

General Session

Lab Meets the Real World: Case Studies of Energy Efficient Upgrades that Saved Money



FCSI
LIVE FROM NASHVILLE
APRIL 14-16
2016

Richard Young
Saturday, April 16 – 8:45-10:00 a.m.

Presentation by:
Richard Young
Director of Education



fishnick

Food Service Technology Center



conServe
National Restaurant Association

The Importance of Design

**Adam Spitz and Carly Burke from ICF
here representing ENERGY STAR**



www.energystar.gov/cfs

Message:

- **Equipment Specs Matter – Efficiency Saves**
- **Commissioning (Cx) Matters - The Best Design is Easily Lost**
- **Employees Really Matter - Need for Training and Continuous Cx**



California Energy Commission Cookline and Hot Water Projects



Airport Catering
Full Service Restaurant
Hospital Kitchen
Hotel Kitchen



Full Service Restaurant
School Kitchen



Hats Off to David, Denis, Amin, Mark, Rich and Don



FES and FER Cooklines Hot Water

UNIFILLER Increase Yield & Reduce Product Waste with Depostors from Unifiller!

Foodservice equipment & supplies

PG&E Cookline Project Update: Gate Gourmet
Published on Friday, 01 April 2016
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Producing 26,000 to 34,000 meals a day requires a lot of firepower, energy and labor. That's the reality Gate Gourmet faces on a daily basis. And thanks to its participation in an ongoing test program, the producer of airline catering and other provisioning services has been able to reduce energy consumption by 20 percent at its Southern California location.

Gate Gourmet is the latest participant in the Comprehensive Commercial Kitchen Equipment Retrofit (aka, "the cookline project"), a grant project awarded by the California Energy Commission to the PG&E Food Service.

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EXCLUSIVE: Hot Water: Fast, Plentiful & Most Efficient: Fisher-Nickel's CEC Water Grant funds groundbreaking research on hot water systems in a restaurant and a school.

By: © 2016 **Wynne-Rousselle, Contributing Editor**

04/01/2016

In today's world—with technological advancements and new "smarter" ways of doing things coming faster and faster every year—it's a little surprising that hot-water delivery systems in restaurants have remained pretty much the same for half a century.

That may be about to change, thanks to an ambitious demonstration project now under way. It's being led by Fisher-Nickel Inc., the San Ramon, Calif.-based division of CTE that consults on energy issues in foodservice (and also runs the Food Service Technology Center for Heat, Gas & Electric).

"For almost 50 years, [Fisher-Nickel] has been testing under every cook-line cooking equipment, refrigeration, kitchen ventilation systems, lighting—for efficiency," says Armin Delaghi, Research Engineer at the company and lead investigator on the project. "One of the last places to look was hot water systems." Delaghi points out that hot water systems are a tough nut to crack because there are so many different elements in play, heat loss can occur not only at the water heater but also in the recirculation pipes, making it harder to identify inefficiencies.

In this project, funded in part by the California Energy Commission, Fisher-Nickel is partnering with two California foodservice operations, one commercial and one noncommercial—a San Mateo outlet of full-service burger chain The Counter and Franklin Elementary School in Santa Barbara.

In both cases, Delaghi's team aims to observe and measure water and energy usage in the current water system configuration to calculate heater efficiency, recirculation heat loss and peak-to-peak efficiency and pinpoint deficiencies. Step 2 is to swap out specific elements for new equipment (directly donated by manufacturers) and observe the results. After on-site observations are completed, the kitchen at The Counter also will be duplicated at the PG&E Hot Water System Lab for more precise and exhaustive testing of equipment and usage patterns, with heater and distribution system designs being swapped out and the most efficient combinations are identified.

Potential Savings At The Counter

"We've worked with Fisher-Nickel before, trying out different technologies to lower restaurant use and utility costs," explains Peter City, Operating Partner for Franchisee Counter-Santa Barbara. "This research project was a great opportunity for us, since we had encountered a number of problems at

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Gategourmet

- Fryer
- Oven
- Steamer
- Range
- Combi
- Broiler



Gategourmet

- 20 feet of exhaust hood
- Airline meals and employee meals
- 18,000 meals a day (doubling this summer)
- Closed midnight to 4 am
- 24/7 operations
- Cleaning done by porters!



Never Turned Off – Lids **Always** Open

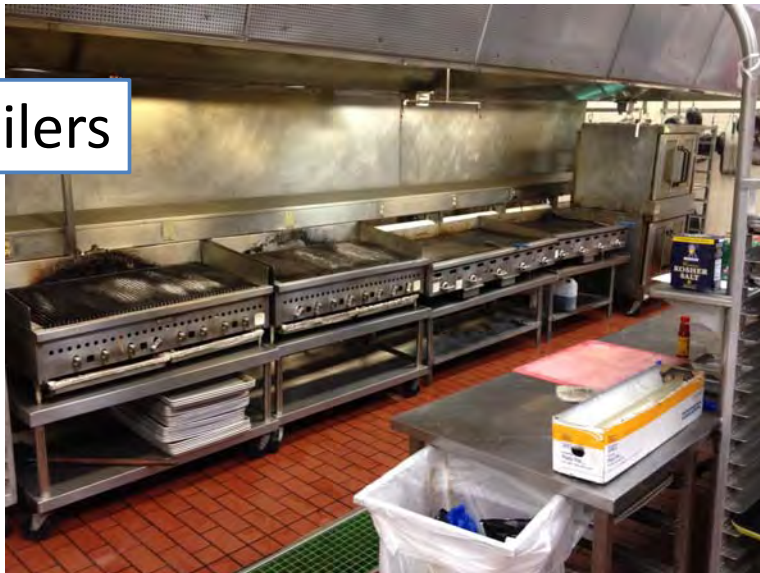


Broilers



Gate Gourmet – Original Broiler Line

Two 4-foot broilers



Broiler Replacement



Broiler Replacement

“We use the broiler for grilling 50 different vegetables, and the employees love it because they can just set the food on a tray and send it through the conveyor.”

