

The Economic Opportunities of Sustainable Manufacturing at *HARBEC* Plastics, Inc.

Through: Energy, Transportation, Building Design, Lighting Systems, and Industrial Efficiencies

A Ten Year Journey in... 15 minutes

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By: Bob Bechtold

HARBEC Plastics, Inc.

Why ? Eco-Economic Advantages

- “Being **Green** is nice but we can’t afford it”
...Disproving a common misconception through eco-economic examples
- Carbon Responsibility in the U.S.
Manufacturer’s future...with or without the Government
- The most important part of Corporate Social Responsibility (CSR) is the “C”

How ? What a Difference Ten Years Makes

- 1998-2000 Problem solving, concept developing, engineering search, **Bank Rejections (no model)**
- 2000-2001 Banked and Built CHP/Wind hybrid... but alas, no wind
- 2003 250 kW wind turbine installed
- 2007 Lighting upgrade
- 2008 CHP project - paid off
- 2009 Barrel insulation installed
- 2010 Wind turbine project - paid off
- Future Thermal Awareness...Biofuels to Blueflame
...900kW...Rankine Cycle...WISP...
also...Energy Saving Manufacturing Alternatives, Processes and Sustainable Bio-origin Materials

What ? Energy - Electricity and HVAC

Combined Heat and Power CHP

- 25 CNG fueled 30kW Microturbine Generators
 - 750 kW max potential provides:
 - 500 kW for *HARBEC*'s max electric load requirement
 - 250 kW redundancy for back-up and maintenance

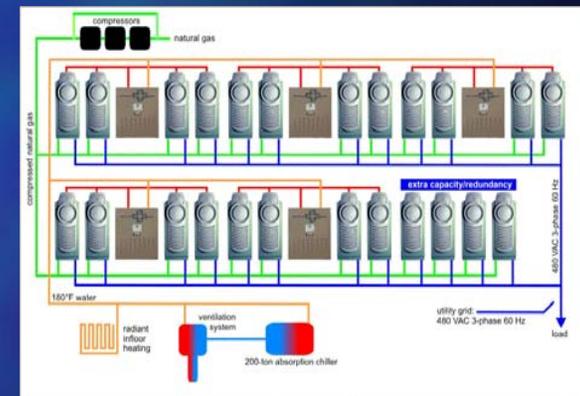
Thermal Advantages

Heating and A/C almost energy (fuel) free

No Magic

We just use the 75% that Utilities throw away

By using the thermal energy from exhaust, we heat and air condition 9000 sq.ft. molding area with 25 injection molding machines and a 17,000 sq.ft. manufacturing/warehouse space



\$\$\$ 7 Year ROI paid for with energy dollars not spent \$\$

Energy – Renewable Wind Electricity

- Installation of 250 kW wind generator to accomplish wind/microturbine hybrid
- Slightly better than Class 3 wind site
- Projected energy production is 300,000 to 350,000 kWh per year, or about 15 % of the total *HARBEC* annual energy requirements.



- Displaces retail value electricity, which is \$.155 per kWh
- Electric savings provides >\$45,000/year revenue stream
- 8-10 year ROI on \$400k project originally
- ROI is shortened as electric costs rise
- **Allows us to predict 15% of our energy costs 20 to 25 years into the future \$\$\$\$\$**



Transportation - Green Fleet



- 100% of Company Vehicles are considered 'Green' due to alternative fuels or efficiency:
 - 2 Toyota Prius Hybrid Electric/Gas cars
 - 1 total electric Ford EV Ranger
 - 1 CNG delivery Ford window van
 - 1 Bio-diesel fueled Ford box van type delivery truck

\$\$\$\$ Improved efficiency reduces consumption, saves money on fuel

\$\$\$\$ Reduced maintenance costs due to cleaner more efficient operation



Building Design - LEED

Leadership in Energy and Environmental Design
U.S. Green Building Council

- **Daylight Gathering:** using natural light resources to replace electric lighting during daylight hours

- **In-floor Radiant Heating:** Using hot water for the most efficient space heating method

- **Double Insulated walls and roof** (R-value = 2X code reqs.) Silicone sealed, self supporting wall panels to minimize heat and cooling loss

\$\$\$\$ By designing facility for sustainability, the energy consumption is reduced. \$\$\$\$

