Environmental and Monetary Saving From Ozone in Hotel Laundry Operations

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Overview

- Objectives
- Hotel on-premise laundry operations
- Ozone 101
- Project methodology
- Project host & laundry facilities
- The ozone system
- Project results

Primary Objective

- Answer the question:
  - "Does the use of ozone in on-premise laundry (OPL) operations in the hospitality industry result in environmental benefits and cost savings to the facility?"

Secondary Objectives

- Showcase an innovative application of an available technology
- Develop technical potential for ozone in hotel OPL operations within PG&E's service territory
- Develop internal marketing communications collateral for PG&E's account managers to highlight the results

Hotel OPL Operations

- Typical equipment
  - Washer-extractors
    - Horizontal axis washing machines on steroids
  - Dryers
- Just like at home, the linens are sorted by type & color
  - Different laundry formulas for different linen types and colors

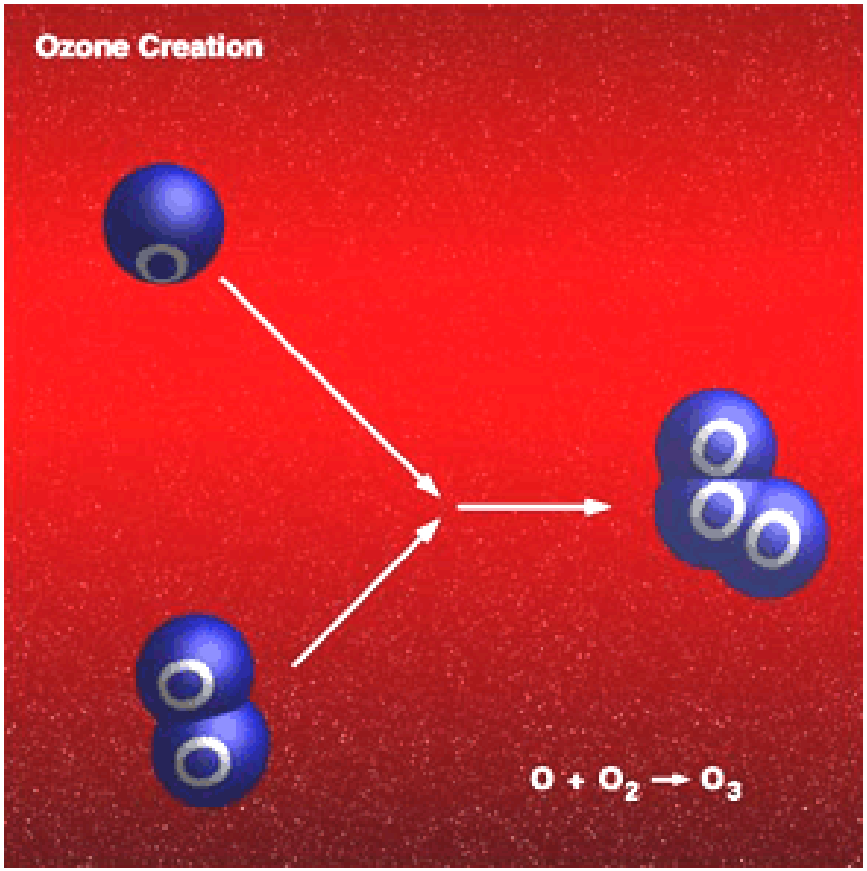
Hotel OPL Operations

- Example of a formula for sheets and towels

Step	**Cold Water** (gals)	**Hot Water** (gals)	**Run-time** (mins)
1) Detergent	0	47	8
2) Bleach	0	15	8
3) Rinse	11	33	4
4) Spin	–	–	2
5) Sour/Soft	22	22	4
6) Spin	–	–	4
Totals	33	117	30