“The broiler creates nice grill marks with better consistency, and we can use it for burgers, proteins and other foods.”



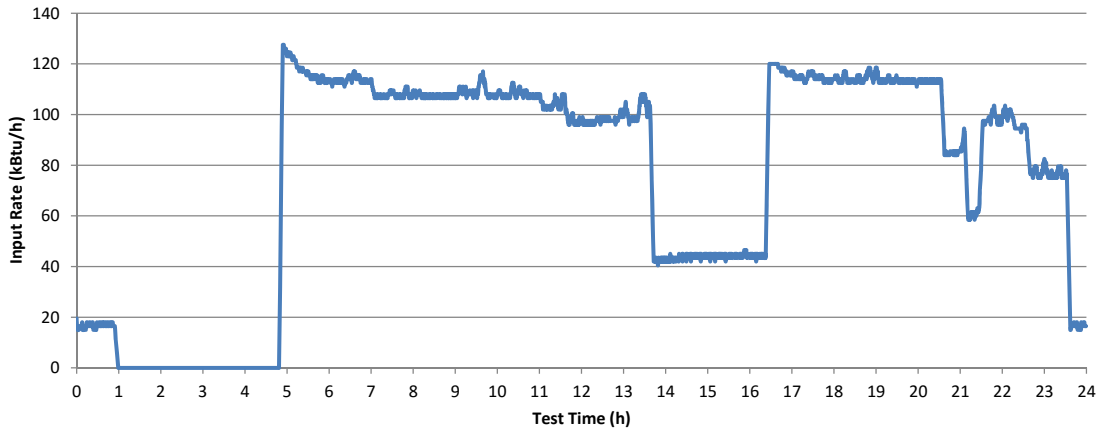
Source: FES Article

Chain Broiler is not only for burgers



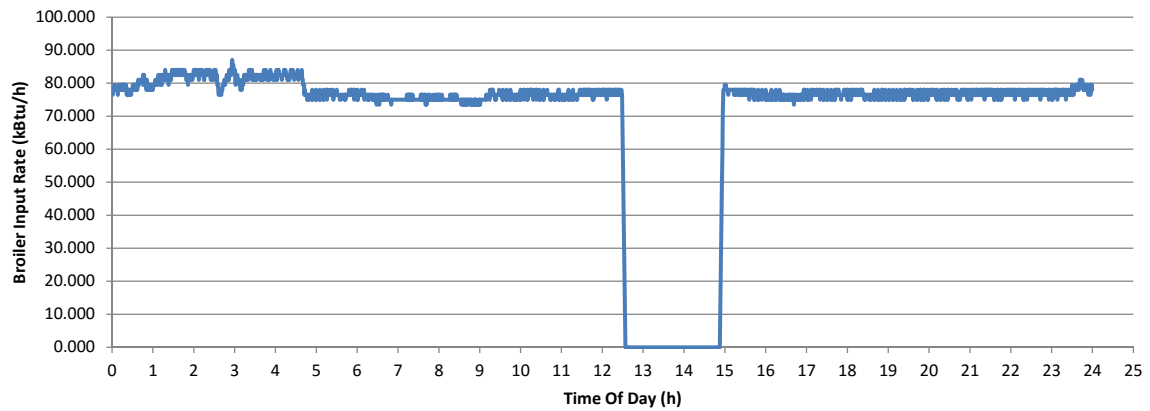
Broiler Savings

Underfired Broiler Typical Profile



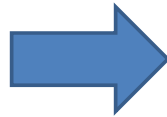
Replacement Broiler

Nieco Broiler



17% Savings = \$1,100/year

18 therms/day



15 therms/day

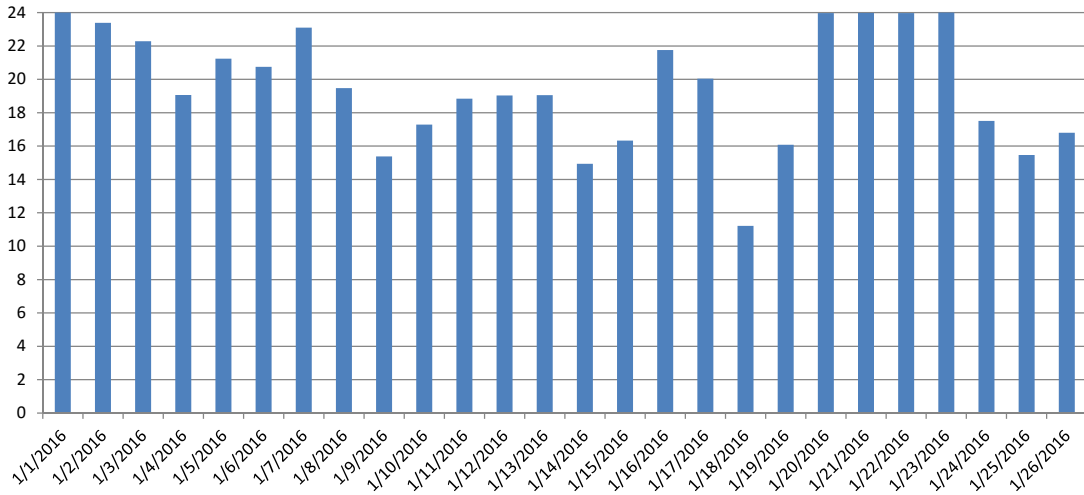


Benefits

- Cooler kitchen
- Expanded menu
- Increased throughput
- Consistent product



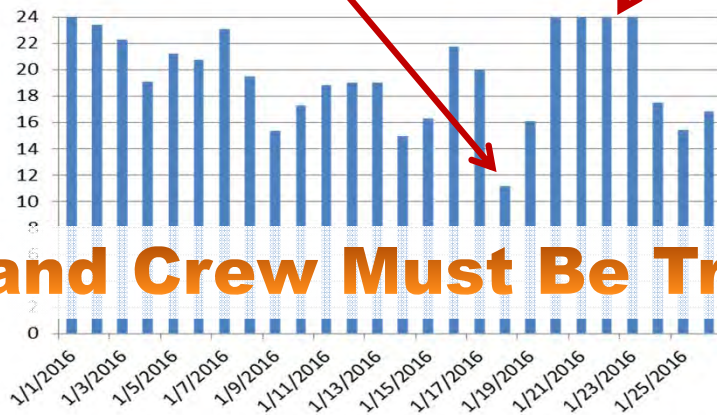
Conveyor Broiler Operating Hours



Challenges:

Poor Maintenance

Poor operations

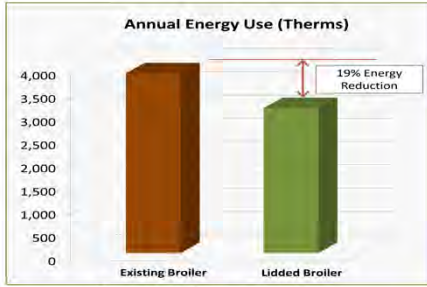


Staff and Crew Must Be Trained

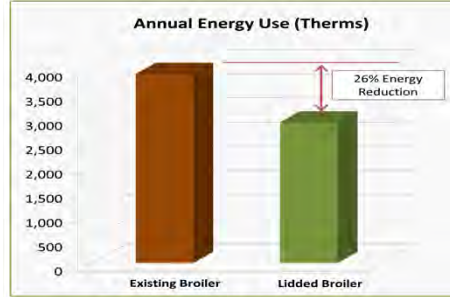


