



Energy Intelligence at the Center for Energy and Environment

Tiger Rost

MnTAP Advisors: Jon Vanyo, AJ Van den Berghe

CEE Supervisor: Gustav Brändström



UNIVERSITY OF MINNESOTA

Driven to DiscoverSM



Center for Energy and Environment

Company Background

- **CEE Energy Intelligence Program**
 - **Small industry businesses left out of most energy programs**
 - **Provided as a no-cost service (funded through utility conservation tariff)**

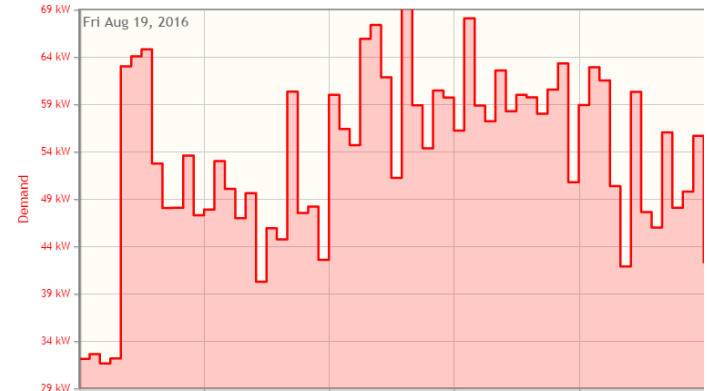
CEE is a non-profit 501 (c) (3) corporation that works to promote the responsible and efficient use of natural and economic resources

Motivations for Change & MnTAP Assistance

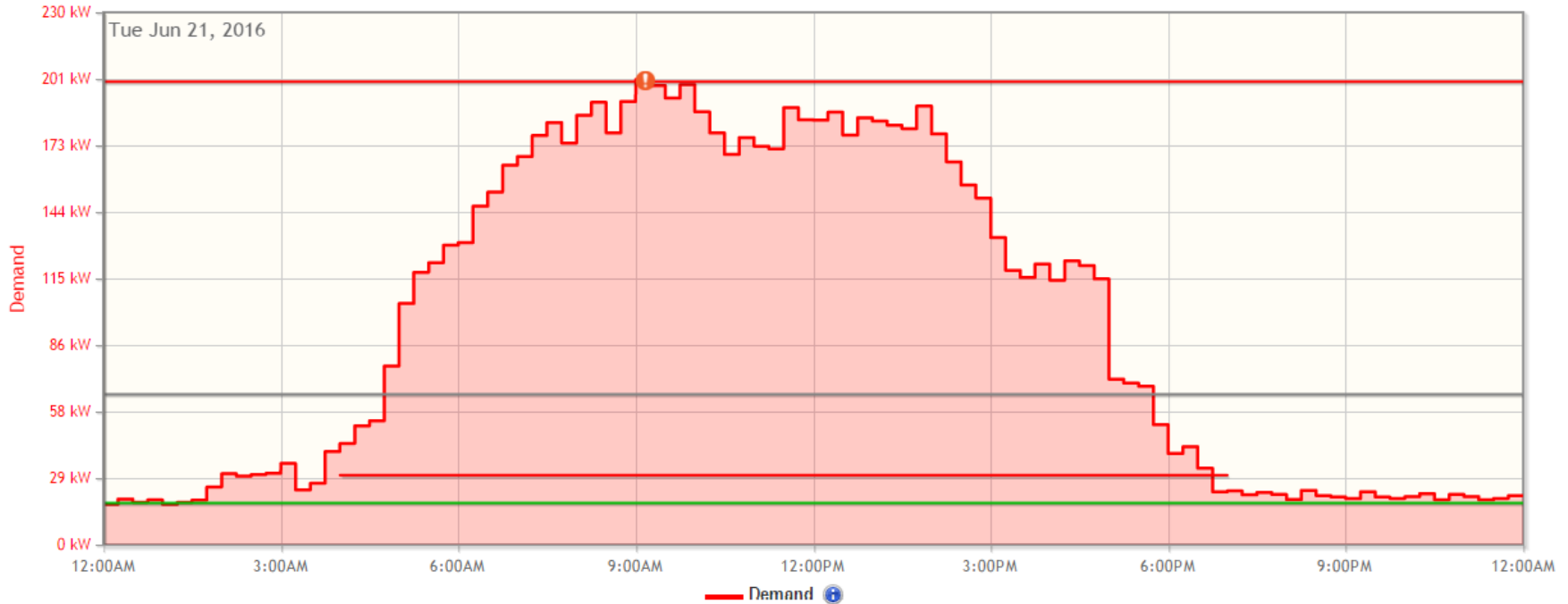
- **Most businesses concerned with production**
- **As the program is no cost to the business, encourages action**
 - **CEE's Energy Intelligence program wonders if it can save customers more money (on average save 8%)**
 - **MnTAP intern could potentially save more energy and lead to more future partnerships**

