Results from Baseline Monitoring of Belas Hall Dishroom and Boiler Room and Next Steps

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Balas Hall Dishroom

Research Focus Areas

- Quantify energy and water use of existing dishwasher
- Normalize data for Water and Energy Use Per:
  - meal served
  - facility size (floor area)
  - Seat
  - Hour of rinse operation
- Create action plan for replacing old equipment
  - Establish benefits for decommissioning old equipment
  - Estimate savings

- Added Focus:
  - hot water system, steam system
  - Total dishroom water and energy use
  - Quantify temperature and RH conditions of the dishroom

Balas Hall Boiler Room

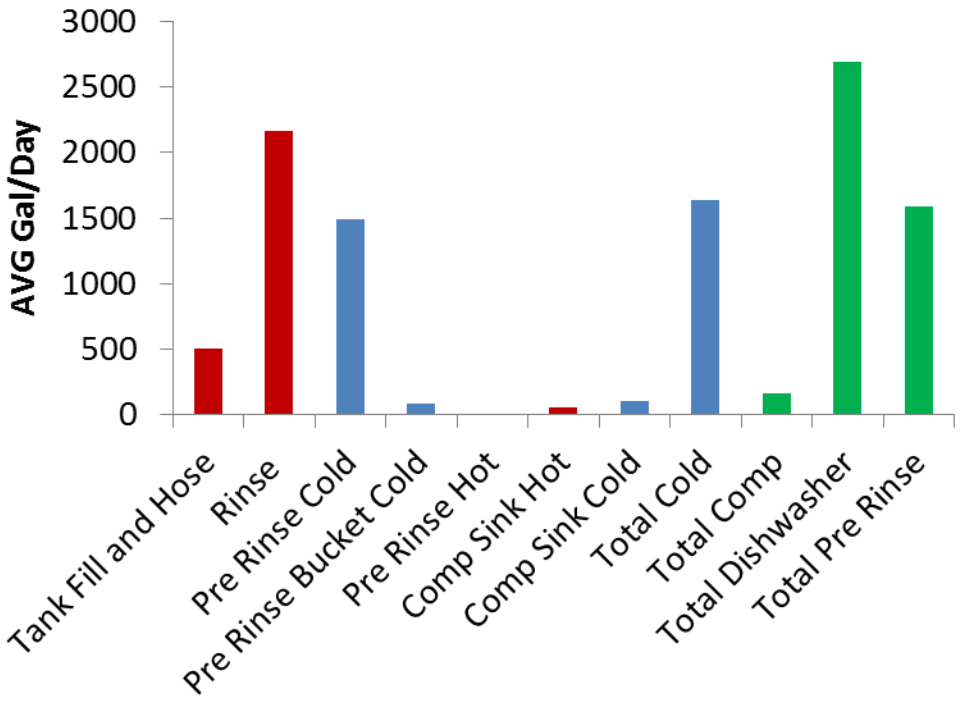
Boiler Room

- Water
  - DHW supply, Steam supply/Condensate top-off, Chem balance supply
- Electricity for DHW, Steam
- Gas for DHW, Gas for Steam
- Temperature
  - DHW inlet, return, outlet
  - Condensate return

What we don't know:

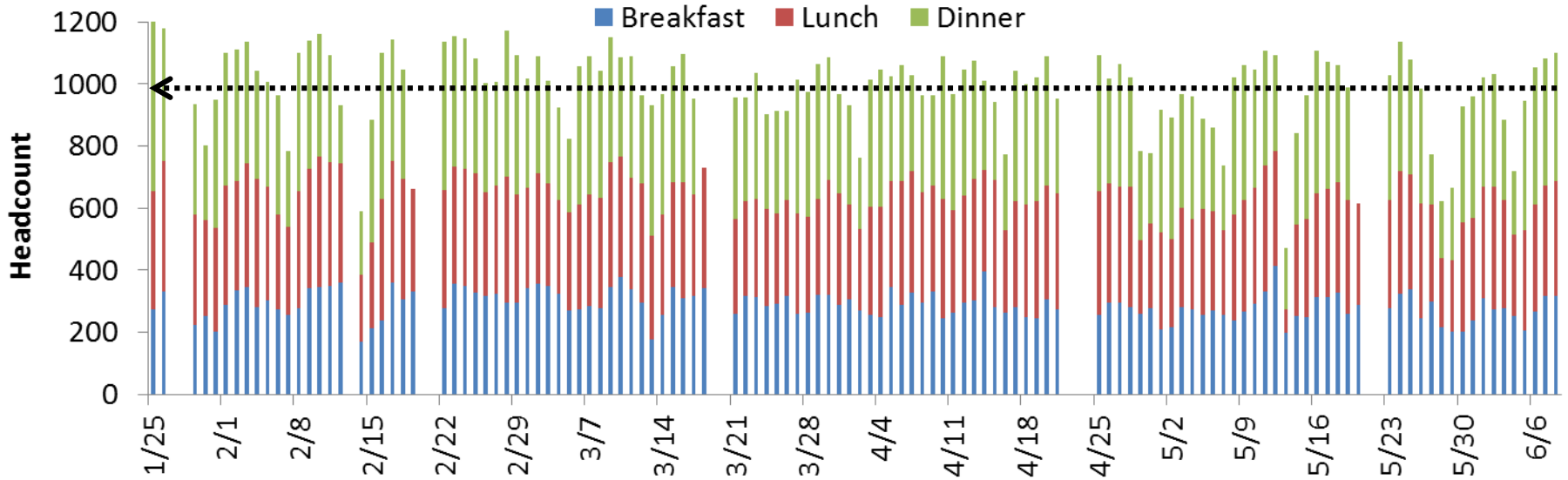
- How much water the steam system actually uses (we only know the makeup water)
- Temperature of condensate when it reaches steam boiler

Daily Dishroom Water Consumption

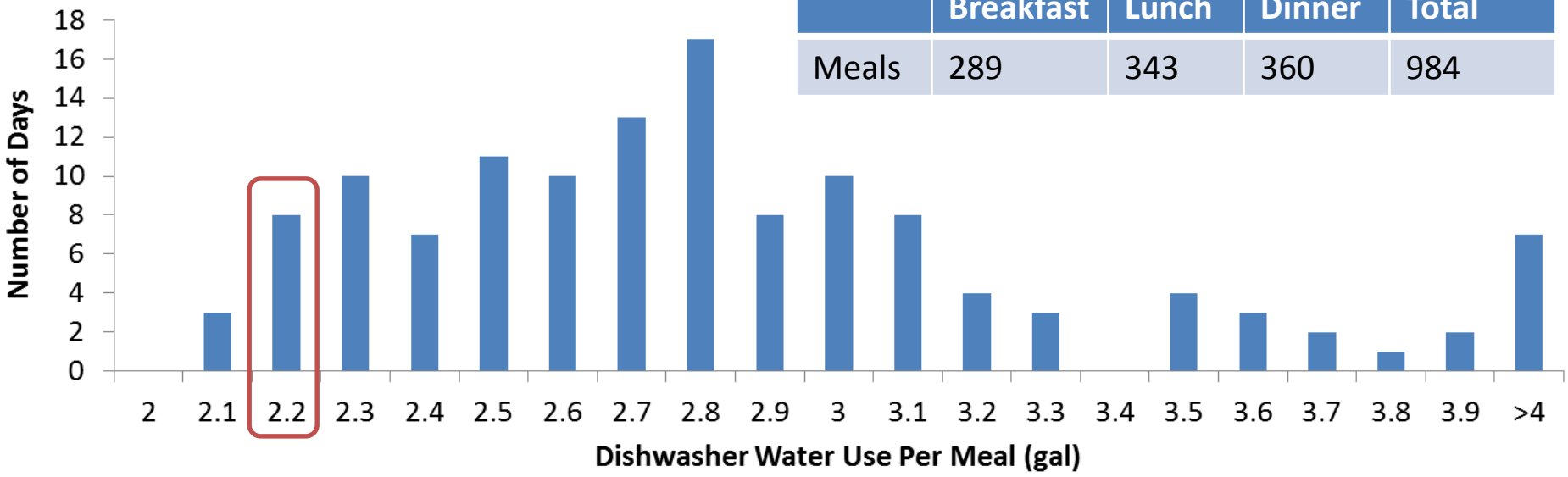


	Temperature During Flow (°F)	NSF Hot Water Sanitizing Temp (°F)
Hot Rinse	169	180
Hot Fill	144	140
Cold Scrapper	64	N/A
Rinse Tank	152	160
Wash Tank	139	150
Prewash Tank	123	N/A
Drain	142	<140