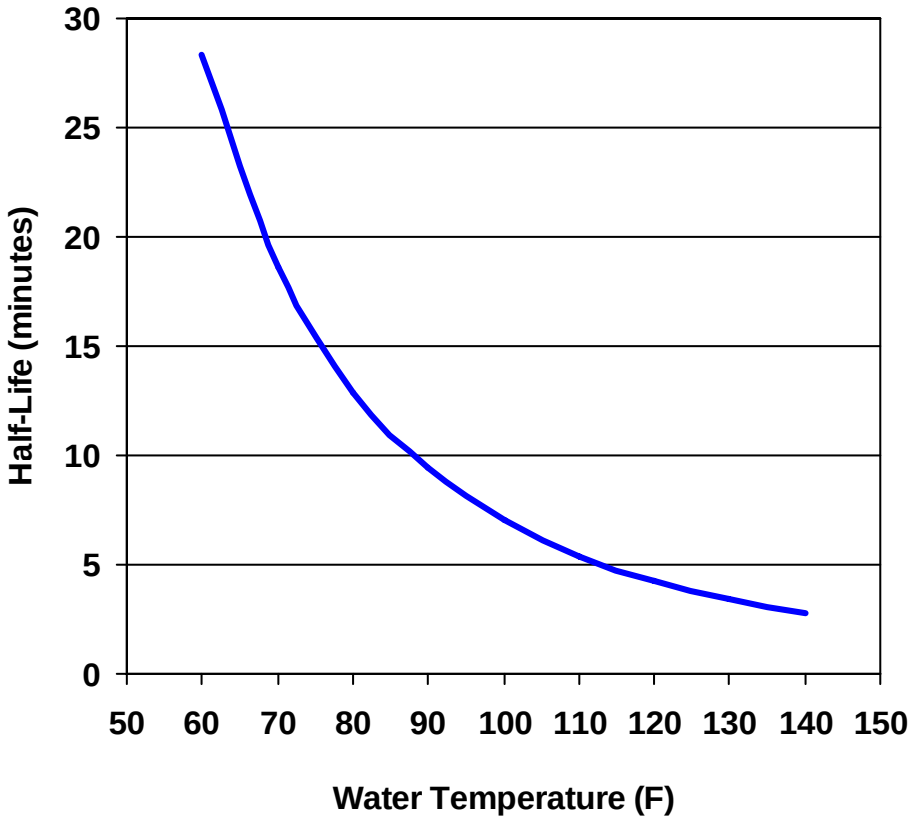
Ozone 101

- What is ozone?
  - Triatomic (O_3) form of oxygen
  - Formed by breakdown of diatomic oxygen and recombination of a percentage of the oxygen atoms



Ozone 101

- Characteristics
  - Ozone is unstable and has a short half-life
    - Heat is the enemy
  - Half-life in water is highly dependent upon water temperature
  - Higher water temperatures also limit ozone's solubility



Ozone 101

- How does ozone clean?
  - Powerful oxidant
  - Very effective biocide
    - More so than bromine or chlorine
  - Ozone removes electrons from soils
  - Soils then break into smaller molecules that are water-soluble

Ozone 101

- How is ozone produced?
  - Because of its short half-life, ozone is always produced on-site
    - UV-light breaks the bonds between diatomic oxygen
      - This is why ozone is found in the stratosphere
    - Corona discharge ruptures the stable oxygen molecule and forms two oxygen radicals
      - Most commonly used method due to higher production and better cost-effectiveness

The Benefits of Ozone in Laundry

- Quantifiable benefits
  - Reduced energy costs
  - Reduced water and sewer costs
  - Increased linen life
  - Reduced chemical and detergent costs
  - Reduced labor costs

The Benefits of Ozone in Laundry

- Qualitative benefits
  - Increased fabric softness and brightness
  - Improved fabric smell
  - Ability to mix white and colored fabrics
  - Improved linen availability

Getting the Ozone into the Washer

- Four most common techniques
  - **Recirculation injection** continuously circulates wash water between washer and ozone generator
  - **Charge systems** inject ozone directly into the water several times before filling the washer
  - **Diffusion** systems continuously inject ozone into the washer's sump
  - **Direct water injection** systems inject ozone directly into the water before it fills the washer

Project Methodology

1. Identify a hotel with OPL operations and strong name recognition interested in trying ozone
   - Strong name recognition would attract more attention to results
   - More likely to be able to duplicate results due to large number of similar facilities

Project Methodology

2. Monitor water and energy use in OPL operations for one month prior to ozone
3. Monitor water and energy use for one month after installation of ozone equipment
4. Establish water and energy savings resulting from the use of ozone
5. Complete report for internal distribution at PG&E

Identifying a Project Host

- Two months spent searching for appropriate facility
  - Many high-visibility hotels did not have OPL operations
  - Others wary of ozone use
    - Early attempts to use ozone were unsuccessful as ozone's characteristics not fully understood
    - Some chemical vendors (and sometimes just individual sales people) see ozone as competition

The Project Host

- 278-room Hilton Garden Inn – Emeryville
  - Full-service restaurant
  - 9,000+ square-feet of meeting rooms
  - Workout facility
  - Cocktail lounge
  - Pool

