



TURA and the Dry Cleaning Sector

Case Studies

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What is Perc and Why is it a Problem?

Able to dissolve most organic materials, perchloroethylene (PCE or perc) is the most widely used dry cleaning solvent in Massachusetts and nationally.

A typical dry cleaning machine...



generates
hazardous waste

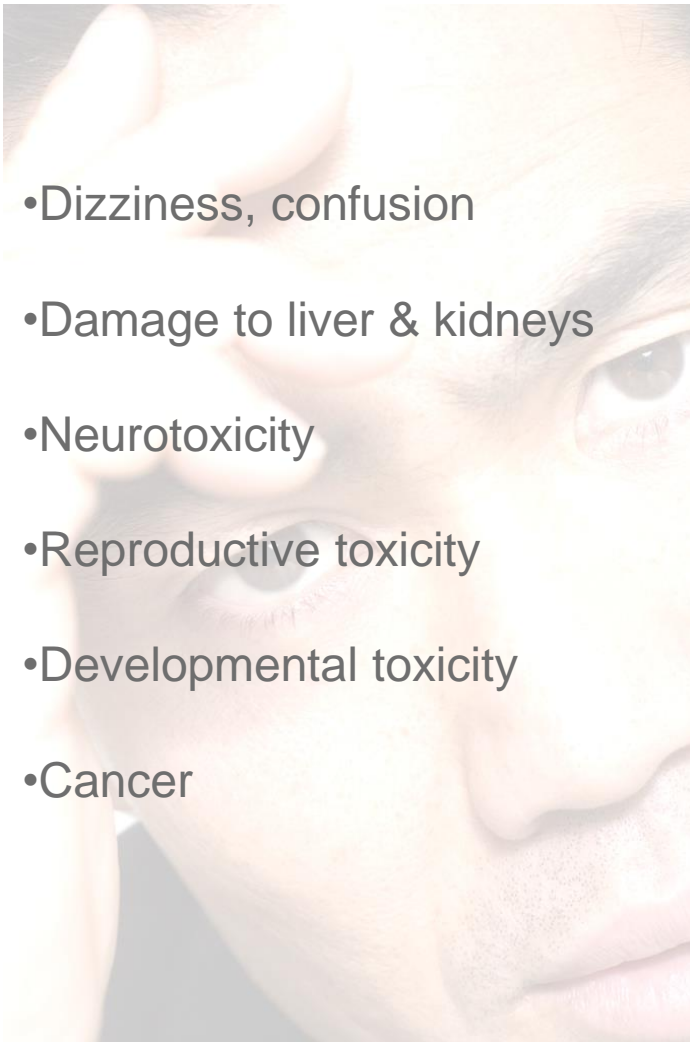


and has fugitive
emissions



Though perc machines have improved emissions over time, there is still exposure to workers and even co-located residences and clothes taken home.

Short and long term health effects linked to use of perc include:



- Dizziness, confusion
- Damage to liver & kidneys
- Neurotoxicity
- Reproductive toxicity
- Developmental toxicity
- Cancer



Misuse of perc can lead to soil and groundwater contamination.

75% of drycleaner sites in the US are contaminated.

Many are Superfund sites.

Cleaners Market Themselves as “Green,” “Organic,” “Natural,” “Environmentally Friendly”

But what does this mean?



Alternatives include:

- Hydrocarbons
- Siloxane (ex: GreenEarth)
- Glycol Ethers (ex: Solvair)