Belas Hall Meals Served



	Breakfast	Lunch	Dinner	Total
Meals	289	343	360	984



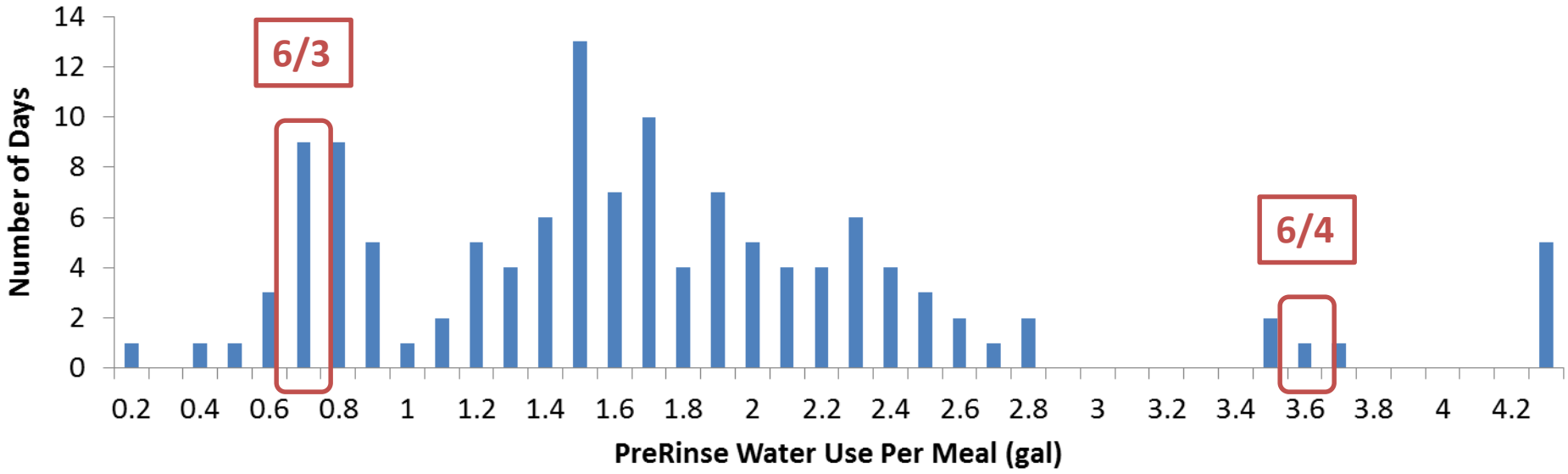
Rinse is Always Running

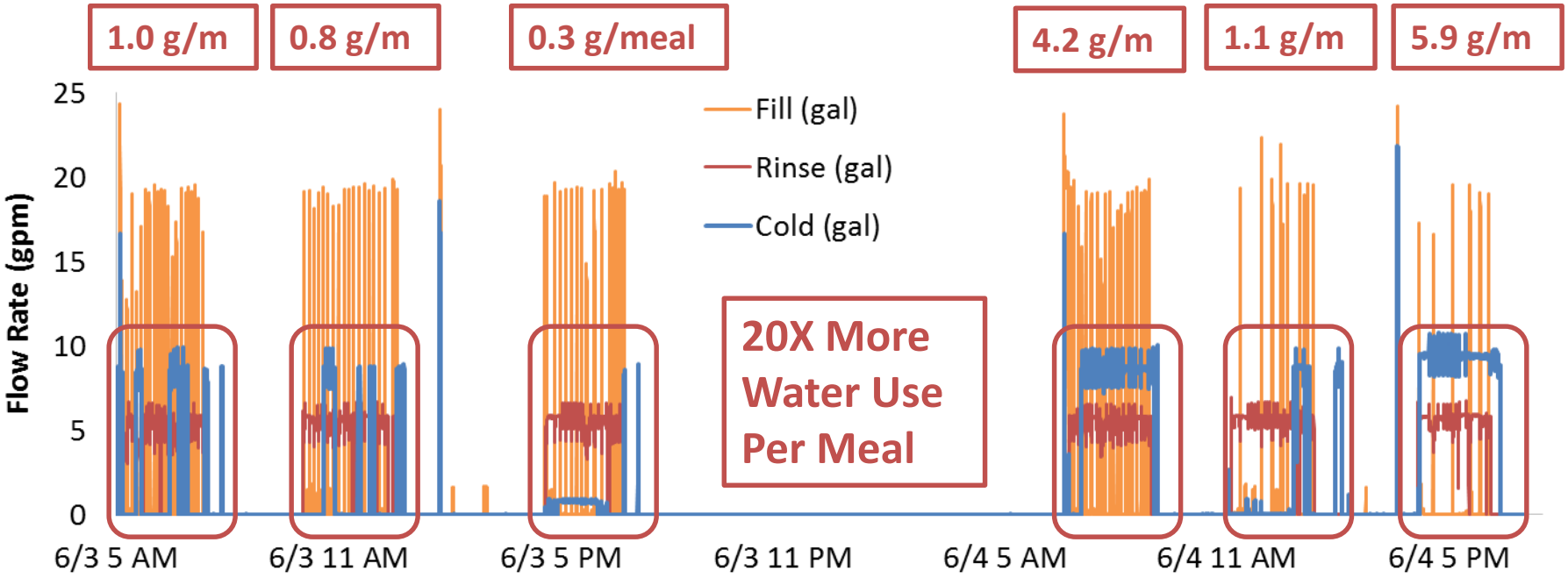
PreRinse Practices (Scrap Only)

PreRinse Practices (Scrap & Bucket)

PreRinse Practices (Cold Water Hose)

PreRinse Water Use Per Meal





Takeaways

- Tray Conveyance System Needs Replacement

- Uses pints of degreaser solution to create grip to advance trays

Takeaways

- Various pre-rinse practices that evolve around hand scrapping without water is excellent
- Using water with an open hose to wash away food debris is wasteful.
- The pre-rinse and bucket approach to wash away debris in the trough is much better as it is up to 20x less water
- Other options are available

- Dedicated pre-rinse sinks and removal of the trough could be a solution

Water Consumption Summary

	Dishwasher (gal/d)		Dishroom (gal/d)		Dishwasher vs Facility (%)	Dishroom vs Facility (%)
	Total	Hot		Total		
February	2704	2654	4484	7686	35	58
March	2520	2458	4460	6575	38	68
April	2787	2727	4333	7443	37	58

	DHW Supply (gal/d)	Steam Top-off (gal/d)	Boiler Room (gal/d)	Boiler Room vs. Facility (%)
May	3465	92	3557	49%

Dishwasher water use is 60% of the dishroom, and the dishroom is 60% of the entire facility's water use.

Daily Boiler Room Consumption

	Water Use (gal/d)	Electricity Use (kWh/d)	Gas Use (therms/d)	Idle Use
Domestic Hot Water System	3465	Not yet Collected	22.8	4.3
Steam System	92	11.9	38.2	15.1
Total	3557	>11.9	61.0	19.4

Idle energy accounts for 40% of the steam system's energy consumption and 20% of the DHW's consumption

Steam and DHW Idles on average operating days

	Steam	DHW
Idle Rate (therm/h)	0.77	0.23
Usage Time (hr)	4.5	5.2
Daily Energy Consumption (therm)	38.2	22.8
Idle Energy/day (therm)	15.1	4.3

Idle energy accounts for 40% of the steam system's energy consumption and 20% of the DHW's consumption

