Charting a Course to Energy Independence

GovEnergy
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Central Utility Plant Optimization

Optimization = Efficiency

Energy Efficiency is not a one time event. It's a mindset. It has become a requirement as we face realities associated with our environment, our energy supplies and the challenges associated with a global economy.

Central Utility Plant Optimization

- ***Typical Equipment and Large Energy Users***
- ***Demand side best practices***
- ***Supply side considerations***

CUP Energy Systems

- ***Chillers*** *largest single user of electricity in most facilities*
- ***Steam*** *can account for up to 40 to 50% of site energy costs*
- ***Compressed Air*** *most misunderstood and inefficient*
- ***Heat Exchangers*** *key components to efficiency*
- ***BMS*** *automatic and consistent control, historical data*
- ***Generators*** *critical load, peak shaving*
- ***Water Treatment*** *chillers, heat exchangers, boilers*

Centrifugal Chillers

Understand your equipment !

1. Chillers operates at full load 1 to 2% of the time-how does that impact your operation?

2. Understand the ***Performance Curves*** at various load conditions-**IPLV/APLV** ratings

3. Look beyond the chiller: pumps, piping, motors

4. Log machine daily – one of the most overlooked and valuable functions

Chiller log analysis

identify the problem

Log Reading	design	actual
voltage	480	480
amperage	315	310
oil temp	135	134
oil temp cooler	110	110
oil level	ok	ok
oil pressure	7	8
evap pressure	17	16
cond pressure	7	13
cond temp in	85	88
cond temp out	95	99
cond refrig temp	96	103
evap water in	54	55
evap water out	44	46
evap refrig temp	38	39
demand limit setpt	100%	100