These all have their own
environmental and health issues

TURI Alternatives Assessment - 2012

Key Assessment Criteria	Perc (reference)	Wet Cleaning ¹	Carbon Dioxide	High Flashpoint Hydrocarbons	Acetal	Propylene Glycol Ethers	Siloxane	n Propyl Bromide
Common Trade Names / Manufacturers of Equipment or Solvents		Wascomat, Miele, Continental, HwaSung, AquaSolo	Cool Clean Technologies, Solvair [®]	DF2000 [™] Fluid, EcoSolv [®] , ShellSol D60, Caled Hydroclene	Solvon K4	Solvair [®] , Rynex 3 [®] , Impress [®] , Gen-X [®]	Green Earth [®] D5 solvent	Drysol [®] , Fabrisolv [™] XL
Solvent Chemical Identification [CAS#]	Perchloroethylene [127-18-4]	Solvent: Water Detergents: See full report ¹	Carbon Dioxide [124-38-9]	Naphtha (petroleum) hydrotreated heavy [64742-48-9]; C10-C13 Isoalkanes [68551-17-7]	1-(butoxy methoxy) butane (butylal) [2568-90-3]	dipropylene glycol tert-butyl ether, [132739- 31-2]; di- propylene glycol n-butyl ether, [29911-28-2]	Decamethylcyclo- penta siloxane (D5) [541-02-6]	N Propyl Bromide (nPB) [106-94-5]

Wet Cleaning and CO2 are considered the most environmentally friendly options. Wet Cleaning technology is the more affordable of the two.

Washer and dryer use biodegradable detergents, and conditioners



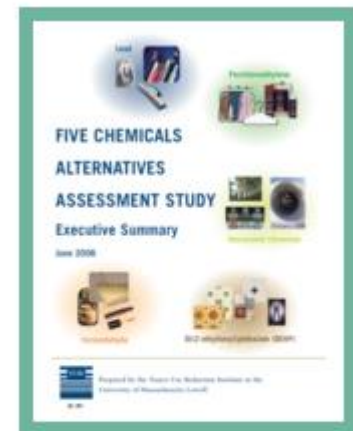
Finishing equipment re-shapes and dries the slightly damp clothes



Short History:

TURI's work with the dry cleaning sector

- TURI gave 1st grant in 1995 to Utopia Cleaners in Arlington to convert to dedicated wet cleaning
 - It didn't last! The technology was not yet sophisticated enough
- 5 chemicals study in 2006 included perc in dry cleaning at the request of the state legislature



Chapter five reports the availability of technically and economically feasible safer alternatives to Perc.

Short History:

TURI's work with the dry cleaning sector

- In 2009, the TURA Program designated Perc to be a "Higher Hazard Substance" and requires users to report use of over 1000 pounds per year
 - This brought about a dozen cleaners into the program. (About 20 originally covered, but some reduced perc below threshold)
 - These facilities had to report for the first time in 2010, and complete plans in 2012

Short History:

TURI's work with the dry cleaning sector

- From 2008 through 2013 TURI has given 8 grants to dry cleaners to eliminate the use of perc and switch to dedicated professional wet cleaning
 - Cleaners save money on solvent, waste, water, and electricity
 - Cleaners are fully satisfied with the process and product

Short History:

TURI's work with the dry cleaning sector

- In 2012, TURI published an updated report on Alternatives to Perc Used in Professional Garment Cleaning
 - The report has an executive summary with an easy to use color coded, fold out table
- In 2013, MassDEP issued an updated ERP Certification Form and Workbook

MA Case Study: Silver Hanger Cleaners

- In 2008, TURI provided a grant to Silver Hanger Cleaners in Bellingham, Massachusetts to convert their operations from Perchloroethylene-based to professional wet cleaning.
- Two years of data were collected from the facility, reflecting one year of solvent use and one year of dedicated professional wet cleaning.

