

Department of Energy 2015 Better Buildings Summit

Ending the Tyranny of 2-year Payback

Bob Bechtold



Assumption:

Most Fortune 500 Companies have between 1 and 2 year ROI requirements for determining if a project or equipment purchase will be funded, insuring maximum potential for their invested funds which is considered wise business practice.



Smaller companies like *HARBEC* can sometimes use 2 to 3 year ROI for project financial metrics and usually find that banks expect this for loan justification and approval



Proposal:

There is a potential exception to this practice that can offer the company excellent long term advantages and not impair liquidity, profits or growth potential



at *HARBEC*...

We refer to this alternative as
'Eco-economic Decision Making'

Energy in our type of
manufacturing = 4% to 6%
cost of doing business

At *HARBEC* we have learned how to
'leverage our consumption'

This has allowed us to develop the *HARBEC* Energy Management Strategy

- Combined Heat and Power (CHP) = reduced energy cost through efficiency (by using the other 65% to 75%)
- Renewable on site generation = fixed energy cost for 25 years (no constantly escalating fuel cost)
- Green power from utility = free energy storage, low cost energy insurance, cost effective renewable energy credits



Facts of Life...

(the things we can do little or nothing about)

- *HARBEC* needs > 3 million kWh/year to operate
- 3 million kWh costs \$420k/year (\$0.14/kWh)
 - *HARBEC* pays \$xx for taxes
 - *HARBEC* pays \$xx for insurance

Ask 10 business owners what their utility bill was last month



???



We believe there are two pockets of potential

Pocket #1



Typical Project ROI

Good business practice demands ROI be limited to 1 to 3 years depending on company size and stock holder status...

And...



Pocket #2

ENERGY PROJECT ROI

If the dollars you use to pay for an energy project come from the **Energy Bill (tax/insurance bill) Pocket** you had to spend them anyway...

If you choose to buy an **asset** that generates an electron with the same dollars, at the end of the payments you have a continuing revenue potential instead of **spent electrons**.

Examples Over the Last Fifteen Years

Opportunities...

- 2000-2001 Banked and Built CHP
- 2002/3 250 kW wind turbine installed
- 2007 Lighting upgrade
- 2008 CHP project - paid off
- 2009 Barrel insulation installed
- 2010 Wind turbine project - paid off
- 2012/13 850 kW Wind Turbine installed
- 2013/15 CHP Upgrade Project
- 2014 /15 LED Lighting Upgrade Project

Future Opportunities...2015...2016...Biofuels to
Blueflame...500kW Solar...Rankine Cycle...WISP...

also...Energy Saving Manufacturing Alternatives, Processes
and Sustainable Bio-origin Materials

Times are Changing

- Banking for wind turbine #1
 - From 1999/2001 turned down by more than **30** banks from New York to Ohio.
- Banking for wind turbine #2
 - Less than 30 days to get 4 financing opportunities from my office.
 - Options included... No out of pocket required for discounted electricity with 10 year lock in.



2000-2001 Banked and Built CHP

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

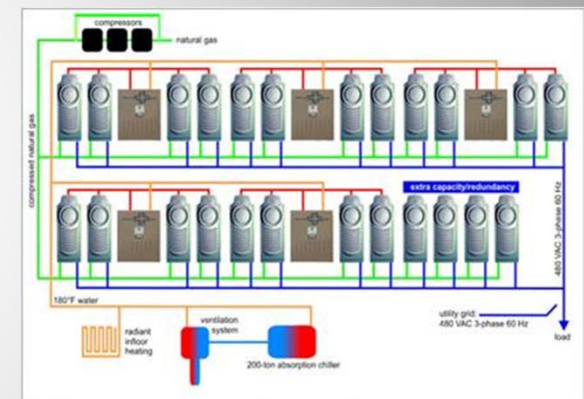
Heating and A/C almost energy (fuel) free

No Magic

We just use the 65 - 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 \$\$\$



2002/3 250 kW wind turbine installed

- Installation of 250 kW wind generator to accomplish wind/microturbine hybrid
- Slightly better than Class 3 wind site
- Projected energy production is 300,000 kWh +/- 10% per year, or about 10 to 15 % of the total *HARBEC* annual energy requirements.



