Making the Cut: Slicing Through Food Service Energy Costs With Cutting-edge Technologies

Better Buildings Summit

Tuesday, May 10, 2016

11:15 AM-12:30 PM

Agenda

11:15	Welcome & Introductions
11:20	David Zabrowski, The Food Service Technology Center
11:35	Jay Fiske, Powerhouse Dynamics
11:50	George Huettel, Ecova
12:05	Group Discussion/Q&A

Today's Presenters

David Zabrowski
The Food Service Technology Center

Jay Fiske
Powerhouse Dynamics

George Huettel
Ecova

How Restaurants Use Energy and Water

David Zabrowski

U.S. DEPARTMENT OF ENERGY

be energy wise

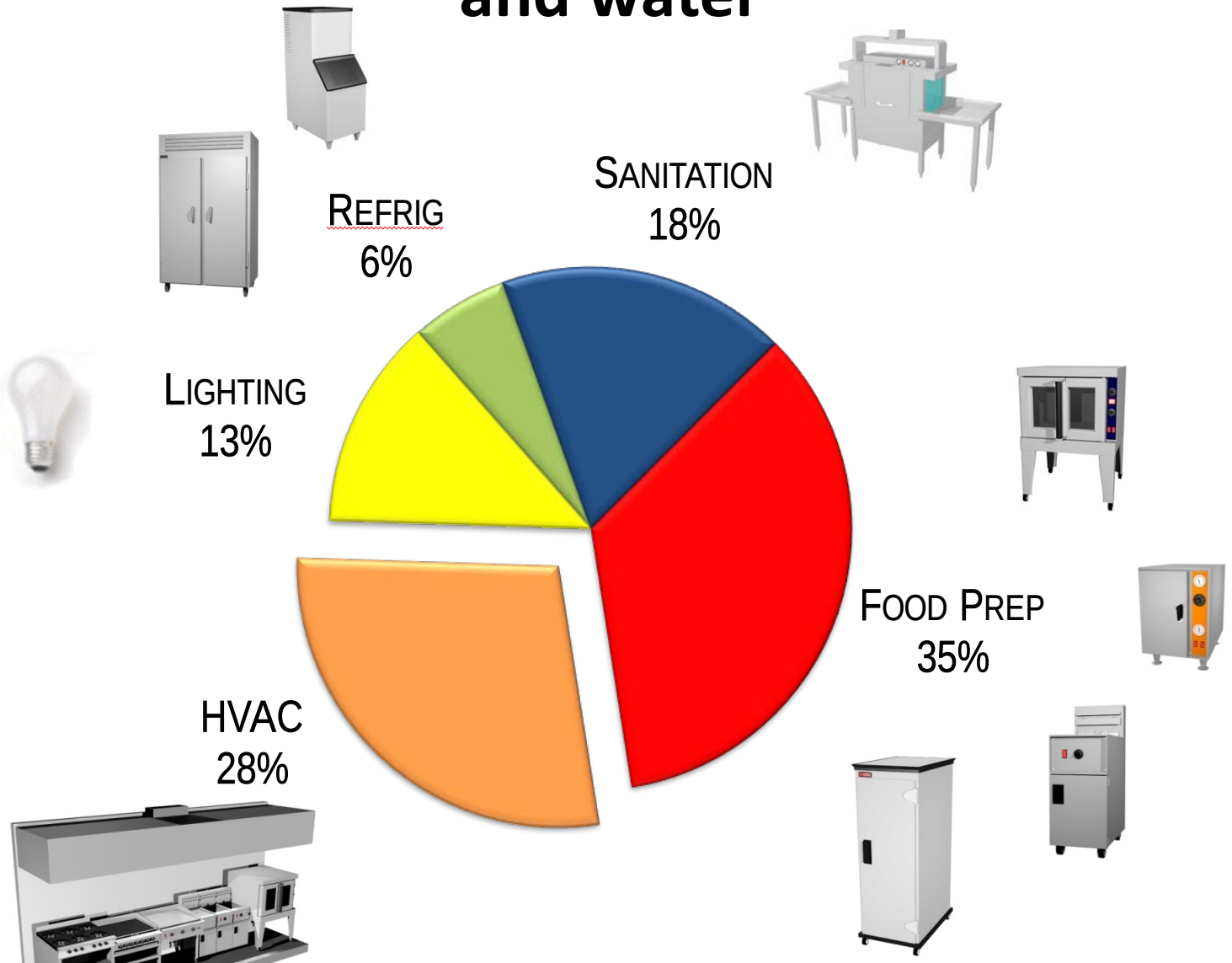
MAKING THE CUT:
SLICING THROUGH FOOD SERVICE ENERGY COSTS

Food Service Technology Center PG&E

May 10, 2016

fishnick.com

FSTC studies all the ways restaurants use energy and water



An example of the total energy breakdown (BTU) in a full service restaurant.

More than 3 Billion CFM…

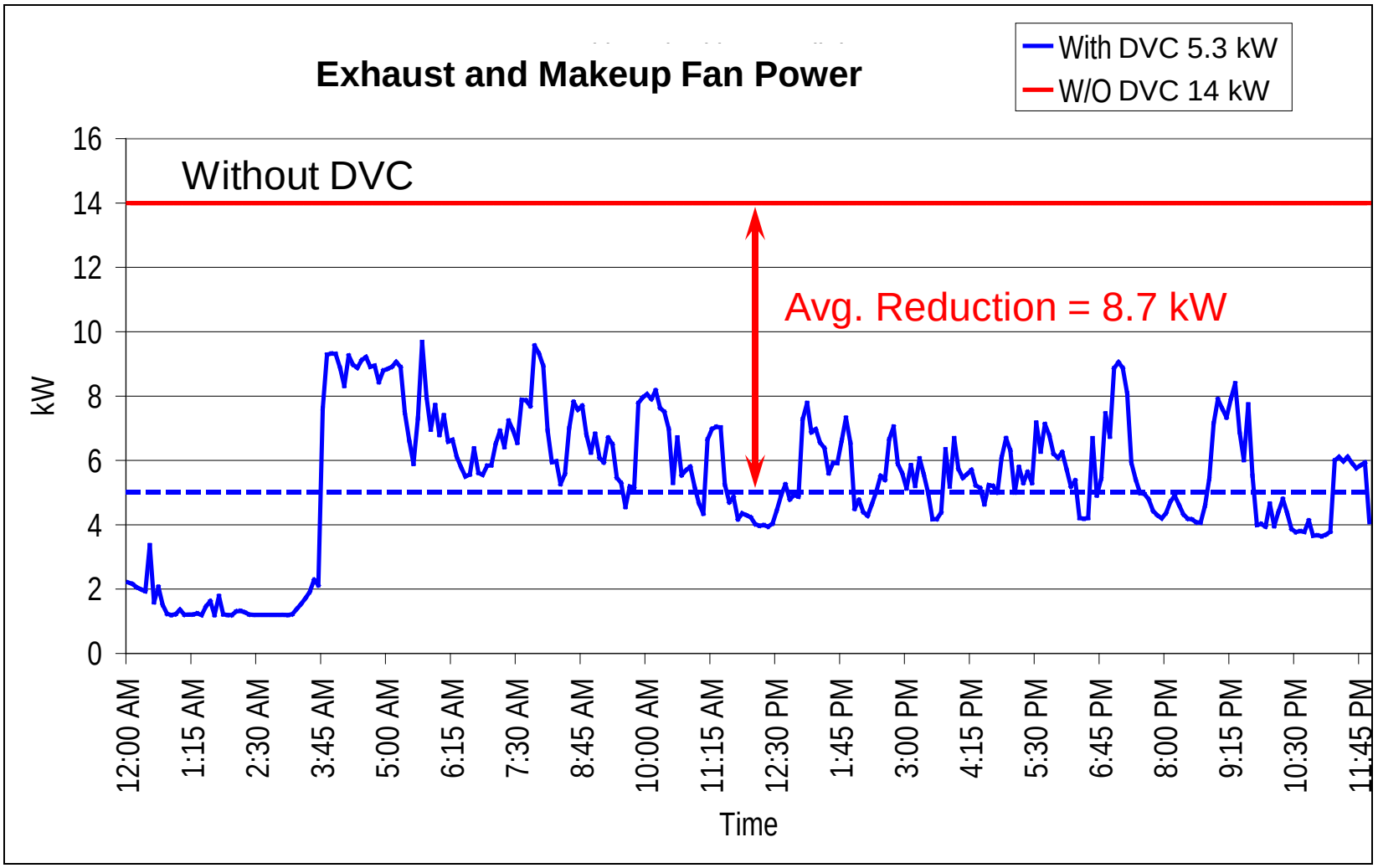
…exhausted from Commercial Kitchens in the U.S.

…dominated by single-speed systems!

Hotel Kitchen 3:00 PM
No appliance use…but exhaust at 100%

Front Line

Back Line



CAUTION:

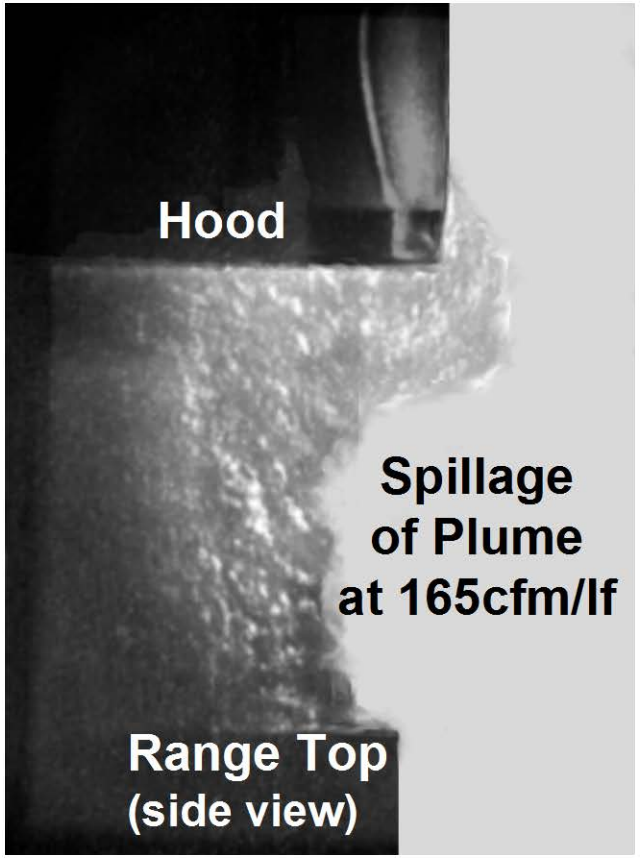
The CKV system must work effectively as single-speed system before DCV is applied.

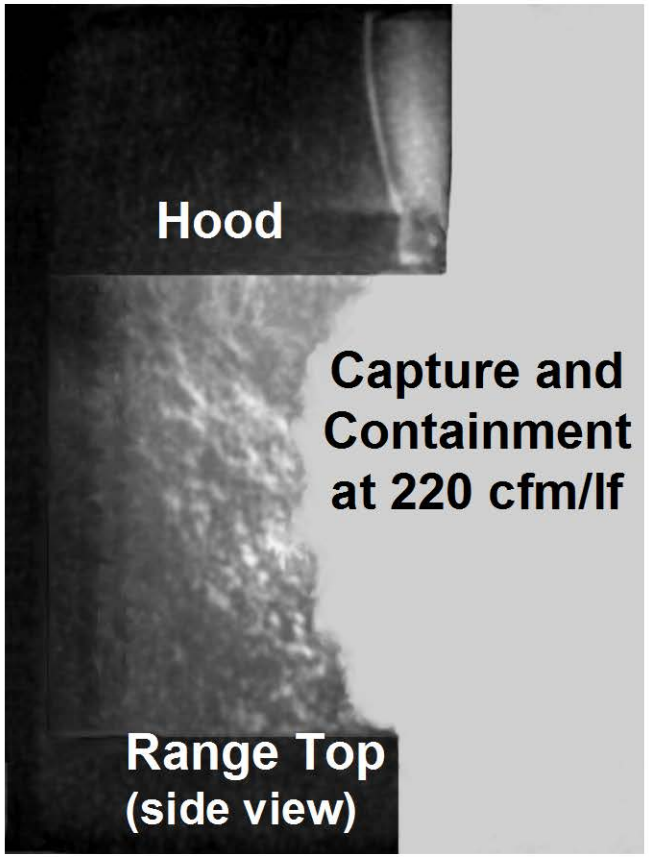
Kitchen Ventilation Lab

What the Eye Sees!