Lidded Broiler...

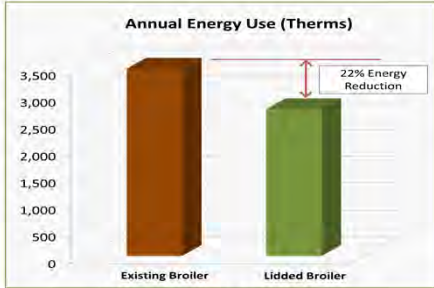
- High Efficiency Infrared Burners
- Lid to Retain Heat
- Thermostatic Control



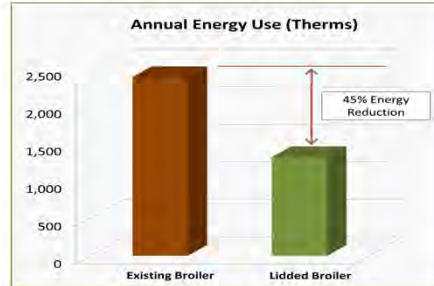
Annual Operating Cost Reduction of \$751.00



Annual Operating Cost Reduction of \$998.00



Annual Operating Cost Reduction of \$755.00



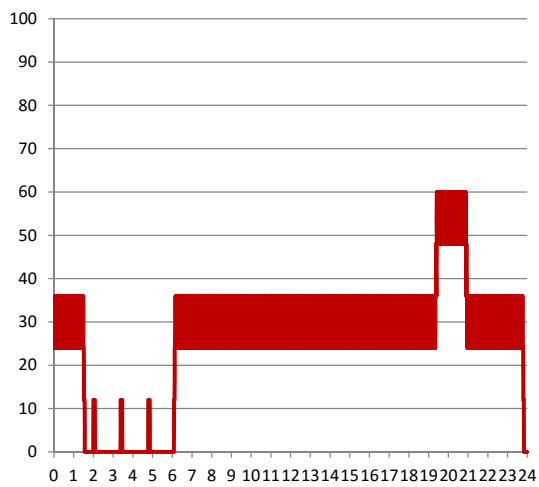
Annual Operating Cost Reduction of \$1067.00



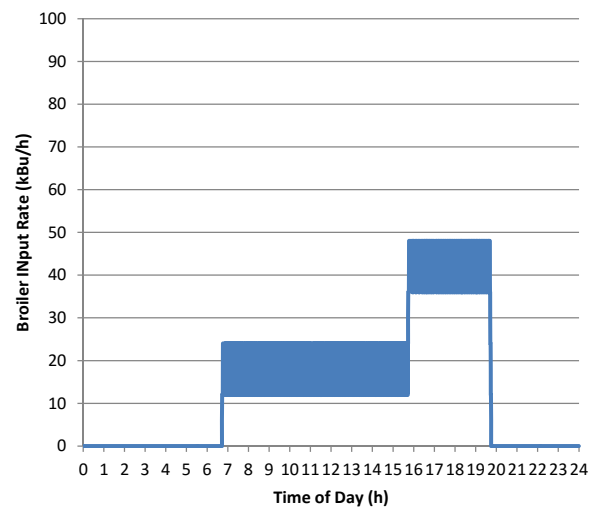
Broiler Replacement



Baseline Broiler



Replacement Broiler



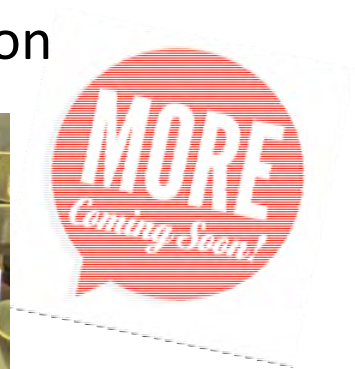
Broiler Replacement

- Old Broiler Falling Apart, 5 therms per day = \$1,800 a year
- New Broiler is Deeper, 3.5 therms per day = \$1,100 a year
- Increased cooking surface area
- No Standing Pilot
- Less heat to space



Why Do We Care About Broilers?

