



Combined Heat and Power (CHP) for
Primary Power and HVAC in Manufacturing



Agenda

- Who is Harbec Plastics, Inc.?
- Reasons for seeking the CHP alternative.
- Problems to overcome.
- The Harbec CHP Project.
 - Microturbine choice
 - Steps to implementation
 - Components used
 - Results
- What lies ahead?



Who is Harbec Plastics, Inc.?

- Established in 1977
- Located in Ontario, NY (Rochester)
- Precision Custom Injection Molder
 - Engineering Models / Quick Manufacturing Solutions (QMS[®])
 - Precision Moldmaking
 - Custom Injection Molding of typically complex component parts
 - Insert molding
 - High tolerance molding
 - Highly engineered resins
- ISO 9002, QS 9000, ISO 14001 certified
- “Technical Innovation with Environmental Responsibility”
- Proponent of sustainable manufacturing using eco-economic measures and practices.



The Reasons for seeking the CHP alternative

- High energy costs
 - #1 reason for businesses leaving New York State
 - Competing in world market means constant pursuit of cost effectiveness and competitive pricing.
- Need to improve electrical power reliability.
- Need to improve environmental control of manufacturing facility.
 - Consistent product quality year round.
- Desire to incorporate renewable energy potentials.



Problems to Overcome

- Utility related problems with Distributed Generation in New York State.
 - No Net Metering
 - Standby Tariffs
 - Utility obstacles and road-blocks
- Difficult to secure financing
 - More than 30 bank rejections
 - No existing economic models
 - 7 to 10 year payback
- Difficult to find engineering partner willing to work with Microturbines and LEED certifications

The Harbec CHP Project



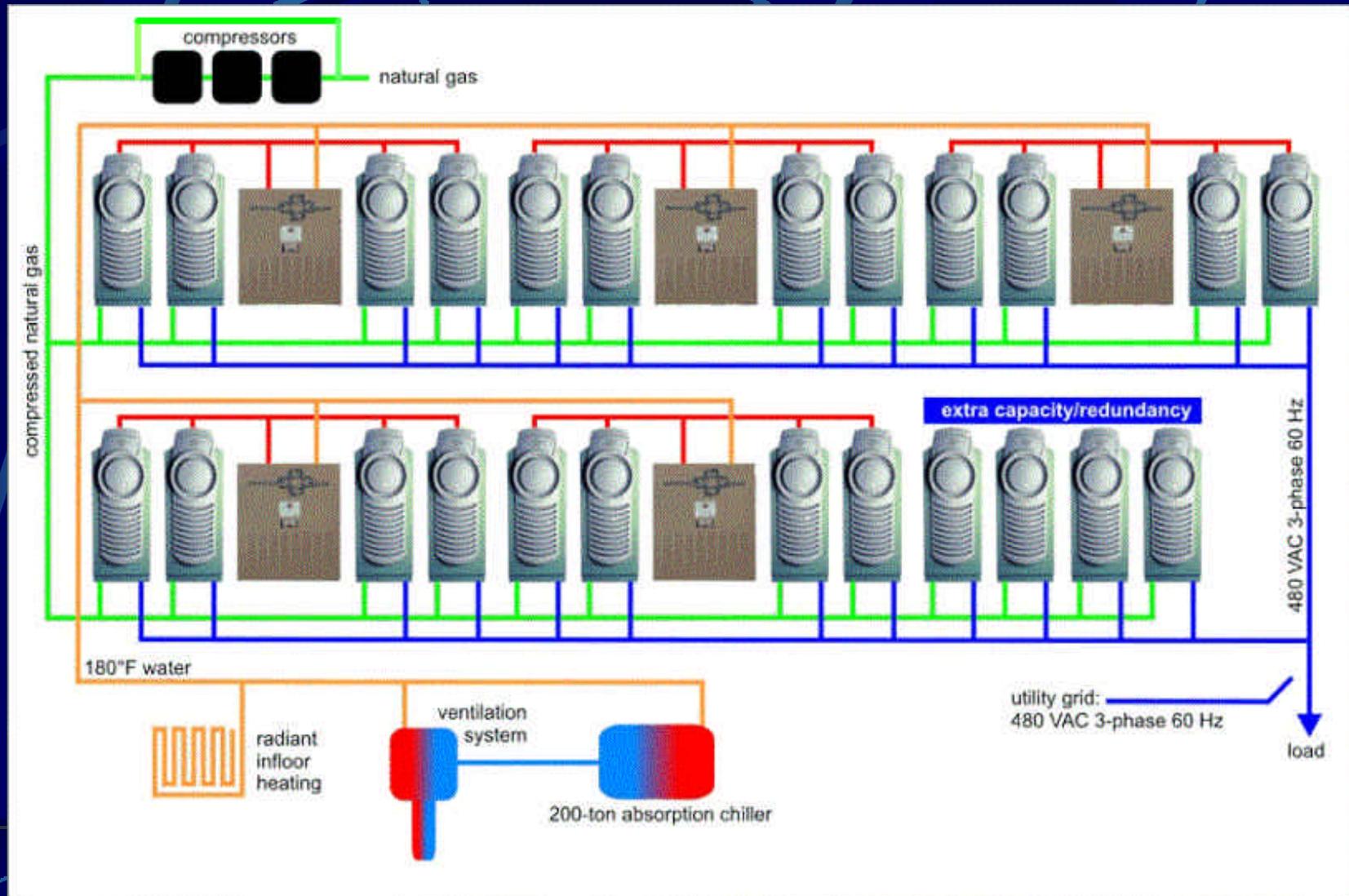
- Microturbines were selected engine solution
 - Increased reliability
 - Decreased maintenance requirements
 - No increase in staff
 - More positive environmental impact - ISO 14001
 - Lower Emissions
 - No lubricants, filters, or coolants to deal with