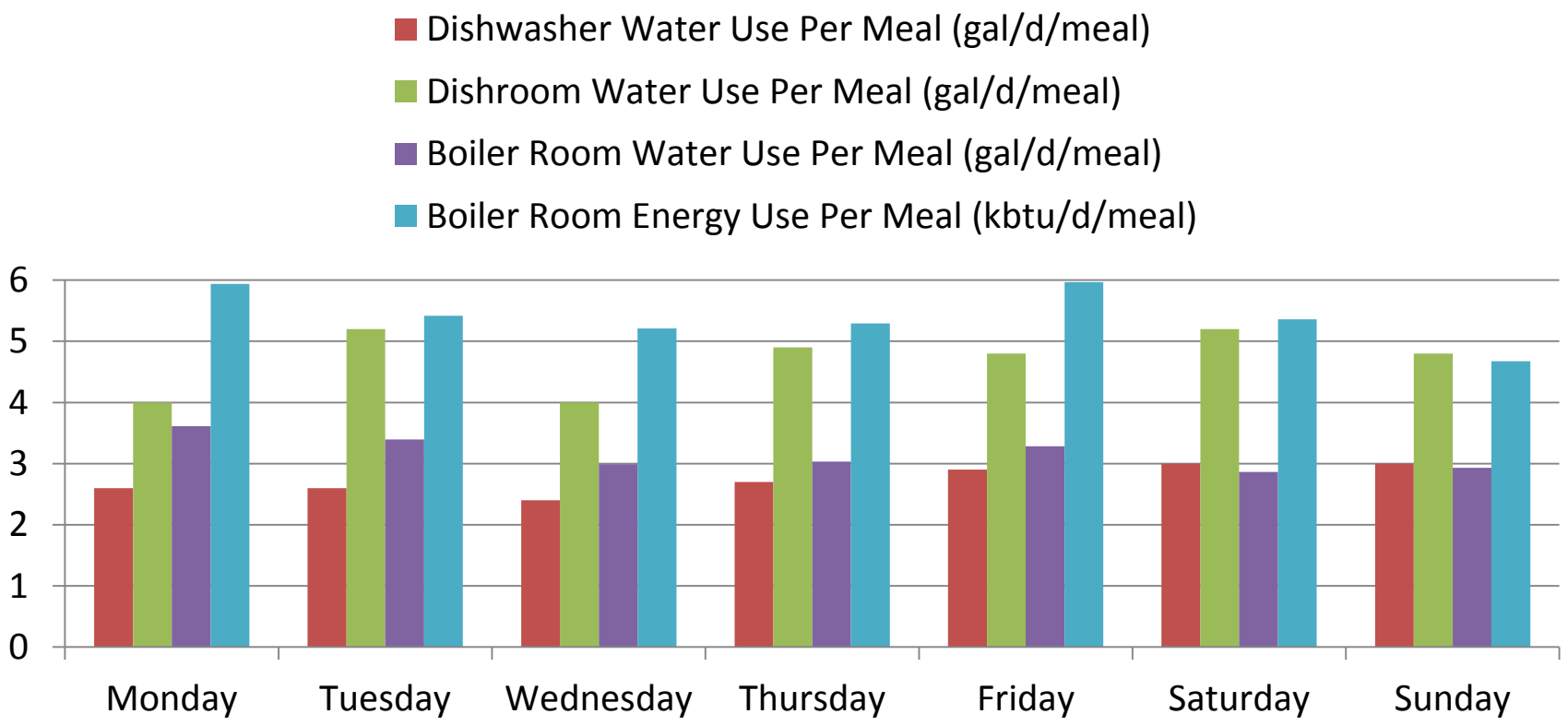
Consumption Per Meal

Average number of meals served per day = 989

	Average gal/d	Average gal/meal
Dishwasher	2670	2.7
Other Dishroom	4426	4.5
Total Dishroom	7235	7.3
Boiler Room	3557	3.6
Total Facility	10792	10.9