The Project Host

- Due to the hotel's amenities, linens used and laundered on-site include
  - Bed sheets
  - Blankets
  - Bedspreads
  - Room towels
  - Pool towels
  - Tablecloths
  - Table skirts
  - Cloth napkins
  - Kitchen towels and rags
  - Cleaning rags

HGI – Emeryville Laundry

- Laundry operations typically between 3 pm and 11 pm daily

HGI – Emeryville Laundry

- Three 95-lb washer-extractors

HGI – Emeryville Laundry

- Four 120-lb gas-fired dryers

Ozone System

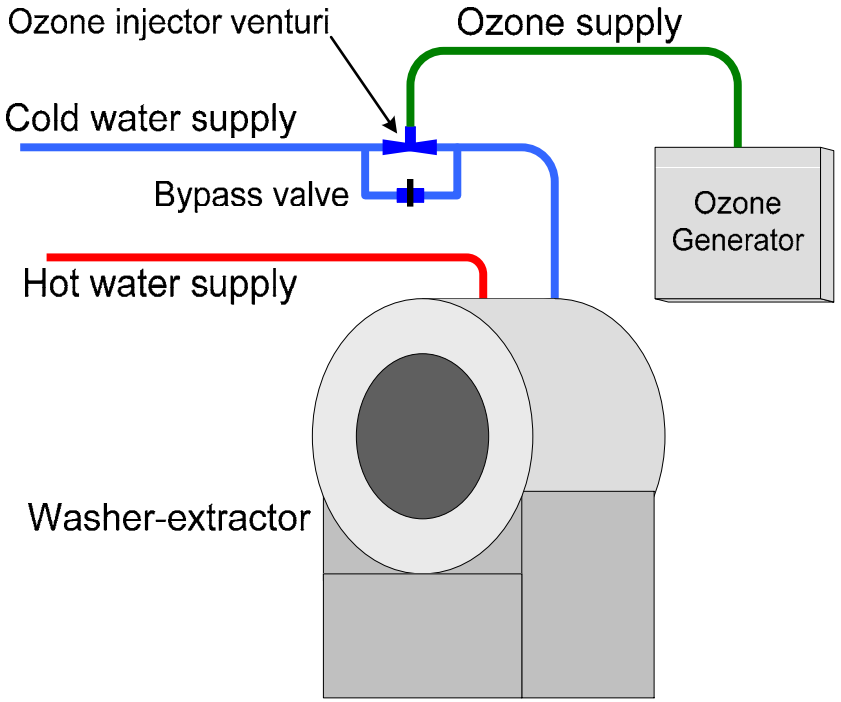
- Self-contained, wall-mounted ozone generator
- Manufactured by Nu-Tek International of Edgewater, FL
- Installed by Total Ozone Solutions of Bridge City, TX

Ozone System

- Generator switched on at beginning of operations / off at end
- User maintenance is weekly cleaning of two cooling fan lint filters