8-Ft Wall Mounted Canopy Hood

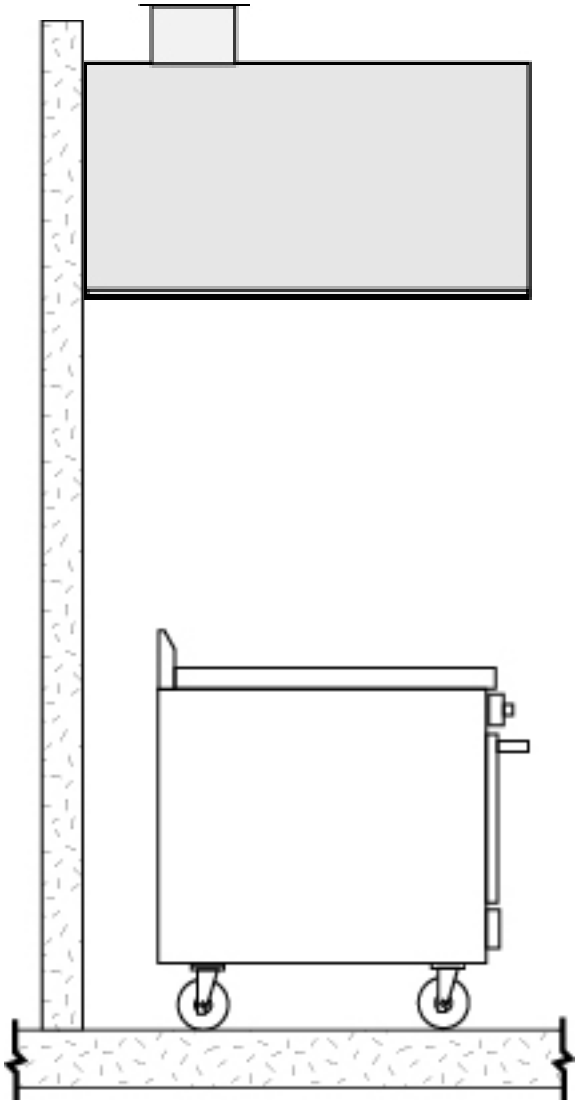
What the Camera Sees



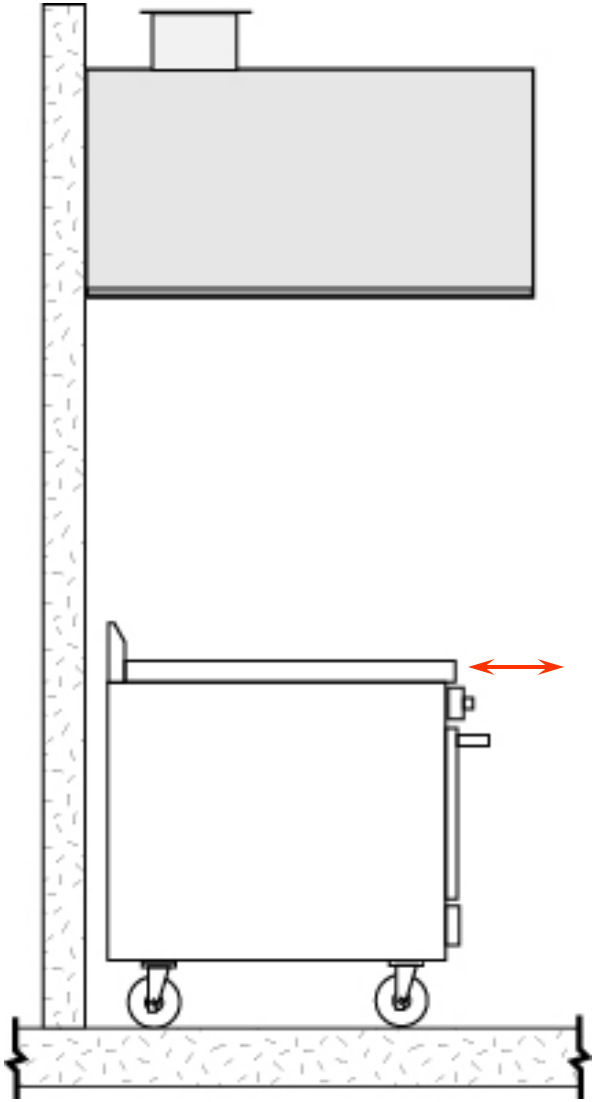


ASHRAE
American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

Research Project RP 1202
Effect of Appliance Diversity And Position On Commercial Kitchen Hood Performance

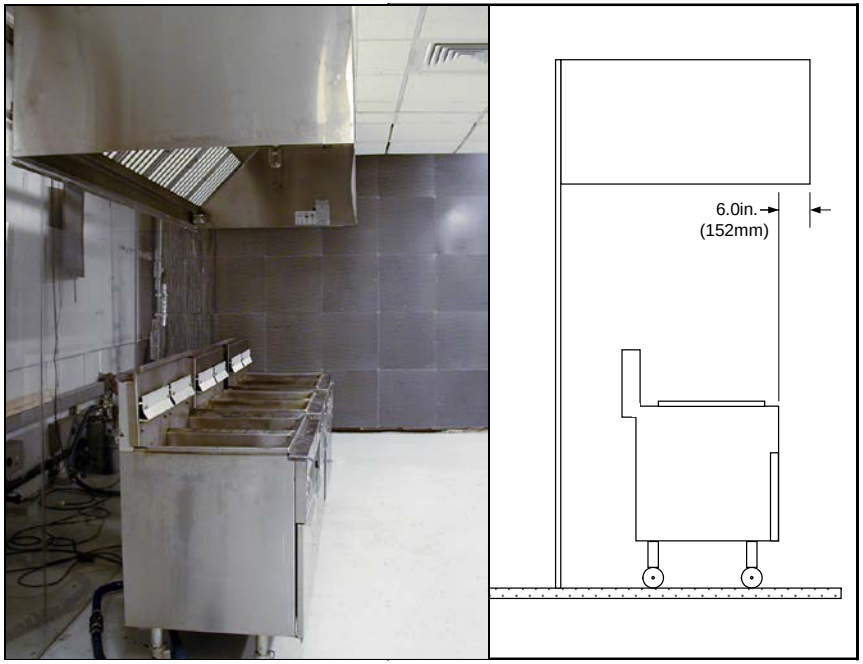


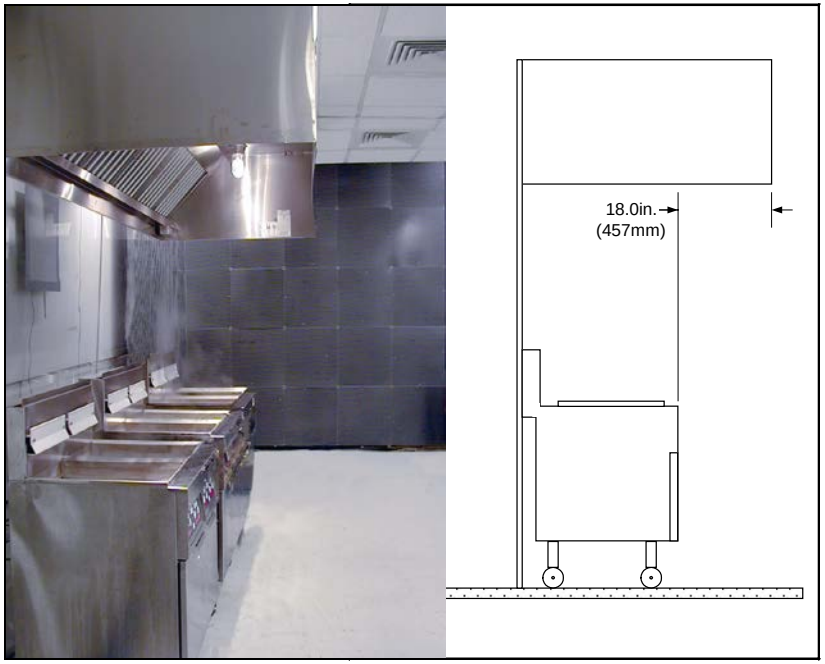
Three Nuggets



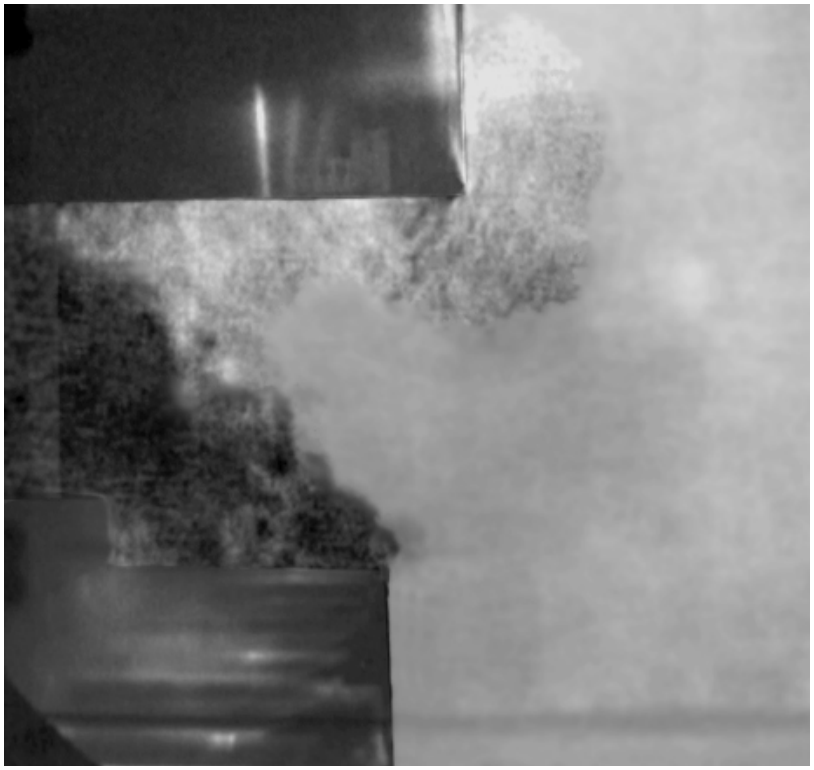
Push Back

Overhang Sensitivity for 3 Fryers



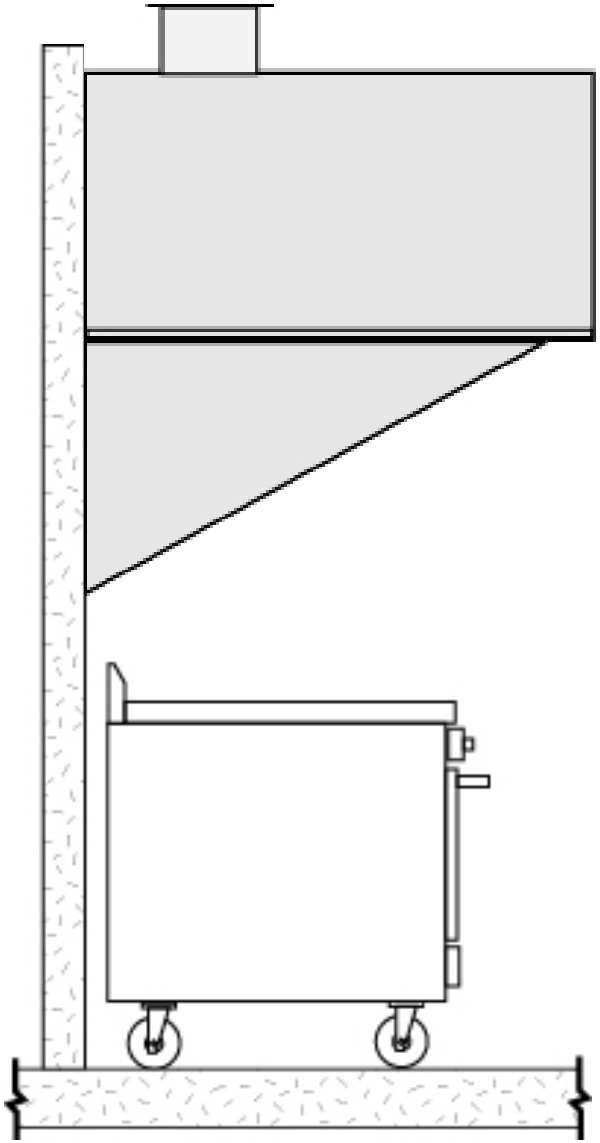


Overhang Sensitivity for 3 Fryers at 2400 cfm (240 cfm/ft)



6 inches of Front Overhang

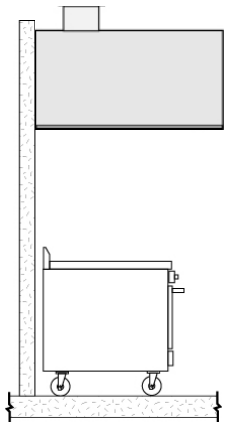
18 inches of Front Overhang

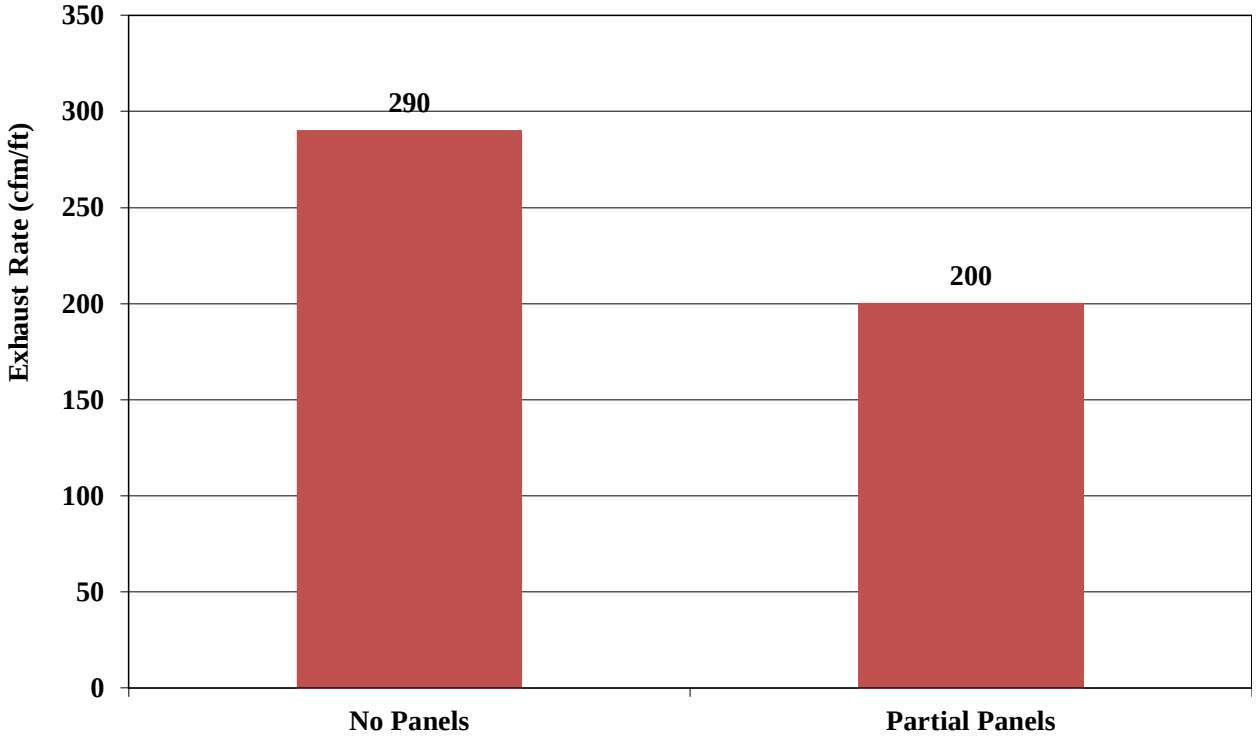


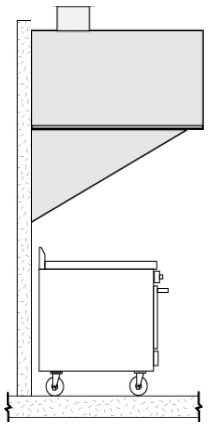
Add Side Panels

A bit more stainless steel can be cheap insurance!