They Ain't Goin' Away Soon



Fryers



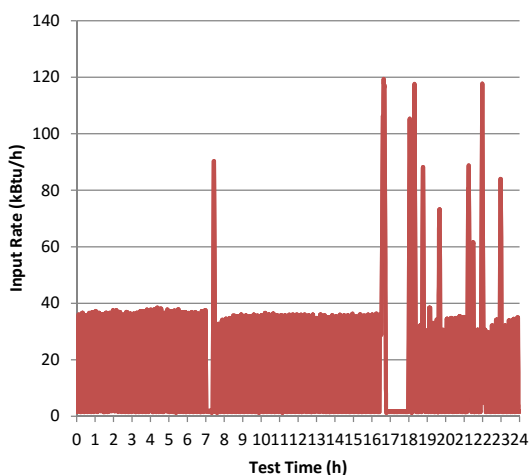
Gategourmet

Old fryer replaced with efficient unit with filtration

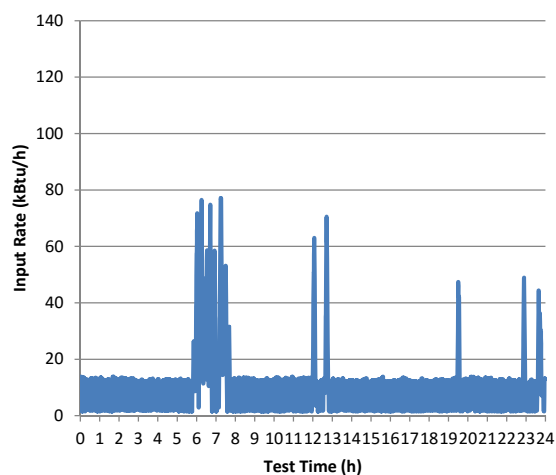


31% Energy Savings = \$388/year

Baseline Fryer Typical Profile



Replacement Fryer



What about the Oil?

Staff changed oil every day!

45 lbs a day = \$12,000/yr

New fryer with filtration: Changed every three days

Annual Savings = \$8,000/yr

Change required lots of training!



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Mixing Up Better Beverages
The Fryer Challenge: Keeping Up with the Fryer
Future of DCV for Commercial Kitchens

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Save Energy **Save Water**
Rebates

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Life Cycle Cost Calculators
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Stream our Webinar:
fishnick.com/education/webinars/kitchendesign/

**TOP SHELF KITCHEN DESIGN:
4 STEPS TO EFFICIENT EQUIPMENT**

Featuring Dick Eisenbarth
President & COO of Cini-Little International



Food Service Technology Center



Oil Life and Cost Savings

Nicole O'Rourke
Southern California Gas Company (Formerly)
Fryer Oil-Life Field Study