Project overview

- Energy Intelligence (EI) uses interval smart metering data
- This data can find trends in production
- With MnTAP, trying to see if it's possible to get more than average 8% savings
- Intern goes through each business and finds additional savings through time spent at each site



Sample smart meter data



Findings - Company A (Printing)

Opportunity	kWh, gal, or therms saved	Financial savings	Cost	Payback
Reducing psi levels and runtime	68,000 kWh	\$4,900	\$0	0 yrs
Replacement of interior lights	73,000 kWh	\$7,500	\$23,000	3 yrs
UV curing	70,000 kWh	\$7,100	\$120,000	17 yrs
Condensing hours	47,000 kWh	\$3,000	\$0	0 yrs
Adjusting thermostats	2,600 kWh and 600 therms	\$550	\$0	0 yrs
Boiler upgrade or eliminating use	230 therms	\$300	Varies	Varies
Replacement of motors	1,000 kWh	\$110	\$830	5 yrs
Replacement of exterior lights	2,400 kWh	\$150	\$1,600	7 yrs
Totals	264,000 kWh and 830 therms	\$24,000	\$145,000, \$25,000 w/o UV	6 yrs. 1.5 yrs w/o UV

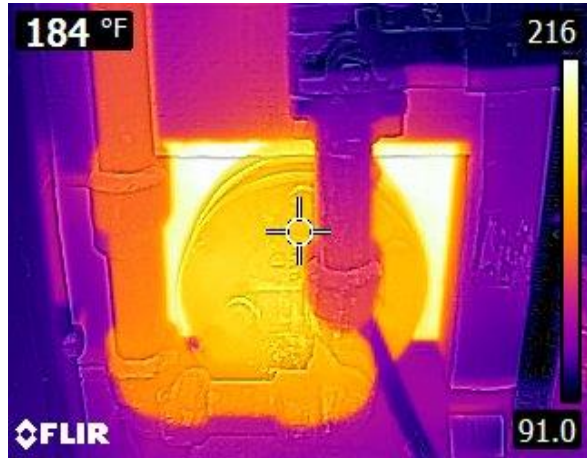
Potential to save 46% of total annual energy (kWh only)

Findings - Company B (Electroplating)