Multiple configurations of appliances under various 10-ft. wall canopy hoods (approx. 90 tests) with and without partial side panels

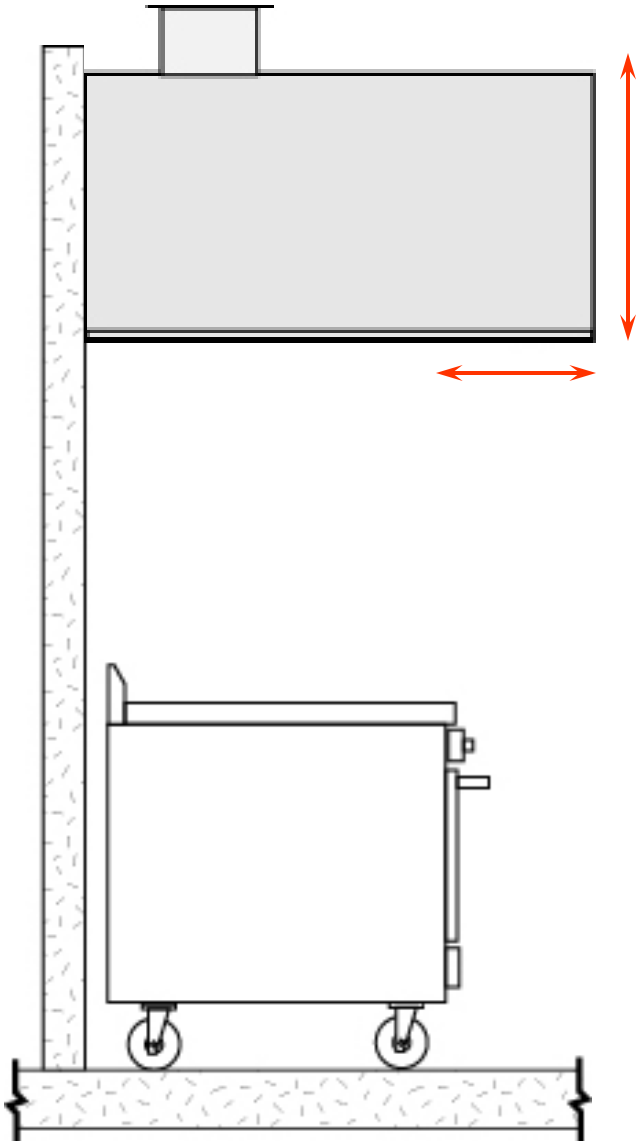






30% reduction in airflow!

Side Panels Pass the Test!

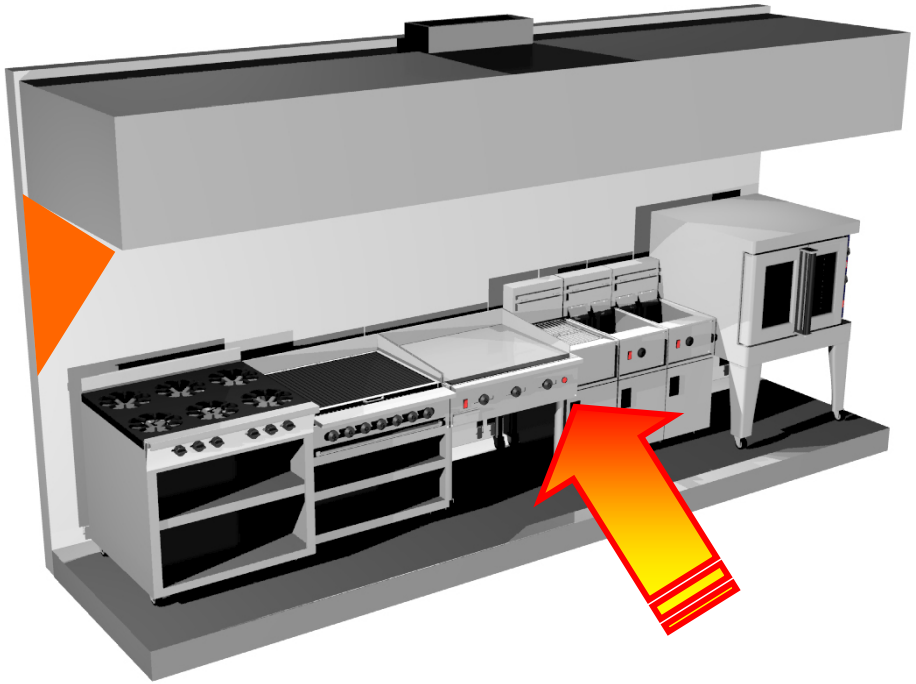


Bigger Hood

Not enough overhang!

Optimize Your Hood

(Guides available at Fishnick.com)

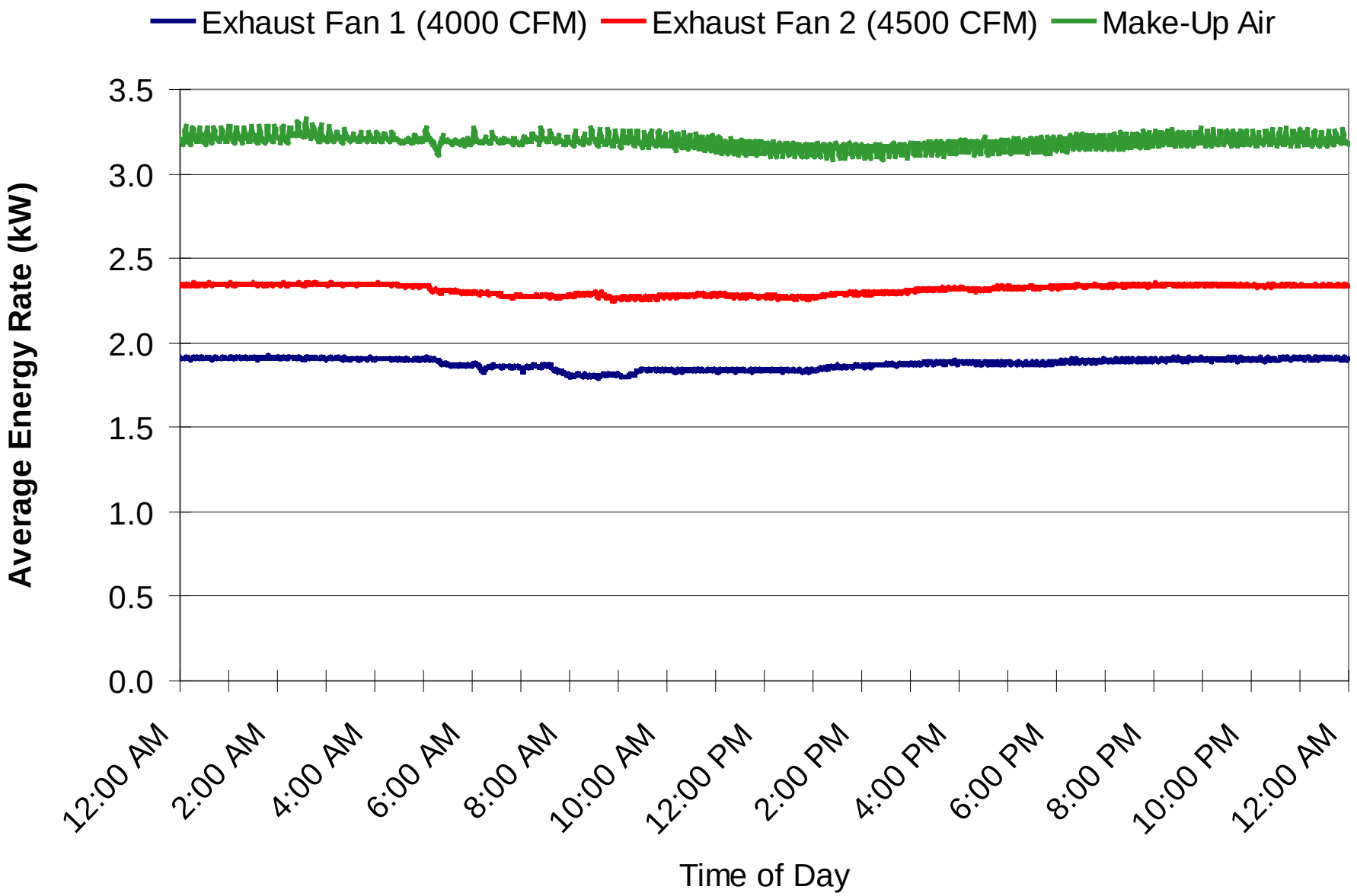


Then…add DCKV

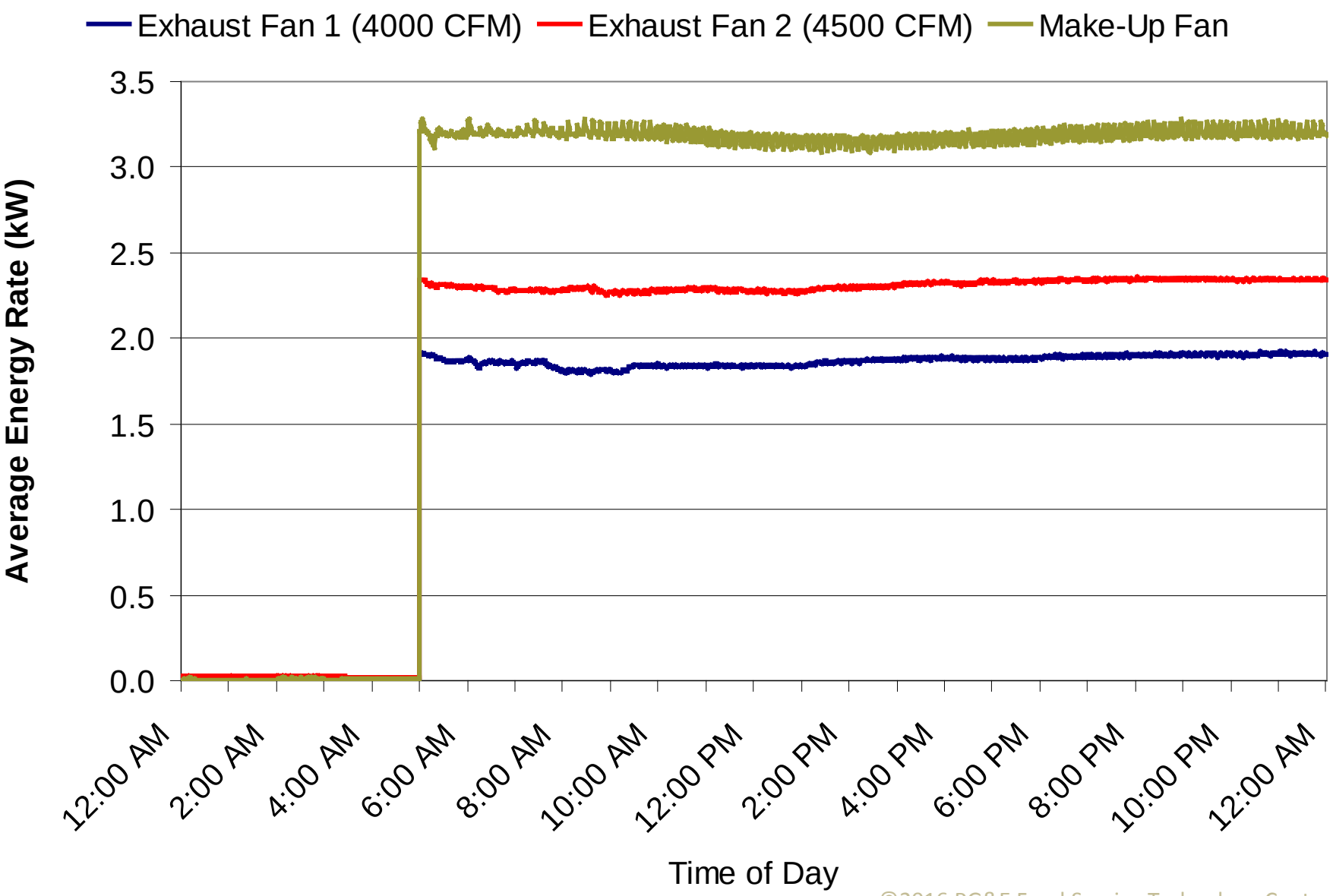
Technical Feature: ASHRAE Journal February 2013