www.etcc-ca.com/reports/energy-star-gas-fired-fryers-field-evaluation-report

SoCal Gas Job Opening





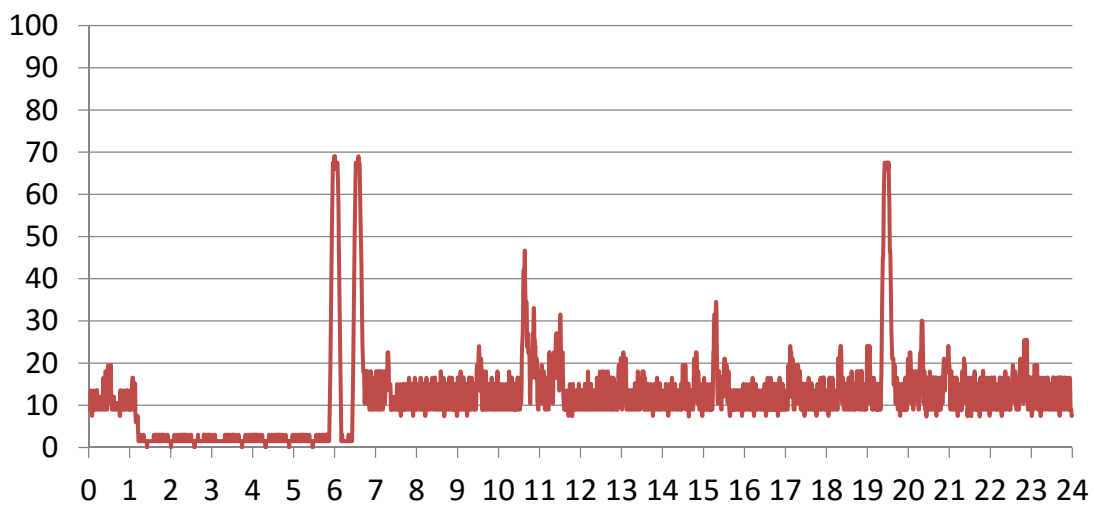
Fryer Replacement

Site had two entry-level high efficiency fryers

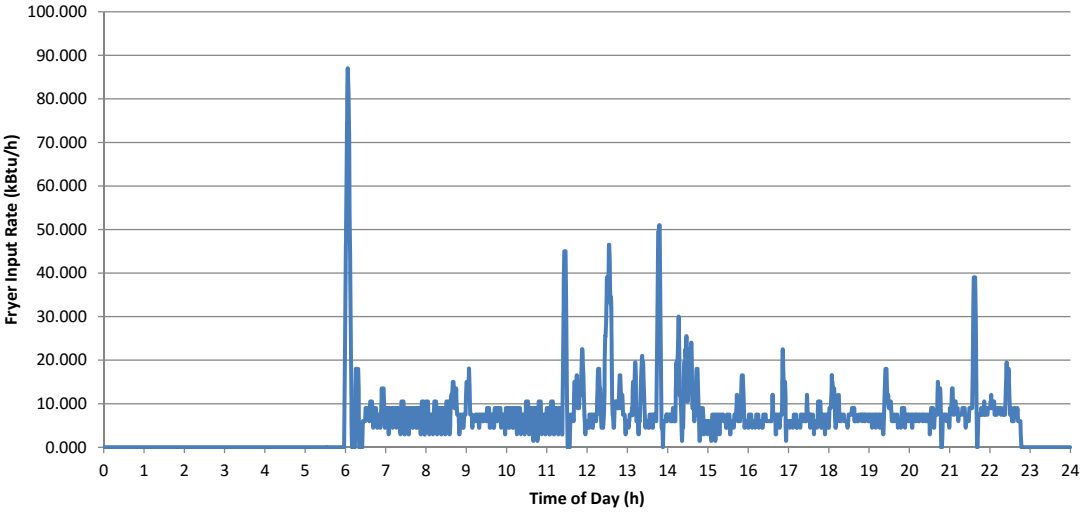


Replaced one with high-efficiency high-performance

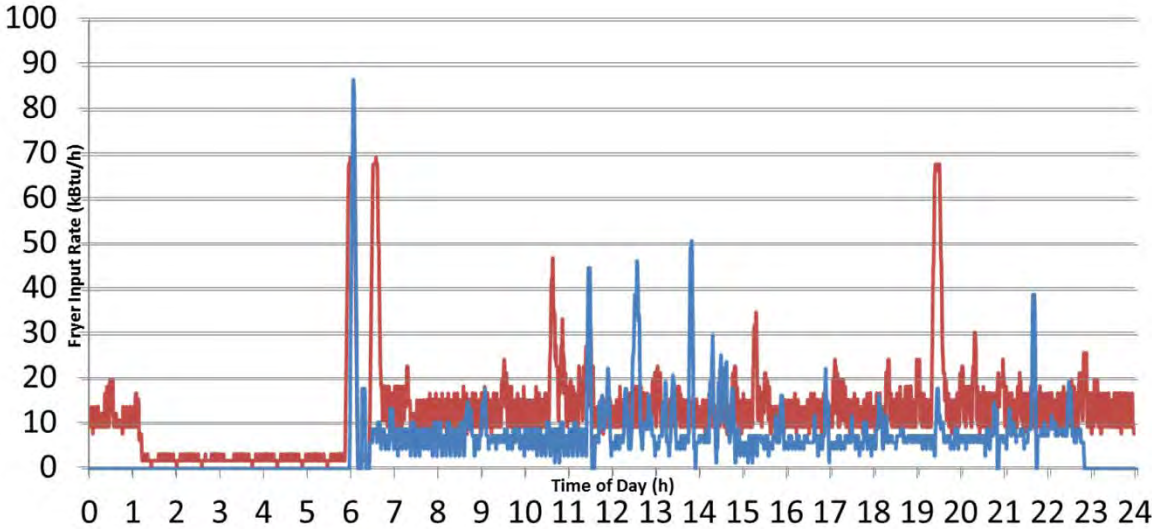
Fryer: High-Efficiency Entry-Level



Fryer: High-Performance Replacement



Energy Savings = \$365/year
Oil Savings (Conservative Guess) = \$1000/year



Why Do We Talk So Much About Fryers?

Because, the more we do the math, the more we realize that high-efficiency fryers are a no brainer!

Performance + Energy +



Another Surprise Savings:

In CA, workman's comp insurance is lower for restaurants with high-efficiency fryers & filtration

One example was \$850/year

Interesting Story:

At first the staff complained about the low productivity of the high-production fryer.



Turns out that the thermostat was over 20 degrees out of calibration

Appliances must be commissioned!

Steamers

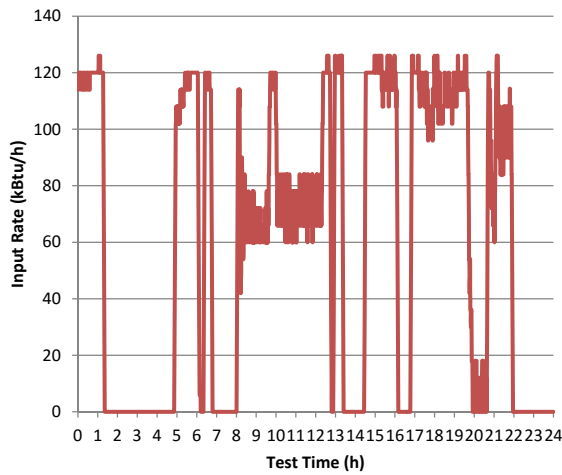


Gate Gourmet – Steamer Swap

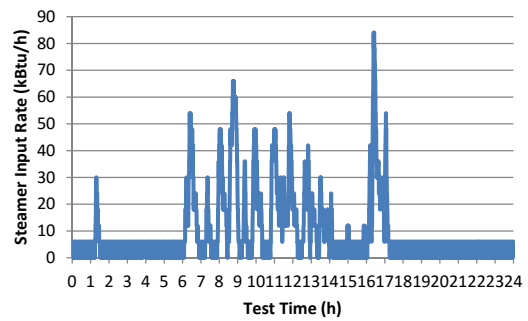


Steamer Savings: 81% Energy Savings = \$4,000/yr

Steam Kettle Typical Profile



Market Forge Replacement Steamer



Question: What's Different Between These Two Sites?