Ozone System

- Direct water injection system
- Ozone injected using venturi

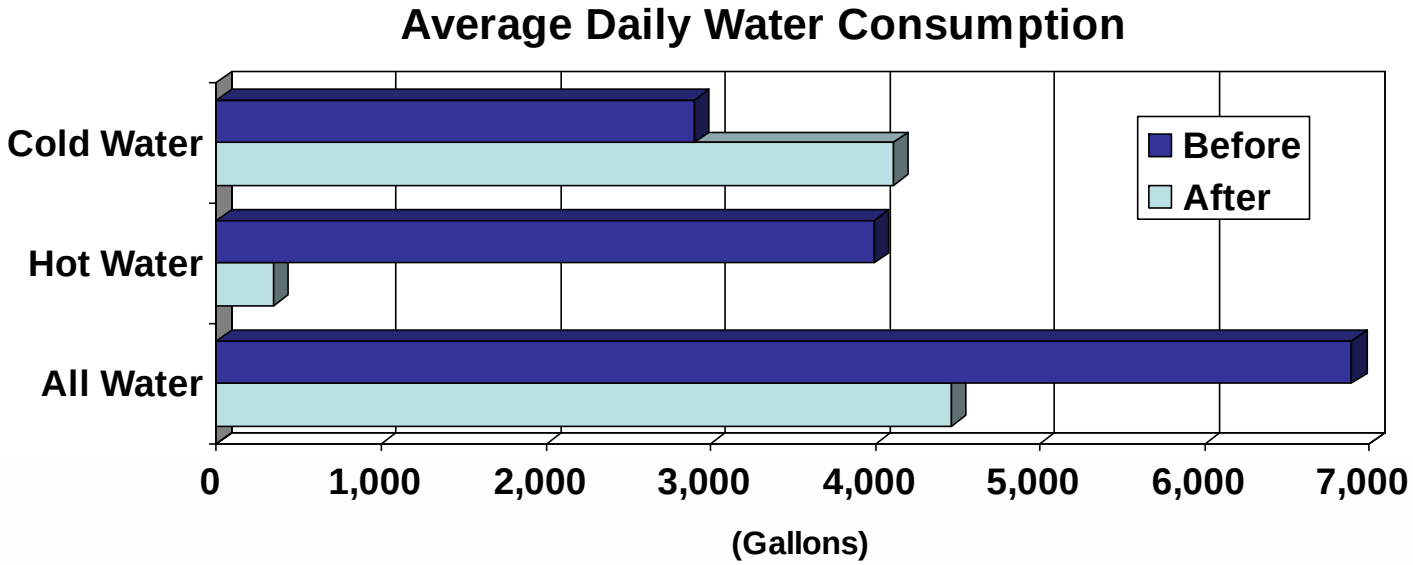


Changes in Operations

Step	Traditional Sheets & Towels Formula			Ozone Sheets & Towels Formula		
	Cold Water (gals)	Hot Water (gal)	Run-Time (mins)	Cold Water (gals)	Hot Water (gals)	Run-Time (mins)
1) Suds	0	47	8	47	0	10
2) Bleach	0	15	8			
3) Rinse	0	22	2	22	0	2
4) Rinse	11	11	2			
5) Spin	—	—	0.5	—	—	2
6) Rinse	22	22	2	44	0	2
7) Sour/Soft	15	0	4	22	0	4
8) Spin	—	—	4	—	—	5
Totals	**48 gallons**	**117 gallons**	**30.5 minutes**	**135 gallons**	**0 gallons**	**25 minutes**
	165 gallons			**135 gallons**		

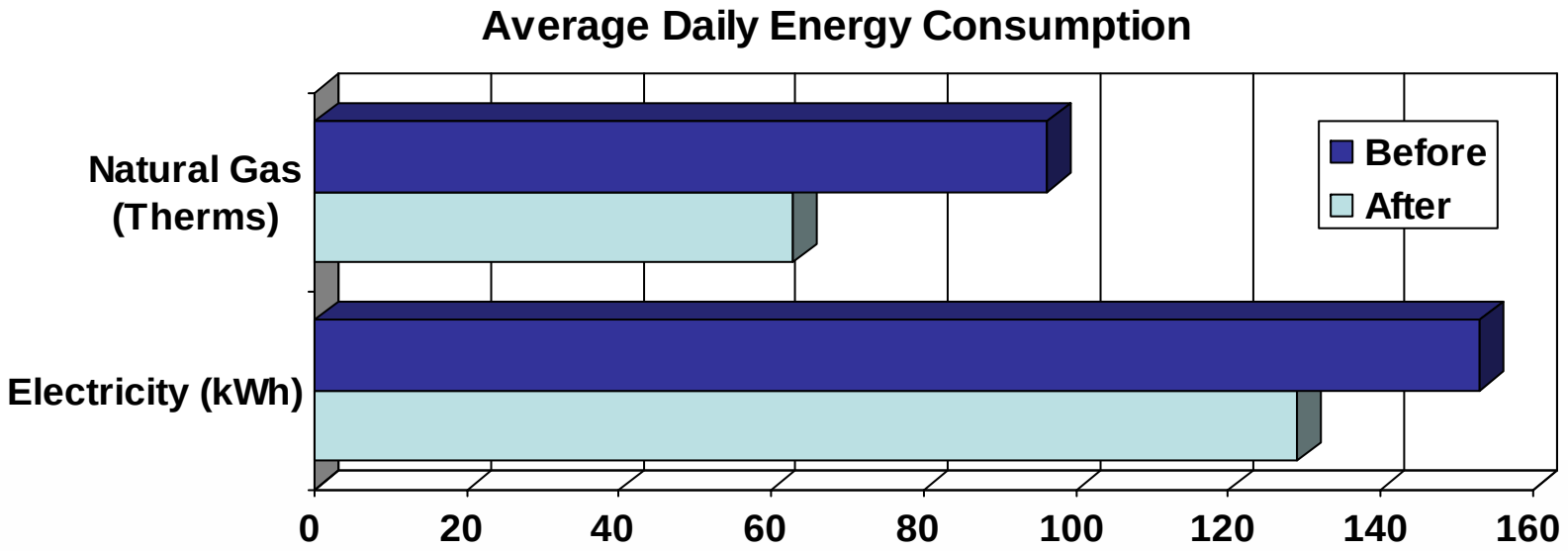
Project Results

- Water & sewer savings
  - Hot water consumption reduced 91%
  - All water consumption reduced 35%
  - Annualized water & sewer savings of $6,835