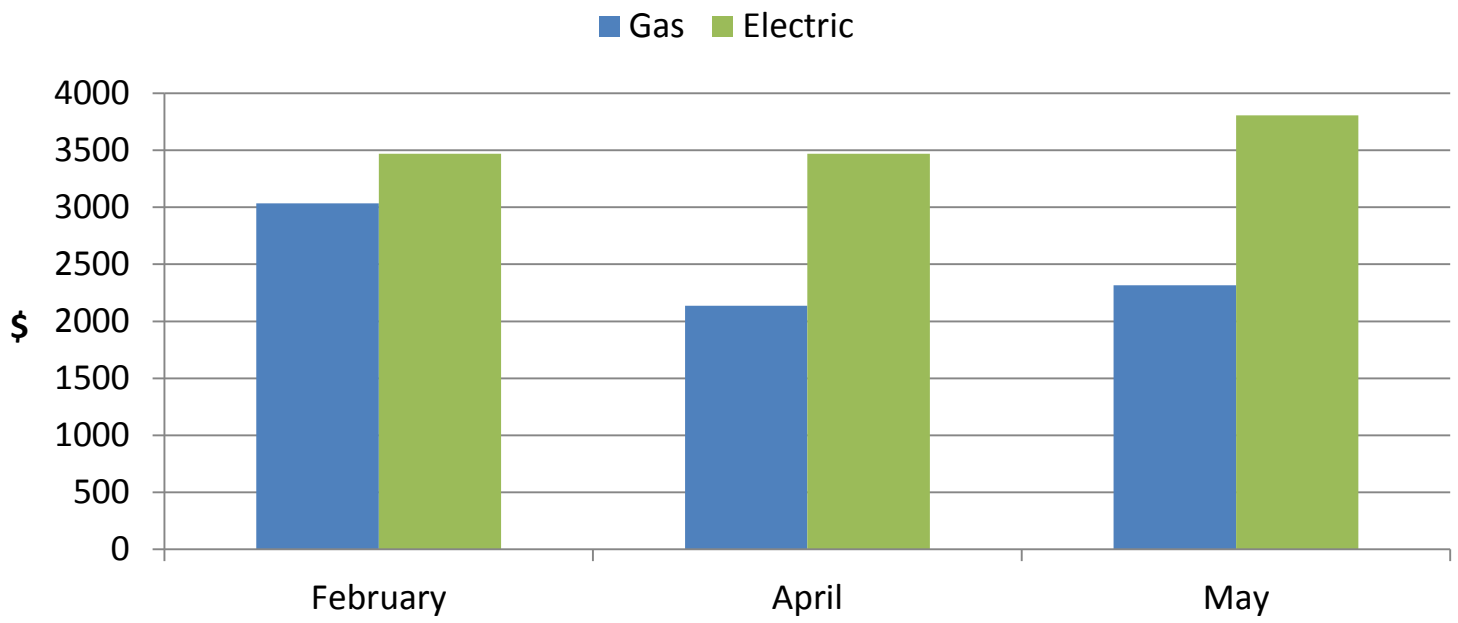
	Gas (kbtu/d)	Gas (kbtu/meal)
DHW	2280	2.3
Steam	3820	3.9