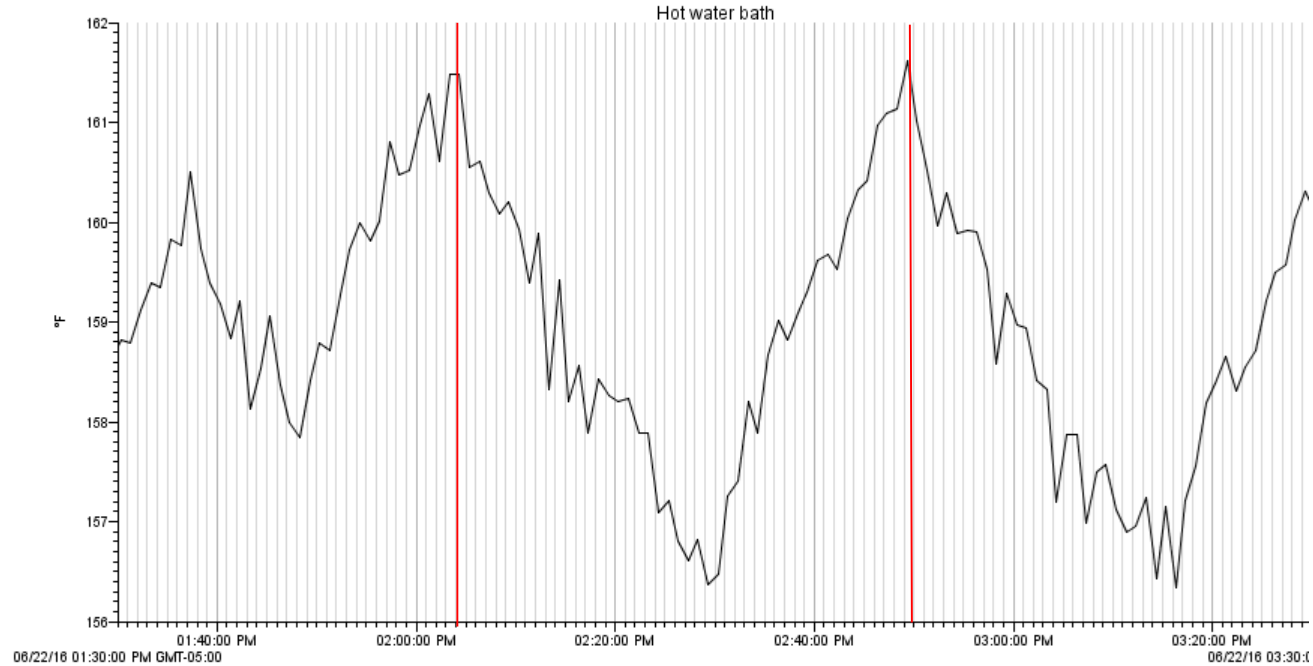
Opportunity	kWh, gal, or therms saved	Financial savings	Cost	Payback
Reducing compressor leakage/use, psi levels	31,500 kWh	\$2,300	\$170	0.1 yrs
Using hexies	37,200 kWh and 64 gal	\$3,800	\$440	0.1 yrs
Replacing hot oil system	20,800 kWh	\$2,200	\$2,000	1.3 yrs
Replacing 32W fluorescents with 15 W LED screw-ins	17,400 kWh	\$1,800	\$4,700	2.6 yrs
Replacing exterior lights	2,900 kWh	\$180	\$1,300	5 yrs
Replacing motors	5,000 kWh	\$520	\$900	1.8 yrs
MAU2 motor replacement	10,300 kWh	\$1,100	\$770	0.7 yrs
Totals	125,000 kWh and 64 gal	\$11,900	\$10,300	1.3 yrs