Corporate Cafeteria

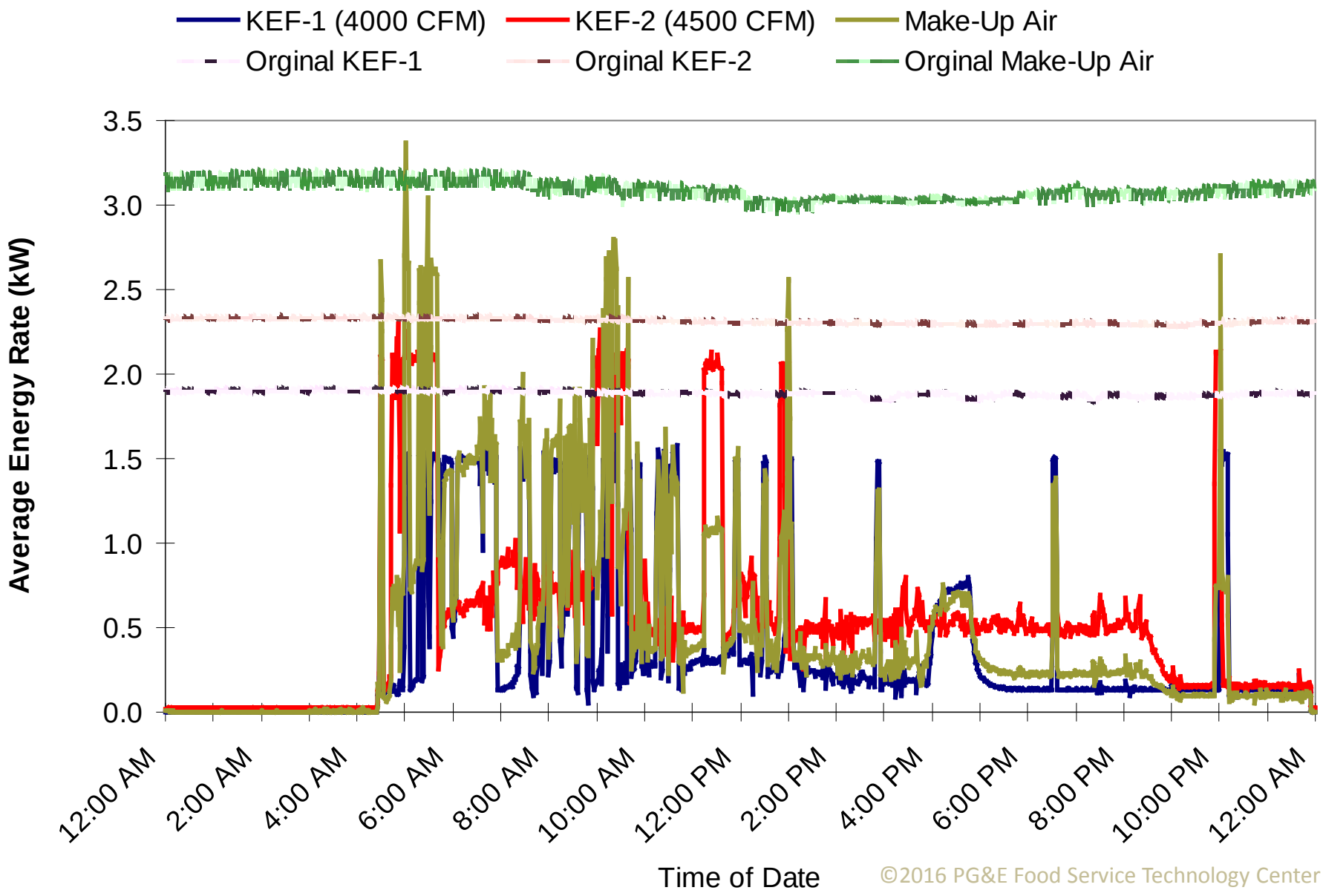
Exhaust System (w/o EMS)



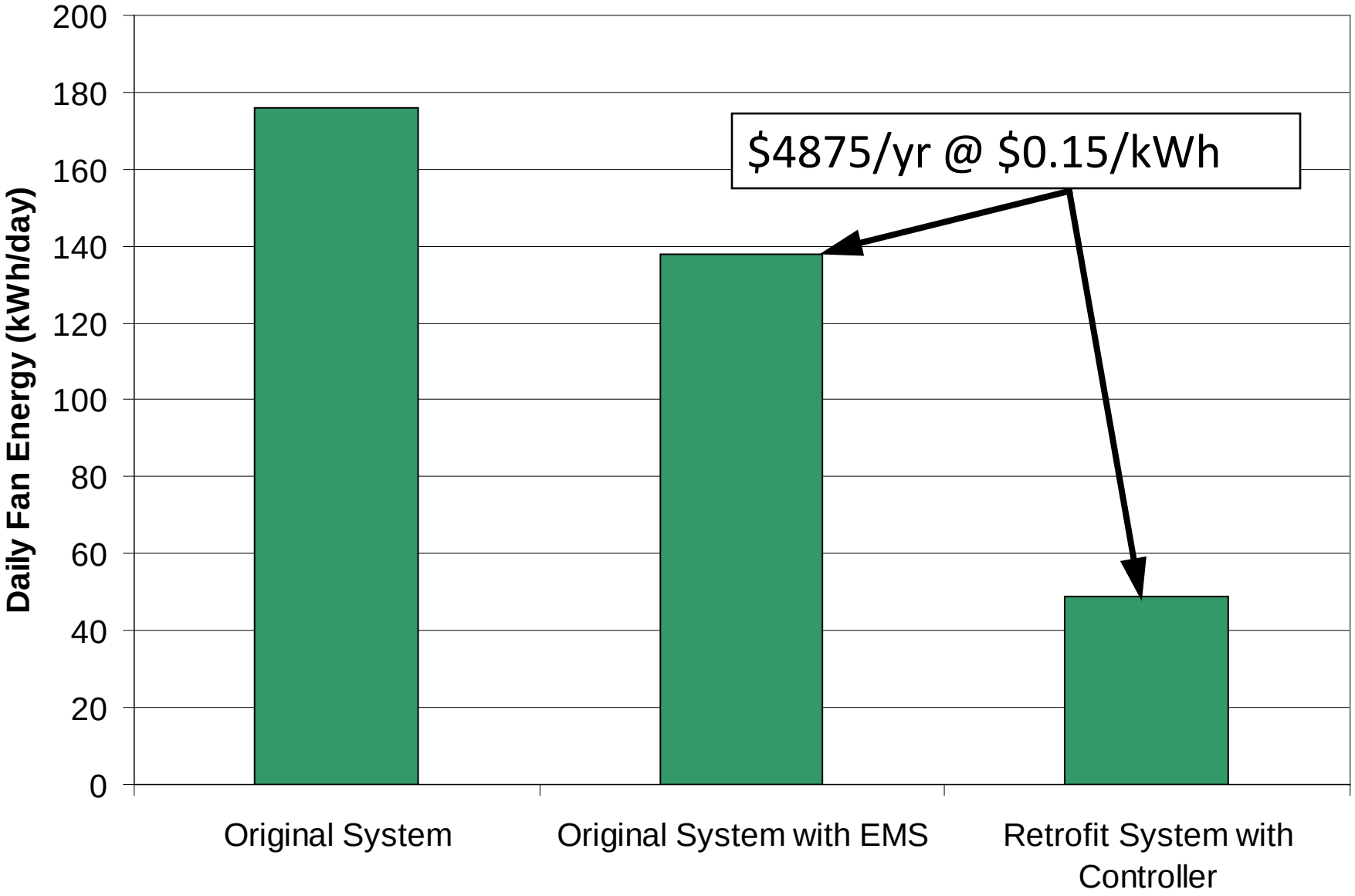
Exhaust System (with EMS)



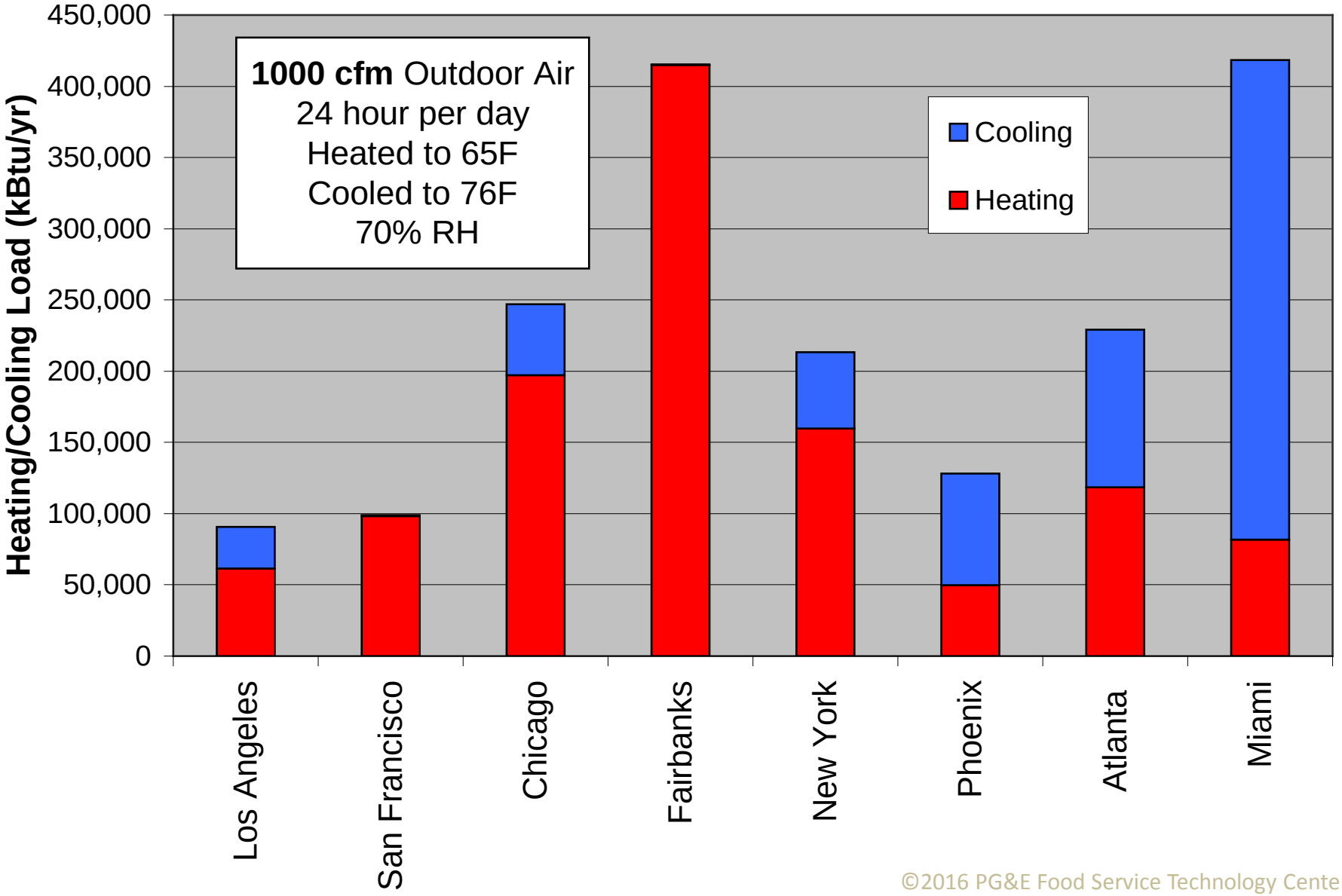
Exhaust System with EMS & DCKV



Total Daily Fan Energy



Climate Effect



DCKV Typical energy/cost savings total 40 to 50%

Case Studies available at:

www.fishnick.com

DCKV-ROI Recap:

- The larger the exhaust airflow (in cfm), the greater the energy savings potential.
- DCKV works best with a mixed duty cookline.
- The CKV system must work effectively as single-speed system before DCKV is applied.
- Effective commissioning of a DCKV system will maximize its performance.
- And in the future, the DCKV system should communicate/integrate with the EMS system.

Thanks

be energy wise

SAVE ENERGY, SAVE MONEY,
SAVE THE ENVIRONMENT

CALIFORNIA INVESTOR-OWNED UTILITIES **PARTNERING FOR ENERGY EFFICIENCY**

SoCalGas
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Pacific Gas and Electric Company
www.pge.com/fstc

SDGE connected
A Sempra Energy utility
www.sdge.com/foodservice

Southern California Edison
www.sce.com/CTAC

SiteSage: Arby's Corporate Case Study

Jay Fiske

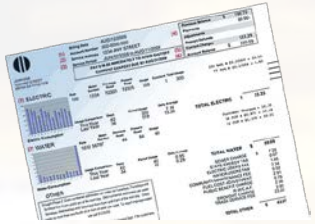
U.S. DEPARTMENT OF ENERGY

Can you find the lost profits in this picture?