The Harbec CHP Project



- Implementation requirements
 - Found IBC Engineering company
 - Developed banking solution
 - Combined CHP plant with needed warehouse expansion

The Harbec CHP Project



The Harbec CHP Project



- 25 CNG fueled 30kW Microturbines
 - 750 kW max potential
 - 500 kW Harbec's maximum load requirement
 - 250 kW redundance

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- 5 Heat exchangers
 - 1 unit per four microturbines

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- 1 Absorptive Chiller
 - Converts 210° water to 44°-47° water

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- 3 - 10 hp CNG rotary Compressors

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- 17,000' of 1" Diameter tubing for radiant floor heating

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- Computer controlled sensing and delivery system



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Daylight Gathering

- Designed facility to be LEED™ certified for sustainability.



In-floor Radiant Heating



Double insulated walls and ceiling

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Results



Since July 9, 2001 microturbines have generated 100% of Harbec power requirements and have provided air conditioning and heat for an injection molding facility, while grid was maintained for back-up

Economic

- BTU efficiency electrical generating 28% - with thermal value for HVAC > 70%
- Power from Utility = \$.105 / kWh
- Cost to Microturbine generate including maintenance= \$.07-.08 /kWh
- Thermal value added = \$.05-.06 /kWh
- Based on \$3.80 / decatherm - 2 year contract with TXU

Environmental

- Less consumption of fossil fuels by increasing efficiency
- CO2 emissions reduced by >90%
- Significant reduction of SOX and NOX emissions
- No additional energy consumed to produce HVAC for plant.

The Harbec CHP Project



What Lies Ahead?



- 2002
 - Addition of 250 kW wind generator to accomplish wind/microturbine hybrid.
 - Anticipated joint development project with NYSERDA to research methods for improving CHP system efficiency.
- Beyond...
 - Increased utilization of thermal potential for application to manufacturing process heat requirements.
 - Implementation of Stuart Electrolyzer to store excess wind as hydrogen (hythane) for use in microturbine or future fuel cells.



HARBECTM
PLASTICS INC
TECHNICAL INNOVATION WITH ENVIRONMENTAL RESPONSIBILITY



Q & A
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Thank You.

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