Conservation is the first rule of Sustainability



Lighting Systems Upgrade

High efficiency: fixtures, ballasts, and sensors

Complete lighting upgrade was installed the end of 2007

- Replaced every fixture and ballast plus high bay sodium with new T-8 type fluorescent bulbs and reflectors
 - Total cost \$65,000
- Quality of light was improved by using fuller spectrum bulbs
- Lighting energy consumed was decreased by 48% on average company wide
- Bulbs have longer life which reduces replacement cost
 - Total annual electric savings \$38,000...+...+
 - NYSERDA Grant \$16,000
 - Direct Federal Tax credit \$8,000
 - Contractor secured financing package

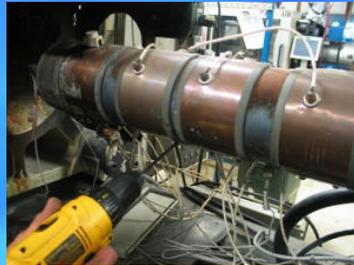
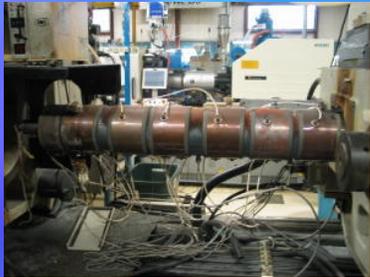
\$\$\$ ROI 1.5 years \$\$\$



HARBEC Manufacturing Equipment Modifications

Molding Machine Barrel Heater Insulation Project:

- Replace heater bands and install insulation covers
- Install metal cover to contain and protect insulation



- Reduced electrical consumption of molding machines by 40% per year (324,000kWH) due to increased efficiency of barrel heaters so reduces energy costs by \$44,000.
- Containing heat reduces amount of excess heat in room which lowers the load on the A/C system by 12 Tons per hour. (or ~12 kWh per hour of operation)
- Exploring screw designs for additional energy efficiency potentials
- Reduction of electricity consumption reduces amount of Green House Gases by 243 tons of CO₂. (324k kWh x 1.5)
- Significant GHG reduction including NO_x and SO_x
- Reduction of demand on A/C system energy saving
- Amount of non-renewable limited resources being consumed is reduced significantly.
- If an Acre = 3 ton CO₂/year
3320 T...1100 A.....60%...to Carbon Zero

Industrial Efficiencies

Eco-Economic equipment and systems purchase decisions

- Over seven year time span, replaced all standard hydraulic type equipment with all-electric injection molding machines
- Electric machines do not use power when they are in static state, which is a significant portion of the time.
- Capable of doing the same or better job than the hydraulic machine, using as much as 50% less energy
- Use of exhaust heat for absorption A/C means reduction of moisture in plant air which reduces the need for use of electric material dryers by as much as 75%.
- Use of inverter drives and soft starts on all motors 10 hp. and greater saves energy due to more efficient motor starting.



More Industrial Efficiencies

Eco-Economic Equipment and Systems Purchasing Decisions

- Replacing standard screw-type air compressor with variable speed unit greatly increases efficiency and reliability.

\$\$\$\$ Reduced electrical consumption due to increased efficiency, lowers energy costs.

- Maintenance requirements and costs are reduced due to lower operating stress and temperatures. \$\$\$\$\$



Eco-economic conclusions about \$ustainable Manufacturing

- Control operating costs
 - Improve competitive pricing
 - Insure power reliability ~ No Blackouts
 - Provide fixed energy costs decades into the future
- Improved operating efficiency through thermal utilization

Eco-Economic Results of Cumulative Energy Efficiency Measures

- From 2005 to 2008 *HARBEC* increased sales and profits

...YET...

- EPA Green Power Partnership Yearly Report:
 - 2005 total electric consumed= 3,627,000 kWh
 - 2008 total electric consumed= 2,402,000 kWh
 - Reduction of total electricity = 1,225,000 kWh
 - Electric consumption reduced by 35%
 - @ .155/ kWh = \$189,875
 - * 1.5lb. = 1,837,500 lb. = 919 tons GHG



Lesson Learned: If you want to make an environmental impact, and save money, use energy efficiency!

Another Way to Look at it...

- Energy = 6% cost of doing business for manufacturing
- **Example Company** is \$10MM sales ~ \$600K annual energy cost
- 35% energy cost reduction = \$200k/year to bottom line
- Annual profitability factor is 5 to 10% = \$700k average
- Would require ~\$3MM additional sales for equal impact on overall annual profitability

- **Would a normal manufacturing company pursue an opportunity to increase sales by 30% ??**

What's next?