Chiller log analysis

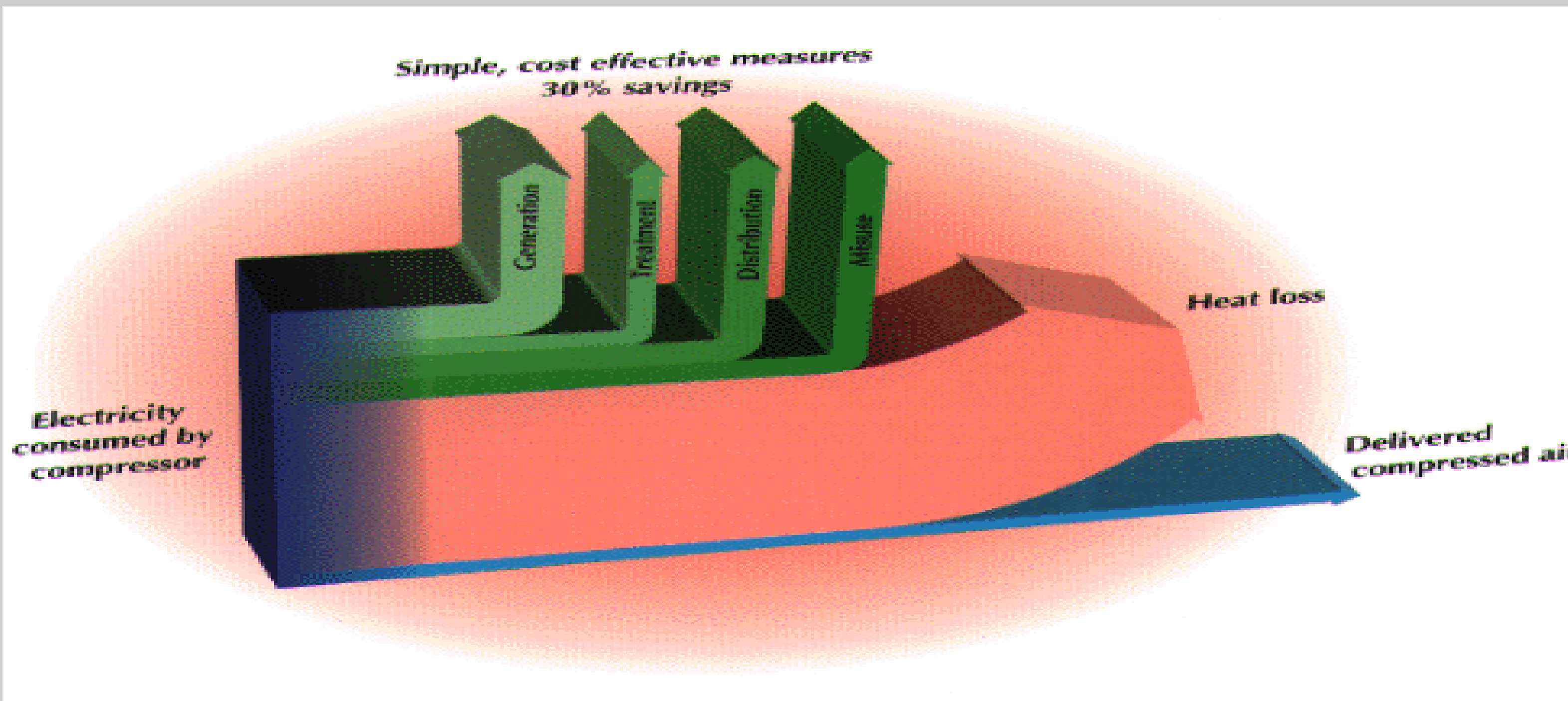
identify the opportunity

Log Reading	design	actual
voltage	**480**	480
amperage	**315**	310
oil temp	**135**	134
oil temp cooler	**110**	110
oil level	**ok**	ok
oil pressure	**7**	8
evap pressure	**17**	16
cond pressure	**7**	7
cond temp in	**85**	81
cond temp out	**95**	89
cond refrig temp	**96**	90
evap water in	**54**	52
evap water out	**44**	44
evap refrig temp	**38**	40
demand limit setpt	**100%**	100

Compressed Air

"the 4th Utility"

- **Compressed Air's Inefficiency: Approximately 10% gets to the point of use!!**



Compressor Efficiency

- Operate the fewest number of compressors
  1. Operate at full-load
  2. Turn off unnecessary compressors

- Do not oversize - smaller compressors at full load operate more efficiently than larger units at part load.

- Compressor Selection
  1. Use efficient base-load compressors to make most of the air.
  2. For large base-load demand, use centrifugal compressors designed to run for years without major maintenance.
  3. Consider VFD compressors for trim compressors to satisfy variable air load.

Air Leaks: your biggest challenge as much as 20-30% of the compressor's output

- **Fixing leaks once is not enough.** On-going leak prevention is the key to continuous efficiency. Established leak prevention programs include identification/tagging, tracking, repair and verification and employee involvement.

- Where do leaks occur?
  valves couplings regulator pipe connections traps drains

- Once leaks are repaired, re-evaluate compressed air supply and monitor / maintain your new baseline.

Compressor Receivers

- *Adequate receiver capacity 2-5 gallons per CFM*
- *Remote receivers for short-term intermittent loads*

Dryers

- *Dry air usually is more expensive; dry the air only to the dryness needed.*
- *Oversized dryers do not perform well at low loads.*
- *Use refrigerated dryers if possible with remote desiccant dryers for critical loads.*

Steam

- Represents up to 45% of the site energy spend.
- A typical boiler will consume many times it's initial capital cost in annual fuel usage.
- Maximize condensate return:
  1. contains up to 20% of the energy required to make the steam
  2. reduces chemical costs
- To calculate condensate return, you must know:
  1. How much steam is produced
  2. Amount of make up water

Steam

- Boiler efficiencies range from 70 to 89%
  1. Combustion Efficiency: measure of how effectively the heat content of a fuel is transferred into usable heat.
- Exhaust gas: **<** 100° F above the steam temperature.