Works Great!



Not So Great!

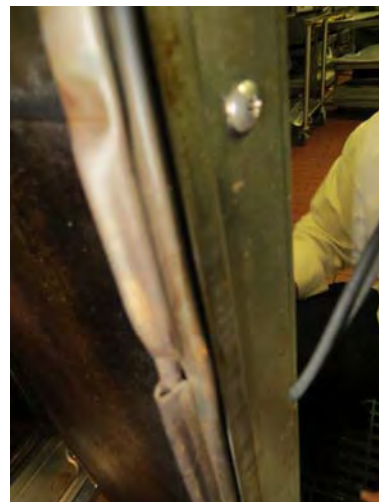


The Un-used Combination Oven....



Complete Lack of Training

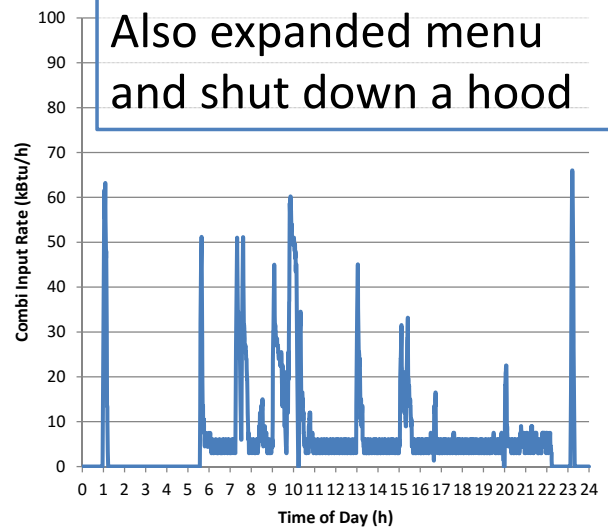
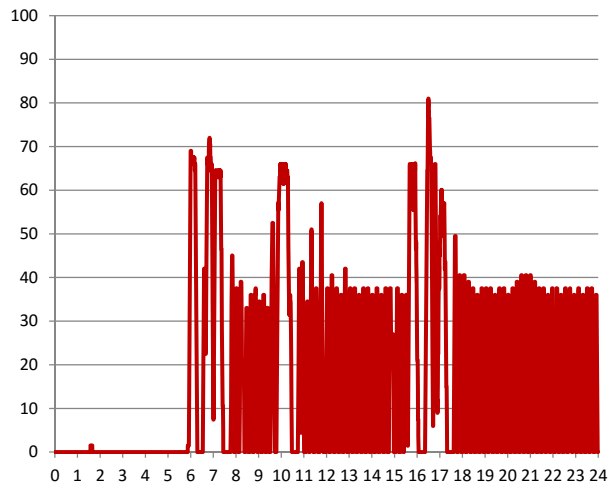
Old/New Equipment – No Maintenance!



Successful Oven to Combi Replacement



Convection to Combi Savings = \$580/year



A couple more quick examples:

High-Efficiency Replacement Ovens



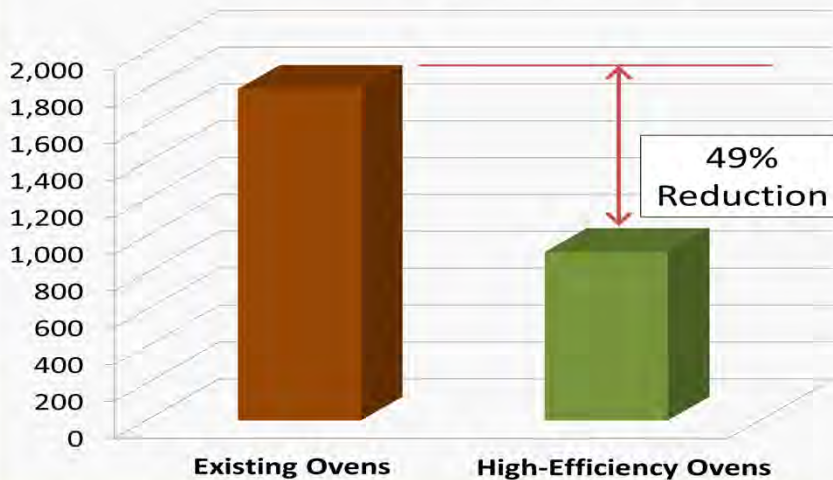
The existing 25 year old ovens were replaced...



...with new ENERGY STAR® ovens.



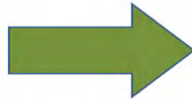
Annual Energy Use (Therms)



Annual Operating Cost Reduced by \$885.00



The existing ice machine was replaced...



...with a new **ENERGY STAR®** ice machine.