- Displaces retail value electricity, which is \$.15 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 10% of our energy costs 20 to 25 years into the future \$\$\$\$\$**



2007 Lighting Systems Upgrade - High efficiency: fixtures, ballasts, and sensors

Complete lighting upgrade was installed the end of 2007

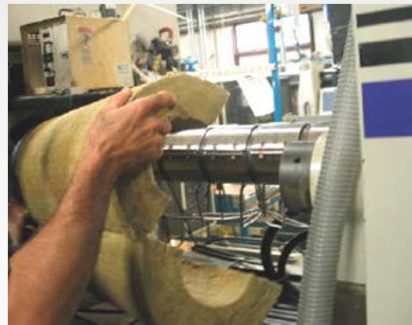
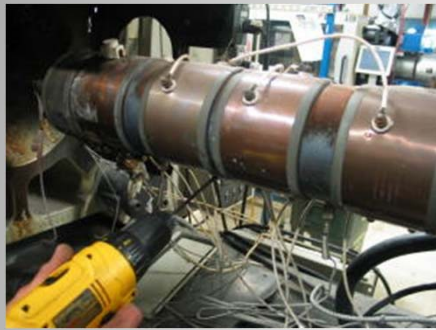
- Replaced every fixture and ballast plus high bay sodium with new T-8 type fluorescent bulbs and reflectors
 - Total cost \$65,000
- Quality of light was improved by using fuller spectrum bulbs
- Lighting energy consumed was decreased by 48% on average company wide
- Bulbs have longer life which reduces 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 \$\$\$



2009 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 Sox
- Reduction of demand on A/C system energy saving
- Amount of non-renewable limited resources being consumed is reduced significantly.

2012/13 – Renewable Wind Energy- II

- Installation of **850 kW** wind generator to accomplish wind/microturbine hybrid
- Slightly better than **Class 3** wind site
- Projected energy production is **1,500,000 kWh** +/- 10% per year, or about 50% of the total **HARBEC** annual energy requirements.
- $300\text{k- kWh} + 1.5\text{MM kWh} = 1,800,000 \text{ kWh}$

- **6 - 7 year ROI on \$2.1M project originally**
 - ROI is shortened as electric costs rise

**Allows us to predict ~ 50% of our energy costs
20 to 25 years into the future \$\$\$\$**

Total energy from Renewable is ~ 60%



2013/15 – CHP – Upgrade Project

Combined Heat and Power CHP

- 10- CNG fueled 30kW Microturbine Generators –Refurb
- 8- 65kW Microturbine Generators = 520 kW
- Increase to 820 kW max potential provides:
 - 500 kW for *HARBEC*'s max electric load requirement
 - 320 kW redundancy for *WISP* and maintenance

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 and soon 14,000 sq.ft. of shop and
office

6-8 Year ROI paid for with
energy dollars not spent



LED Lighting Systems Upgrade – 2014/15

– Direct Replacement / Ballast Compatible Bulbs

- New LED tubes that are magnetic or electronic ballast compatible means:
 - No rewiring of fixtures
 - No fixture replacement cost
 - 50k hour bulb life
 - 45% Lighting energy reduction (from 32w to 18w)
- Complete Facility 1280 bulb replacement project:
 - \$32,000 total cost
 - 50% RG&E grant = \$16k
 - Lease option for no upfront cost
 - < One year payback w/grant...< Two year payback no grant
 - \$22k annual savings



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. (<3 yr. payback)

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



Eco-economic conclusions about Sustainable Manufacturing Opportunities

- *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

ENERGY PROJECT ROI



Most Energy Projects

The equipment and asset life span outlast the ROI period by > 2 or 3 times
Often they can be refurbished or rebuilt for a fraction of the original project cost

If you choose to buy an **asset** that generates an electron with the same dollars, at the end of the payments you have a continuing revenue potential for many years instead of **spent electrons**.

Eco-Economic Results of Cumulative Energy Efficiency Measures

- From 2005 to 2008, each year **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%
 - @ .145/ kWh = \$177,625
 - 1.5 lb/kWh = 1,837,500 lb. = 919 tons GHG



