
- Hardwired safety trips

Pre-Wired, Factory-Tested Instrumentation and Controls

- Quick connect cables
- Plug-and-play operation
- Minimum installation costs

Full Load Power Output

- 275 kWe @ 480 V, 60 Hz, 3 Phase
- 275 kWe @ 400 V, 50 Hz, 3 Phase

Full Load Steam Heat Rate

- **3,690 Btu/kWh**

Standard Maximum Inlet Pressure

- 200 psig

Standard Minimum Discharge Pressure

- 2 psig

Steam Flow Rate

- 4,000 - 20,000 lb/hour

Typical Letdown Duty

- 200/60 psig, 150/30 psig, 125/30 psig, 125/15 psig

Long Life

- 15 Year Design



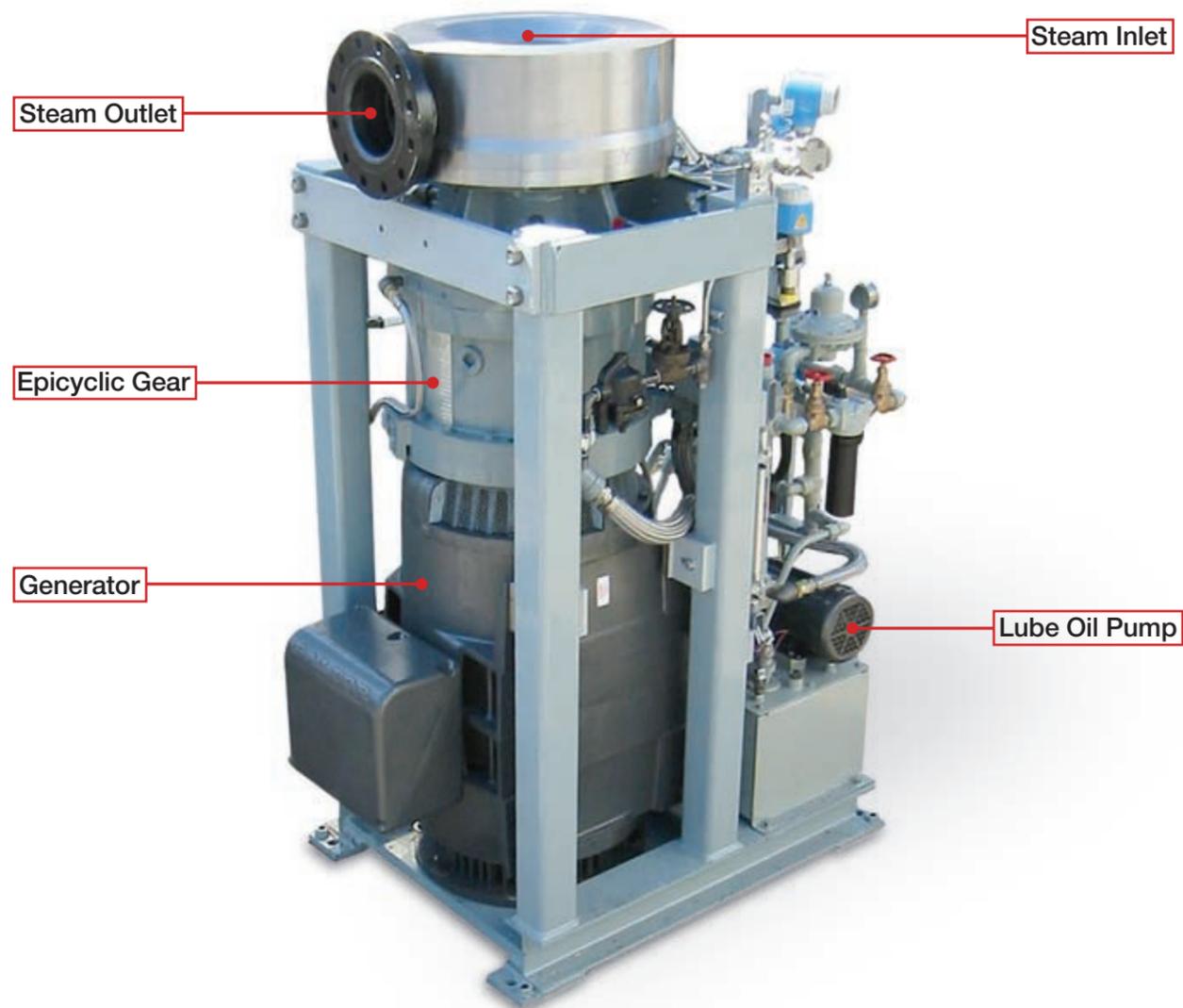
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Microsteam® Turbine Power System

Power from Lost Energy



Energent's Microsteam® Turbine Power System efficiently converts your wasted steam energy into electric power.



The Microsteam® Turbine is in commercial operation and has been independently tested at the United Technologies Research Laboratory to qualify the installation in the 7 World Trade Center Building.

from the Microsteam® Turbine is connected directly to the building power panel with utility approved protective relays, reducing the purchased electricity.



The system is based on patented Euler turbine technology. In addition to achieving the highest efficiency, the rugged turbine rotor is constructed from corrosion resistant titanium alloy and has a design that readily handles poor quality steam.

Revolutionary. Innovative. Green. All words which accurately describe Energent's Microsteam® Turbine. This efficient, compact power system generates electricity from previously wasted steam energy in buildings and plants. Any application having steam boilers or steam service with pressure reduction valves (PRVs) is a candidate for this "plug and play" preassembled system. These units represent a significant opportunity

for progressive-minded facility managers who want to optimize an existing resource, improve energy security, contain electricity costs, and take an important step towards creating a sustainable future.

How It Works

The operating principle is simple—energy otherwise dissipated by reducing the steam pressure in a valve is converted to power by the Microsteam® Turbine. The

power package is installed in parallel to an existing PRV. When started, the turbine automatically takes over the steam flow control from the PRV. When the turbine is shut down, the PRV automatically resumes steam control. The power generated

Turbine System Advantages

- **High Turbine Efficiency:** Greater than 80% measured in independent testing.
- **Reliable and Resistant to Corrosion and Erosion:** Titanium alloy construction with novel design to clear any particulates or contamination.
- **Compact Power Package:** 34" W x 42" L x 78" H. Allows easy access through standard doors and fits in congested equipment rooms.
- **Simple Installation:** Controls and electrical are pre-cabled and factory assembled—just hook up the steam and electrical interconnection.
- **Simple operation:** Single button startup and shutdown, unattended operation with automatic electrical synchronization and safety controls.
- **User Friendly Control Panel:** Separable from steam equipment with prefabricated quick connect cables.

Performance

Under many conditions, the Microsteam® Turbine will pay for itself in two to three years. As an example, if the steam load is 13,500 lb/h and the pressure is reduced from 150 psig to 30 psig, the Microsteam® Turbine will generate 275 kWe. The amount of additional steam utilized to produce the power is 4 lb/kWe.

For service of 8,000 hours per year, with an average electricity cost of \$0.15/kWh and a steam cost of \$0.015/lb, the net savings would be calculated as follows:

$$\text{NET SAVINGS} = (275 \times .15 - 275 \times 4 \times .015) \times 8,000 = \$198,000 \text{ per year.}$$

How much will you save? Energent will survey your steam usage and conditions and, based upon your electricity and steam bills, provide a free estimate of your annual savings from installing a Microsteam® Turbine.

A typical installation to generate electricity from an existing steam system utilizing a PRV. Connected in parallel with the PRV, the high-pressure steam source feeds both the PRV and the steam turbine.

