CHP Plant



Victoria Packing Food Processing Facility Brooklyn, NY

Facility Profile

- Medium size food processing
- Private (Family Owned Business)
- Critical process systems
- Approx 6 day, 20 hour operation
- 100 to 250 Kw profile
- Concurrent heavy hot water/steam use
- Competitive business

Automated, High-tech Plant Victoria Packing



How Do I Start ?

Size Plant ??

Utility Regulations ?

Annual Savings ?

Construction Cost ?

Type of Cogen Units ??

Location ??

Will It Work ? !

Reliability ??

Funding and Financing ?

Codes NYDEC, Safety ??

Construction Method ??

Planning A CHP Plant Getting Started

- 1.) Initial Review and Qualification
- 2.) CHP/Energy Feasibility Study
 - * Owner's Goals
 - * Accurate Energy Profile
 - * CHP Plant Electric and Heat Recovery
 - * Proper Size, Cost and Type
 - * Calculations for Net Savings
 - * Net Savings Vs Total Cost to Install

<u>Electric profile – Economic Fit</u>



<u>Thermal Profile – Economic Fit</u>



Proper CHP Plant Design

- The CHP plant must be modeled to determine the proper economic balance
- Proper economic balance based on power produced verses power needs
- Proper economic balance based on waste heat produced verses waste heat used.
- Engineering model and spreadsheet analysis

Process For Victoria Packing

- 1.) **Preliminary review/qualification**
- 2.) Engineering analysis/economics
- **3.) NYSERDA funding application/award**
- 4.) CHP plant design
- 5.) CHP bids, pricing and options
- 6.) CHP plant construction

CHP Plant Modeling

- 12 Month electric profile
- Peak and off-peak analysis
- Per NYSERDA CHP Guidelines
- 12 month plant and facility thermal profile
- Ability to model various size plants
- Simultaneous energy savings and estimating

CHP Plant Modeling

- CHP Plant Emissions vs NY-DEC regs
- FERC Compliance
- Sensitivity of Savings to Fuel Cost
- Construction Cost
- Over 50 CHP plant input parameters

