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· August 15-18, 2010 · Dallas, Texas ·
· Dallas Convention Center ·

Practical M&V: How M&V Can Help You with All Your Energy Projects

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Sentech, now part of SRA International Inc.

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Measurement and Verification

- You cannot improve what you do not measure.
  - Dr. W. Edwards Deming

Practical Look at Measurement and Verification

- What can it do for us?
- When should you use it?
- What can you expect from it?

Why do we Need M&V?

- Progress of projects
- Check on vendors/consultants
- Project ROI
- Justify additional projects

Can M&V be Used to Create Project Interest?

- Do people know what you are doing?
- Is project effective?
- Generating interest with the people you work with

Documentation Takes Many Forms

- We need to document our work
- You do not need fancy equipment to document work
  - Meters
  - Cameras
  - IF cameras
  - Spreadsheets
  - Smoke signals

    can all be used

Documentation:

Simple Spreadsheet

Facility	Gross Square Feet	Annual MWh if metered	Electric Rate per MWh (energy only)	Electrical Energy Cost for Building	Percent of Steam Plant Allocated to Building	Steam Plant Cost (Fuel only)	Steam Fuel Cost for Building	Percent of 4509 Chiller Plant Allocated to Building	Total Building Utility Cost (energy, fuel, & water)
5600CC1	18,233	21,672	$ 55.90	$ 1,211,465					$ 1,211,465
4509	9,160	16,344	$ 55.90	$ 913,630	0.1069%	$10,042,746	$ 10,739		$ 962,112
7900	66,817	12,528	$ 55.90	$ 700,315	1.4060%	$10,042,746	$ 141,200		$ 993,726
6000	125,018	12,092	$ 55.90	$ 675,943	1.9524%	$10,042,746	$ 196,071		$ 898,704
4500S	347,346	11,501	$ 55.90	$ 642,906	14.0542%	$10,042,746	$ 1,411,423	36.7227%	$ 2,182,693
4500N	341,237	8,203	$ 55.90	$ 458,548	9.0648%	$10,042,746	$ 910,357	18.9994%	$ 1,370,309
5600CC2	8,707	5,533	$ 55.90	$ 309,295					$ 309,295
4508	93,912	5,325	$ 55.90	$ 297,668	6.3453%	$10,042,746	$ 637,246	11.6071%	$ 976,809
5600	108,730	4,145	$ 55.90	$ 231,706	0.7460%	$10,042,746	$ 74,919		$ 306,624
1505	90,171	3,902	$ 55.90	$ 218,122	3.3755%	$10,042,746	$ 338,995		$ 574,209
5700	140,851	3,215	$ 55.90	$ 179,719	0.4666%	$10,042,746	$ 46,859		$ 226,578
4515	66,793	2,937	$ 55.90	$ 164,178	2.5205%	$10,042,746	$ 253,128	5.1230%	$ 425,192
2519	29,479	2,609	$ 55.90	$ 145,843	0.0258%	$10,042,746	$ 2,595		$ 195,845
5800	97,985	2,523	$ 55.90	$ 141,036	0.6318%	$10,042,746	$ 63,450		$ 204,486
7920	29,000	2,435	$ 55.90	$ 136,117	1.7226%	$10,042,746	$ 172,997		$ 320,437
4501	80,973	1,896	$ 55.90	$ 105,986	3.1172%	$10,042,746	$ 313,053	5.5793%	$ 419,039
3500	72,068	1,750	$ 55.90	$ 97,825	1.3894%	$10,042,746	$ 139,535	6.3760%	$ 237,360
7930	32,950	1,487	$ 55.90	$ 83,123	1.6769%	$10,042,746	$ 168,405		$ 262,043
2026	28,144	1,476	$ 55.90	$ 82,508	1.5674%	$10,042,746	$ 157,410		$ 239,918
3025M	46,053	1,459	$ 55.90	$ 81,558	2.2367%	$10,042,746	$ 224,625		$ 306,183
7601	40,007	1,392	$ 55.90	$ 77,813	0.2695%	$10,042,746	$ 27,060		$ 104,873
6010	52,432	1,371	$ 55.90	$ 76,639	0.6866%	$10,042,746	$ 68,957	2.5172%	$ 145,595
3525	27,000	1,337	$ 55.90	$ 74,738	0.8673%	$10,042,746	$ 87,105		$ 161,843
3019A	44,071	1,334	$ 55.90	$ 74,571	1.4379%	$10,042,746	$ 144,409		$ 218,980
5500	64,238	1,302	$ 55.90	$ 72,782	2.6716%	$10,042,746	$ 268,306	6.4353%	$ 422,305

