

Agenda



- 12:45pm Check in
- 1:00pm Introductory remarks & roundtable introductions
- 1:30pm Professional wet cleaning overview, Kate Winnebeck, NYSP2I
- 2:15pm Alternative dry cleaning technologies, NYDEC
- 2:45pm break
- 3:00pm NYS Professional wet cleaning program: What we learned from wet cleaning conversions, demos, and customer survey, Kate Winnebeck, NYSP2I
- 3:30pm Facilitated discussion: How do we encourage movement to wet cleaning? led by John Vana, NYSDEC
- 4:30pm Close



Professional Wet Cleaning Overview

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May 3, 2016 | NYSDEC Region 2

NYS Pollution Prevention Institute



- Established in 2008 **NYSP2I**
- HQ at RIT
- **\$4M** in annual NYS funding
- Focus on reduction of natural resource consumption (water, raw material, energy) and elimination of waste and toxics
- P2 research, technical assistance, education and outreach
- **15+** full-time staff

R·I·T

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UNIVERSITY
defy convention



Department of
Environmental
Conservation

UB University at Buffalo
The State University of New York



Rensselaer

10 NYS RTDCs

Professional Wet Cleaning Program



NYSP2I is addressing the use of toxic perchloroethylene (perc) in garment cleaning by promoting environmentally preferable alternatives through information dissemination, assisting cleaners in the conversion to professional wet cleaning (PWC), and holding demonstrations at established wet cleaners.

Background:

Perc is classified by IARC as Group 2A: Probably carcinogenic to humans and is also a suspected developmental, gastrointestinal, kidney, reproductive, respiratory, and skin or sense organ toxicant.

Professional wet cleaning has minimal negative environmental and human health effects, lowest installed system cost, the smallest electricity usage per load, and the lowest operating cost over the first five years of ownership

According to NYSP2I's database compiled from National Emissions Standards for Hazardous Air Pollutants (NESHAP) reporting data and the New York State Department of Environmental Conservation operating permit records, as of April 2016, there are

- 2,597 cleaners in New York State (71%, 1781 in NYC & Long Island)
- 1,251 use perc (83%, 998 in NYC & LI)
- 1,246 use an alternative to perc (63%, 783 in NYC&LI)
- 31 use PWC (includes 100% dedicated and mixed use shops) (84%, 26 in NYC & LI)

Professional wet cleaning (PWC) uses water, detergents, and sophisticated computer controlled washers and dryers to clean garments and other fabrics labeled “dry clean only.”

Wet is the new dry

did you know there's a **BETTER** alternative to dry cleaning?

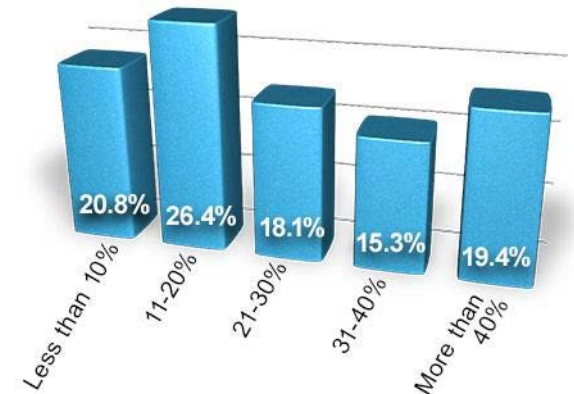


PWC Gaining Traction



- 6% of respondents only do PWC, while 16.9% listed “other” items they primarily wet clean, such as polyester suits, down comforters and “items with heavy water-soluble stains.”
- Most cleaners use PWC in mixed shops
 - “We tend to only dry clean [silk and wool] as we have a drycleaning machine, and they require less work this way”
 - “Wool and the mix textiles [are difficult to process because] the texture or feel of fabrics change. Wear and tear are accelerated since water is [harsher] on fabrics.”
 - “Wet cleaning has reduced our costs as we purchase less solvent, less filters and all other costs associated with dry cleaning”
 - “Wet cleaning has been a great addition to our cleaning arsenal”
 - “I do not believe that wet cleaning is the best method for all garments. Some fabrics and fibers need to be dry cleaned.”
 - “Although wet cleaning has its benefits, [it] cannot be the only method a cleaner can rely on. Certain fabrics [like] wool and silk just benefit from dry cleaning.”