PowerWind PW-56

- 900 kW Wind Turbine
 - 2x height
 - 2x rotor diameter
 - 8 to 10x power output
- Proposed Financing by 8 to 10 year PPA + FMV buyout



RENEWABLE ENERGY FOR GAS TURBINES

Cleanest use of Renewable Fuels

- Fuel Flexibility with Lowest Emissions Possible
 - Carbon Neutral (“net” zero)
 - Generate Carbon Credits
- Generate Renewable Energy Credits
 - Helps Meet (RPS) Requirements



The Dream of Rankine Cycle... becomes a reality at *HARBEC*



Thanks to the invention of:

Ener-G-Rotors, Inc.

Converting Low Temperature Heat to Electricity

112 Erie Blvd.

Schenectady, NY 12305

518-372-2608



- 2 Turbine @ 24 kW each
- Water set point @ 225 F
- Hot water flow=62 GPM @ 218 to 227 F
- Cold water flow= 25 GPM @ 67 to 88 F
- Exhaust gas temp to stack = 223 F (vs. 350)

Produces 5 kW electric power
by **2010** plan 50 kW to be continued...

Green Finance Success Enhancements

What's Needed ? Some Suggestions

- Longer repayment terms than US Corporate ROI norm:
 - 1.5 to 3 to 5 years ROI is fine for most investment decisions
 - Exception for alternative energy and energy efficiency projects because loan payments are alternatives to utility payments
 - Business is using mandatory monthly energy payments to buy asset instead of non-renewable energy
 - **Start thinking 8 to 10 years for finance packages**
- **Government Loan Guarantees** needed to 'shore up' Bank confidence are more real and useful than tax incentives, tax subsidies, etc.

HARBEC conviction to Eco-economic Sustainable Manufacturing

At *HARBEC* we regard Eco-economic Sustainability as absolutely critical to the future of our business, and we believe that our success in the pursuit of it, will improve our competitive advantage by insuring our efficiency.



Striving to be a
Carbon Neutral
manufacturing company



Next - Phase 2 – What If ?

If this worked so well for *HARBEC*, could it be expanded into an Industrial Park?

- What would be the advantages and disadvantages of expanding the eco-economic model used by *HARBEC*?
- What were the opportunities and the obstacles that it would present?



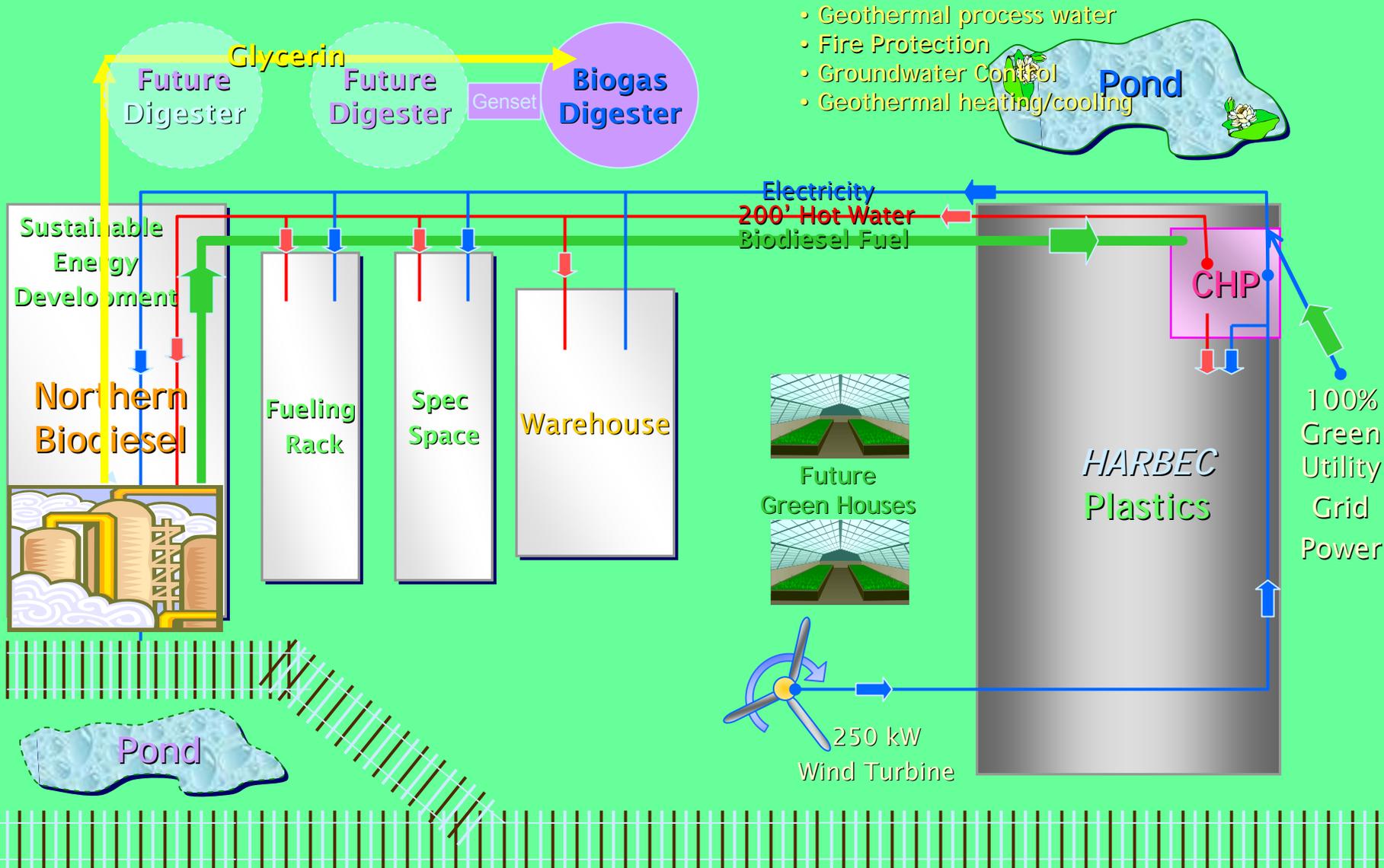
Wayne County Industrial Sustainability Park