Normalizing to # Meals Served



	Mon	Tues	Wed	Thurs	Fri	Sat	Sun
Meals	1025	1060	1092	1006	907	876	954

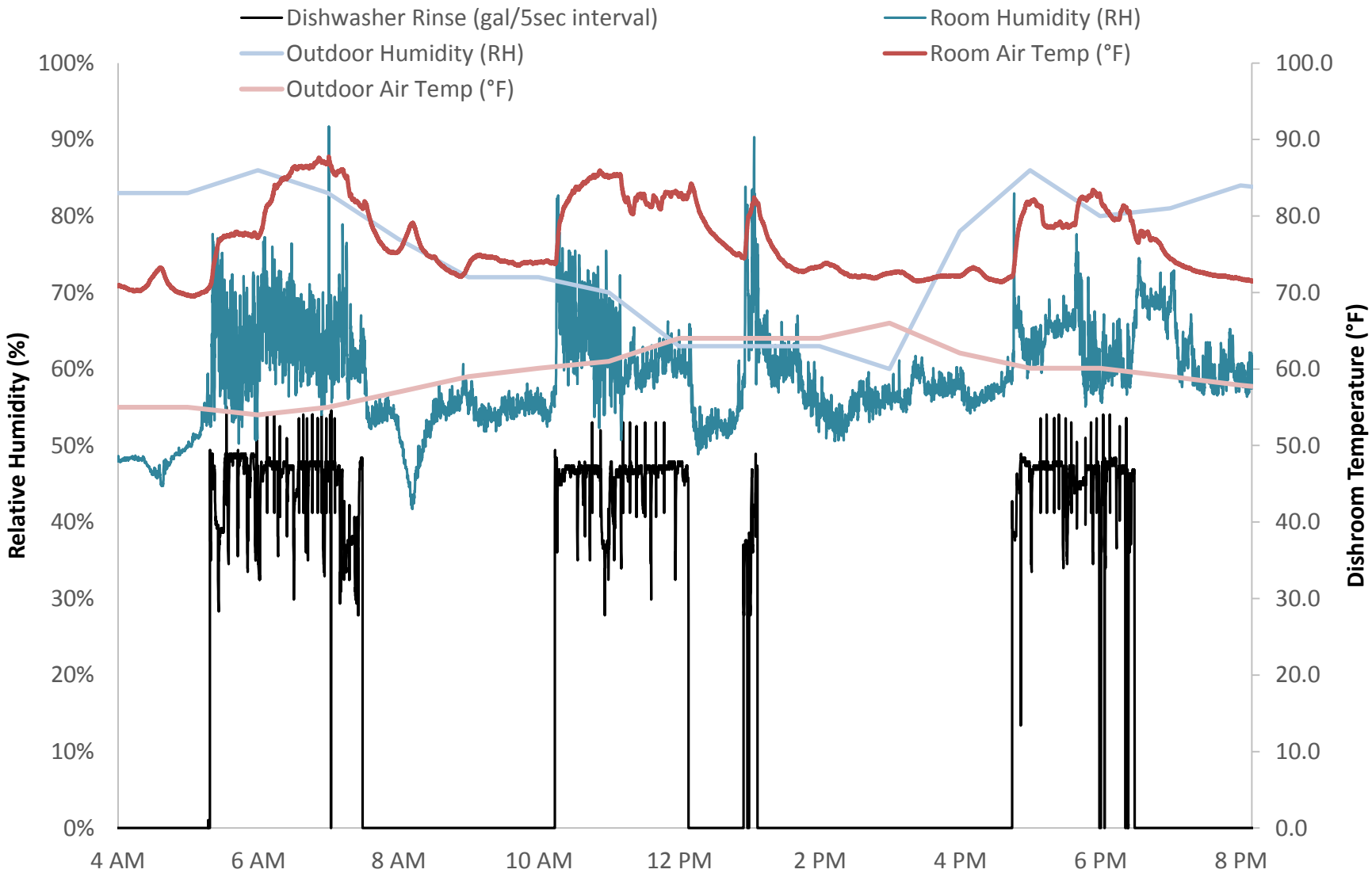
Facility Energy Bill Analysis



	Total Gas Intensity (%)	Total Electric Intensity (%)	Total Daily Energy Cost ($)
Boiler Room	61.6	1.4	48.0

Dishroom electricity use was 3.6% of the average facility electric consumption.
$0.61 spent on energy per meal served

Dishroom Comfort

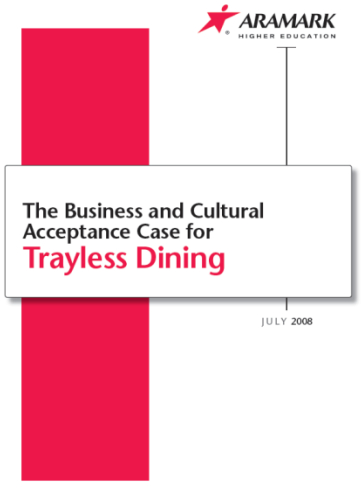


Dishroom Design: Existing

- Diner is currently sorting out recycled bottles and utensils
- The dishroom operator handles all the food waste and other debris in the trash

Shift to Trayless Dining Was Discussed

An ARAMARK study in 2008 0of 186,000 meals at 25 colleges and universities found a 25 percent to 30 percent reduction in food waste per person on trayless days.



2012 study, released by the *Journal of Hunger & Environmental Nutrition* documented a 32% reduction in food waste and a 27% reduction in dish use when trays were made unavailable at a university dining facility.

In 2009, 42% of colleges and universities begun curbing the use of trays in their dining halls. In 2013, 75% of the tracked schools have eliminated trays in some or all of their dining facilities.