Project Results

- Energy savings
  - Annualized electricity consumption reduced 8,651 kWh
  - Annualized gas consumption reduced 12,331 therms
  - Annualized electricity & gas savings of $14,725



Project Results

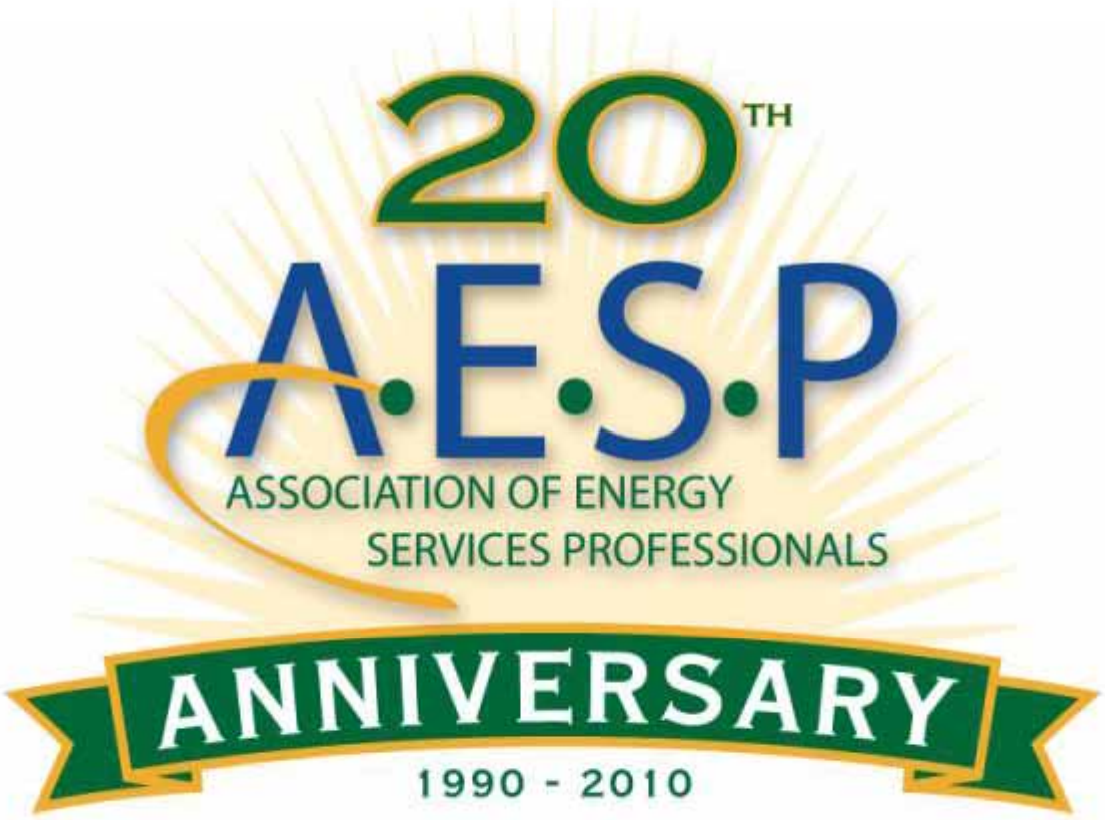
- Total estimated annual savings
  - $22,337
- Total installed cost for ozone system
  - $14,000
- Simple payback
  - 7.5 months - not including incentives
  - 83-day payback when incentives included
    - $7,086 from PG&E
    - $1,740 from water & sewer utility

Environmental Benefits

- Reduced greenhouse gas emissions due to reduced electricity and natural gas consumption
- Reduced water consumption and chemical loaded sewer outflows

Conclusion

- The question:
  - "Does the use of ozone in OPL operations in the hospitality industry result in environmental benefits and cost savings to the facility?"
  - Yes, it does
  - These results should apply to just about any facility operating OPL systems
    - Hospitals
    - Gymnasiums
    - Schools
    - Prisons



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