Potential to save 31% of total annual energy

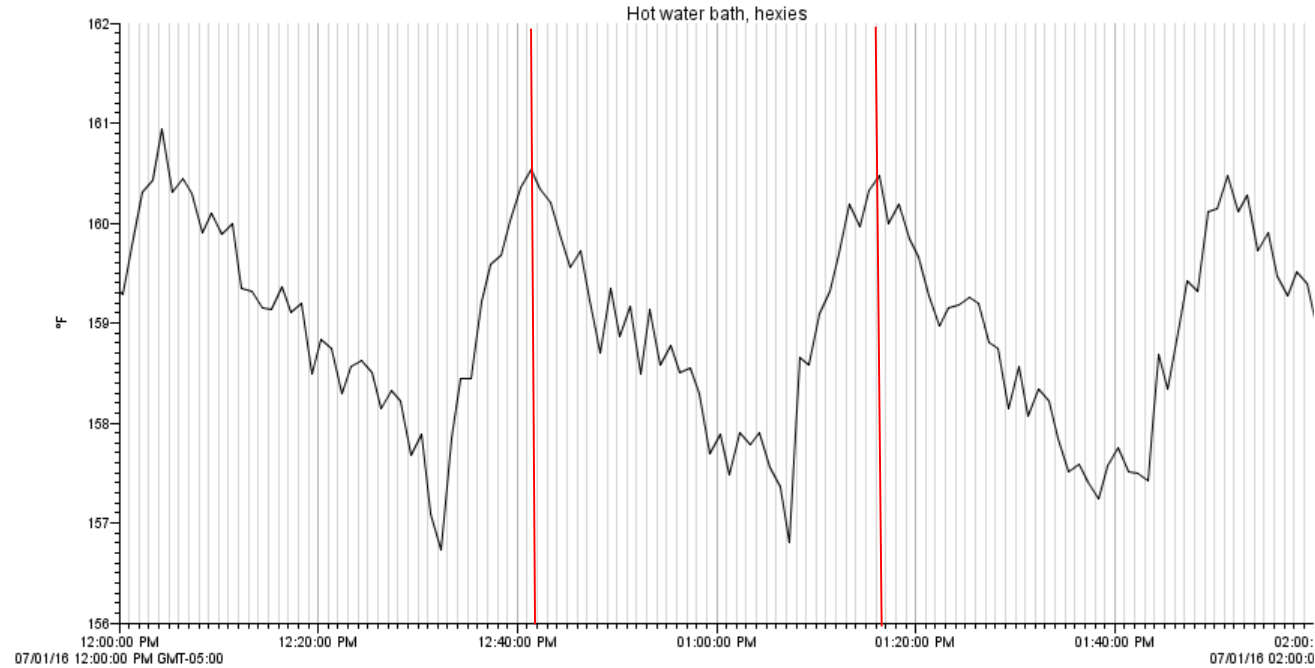
Company B IR pictures



Uncovered baths, Company B



Hexies experiment, Company B



Findings - Company C (Clean rooms)

Opportunity	Energy or power saved	Financial savings	Cost (with rebate)	Payback
Fixing compressed air leaks	6,000 kWh	\$680	0	Instant
LED screw-in lamps, 15W	61,000 kWh	\$6,900	\$13,200	1.9 yrs
Utilizing motion sensors	19,000 kWh	\$2,100	\$1,840	0.9 yrs
Installing alert system	3 kW	\$400	\$730	1.8 yrs
Adjusting solar panels	600 kWh	\$60	\$0	Instant
Totals	86,600 kWh and 3 kW	\$10,140	\$15,770	1.6 yrs

Potential to save 25% of total annual energy (kW not included)

Findings - Company D (Injection molding)

Opportunity	Energy or power saved	Financial savings	Cost (with rebate)	Payback
1. Switching 25W fluorescents to LED screw-in bulbs	6,400 kWh	\$1,000	\$4,100	4.1 yrs
2. Replacing exterior lighting with low-wattage alternatives	840 kWh	\$51	\$400	7.78 yrs
3. Replacing select motors as they age	15,200 kWh	\$1,420	\$5,230	3.7 yrs
4. Managing humidity through injection mold dehumidification	Varies	\$100,000	\$15,000	0.15 yrs
Totals	22,440 kWh	\$2,500 + \$100,000	\$9,730 + \$15,000	3.9 yrs + 0.24 yrs

Potential to save 11% of total annual energy (IM dehumidification not included)

Findings - Company E (Millworking)

Opportunity	Energy or power saved	Financial savings	Cost (with rebate)	Payback
1. Switching from 32W fluorescents to LED screw-in bulbs	107,000 kWh	\$11,800	\$16,100	1.4 yrs
2. Managing compressor psi use and leakage	135,000 kWh	\$8,300	\$0	Immediate
3. Replacing exterior lighting	4,400 kWh	\$270	\$1,400	5.1 yrs
4. Retrofitting dust collection	35,600 kWh	\$3,920	\$3,500	0.89 yrs
5. Reducing energy spent on ventilation with VFDs	4,500 kWh	\$490	\$270	0.6 yrs
Totals	290,000 kWh	\$25,000	\$21,270	0.9 yrs

Potential to save 45% of total annual energy

Findings - Totals

Location	Energy/Power savings	Financial savings	Cost (with rebates)	Percent energy savings
Site A	264,000 kWh and 830 therms	\$24,000 (\$17,000 w/o UV)	\$145,000 (\$25,000 w/o UV)	46%
Site B	125,000 kWh and 64 gal water	\$11,900	\$10,300	31%
Site C	86,600 kWh and 3 kW	\$10,140	\$15,770	25%
Site D	22,440 kWh	\$102,500 (\$2,500 w/o IM)	\$25,000 (\$9,830 w/o IM)	Without IM, 11%
Site E	290,000 kWh	\$25,000	\$21,270	45%
Totals	788,040 kWh, 3 kW, 830 therms, 64 gal water	\$173,540 (\$73,540 w/o IM)	\$217,340 (\$202,000 w/o IM)	36%

Potential Future Projects

- Expanding internship into partnership with U of M for energy audits with students
- Further developing benchmarking to compare sites between different industries
- Adopting uniform procedures for different energy opportunities and applying at all sites (compressors, lighting, etc.)

Personal Benefits

- Experience with electroplating, printing, manufacturing, lighting, compressed air, etc.
- Experience in project management
- Had the opportunity to apply engineering and technical skills
- Gained background knowledge of several different types of equipment



Questions?

This project was supported in part by the Minnesota Pollution Control Agency