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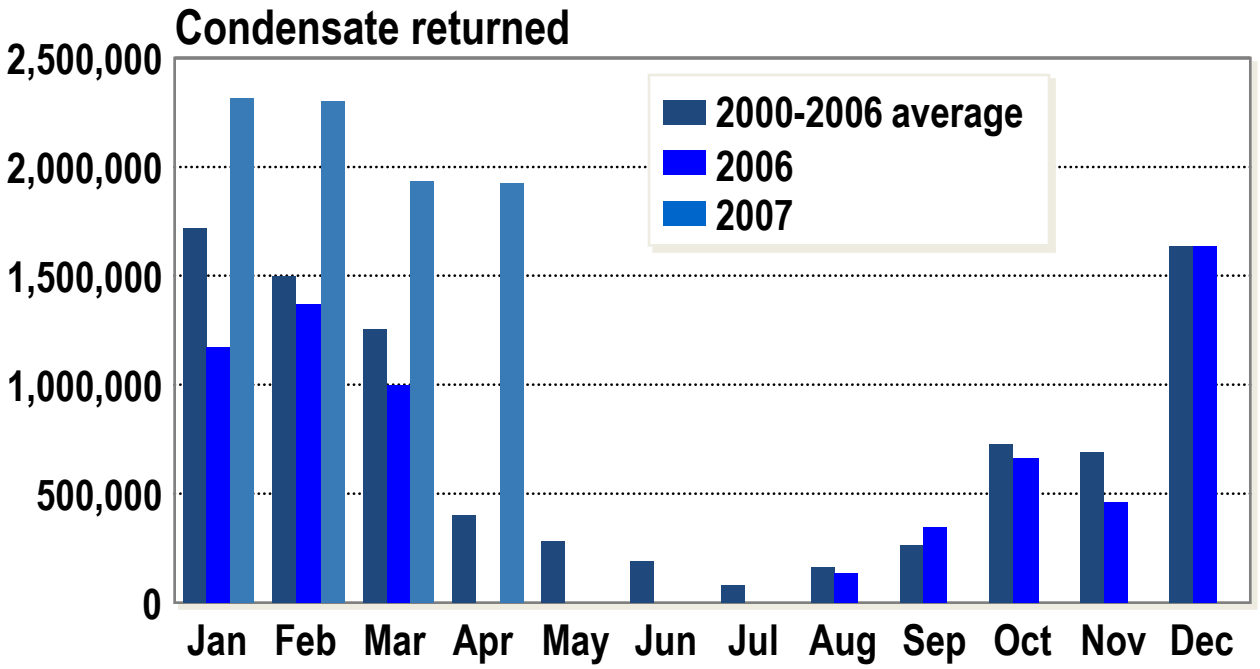
Documentation:
Digital Camera and Condensate Data

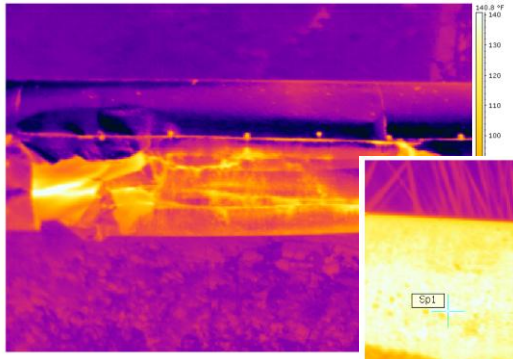
- Condensate return system rebuilt
- 1 million gal per month added
- $200k per year savings – so far



Documentation:

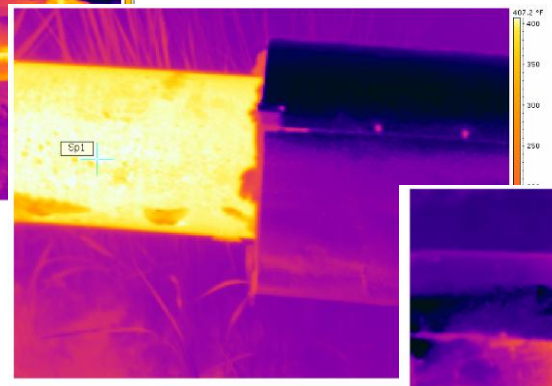
Infrared Camera

Steam line: Before, 357.2°F



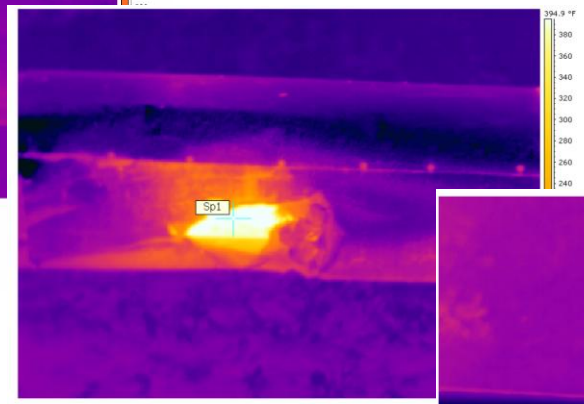
behind 5500A torn insualtion

Sp1 158.8 °F



line behind 550A torn insulation

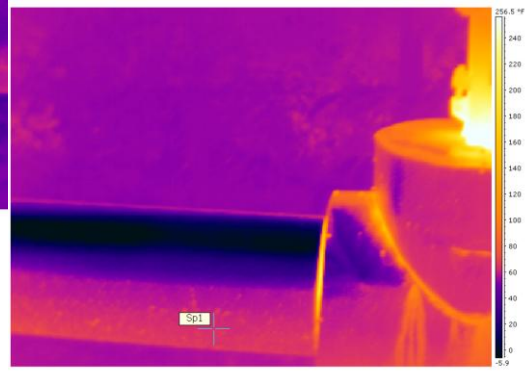
Sp1 408.8 °F



behind 5500 A torn insulation

Sp1 393.2 °F

Steam line: After new insulation, 64.5 F



new insulation at steam pit #48

Sp1 64.5 °F

- Pipe insulation:
  - Over 1800 ft of pipe
  - 7 steam pits
- Condensate return system
- Regulators and traps