Your guests won't arrive for 3 hours - so why is every light in your restaurant turned on?

Restaurants spend *3 times more on energy* per sq. ft. than other businesses

Energy costs unknown until the bill arrives - long after anything can be done



Are there any other products or services you buy this way?

Reactive equipment repairs are *3 times as expensive* as planned repairs

According to PRSM, proactive repairs average ~ $200 vs. $600+ for reactive

Do you get notified before equipment fails?

Powerhouse Dynamics

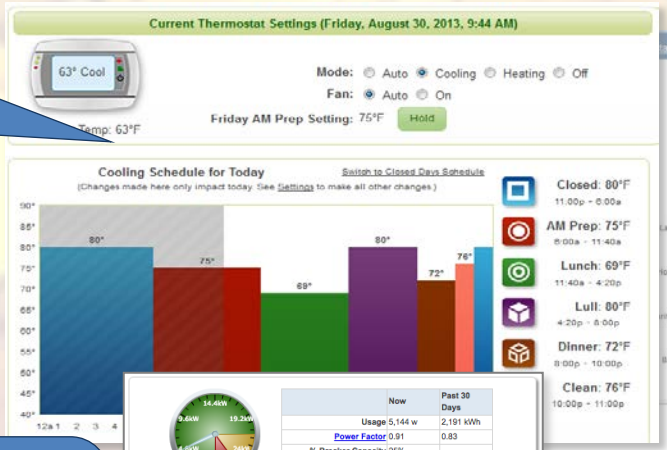
Energy Management Success: It's Not Just About Energy

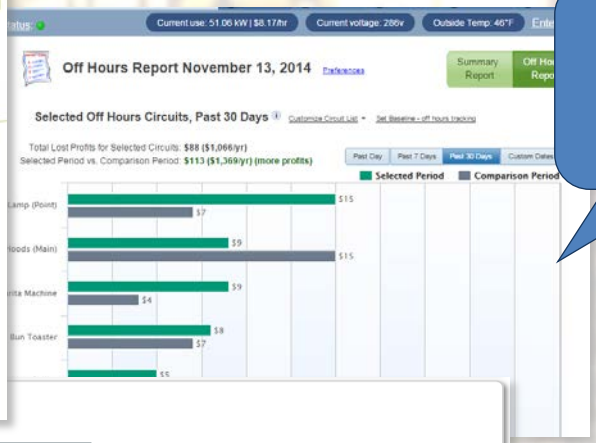
Centralized, easy to use HVAC & other controls

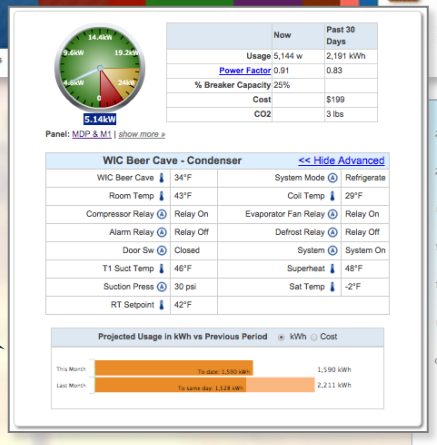
Real-time monitoring to identify operational inefficiencies

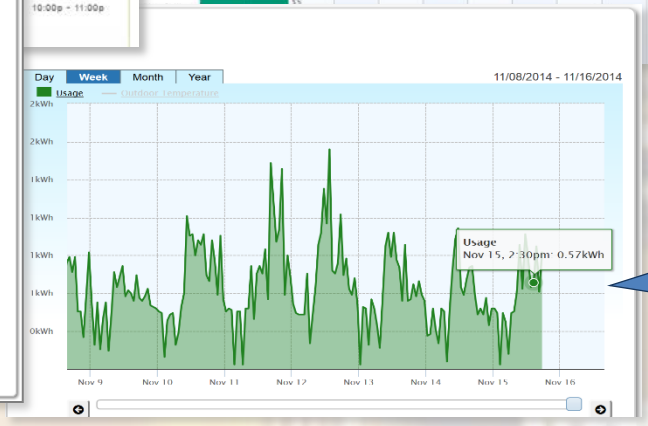
Integration with equipment from other companies for advanced control & diagnostics

Analytics address equipment performance



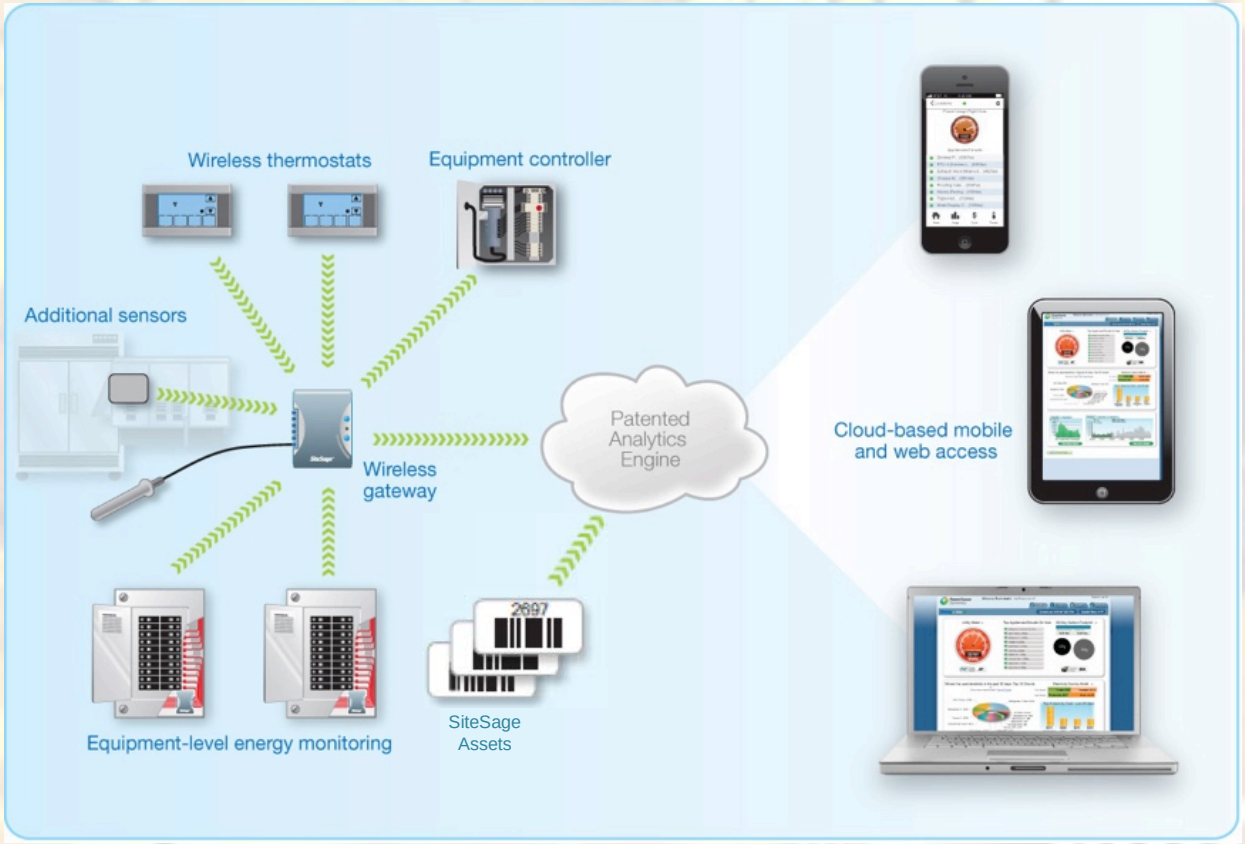






Powerhouse Dynamics

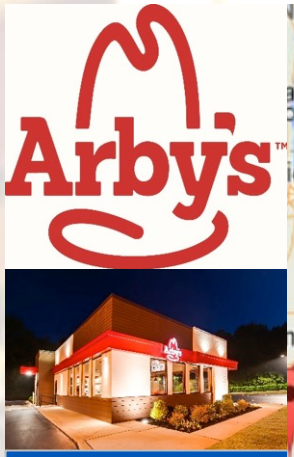
Components of an Energy- *and* Asset-Management Solution

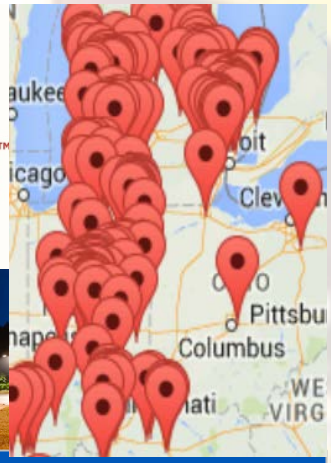


Powerhouse Dynamics

Arby's Case Study

- SiteSage installed in all 970+ US corporate-owned stores after competitive evaluation
- Energy savings alone deliver payback in <2 years
  - Enterprise HVAC Control + HVAC Analytics
- Positioned as Energy Management **and** Food Safety Platform
  - Kitchen equipment vendors interface with SiteSage as part of Arby's *Smart Kitchen* initiative
- SiteSage is also used as repository for all equipment asset data
- **Arby's has reported a >15% reduction in restaurant energy costs across the chain**





"We have been very impressed by the capabilities of SiteSage. Not only will the system enable us to get HVAC costs under control, but it will also help identify problems with both rooftop cooling units and refrigeration equipment."

- Arby's SVP

Powerhouse Dynamics

Arby's Case Study: Automating Food Safety Reporting

Implemented Solution with SiteSage

Wireless Module
- Connects to Cook & Hold control board
- Sends data wirelessly to Gateway

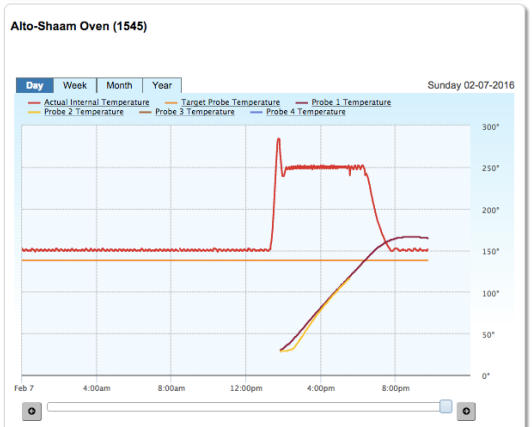
Gateway
- Connects to Internet

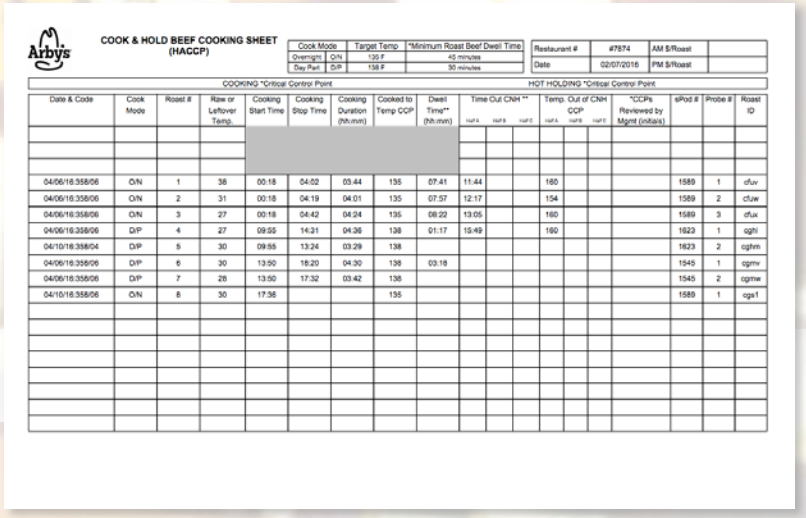
SiteSage software
- Stores data and automates Beef Sheet HACCP Report

Arby's Case Study: Automating Food Safety Reporting

Implemented Solution with SiteSage

Alto-Shaam Oven (1545)			
Target Internal Temperature	150°F	Actual Internal Temperature	151°F
Target Probe Temperature	138°F	Operating Mode	Hold
Probe 1 Temperature	164°F	Probe 2 Temperature	Offline
Probe 3 Temperature	Offline	Probe 4 Temperature	Offline





COOK & HOLD BEEF COOKING SHEET (HACCP)

Cook Mode		Target Temp	*Minimum Roast Beef Dwell Time
Overnight	O/N	135 F	45 minutes
Day Part	D/P	138 F	30 minutes