| | | | | | ``` | /ictoria Pa | cking | | | | | |
|----------------------------|-----------------------------------|--------------|----------------|-----------|---------------|----------------|--|--------------|--------------|-------------------|-------------------|--|
| | | COGENERATION | | | | | | ANALYSIS | | | | |
| | | | 2 - 150 kW | INITS | | | 300 KW T | OTAL (No | Absorber) | | | |
| | THERMALL CAD DE COGENERATION SETS | | | | | | | | | | | |
| | HEAT | MAXIMUM | AVERAGE | CHON SETS | THERMAL | | LOAD BASED | AVG COGEN | MAXIMUM | PREDICTED | ON | |
| | LOAD | ABSORBER | ABSORBER | AVG. NET | LOAD OF | TOTAL | POTENTIAL | RUNTIME | COGEN | COGEN | PEAK | |
| | including | CHILLER | CHILLER | OPERATING | ABSORPTION | USABLE | RUN HOURS | max/month = | RUN HRS | RUN HRS | ELECTRICITY | |
| MONTH | deductions | LOAD | CLG. LOAD | LOAD | CHILLER | LOAD | max/month = | 95% | 2 | 2 | GENERATED | |
| | (Therms) | (tons) | (% factor) | (tons) | (Therms) | (Thems) | 1460 | (percent) | | UNIT(S) | (KVVh) | |
| 100 | 10.002 | | ~ | | <u> </u> | 10.002 | 0740 | 57.0% | 1 207 | 000 | 12 | |
| Jan-00 | 18,083 | 75 | 0% | 0 | 0 | 18,083 | 2,712 | 57.0% | 1,387 | 832 | 83,220 | |
| Feb-00 | 20,363 | 75 | 0% | 0 | 0 | 20,363 | 3,054 | 52.0% | 1,387 | 759 | 75,920 | |
| Iviar-00 | 9,299 | 75 | 0% | 0 | 0 | 9,299 | 1,395 | 50.0% | 1,387 | 730 | 73,000 | |
| Apr-00 | 15,999 | 75 | 0% | 0 | 0 | 15,999 | 2,400 | 50.0% | 1,387 | 730 | 73,000 | |
| May-00 | 12,000 | 75 | 0% | 0 | 0 | 12,000 | 1,800 | 50.0% | 1,387 | 730 | 73,000 | |
| Jun-00 | 21,083 | 75 | 0% | 0 | 0 | 21,083 | 3,162 | 44.0% | 1,387 | 642 | 64,240 | |
| Jui-00 | 2,795 | 75 | 0% | 0 | 0 | 2,795 | 419 | 53.0% | 1,387 | 774 | 77,380 | |
| Aug-00 | 10,633 | 75 | 0% | 0 | 0 | 10,633 | 1,595 | 55.0% | 1,387 | 803 | 80,300 | |
| Sep-00 | 17,684 | 75 | 0% | 0 | 0 | 17,684 | 2,653 | 55.0% | 1,387 | 803 | 80,300 | |
| Oct-00 | 8,912 | 75 | 0% | 0 | 0 | 8,912 | 1,337 | 55.0% | 1,387 | 803 | 80,300 | |
| Nov-00 | 23,174 | 75 | 0% | 0 | 0 | 23,174 | 3,476 | 55.0% | 1,387 | 803 | 80,300 | |
| Dec-00 | 14,390 | 75 | 0% | 0 | 0 | 14,390 | 2,159 | 56.0% | 1,387 | 818 | 81,760 | |
| TOTAL | 174,413 | | | 0 | 0 | 174,413 | 26,162 | 53% | 16,644 | 9,227 | 922,720 | |
| Percent boiler | plant at utility peak = | | 100% | | | | 17,520 | max | | | | |
| | | | | | | | | | | | | |
| | GR | COSS SAVIN | IGS FROM CO | GENERATIC | ON UNIT OPER | ATION | | | COGEN F | UEL USE | NETCOG | |
| | | | ELECTRICIT | Y | | THERM | AL LOAD | | | | | |
| | AVERAGE | ELECTRIC | GENERATED | CHILLER | CHILLER | BOILER | COGENHTG | TOTAL | COGEN | COGEN | GROSS | |
| MONTH | DEMAND | DEMAND | ELECTRICITY | SAVINGS | ELEC COST | | LOAD COST | GROSS | FUEL | FUEL | ENERGY SAVINGS | |
| NICAN III | 85% | SAVINGS | SAVINGS | (K)M(b) | SAUNUSS | (Therms) | Actual | SAVINGS | (THERMS) | (COS D | SAVINOS | |
| 1 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | |
| lan 00 | 186 | \$3,977 | \$1,926 | 0 | \$0 | 6 806 | \$4.764 | \$13.568 | 9.543 | \$5,726 | \$7.842 | |
| Eeb-00 | 210 | \$4.374 | \$4,520 | 0 | \$0 | 6 209 | \$4,704 | \$13,214 | 8705 | \$5,720 | \$7,042 | |
| Mar-00 | 176 | \$3.674 | \$4,321 | 0 | \$0 | 5.970 | \$4.179 | \$12,174 | 9.371 | \$5,022 | \$7,551 | |
| Apr-00 | 193 | \$3,874 | \$4,321 | 0 | 00 | 5,970 | \$4,179 | \$12,174 | 8,371 | \$5,022 | \$7,152 | |
| Apr-00 | 201 | \$3,603 | \$4,321 | 0 | 50 | 5,970 | \$4,179 | \$12,504 | 8371 | \$5,022 | \$7,201 | |
| lum 00 | 476 | \$2,669 | \$2,902 | 0 | 00 | 5,570 | \$4,175 | \$12,030 | 7,266 | \$3,022 | \$7,878 | |
| Juneoo | 176 | \$3,000 | \$3,003 | 0 | 50 | 3,200 | \$3,677 | \$11,140 | 7,300 | \$5,224 | \$6,720 | |
| | 213 | \$4,470 | \$4,561 | 0 | \$0 | 3,420 | \$2,400 | \$11,459 | 0,073 | \$5,324 | \$6,135 | |
| Aug-00 | 100 | \$5,924 | \$4,754 | 0 | 50 | 0,507 | \$4,597 | \$13,274 | 9,208 | \$5,5∠5 ¢5,525 | \$7,749 | |
| Sep-00 | 255 | \$5,314 | \$4,754 | 0 | \$0 | 6,567 | \$4,597 | \$14,664 | 9,208 | \$0,525 ¢E.E2E | \$9,140 | |
| Oct-00 | 214 | \$4,451 | \$4,754 | 0 | \$0 | 6,567 | \$4,597 | \$13,801 | 9,208 | \$5,5∠5 ¢5,525 | \$8,276 | |
| Nov-00 | 204 | \$4,250 | \$4,754 | 0 | \$0 | 6,567 | \$4,597 | \$13,601 | 9,208 | \$5,525 | \$8,076 | |
| Dec-00 | 194 | \$4,041 | \$4,840 | 0 | \$0 | 6,686 | \$4,680 | \$13,561 | 9,375 | \$5,625 | \$7,936 | |
| TOTAL | 2,402 | \$50,051 | \$54,623 | 0 | \$0 | 72,558 | \$50,791 | \$155,464 | 105,805 | \$63,483 | \$91,981 | |
| | Description | | | | | A - 4 - 1 0/ - | | | | | | |
| | Demand notes : | | | | | Actual % = | 92.0% | of potential | hermal savin | ngs. | | |
| | | | | | | | | | | Serv | ice Consolidat | |
| | | | | | | | | | | ** ** * | | |
| Demand saved by absorber = | | 0 | | Avoided | boiler therms | s gas based o | jas based on natural gas fuel cost of | | | Per Therm | | |
| | | | | | | Cogen fuel | Cogen luer cost based on natural gas fuel cost of \$0. | | | \$0.600 | Per Therm | |
| | | | | | | | Cogen maintenance contract set at | | | \$0.0150 | Per full run h | |
| | | | | | | | | | | | | |
| GRAND | | | | | | | | | | | | |
| TOTALS | 2,402 | \$50,051 | \$54,623 | 0 | \$0 | 72,558 | \$50,791 | \$155,464 | 105,805 | \$63,483 | \$91,981 | |
| | Total Kwh | generated | peak and off p | eak = | 922,720 | Kwh | | | | | | |
| | Total plan | trun nours | ai 100 | N KW | average = | 9,227 | Hours | | | | | |



Plant Selection

- Total size approx 300 Kw
- Modular with 3 units
- Reciprocating engines Catalytic controls
- Full heat recovery via hot water (not steam)
- Specific, custom tie-in to hot processes
- Modification to electric service
- Consolidation of existing electric loads

Specific Identification of Process Tie - In



<u>Plant Location</u> Hint – In NYC It's Tight !



Benefits to Victoria

- Annual Net Savings \$ 50,000 to \$ 90,000
- Simple payback from 4 to 7 years without funding
- With funding 3 to 5 years
- Payback depends on selection of design options presently being evaluated
- Victoria Packing expansion of processes
- Victoria Infrastructure needs
- Overall 80 percent reduction in electric bills

Project Timeline

- Selection of design options July 2002
- Construction Sept 2002
- Plant Operational Spring 2003
- Design to allow expandability
- Design can allow type of unit flexibility