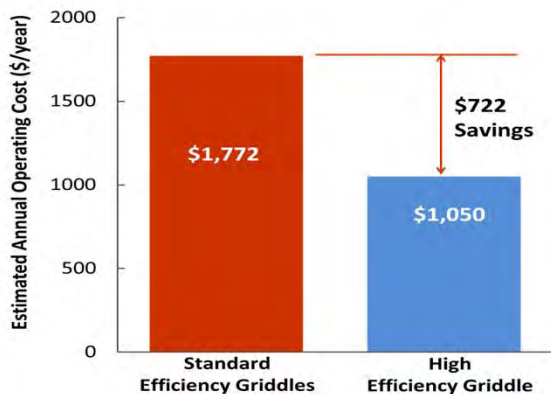
Annual Energy Use (kWh)



High Efficiency Griddle



- 849 Therms/year Savings
- \$722/year Savings
- \$125 Utility Rebate



Dirty Facts From the Dishroom:

What You Should Know About the Operation and Maintenance of Your Dishwasher



November 10th, 2015

Presented by:
Amin Delagah

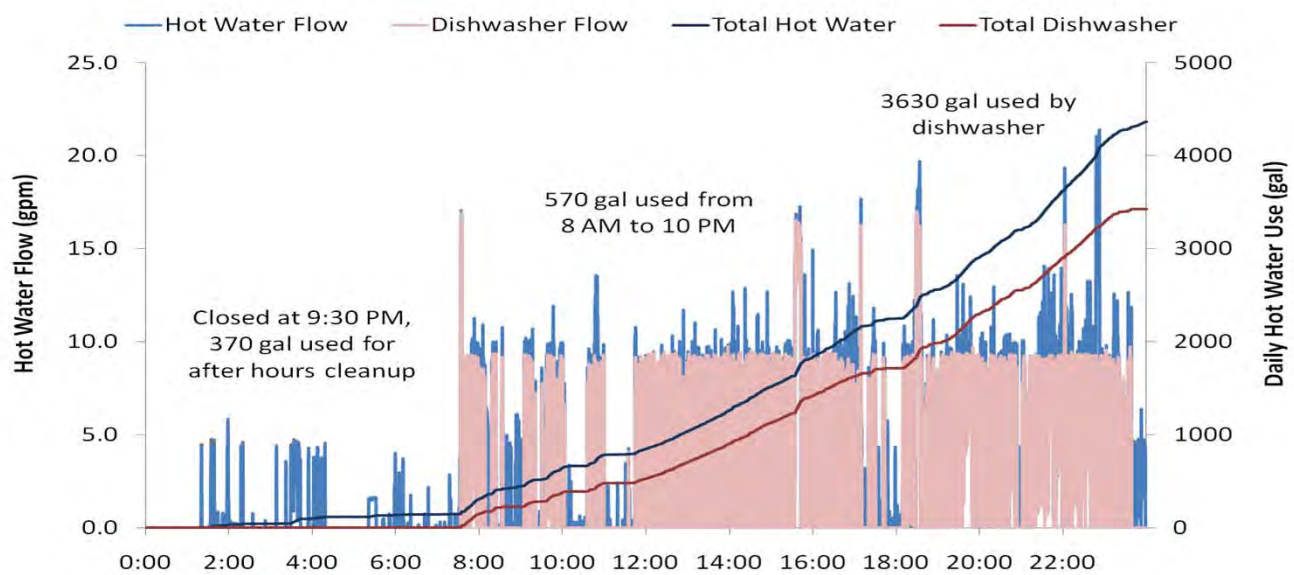


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Relationship of Hot Water Systems and Dishwashers

- Dishwashers consume 25-75% of the hot water used in restaurants.
- Operating cost of a dishwasher (water, energy, detergent) is approximately 40-85% of the total cost of the entire hot water system.

Heavy Dishwasher Use in FSR



Case Study of Door-Type and Undercounter Dishwasher Replacement

Dishwasher Replacements in Fine Dining

- Project entailed changing out two low-temp units for ventless high performance high-temp dishwashers
 - Existing door-type (2.0 gal/rack)
 - Existing undercounter (1.6 gal/rack)
- Goal was to see if the added performance and detergent savings offset the additional energy costs



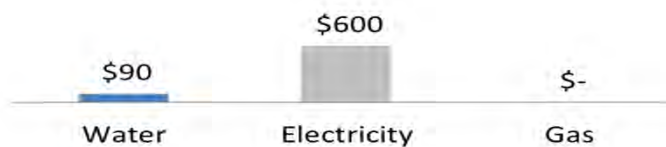
Undercounter Dishwasher

- High-temperature, heat recovery, no chlorine, less steam



Results of Undercounter Units with HR

- 25 racks/day will cost \$690 a year



**Extra \$250
in annual
cost**

- Operator very happy with quality of wares, mitigation of steam in bar area and the chlorine smell.
- Operates on the cold water line only!
- Potential to reduce the size of the water heater and distribution system.



Lessons Learned

- Project was able to reduce water use by over 60% in both cases while delivering cleaner wares with less labor time.
- The door type unit added great value to the restaurant but increased utility cost by approximately \$2,000.

3 Case Studies on Conveyor Dishwasher Replacement

Original Dishwasher in University Kitchen

- Steamy room even with 3 fans going
- Large amount of water and energy use due to old steam distribution system, dishwasher, table layout



New Dishwasher w/ Heat Recovery

- Significantly more comfortable work environment
 - Removal of steam system
 - Insulated doors
 - Door seal system
- Door actuated drain closure
- Vent fan control
- Energy saver mode
- Built-in booster heater
- Final rinse flow rate specification of 2.2 gpm



Preliminary Results From Rack Conveyor Replacement Project

	Water Use (gal/d)	Electricity Use (kWh/d)	Gas Use (therms/d)	Utility Cost (\$/d)	Total Energy Use (therms/d)
Original 108" Rack Conveyor Dishwasher	1372	21	30.2	\$57	31.0
Replacement 86" Rack Conveyor Dishwasher	628	276	3.2	\$52	12.6
Savings Percentage	54%	-92%	89%	9%	59%