Restaurant #	#7874	AM S/Roast	
Date	02/07/2016	PM S/Roast	

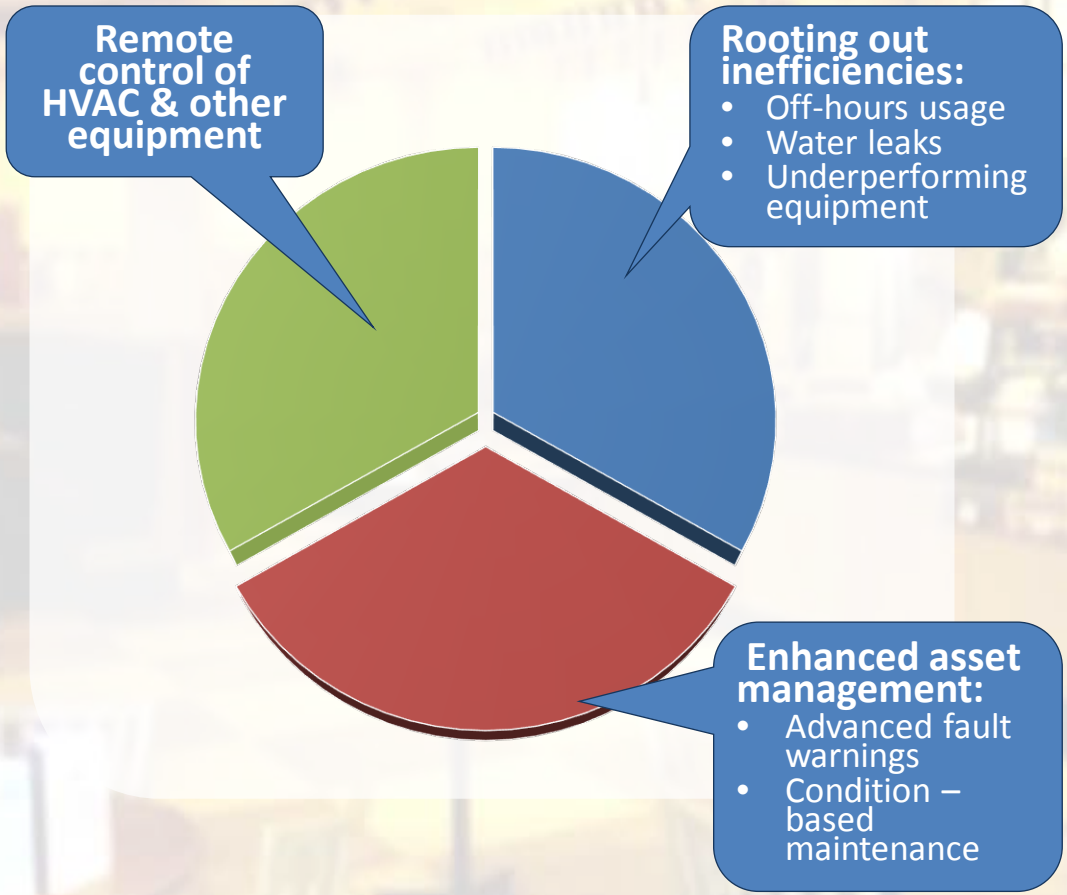
COOKING *Critical Control Point | HOT HOLDING *Critical Control Point

Date & Code	Cook Mode	Roast #	Raw or Leftover Temp.	Cooking Start Time	Cooking Stop Time	Cooking Duration (hh:mm)	Cooked to Temp CCP	Dwell Time** (hh:mm)	Time Out CNH **			Temp. Out of CNH CCP			*CCPs Reviewed by Mgmt (initials)	sPod #	Probe #	Roast ID
									N/A	N/A	N/A	N/A	N/A	N/A				
04/06/16 358/06	O/N	1	38	00:18	04:02	03:44	135	07:41	11:44			160				1589	1	cfuv
04/06/16 358/06	O/N	2	31	00:18	04:19	04:01	135	07:57	12:17			154				1589	2	cfuw
04/06/16 358/06	O/N	3	27	00:18	04:42	04:24	135	08:22	13:05			160				1589	3	cfux
04/06/16 358/06	D/P	4	27	09:55	14:31	04:36	138	01:17	15:49			160				1623	1	cghl
04/10/16 358/04	D/P	5	30	09:55	13:24	03:29	138									1623	2	cghm
04/06/16 358/06	D/P	6	30	13:50	18:20	04:30	138	03:18								1545	1	cgmv
04/06/16 358/06	D/P	7	28	13:50	17:32	03:42	138									1545	2	cgmw
04/10/16 358/06	O/N	8	30	17:36			135									1589	1	cgs1

- System generates real-time data on cooking roast
- Automates creation of HACCP Beef Sheet Report & emails report daily

Powerhouse Dynamics

Energy Management Success: It's Not Just About Energy



… also provides:

- **Enhanced Food Safety**
- **Improved guest comfort**
- **Increased staff productivity**

Thank you!

SiteSage®
Manage wisely

Leverage Data, Technology and Services to Reduce Operating Costs

George Huettel

U.S. DEPARTMENT OF ENERGY

ecova™

total energy and sustainability management

MAKING THE CUT: SLICING THROUGH FOOD SERVICE ENERGY COSTS

Leverage Data, Technology and Services to reduce operating costs

SEE MORE SAVE MORE SUSTAIN MORE

Today's Agenda

- Strategic Process
- Solid Foundation in Data
- Identify Opportunities
- Take Action
- Continually Monitor
- Client Examples
- Q&A

Implement a Strategic Process

Life-cycle approach

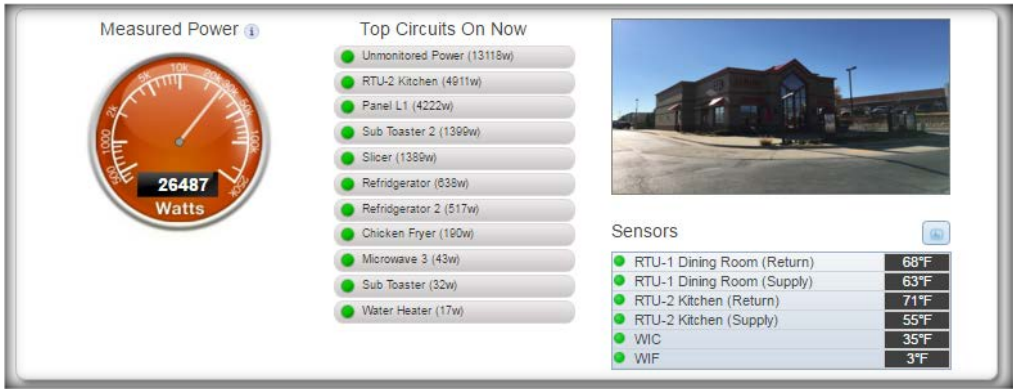
- **Analyze** data to reveal resource saving opportunities
- **Identify** operational patterns to provide insight into cost drivers and outlier sites
- **Take Action** by implementing changes and modifying operational procedures
- **Monitor,** track, and report on cost and operational data and trends to ensure solutions are sustainable

Collaborative engagement with clients guides the energy program towards a best practice, continuous energy improvement approach.

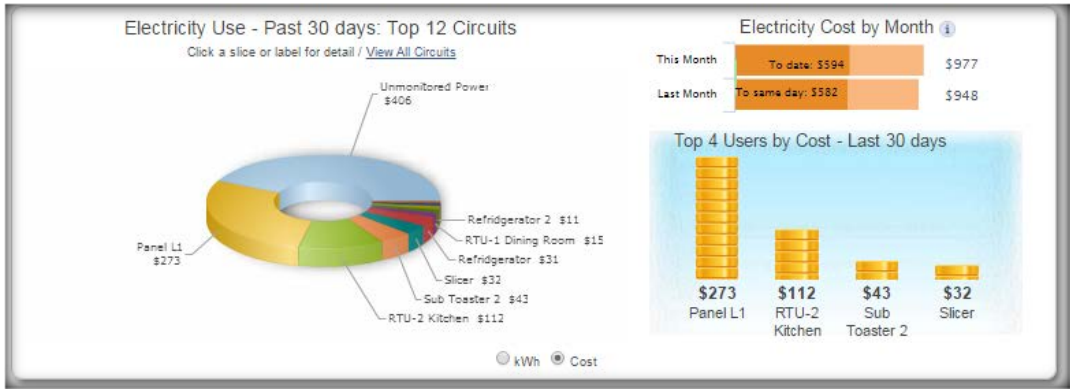
It all starts with the data

Extend to site level meter data

Asset level measurement of energy usage



Track Operating Costs by Asset

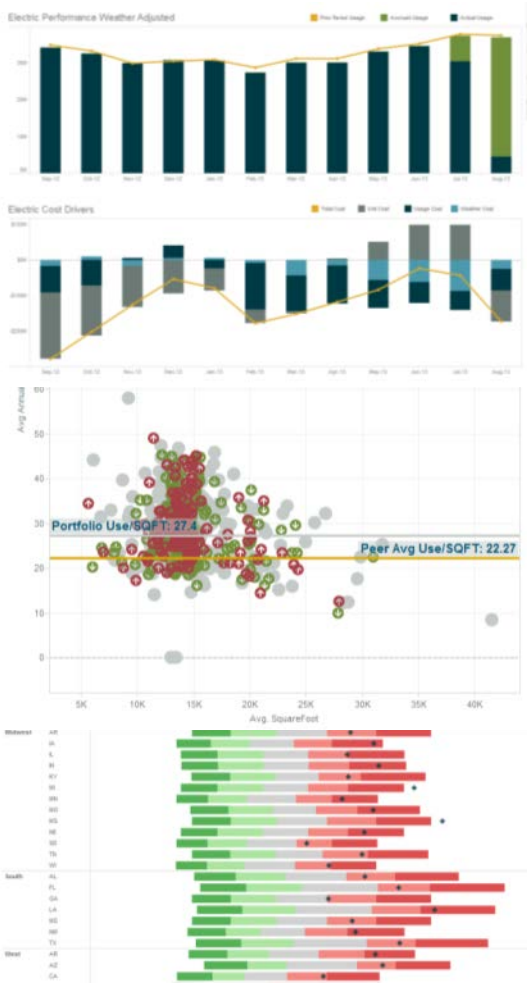


Analyze Equipment Performance

Resource Performance Reporting

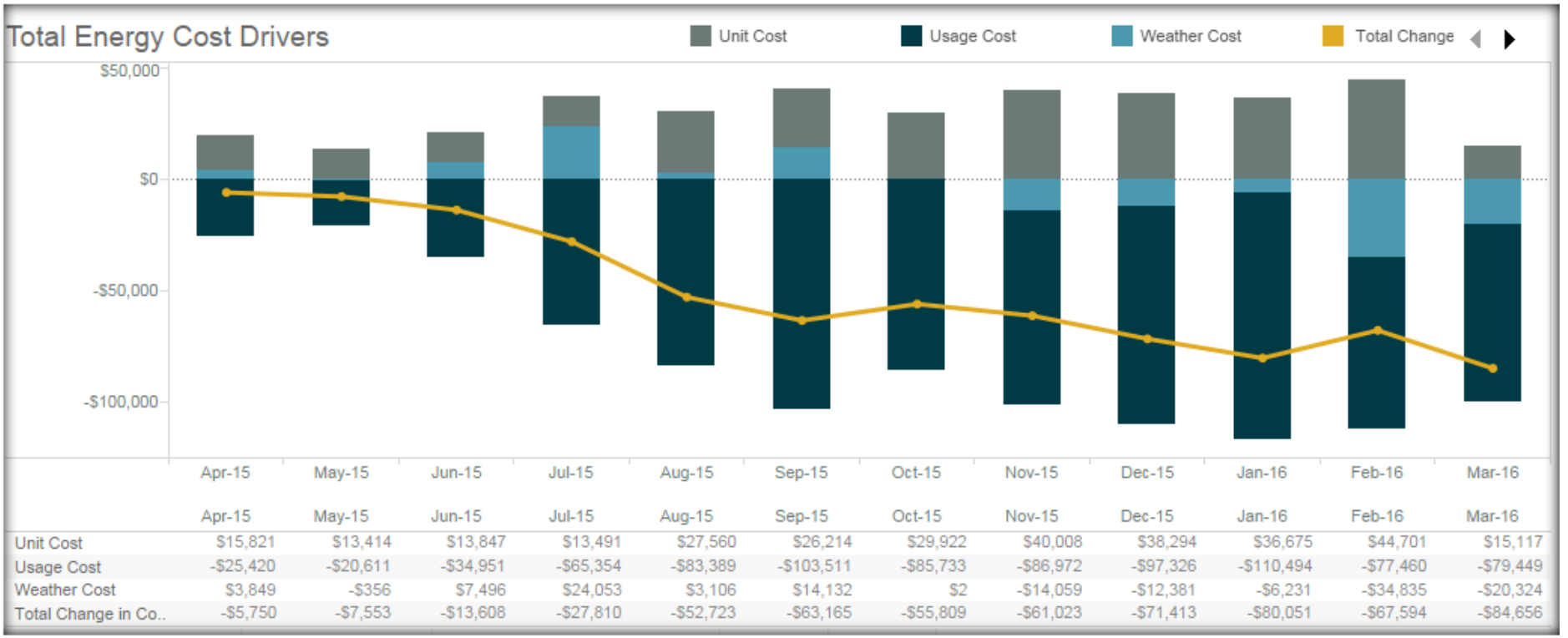
Benchmark, Trend and Analysis Reports

- Benchmarking Reports – comparing sites nationwide and against industry peers
- Trending Reports – comparing sites to past performance
- Cost drivers – Identify what is influencing energy cost
- Weather and calendar normalized comparison of sites on both a per service and combined kBtu basis to identify performance trends and Outliers