Data Collection

- Capital costs
- Performance data
 - send-outs, re-dos, and claims
- Operational costs
 - machine maintenance, filters, solvent, detergent, spotting agents, hazardous waste disposal, regulatory fees, labor time
- Resource use
 - electricity (for equipment and facility), natural gas for the boiler, water, and sewage

Capital Costs

New perc machine:
\$44,000

Assuming a 15-year life for the equipment, and a cost of capital of five percent, the annualized cost of using a PCE machine is \$3,054

New Wet Cleaning
Equipment: \$48,443

Assuming a 20-year life for the equipment, and a cost of capital of five percent, the annualized cost of using wet cleaning equipment is \$2,553

Performance Data

<i>Attribute</i>	<i>PCE</i>	<i>Wet Cleaning</i>	<i>Qualitative Analysis</i>
<i>Send-outs</i>	5 items/month	Initial: 15-40 items/month After experienced: 5 items/month	Learning curve applies; eventually no difference
<i>Re-dos</i>	0	Initial: 3 items/month After experienced: <3 items/month	Staff learning curve effects rate of re-dos; eventually slight increase
<i>Claims</i>	\$1226	Initial: \$1125 After experienced: \$0	Saved >\$100/year initially; saved >\$1000/year with experience

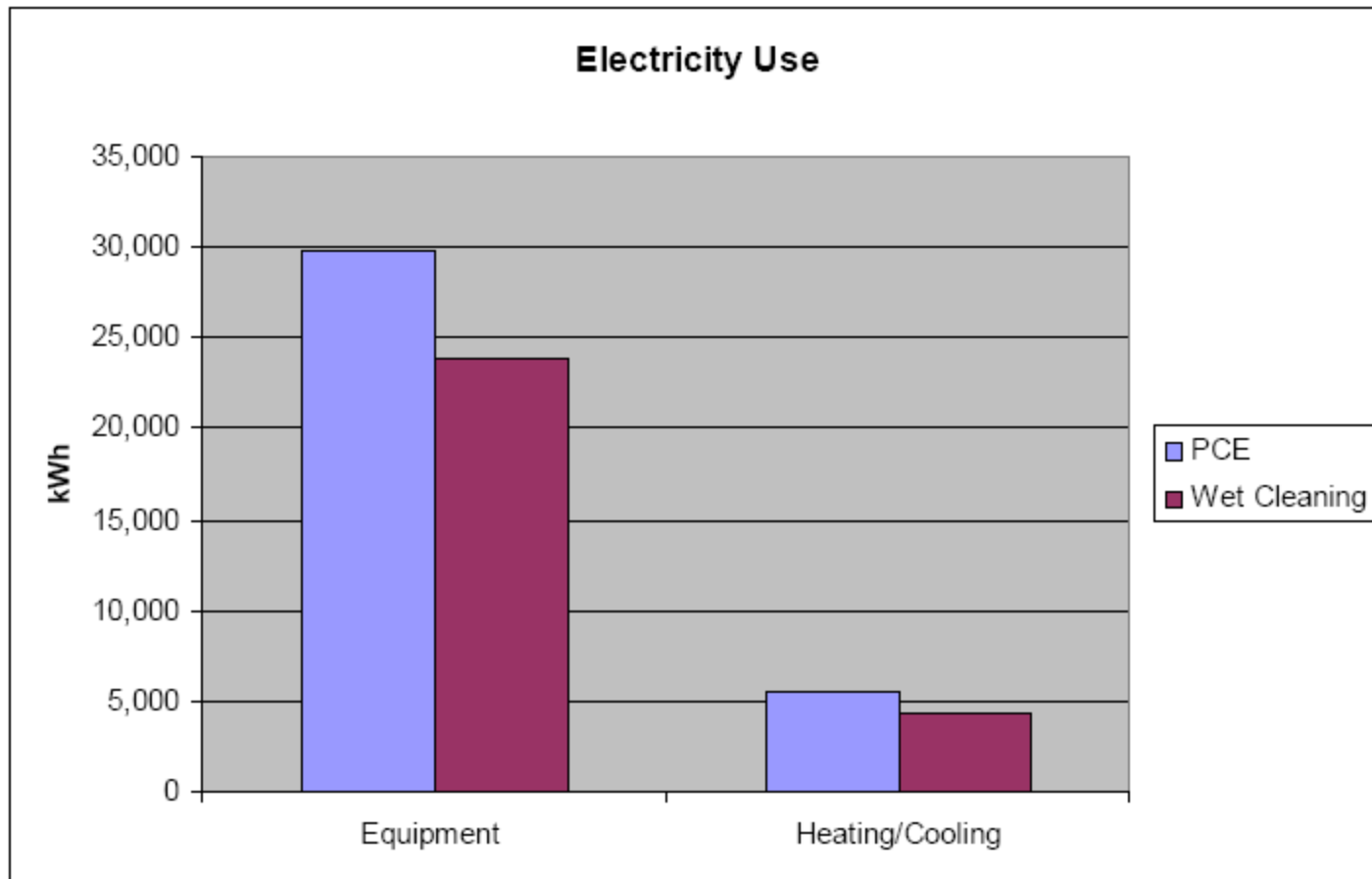
Operational Costs

Item	Costs/month <i>(areas where costs are higher with wet cleaning)</i>	Savings/month <i>(areas where costs are lower with wet cleaning)</i>	Costs/Savings per year
Maintenance	--	\$227	-\$2,721
Filters	--	\$26	-\$316
Solvent	--	\$130	-\$1,560
Detergent	\$631	--	+\$7,572
Spotting Agents	\$41	--	+\$492
Hazardous Waste Disposal	--	\$179	-\$2,148
Regulatory fees	--	\$21	-\$250
Totals	\$672	\$583	
Total Costs		+\$89	+\$1,069

Electricity Use

	2008 PCE Data	2009 Wet Cleaning Data	Decrease in Use from PCE to Wet Cleaning	Savings in Dollars at rate of 16.961¢/kWh
Total Electricity Use for Equipment (kWh)	29,736	23,892	5,844	\$991
Monthly Average Electricity Use for Equipment (kWh)	2,480	1,990	490	\$83
Total Electricity Use for Heating/Cooling (kWh)	5,489	4,377	1,112	\$189
Monthly Average Electricity Use for Heating/Cooling (kWh)	460	365	95	\$16