Opportunities

- The number one reason for businesses leaving NY State is the cost of energy (3rd highest average in the US)
- If we build it they will come...as long as it's cheaper
- More predictable energy reliability due to on-site generation means less impact from utility problems
- Carbon Offset possibilities in the future



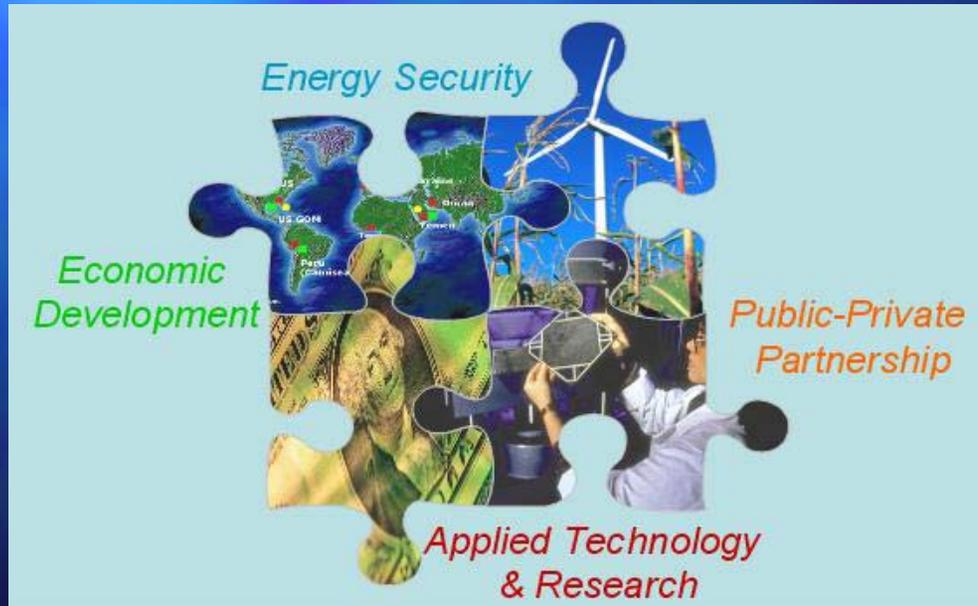
Wayne County Industrial Sustainability Park



Wayne County Industrial Sustainability Park

The Advantages and Benefits

- +Tax revenues
 - + Increased employment
 - + Energy security from blackouts
 - + Energy independence from foreign sources
 - + Energy cost controls decades into the future
 - + Lower energy costs than competing communities- plus- Green
 - + Uniqueness in demonstrating positive solutions for the future
- ...leading edge vs. trailing edge...



Eco-economic Sustainability is the Key to the *HARBEC* future



In an attempt to move beyond the lack of common understanding of what being Green means from one company to another, *HARBEC* is currently assessing its Carbon Foot Print in order to become a

Carbon Neutral Sustainable Manufacturing Company

Thank You

HARBEC, Inc.
585-265-0010

Ontario, NY
www.harbec.com