Identify Energy Cost Drivers

What's really behind year over year performance changes

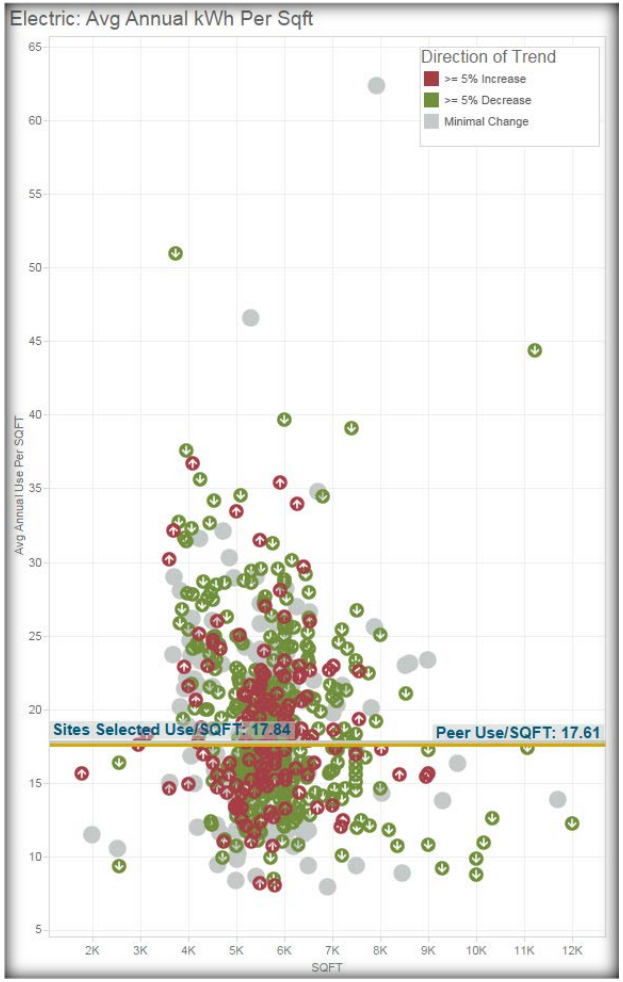


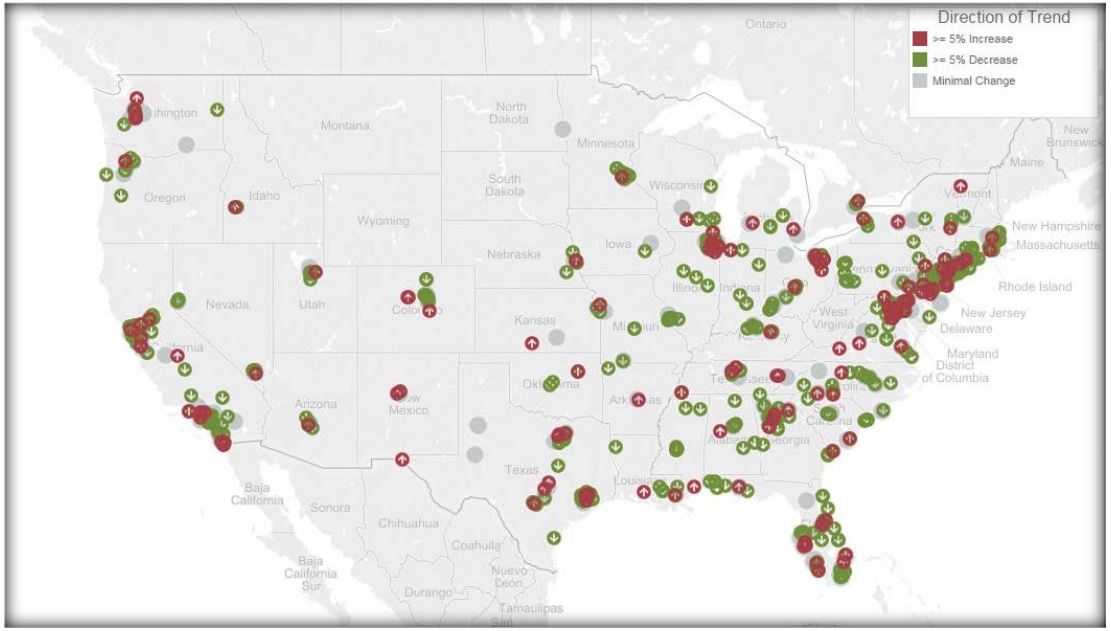
	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16
Unit Cost	$15,821	$13,414	$13,847	$13,491	$27,560	$26,214	$29,922	$40,008	$38,294	$36,675	$44,701	$15,117
Usage Cost	-$25,420	-$20,611	-$34,951	-$65,354	-$83,389	-$103,511	-$85,733	-$86,972	-$97,326	-$110,494	-$77,460	-$79,449
Weather Cost	$3,849	-$356	$7,496	$24,053	$3,106	$14,132	$2	-$14,059	-$12,381	-$6,231	-$34,835	-$20,324
Total Change in Co..	-$5,750	-$7,553	-$13,608	-$27,810	-$52,723	-$63,165	-$55,809	-$61,023	-$71,413	-$80,051	-$67,594	-$84,656

Identify impact on energy usage absent of weather, utility rates and other important factors

Identify Outliers and Energy Usage Trends

Determine where to focus resources of time, manpower and capital

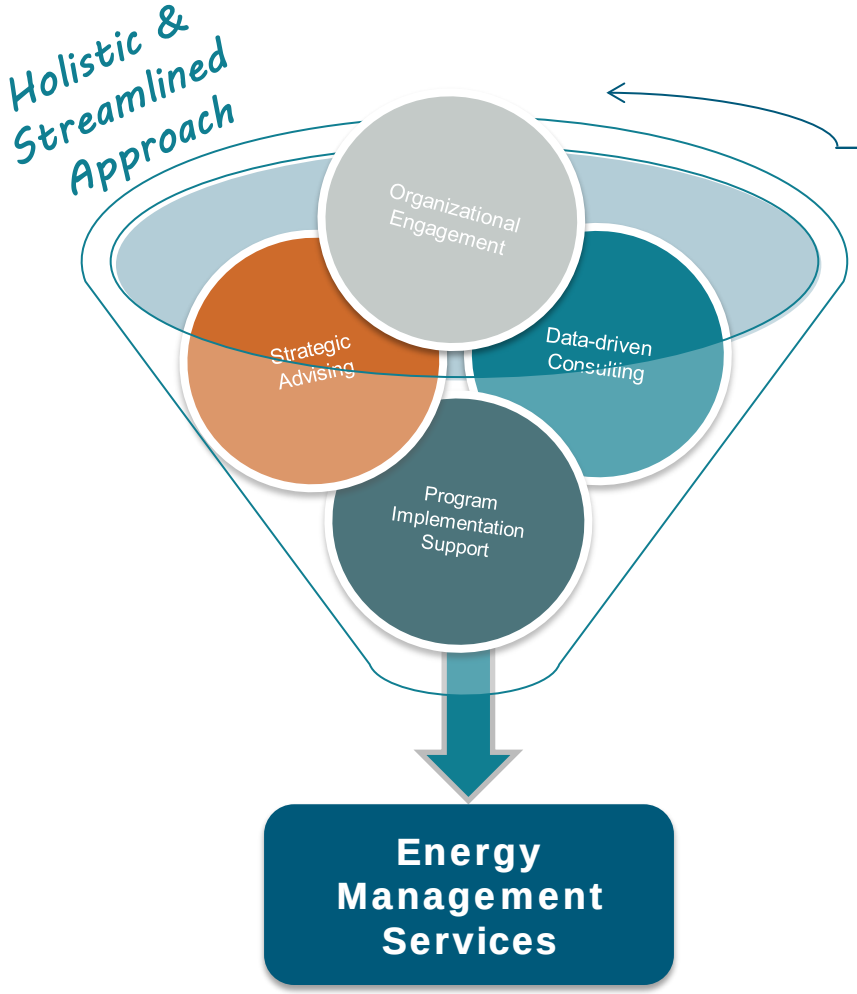




Name	City	State	Cost	Cost Sq. Ft.	Cost Oper.Hr.	
6837	COMMERCE CITY	CO	$ 1,315	$ 0.26	$ 3.41	View
0798	Tulsa	OK	$ 1,254	$ 0.45	$ 3.52	View
0124	DENVER	CO	$ 1,231	$ 0.25	$ 3.19	View
0639	DENVER	CO	$ 1,176	$ 0.24	$ 3.05	View
7058	BROKEN ARROW	OK	$ 1,046	$ 0.21	$ 2.71	View
1604	TULSA	OK	$ 956	$ 0.19	$ 2.65	View
8331	TULSA	OK	$ 942	$ 0.19	$ 2.44	View
1260	Claremore	OK	$ 926	$ 0.51	$ 2.40	View
7399	DENVER	CO	$ 759	$ 0.15	$ 1.05	View

Determine optimum course of action

Leverage expertise to make sense of all the data



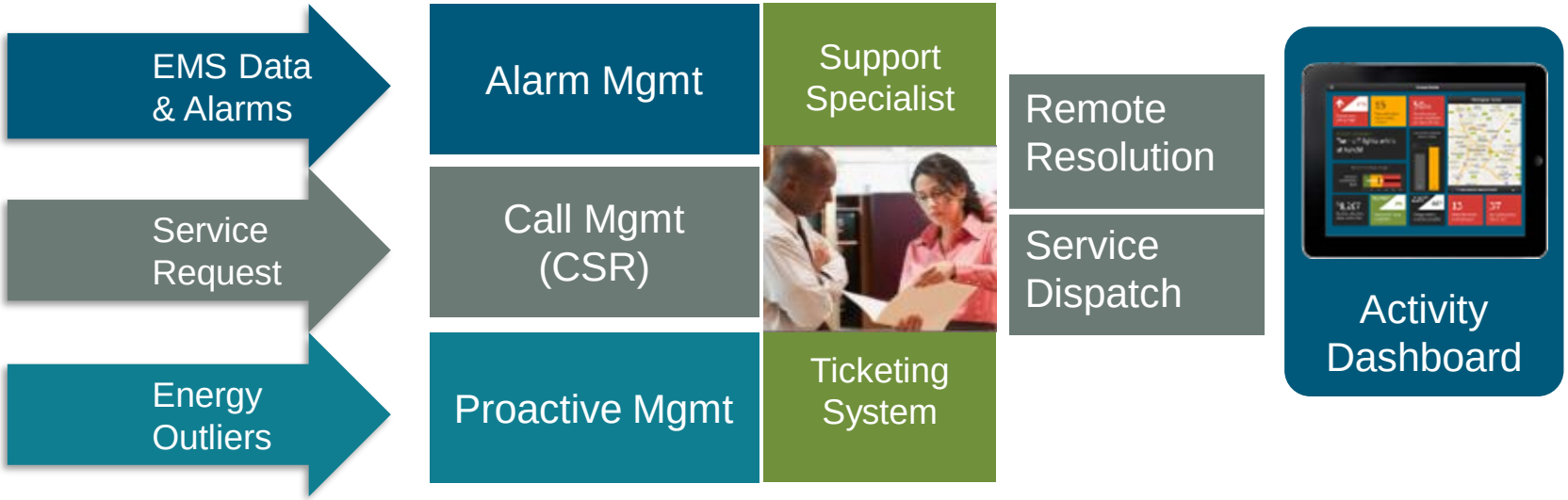
Implement Continuous Monitoring

Primary Components

- Service Call Response
- Alarm Management
- Workflow Management
- Designated toll-free number and email address to the 24/7/365 OCC
- Web-based Ticket Activity and Performance Dashboard

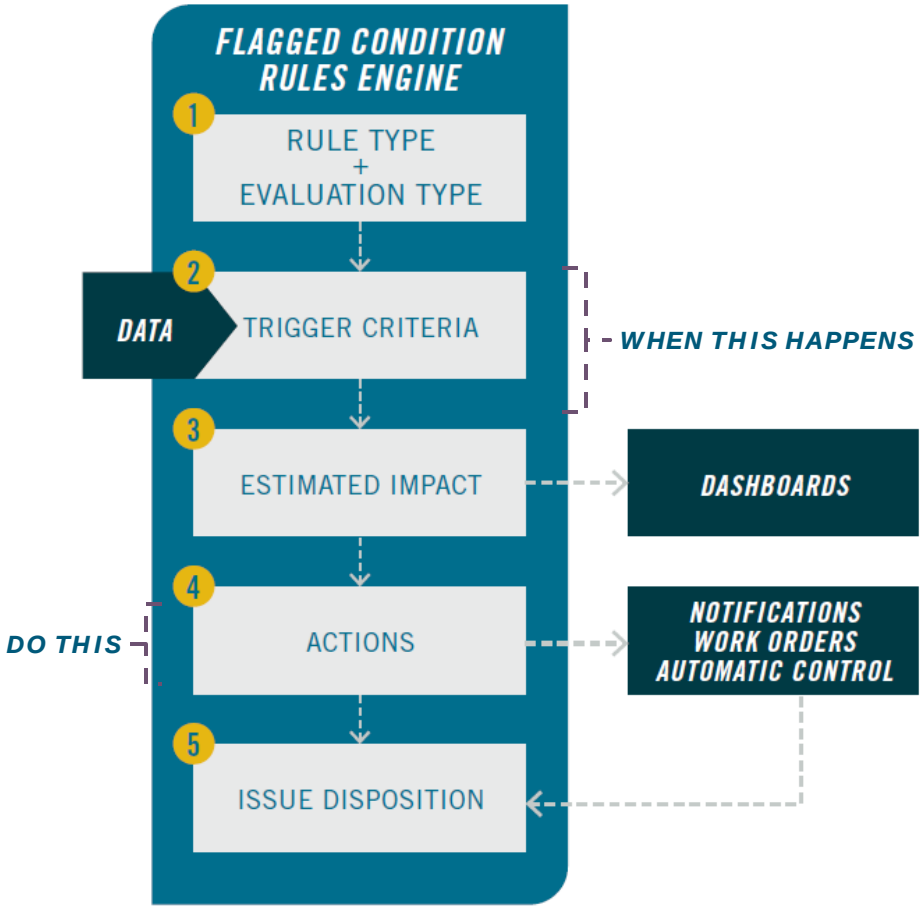
Key Benefits

- More effective maintenance and repair operations through improved issue tracking/reporting
- Improved first-call resolution through accurate diagnoses and description of equipment issues
- Improved visibility into facility operations & better documentation of equipment performance