Electricity Use Comparison

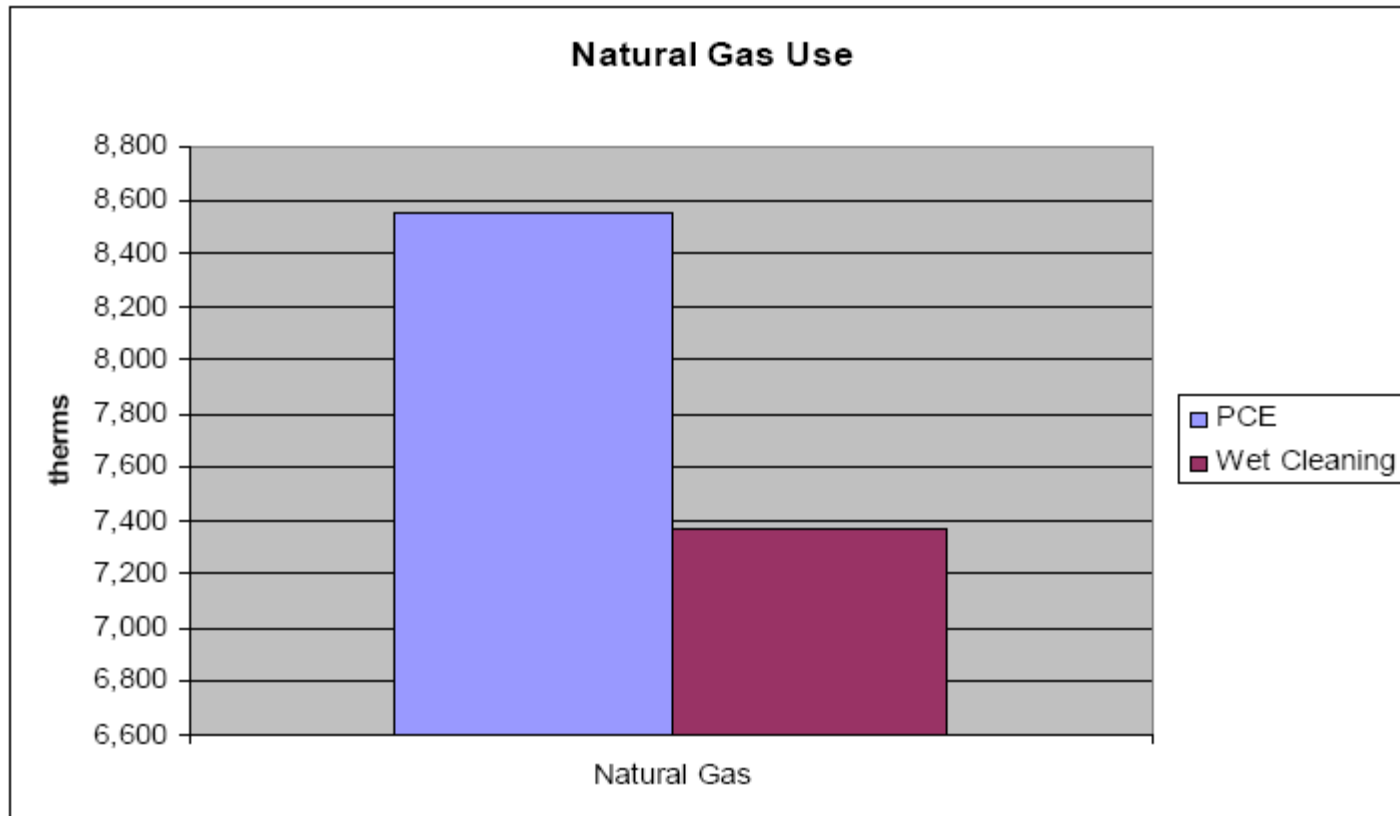


Natural Gas Use

	2008 PCE Data	2009 Wet Cleaning Data	Decrease in Use <i>from PCE to Wet Cleaning</i>	Savings* <i>in Dollars</i>
Total Natural Gas Use for Boiler (therms)	8,547	7,367	1,180	\$1,090
Monthly Average Natural Gas Use for Boiler (therms)	712	614	98	\$90

*reflects average rates over the two years.