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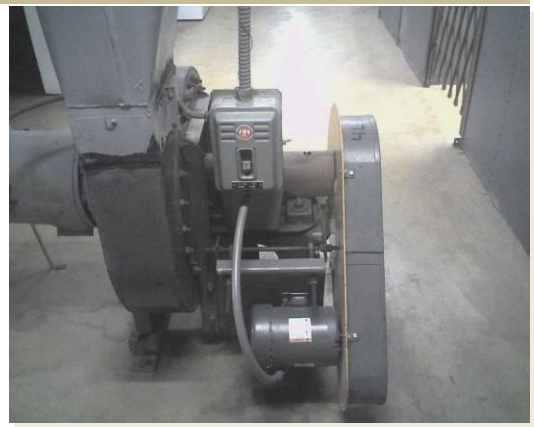
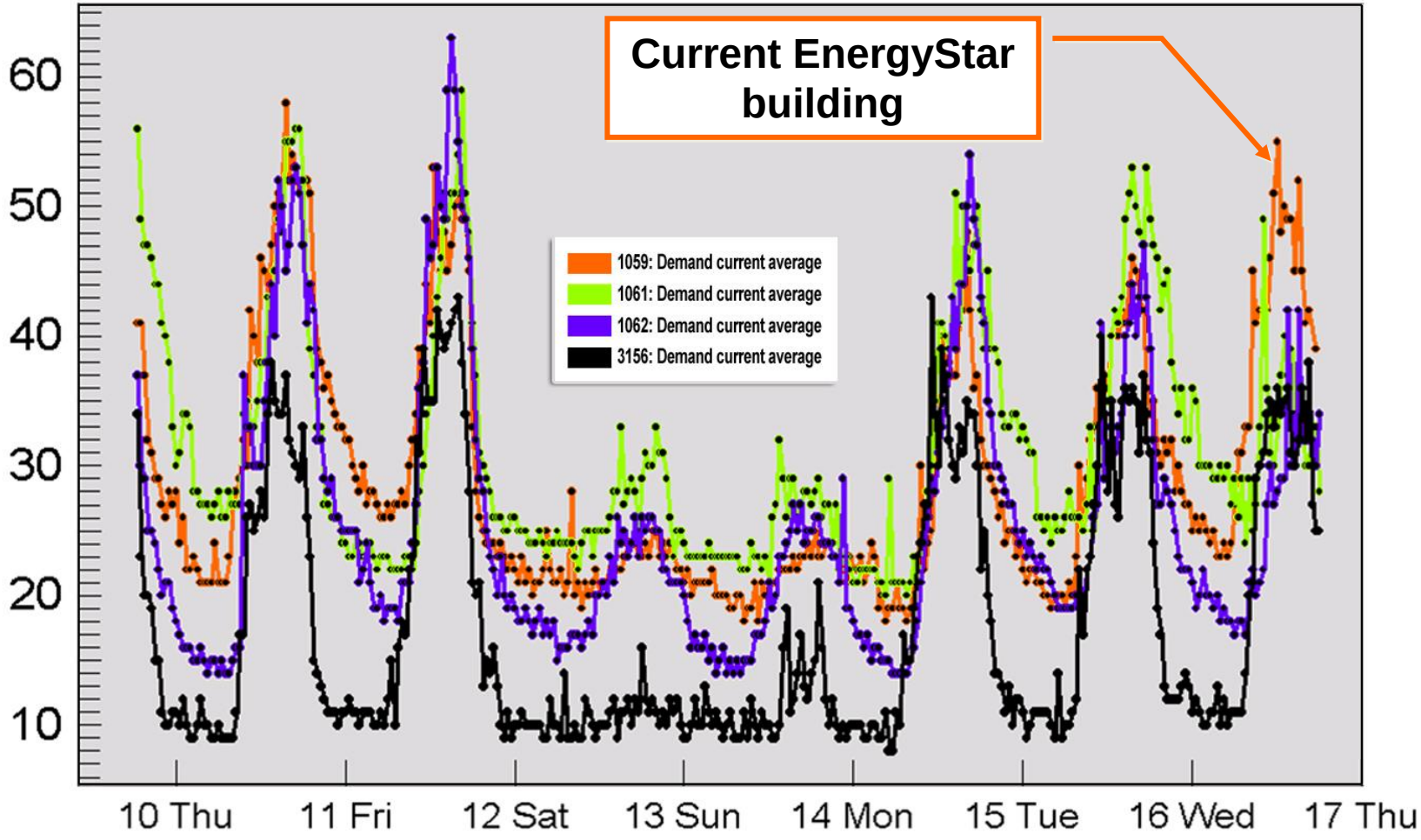
Documentation:
Digital Camera

- Variable-frequency drives on hoods produce significant savings
  - Electricity
  - Chilled water and steam
- Electricity metering
- Rebalancing HVAC
- Improved in-lab hood performance



Documentation:

Meter Data Used for Comparison



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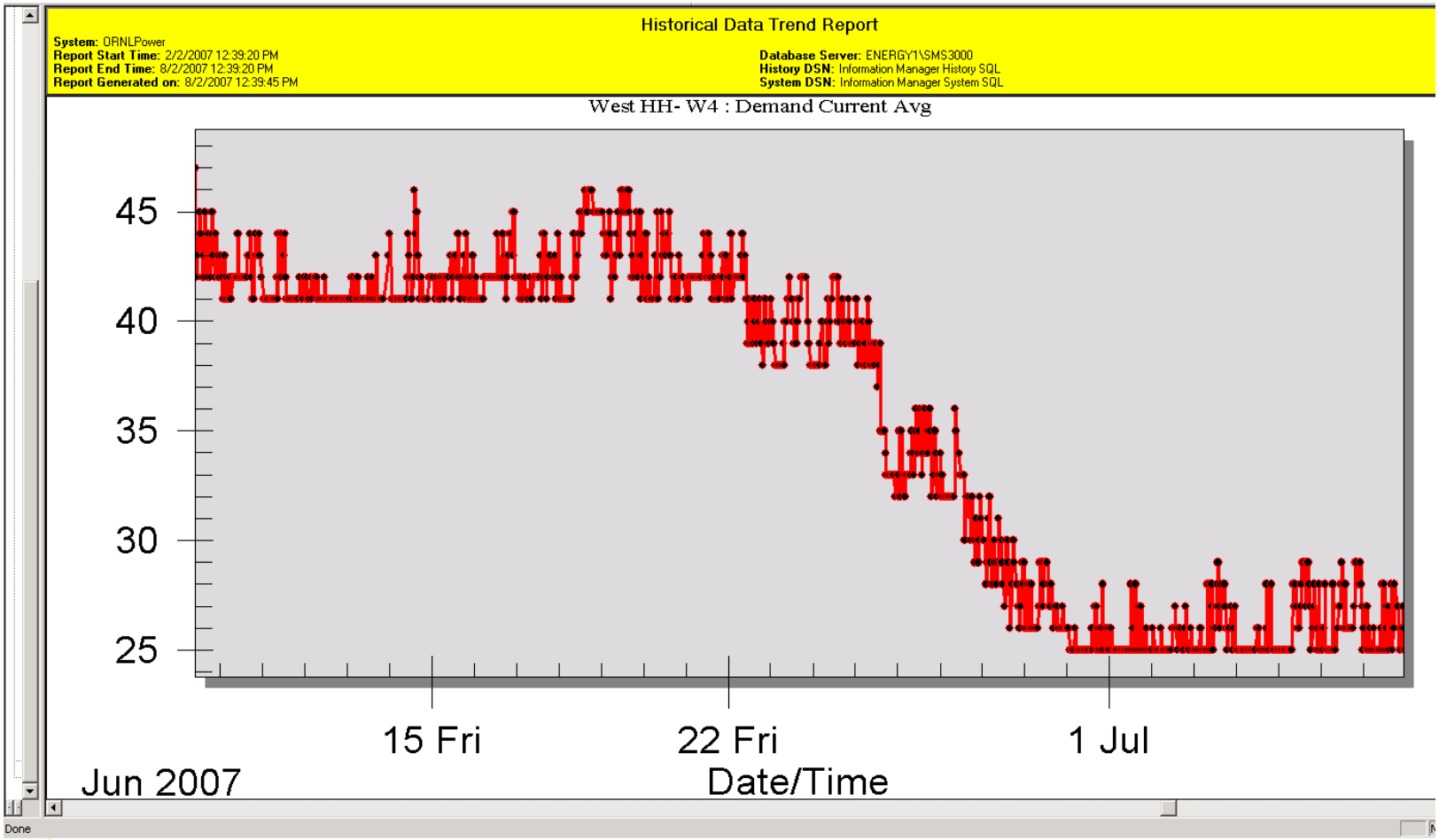
Projects must have M&V

Notice granularity over short time (hours)



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Don’t Forget – EPAct 2005

- Communicate requirements
- Replicate positive lessons learned from projects to other areas
- Aggressively document cost/energy savings achieved

Reality Check

- Unless we change our direction we are likely to end up where we are headed
  - Dr. W. Edwards Deming

Can M&V be Used to Create Interest in Saving Energy?

- Hawthorne Effect
- Reporting results
- Using results to make decisions
- Making the results real-time
- Friendly competition

Can M&V Results be Used to Obtain Additional Funding for Energy Projects?

- Stakeholders like to see results
- If similar projects have already saved money, more may come
- Real ROI speaks volumes

Results When M&V is Properly Used for Projects?

- Think practical

M&V – It Works

- ORNL
  - VFDs
  - Building automation
- Dover
  - Meters

Value of M&V

- When NOT doing performance contracting
  - Providing information to project members
  - Letting your sponsors know what they are paying for
  - Change behavior
  - Meet site goals

Need More Advanced Meters to Get Solid M&V Numbers

- Simple kWh will suffice for only a short while
  - To meet 30%, we need more
- Need other metrics
  - Harmonics, event capture, etc.

Turn the corner

- M&V is important – using a contractor
- Really worth gathering this data when there is NO contactor
  - Need more advanced meters

Turn the corner

- Make it a policy to add a meter to almost every project
- Use the results for making your case
- Take photos of everything!
- Use results for reporting accurate energy consumption
- Use the results for reporting accurate greenhouse gas emissions
- Other uses

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Q & A

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