Fuel Switching and low hot water supply temp of 120°F responsible for low cost savings

Original Dishwasher in Work Cafeteria

- 98 gph spec. rinse flow rate
- 189 gph measured rinse flow rate
- The unit was using over 2 million gallons of water annually



New Dishwasher w/ Heat Recovery + Blower Dryer

- 58 gph spec. rinse flow rate
- 71 gph measured rinse flow rate
- More comfortable work environment
 - Insulated doors
 - Door seal system
- Vent fan control
- Energy saver mode



Final Results From Flight Dishwasher Replacement Project

	Water Use (gal/d)	Electricity Use (kWh/d)	Gas Use (therms/d)	Utility Cost (\$/d)	Total Energy Use (therms/d)
Original Flight Conveyor Dishwasher	5656	668	48.0	\$271	70.8
Replacement Flight Conveyor w/ Heat Recovery + Blower Dryer	1857	931	10.0	\$240	41.8
Savings Percentage	67%	-39%	79%	11%	41%

The addition of a blower dryer on the replacement unit increased overall electricity use

Dishwasher Change Out in a Large Hotel



**Downsize Dishwasher
Upsize Efficiency**



Original rackless conveyor used 360 gal/h rinse water continuously when the machine is in operation.

FSTC recommended choosing an ENERGY STAR Best-in-Class model using 78 gal/h.

Dishwasher Change Out at a Large Hotel

- Existing flight machine was consistently breaking down after being in service for 20 years.
- Costing the hotel time and \$12,000 a year to maintain.
- The flight conveyor was being operated by 1 or 2 staff members.
- Oversized and no longer meeting their needs to operate the restaurant and conference catering events.
- Executive chef and facilities director were looking to downsize to a rack-type conveyor.

Surprise Savings From Downsizing

	Flight	66"-Rack	Percentage Reduction
Reduction in Operating Time (h/d)	9.1	2.9	68%
Reduction in Hot Water Use (gal/d)	3,700	395	89%
Reduction in Rinse Flow Rate (gpm)	6.0	1.5	75%
Daily Reduction in Gas Use (therms)*	50.4	4.2	92%
Daily Reduction in Electricity Use (kWh)*	398	179	55%

*Switched from an external gas booster heater on the original flight conveyor to a on-board electric booster heater on the new rack conveyor.

Annual Savings and Payback

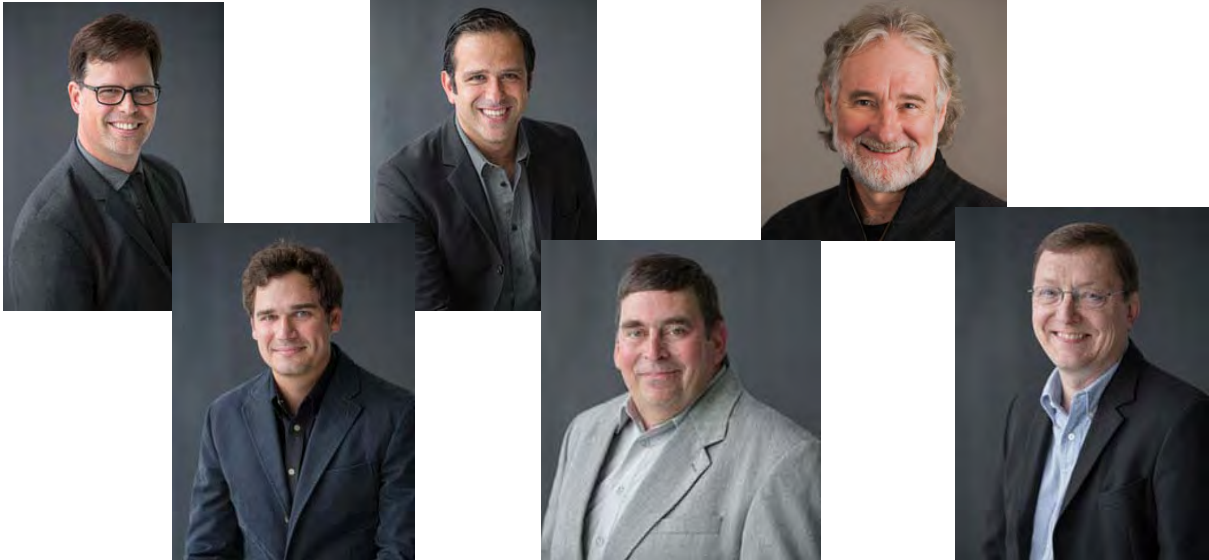
	Original Flight Conveyor in Operation	Replacement 66"-Rack Conveyor
Water Use (HCF or 748 gal)	1,807	193
Gas Use (therms)	18,400	1,521
Electricity Use (kWh)	145,132	65,383
Cost of Operation	\$53,300	\$12,730
Annual Operating Savings		\$40,560
Water, Gas and Electricity Rebates		\$16,940
Total 1st-Year Savings	Not Including	\$57,500
Cost of Project	Chemical	(\$47,300)
Payback Period (years)	Savings →→→→	.82

Message Revisited:

- **Equipment Specs Matter – Efficiency Saves**
- **Commissioning (Cx) Matters - The Best Design is Easily Lost**
- **Employees Really Matter - Need for Training and Continuous Cx**

Why I left the South?

So I Could Work With These Awesome People!



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PROMOTING ENERGY EFFICIENCY IN FOODSERVICE

Thanks!

**be
energy
wise**

**save energy, save money,
save the environment.**



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