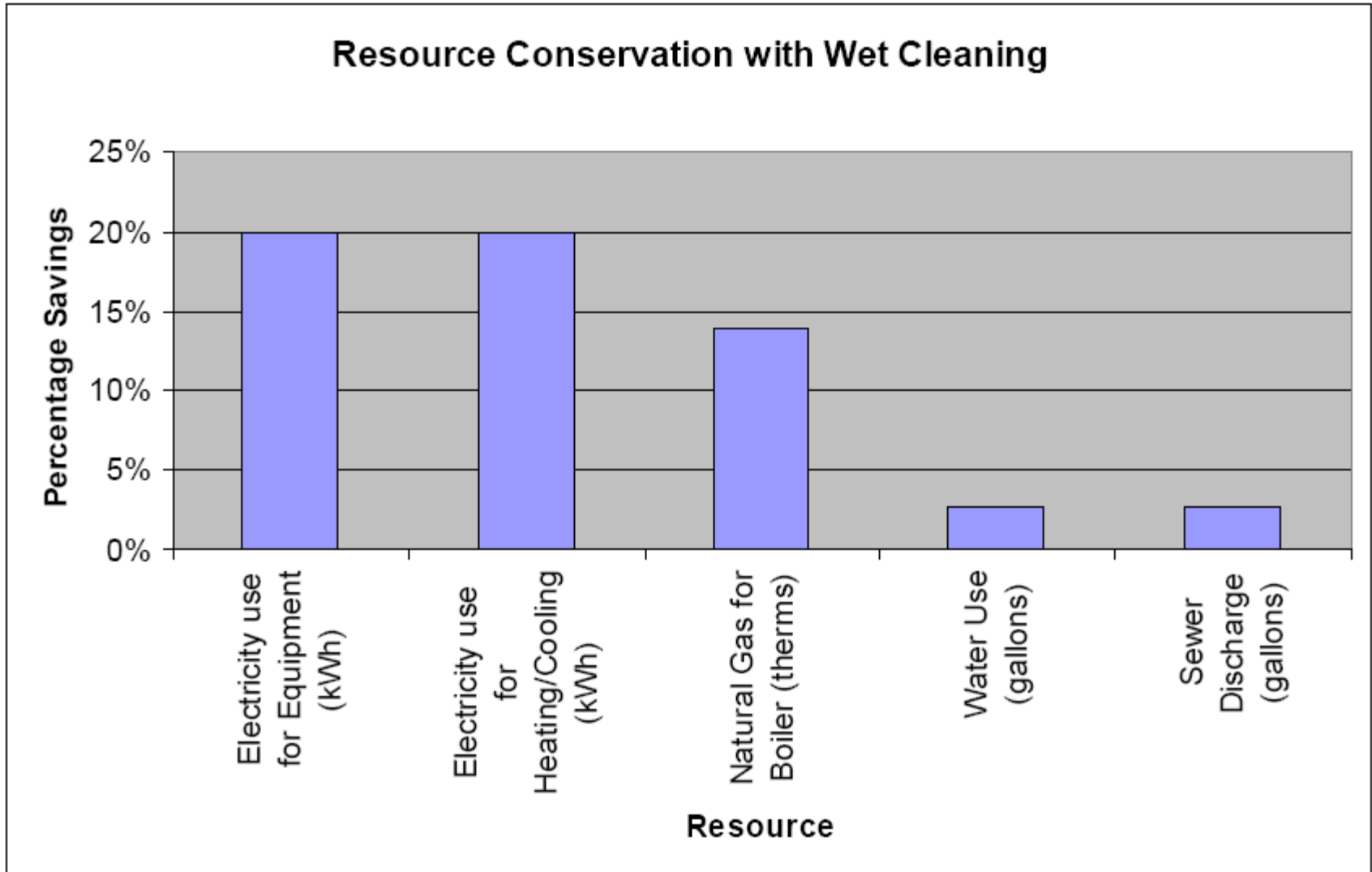
Natural Gas Use Comparison



Water Usage

	2008 PCE Data	2009 Wet Cleaning Data	Decrease in Use <i>from PCE to Wet Cleaning</i>	Savings <i>in Dollars</i>
Total Water Usage (gallons)	223,000	217,000	6,000	\$20
Monthly Average Water Usage (gallons)	18,583	18,083	500	\$1.63

Resource Savings



Summary of Costs/Savings: Resource Use

Item	Increased Use/month <i>(areas where use is higher with wet cleaning)</i>	Reduced Use/month <i>(areas where use is lower with wet cleaning)</i>	Cost/Savings per month <i>(in dollars)</i>	Cost/Savings per year <i>(in dollars)</i>
Electricity use for Equipment (kWh)	--	490 or 20%	-\$83	-\$991
Electricity use for Heating/Cooling (kWh)	--	95 or 20%	-\$16	-\$189
Natural Gas for Boiler (therms)	--	98 or 14%	-\$90*	-\$1,090*
Water Use (gallons)	--	500 or 2.7%	-\$1.63	-\$20
Sewer Discharge (gallons)	--	500 or 2.7%	-\$2.30*	-\$28*
Total Savings			-\$193*	-\$2,318*

*reflects average rates over the two years.