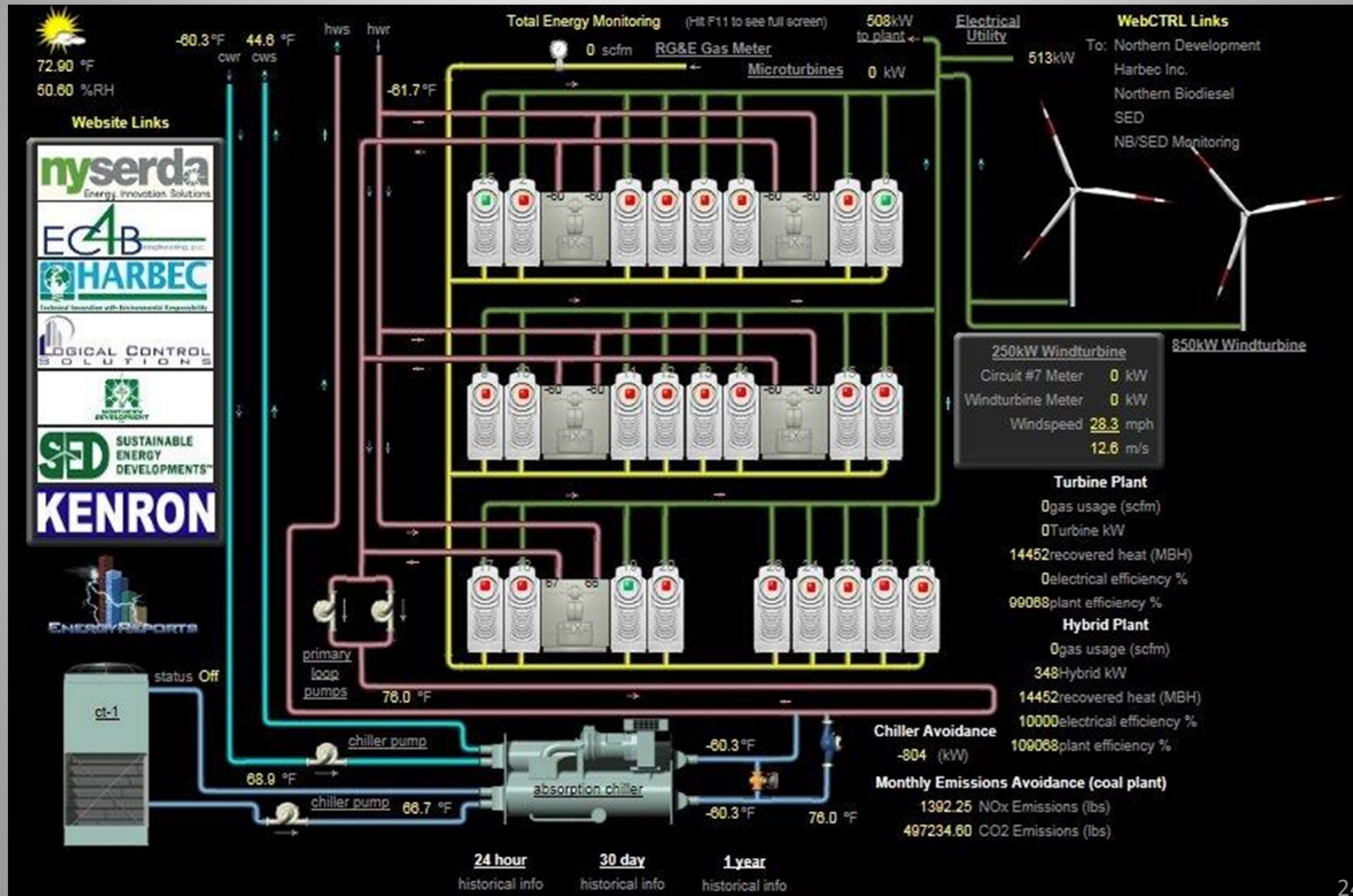
Lesson Learned: If you want to make an environmental impact, and save money, use energy efficiency!

Another Way to Look at the opportunity for positive impact to bottom line...

- Energy = 5% cost of doing business for manufacturing
- Example Company is \$10MM sales ~ \$500K annual energy cost
- 35% energy cost reduction = \$175k/year to bottom line
-
- If (5% to 10% is average profit) = \$700k
- \$175k is 30% of \$700k
- Would require (30%) ~\$2MM to \$3MM additional sales for equal impact on overall annual profitability
-
- Would a normal manufacturing company pursue an opportunity to increase sales by 30% ??

The HARBEC CHP Project

www.northerndevelopment.com



The NEW *HARBEC* CHP Project
www.northerndevelopment.com



HARBEC Conclusion...

When it comes to energy project ROIs

Don't...



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.



A Carbon Neutral
manufacturing company

Striving to be
Water Neutral by 2015



ISO 50001/SEP Platinum Nov. 2013

DOE - Better Plants – Challenge Jan. 2014

HARBEC, Inc.
585-265-0010

Thank You

Ontario, NY
www.harbec.com