Automated Business Rules Engine

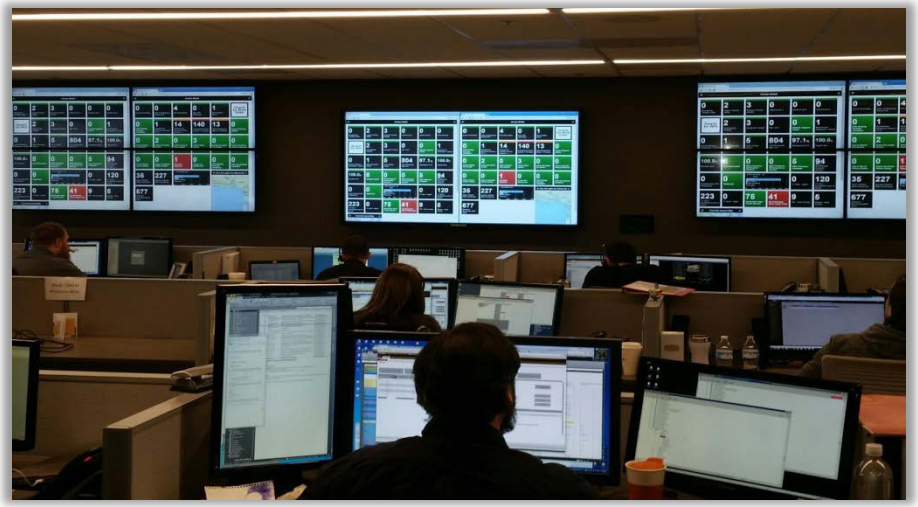
- Implement advanced analysis of site data, EMS programmed alarms and advanced system alerts
- Create Business Rules to process and identify meaningful issues, analyze their impact and prioritize actions
- Reduce alarms, site activity, energy and maintenance costs

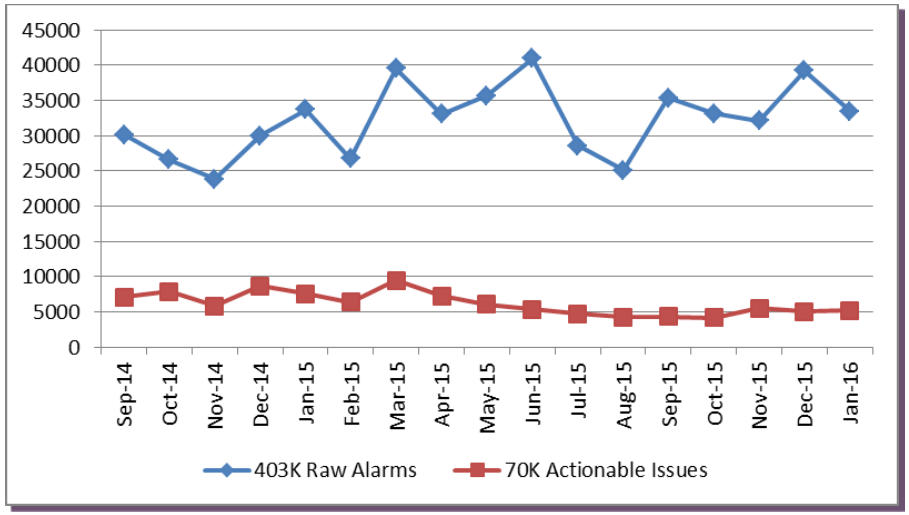


Example – Slicing through Alarm Data

2015 Statistics

- 403,170 alarms processed
- 70,260 determined actionable
- 59,610 processed by OCC
- 7,470 Avoided Service Dispatch
  - Issues resolved without a dispatch
  - Ecova Building Specialists provide remote resolution
- 3,180 Avoided Risk of Product Loss
  - Issues resolved by early service dispatch resolution
  - Timely identification eliminates food safety product loss event
- Annual cost avoidance is $1.83 million in 2015





Example – Slicing through Operational Data

Savings Identified by Category

	New	Total
Configuration	$ 1,493	$ 35,515
Food Safety	$ -	$ -
Mechanical	$ -	$ 390
Operations	$ -	$ 30
Schedule	$ 447	$ 19,293
Setpoint	$ 1,661	$ 173,010
Total	**$ 3,601**	**$ 228,237**

Connectivity - Offline (all sites)

	Current	Last Week
Gateways	27	26
eMonitors	97	96
Thermostats	456	443
Sensors	1,327	1,329

Savings from Top 10 Issues

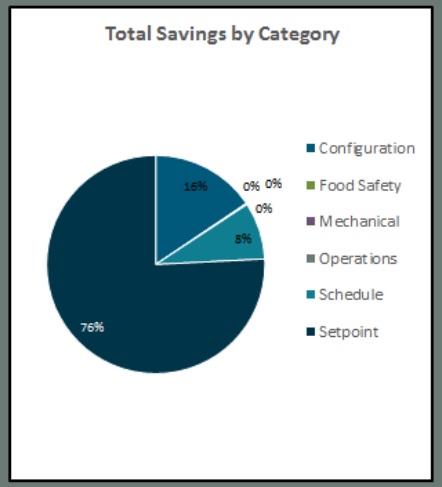
	New	Total
Occ Cooling	$ -	$ 59,717
UnOcc Heating	$ 1,411	$ 47,918
Thermostat Lock-o	$ 1,246	$ 33,442
Pre-Open Cooling	$ -	$ 31,998
UnOcc Cooling	$ -	$ 14,135
Open	$ -	$ 11,393
Pre-Close Cooling	$ -	$ 9,392
Occ Heating	$ 196	$ 6,448
Pre-Open Heating	$ 48	$ 2,803
Christmas	$ -	$ 2,703

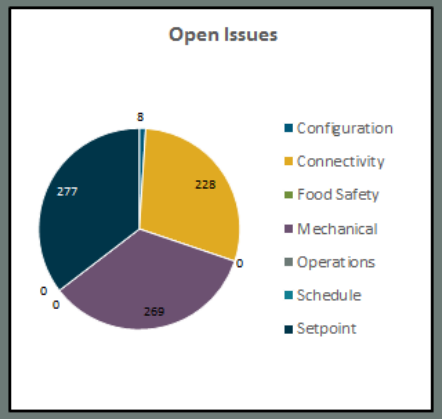
Issues Identified by Category

	New	Total
Sites Analyzed	19	862
Configuration	36	906
Food Safety	0	5
Mechanical	0	275
Operations	0	12
Schedule	36	3,560
Setpoint	43	3,794

Top Outliers

Site	Incidents	Cost
611	22	$2,064
7606	36	$1,668
53	23	$1,607
7137	23	$1,514
1022	28	$1,499
993	27	$1,487
929	26	$1,398
7056	23	$1,380
879	29	$1,304
1044	27	$1,229



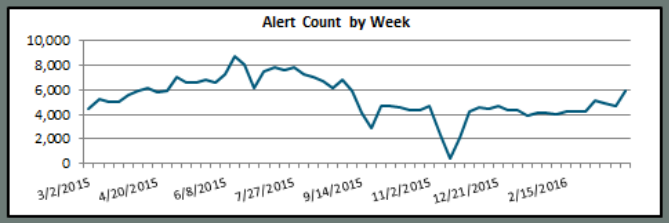


Alerts by Type

	New	Total
Temperature Exceeded Threshold on WIC	0	166,073
Temperature Exceeded Threshold on WIF	0	77,606
SiteSage Has Detected a Circuit On Too Long	0	12,797
WIC Temperature too High	0	10,320
WIF Temperature too High	0	4,856
Thermostat Lost Connectivity	0	1,595
Temperature Exceeded Threshold on RTU 2 (Lobby Supply)	0	955
Temperature Exceeded Threshold on WIC 2	0	498
Temperature Exceeded Threshold on WIC #2	0	497
Thermostat Not Reaching Target: #9002	0	430
Your SiteSage Device is Offline	0	428
Temperature Exceeded Threshold on RTU 3 (Kitchen Return)	0	382

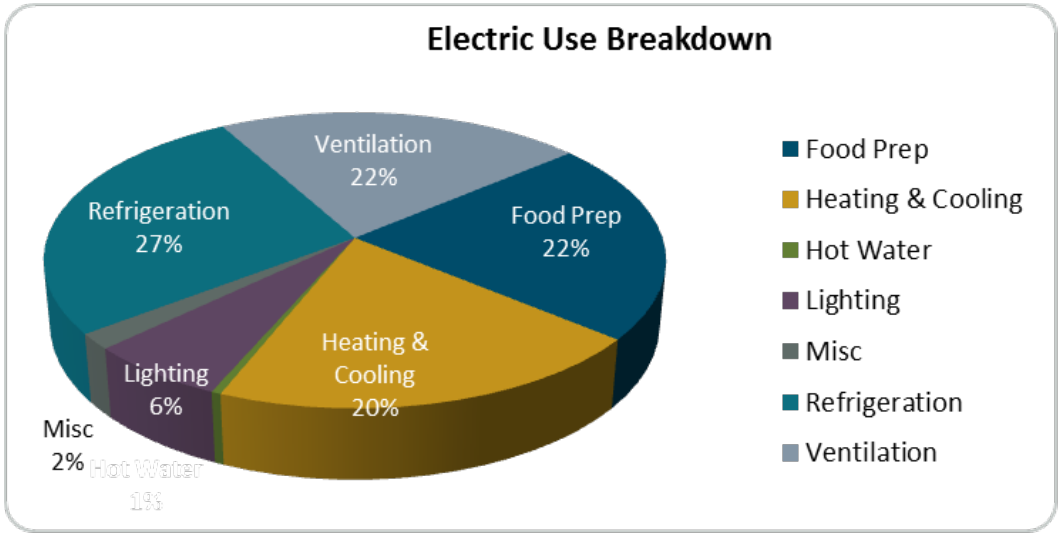
Top Alert Sites - Last Week

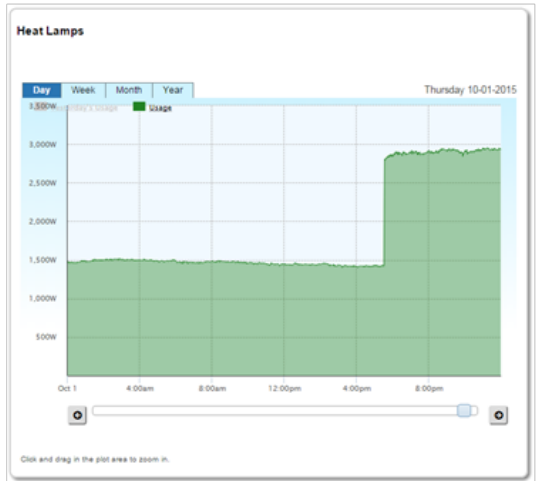
Type	Site	Count
#0537 - RTU 1 (Kitchen) On Too Long	#0537	43
#0161 - WIC Evaporator Temperature too High	#0161	42
#0251 - RTU 2 Dining On Too Long	#0251	42
#0255 - WIC Evaporator Temperature too High	#0255	42
#0990 - WIC Evaporator Temperature too High	#0990	42
#1438 - wic right Evaporator Temperature too High	#1438	42
#1824 - WIC Evaporator Temperature too High	#1824	42
#1833 - WIF Evaporator Temperature too High	#1833	42
#1956 - WIC Evaporator Temperature too High	#1956	42
#5021 - WIC Evaporator Temperature too High	#5021	42

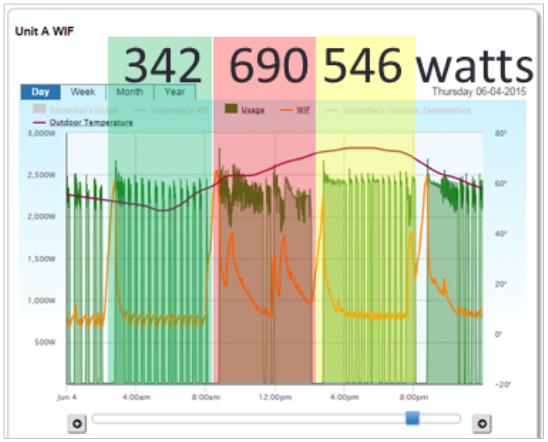


Example – Slicing through Energy Data

- Detailed breakdown of electricity usage
- Heat lamps use nearly as much energy as the WIC and WIF combined, and 2nd unit can be turned off overnight
- Waffle irons use approximately 4.5% of the total electricity use
- Walk-in freezer doors are left open often
- Ventilation and refrigeration are significant opportunities







Summary

Program Objectives

- Reduce energy consumption and operational costs
- Maintain a comfortable store environment
- Ensure Product Quality, Food Safety and Compliance
- Leverage People, Process and Technology
- Correlate Energy and Site performance
  - Identify and investigate Outlier Sites
  - Identify and prioritize under-performing assets
- Implement Intelligent Dispatch
  - Reduce service dispatch quantity
  - Minimize onsite service technician time

Discussion/Q&A

U.S. DEPARTMENT OF ENERGY

Thank you!

Contact Information:

- Adam Spitz: Adam.Spitz@icfi.com
- David Zabrowski: Dzabrowski@fishnick.com
- Jay Fiske: Jay@powerhousedynamics.com
- George Huettel: GHuettel@ecova.com