Total Wet Cleaning Savings

Item	Annual Costs	Annual Savings
Equipment		\$500
Performance (Claims)		\$1,000
Operations	\$1,069	
Resource Use		
• Electricity		\$1,180
• Natural Gas		\$1,090
• Water		\$20
• Sewer		\$28
Total Cost/Savings in 12 months	\$1,069	\$3,818
Total Savings	\$2,749/year	

Return on Investment

- \$2,749 in savings over the 12 months of the study.
- The facility spent approximately \$12,000 (in actual costs, but not factoring in discounts and grant monies received) more than it would have to simply replace their solvent machine.
- This equates to a return on investment realized in just under 4.5 years.

Additional Benefits of Wet Cleaning

- Time Savings:
 - The Bellingham cleaner has stated that the process, in fact, does not take any longer once the wet cleaning system is learned. In fact, less time is spent on pre- and post-spotting. Just a few months in to using the new technology, his finisher was completing his work earlier each day than when they were using PCE.
- Significantly improved air quality in the facility.
- Customers are happy with the conversion to wet cleaning – as more and more consumers are looking for environmentally friendly services.

Comment from the Cleaner...

- *“I was anxious to get rid of the perc machine because of the health and waste issues but I wanted to replace it with something that I wouldn’t find out later caused other problems. Wet cleaning was the logical solution for me and I couldn’t be happier with the results. It works much better than I imagined, my workers are grateful, and my customers are happy.”*

– Mark Isabelle, Owner, Silver Hanger Cleaner, Bellingham, MA

Hear From the Bellingham Cleaner About His Wet Cleaning Experience

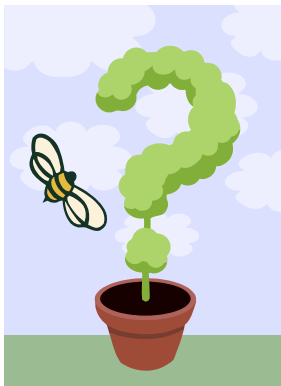
(Video Clip)

https://www.youtube.com/watch?v=X5PiG9jAiMg&feature=player_embedded

Mark Isabelle
Silver Hanger Cleaners, Inc.
Bellingham, Mass

Additional Data

- We are now working on converting the 9th cleaner in MA in JP
- From the next several conversions:
 - Water use dropped over 50% at two cleaners
 - Electricity use dropped over 30% at two cleaners
 - Natural gas use dropped up to 14% at three cleaners
 - Operational costs dropped \$76 to \$662 across four cleaners



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Wet Cleaning Testimonials

- “We knew that perc was not good for us. I was concerned for the health of my pregnant wife and baby and also for my employees. You know perc is in the air especially when you see the dust build up and smell the air when you first come in the shop. I always had a bad feeling about it.”
- “We made the switch to wet cleaning and are very happy with the results. There has been a huge improvement in the way the air smells and the clothes come out cleaner without any shrinkage or the feel of chemicals.”
 - Joon Han, Owner AB Cleaners, Westwood

Wet Cleaning Testimonials

- “Now when I get to work, everything smells clean and fresh. Not only does the technology do a great job of cleaning the clothes, it is better for the health of my customers and workers.”
 - Mr. Kim, Owner, Ace Cleaners, N. Andover
- In the first year as a wet cleaner, Ace Cleaners saved \$1,844 and reduced electricity use by 15%

Wet Cleaning Testimonials

- “I'm convinced that wet cleaning is the future for the dry cleaning business.”
 - Mark Isabelle, Owner, Silver Hanger Cleaners, Bellingham
- The analysis of the data, including capital costs, performance metrics, operational costs, and resource use and associated costs showed a savings of \$2,749 per year.

Wet Cleaning Testimonials

- “I operated two perc facilities in the past, and wet cleaning technology is much safer for me and my staff, my customers and the community.”
 - Tom Nguyen, Owner, Best Neighborhood Cleaners, Medford
- ["Medford Business Recognized for Going Green"](#) article in InsideMedford.com