Pressure psig	Temp °F
0	212
25	267
50	298
100	338
200	388

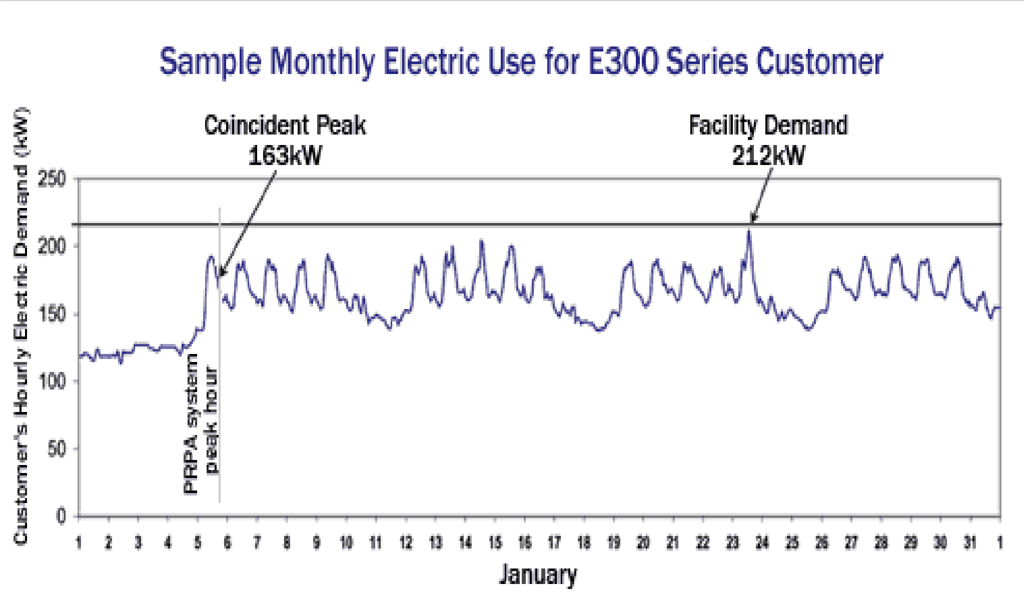
Example: boiler steam pressure: 100 psig

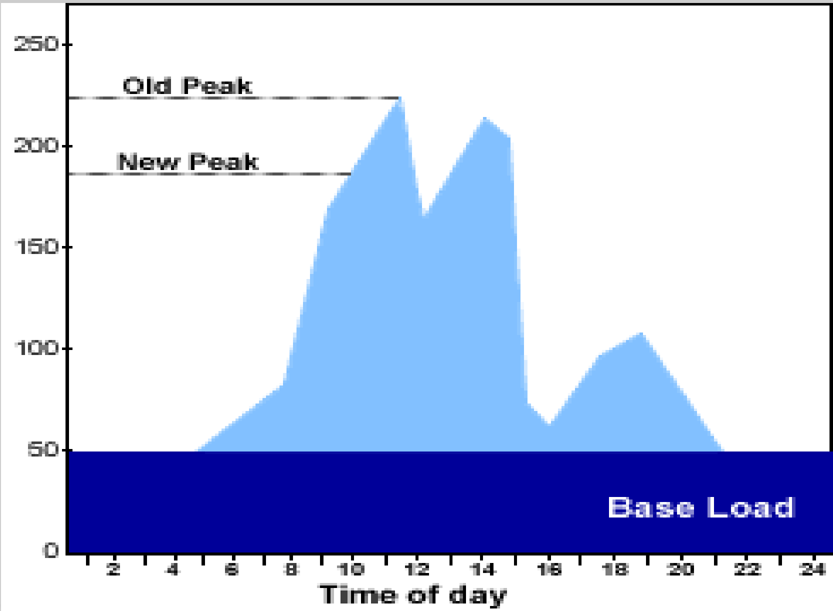
338 + 100 = 438°F

Supply Side Energy- know costs and contracts

Electric Utilities bill through demand and usage

1. What are your costs/kWh?
2. Where is your usage in comparison to your contract demand?
3. Are more applicable rate structures available?
4. Ability to shift loads or processes to off peak hours
5. Incentives or rebates available?





EFFICIENCY

a mindset that unlocks the key to optimum performance

"I don't care how much power, brilliance or energy you have, if you don't harness it and focus it on a specific target, and hold it there you're never going to accomplish as much as your ability warrants." **Zig Ziglar**

M&M Mars: Burr Ridge IL

Since 2002, the site Engineer has reduced energy consumption at the site by over 38%...all at a time when electrical rates doubled and manufacturing went from a 5 to 6 day schedule.

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Contact Information

Ted Warlick

Schneider Electric

International Account Manager

704-497-0990

Ted.warlick@us.schneider-electric.com

Thank You