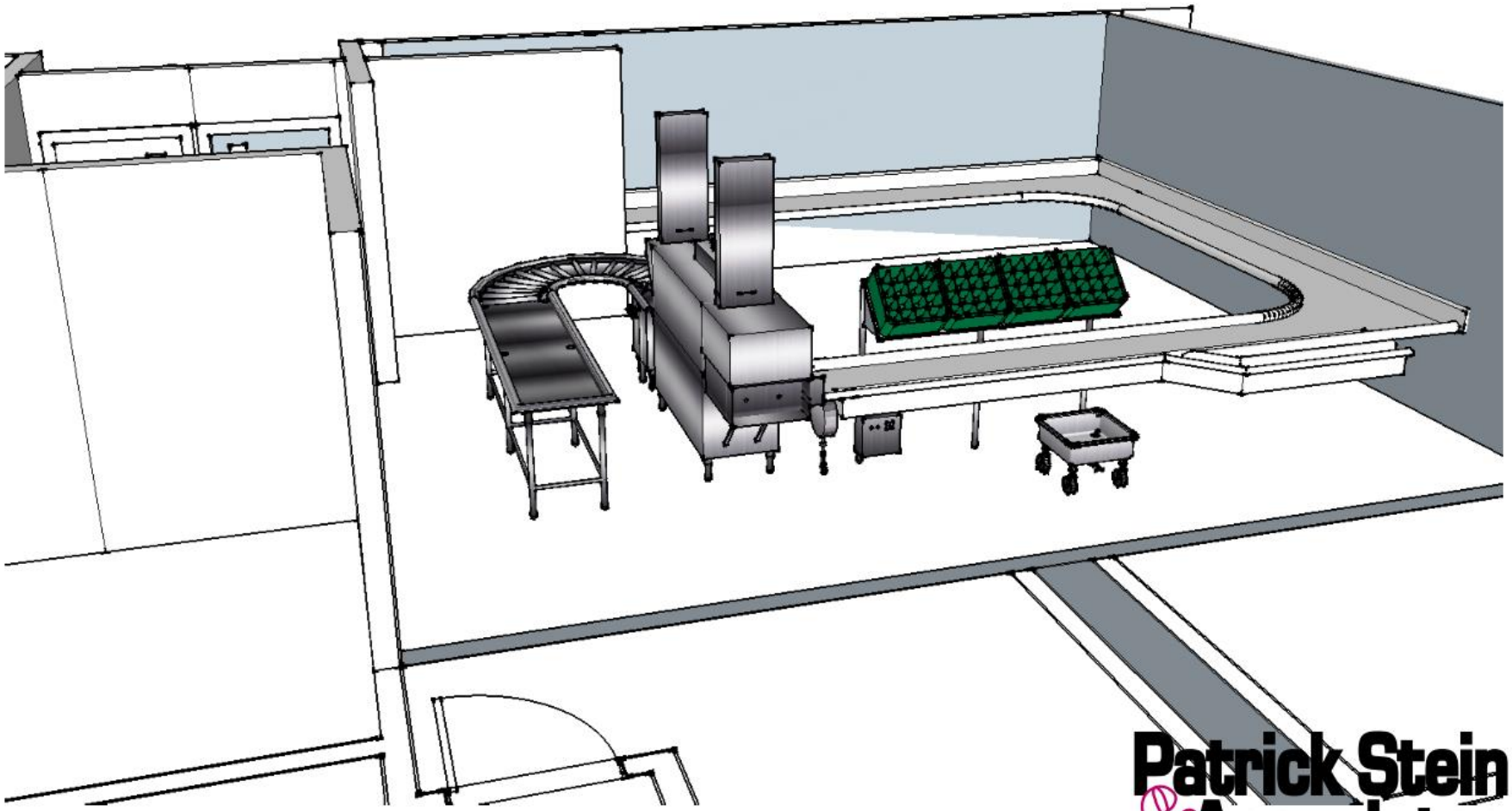
Trayless Dishroom Design

Existing cafeteria not set up for that, but some elements can be incorporated

Replacement Dishwasher
w/ Exhaust Heat Recovery (Hobart CL64eNER)

- Comparing onboard and external (Novothermic) drain water energy recovery devices
- Rinse flow rate of 2.2 gpm
- Gas tank heaters (156,000 Btu/h)
- Gas Booster Heater (Hubbell)

Dishroom Design



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Thank you for your Attention!

I will relay your questions to Eddie!

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