Wet cleaning has gone from being a drycleaning alternative to a plant staple for processing garments. How much of your volume do you process using professional wetcleaning techniques today?



On what kind(s) of items is wet cleaning your first choice of process? (Check all that apply)



<https://americandrycleaner.com/articles/survey-majority-dry-cleaners-immersed-wet-cleaning-process>

Dry Cleaning Process



- Garments usually follow the process outlined below, but may skip the pretreat stage depending on soil level

Dry cleaners are starting to remove solvents from their methods. Below is a typical dry cleaning process



GUARDIAN GRAPHICS

Wet Cleaning Process

- Garments usually follow a standard process but may skip the pretreatment step

Wet Cleaning

The washer and dryer are two separate machines. **No solvent is used** in the cleaning process. Biodegradable detergents, sizers, and conditioners are used. Equipment has sophisticated temperature and agitation controls.

Dry cleaners are starting to remove solvents from their machines



GUARDIAN GRAPHICS

Spotting Board



Dry Cleaning Machines



Wet Cleaning Machines



Form Fitter



Pant Tensioner



Wet Cleaning Washer & Detergents



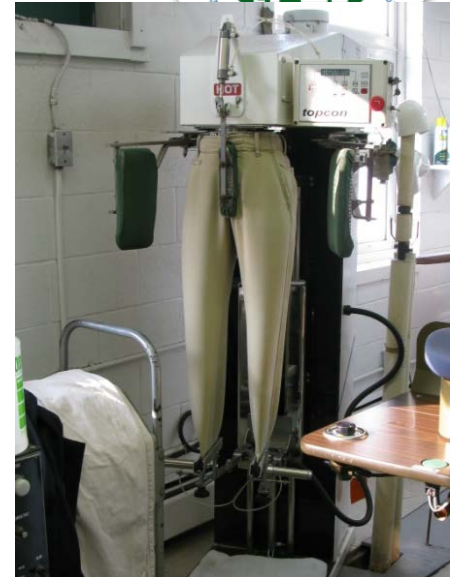
- Washer
 - Frequency-controlled motor: internal computer with wash program software to achieve the optimal water level, cycle time, degree of agitation, temperature, and cleaning agents for each load
 - External detergent injection system to provide a precise amount and combination of cleaning agents & sizers
 - Rotation of the cleaning drum is controlled for an ultra-gentle wash
- Detergents
 - Non-toxic, pH-neutral, biodegradable, and approved for discharge into sanitary sewers
 - Additives that optimize cleaning ability while minimizing color change and shrinkage
 - Usually have strong anti-deposition characteristics and are slightly acidic to decrease color loss
 - Sizers add body and improve creases to make finishing easier



Wet Cleaning Dryer & Finishing



- Dryer
 - Computer controlled moisture sensor to ensure loads are sufficiently dry without over drying
 - Cycle times minimized by high-speed moisture extraction using heat sourced either directly from natural gas or indirectly in the form of steam heat from a boiler
 - Garments are typically dried down to a specific moisture level, usually <10% allows wrinkles to more easily be removed & prevents shrinking or distortion
 - Garments may have more wrinkles than perc cleaned garments out of the dryer
- Finishing
 - Use traditional pressing equipment or tensioning equipment specialized for wet cleaning
 - Form finishers and pant toppers are typically used as they significantly reduce the amount of time it takes to finish garments



Perc & PWC Comparison



Perc Concerns

- **“Group 2A: Probably carcinogenic to humans”**; also a suspected developmental, gastrointestinal, kidney, reproductive, respiratory, and skin or sense organ toxicant
- **Central nervous system depressant**
- **Persistent** in water and soil and very persistent in sediment and air
- NYS has the second highest #of cleaners in the US, many on the bottom floor of apartment buildings or strip malls
 - **Apt residents** are exposed to low levels - may lead to reduced scores on tests of visual perception, reaction time, and attention
 - **Dry cleaning workers** have long term exposure to high levels, can affect the liver, brain, and kidneys

Benefits of PWC

- **Cheapest garment cleaning system**: lowest installed system cost, smallest electricity usage per load, lowest operating cost over the first 5 years of ownership (compared to perc, HC, GreenEarth, and CO2)
- **Cleans better than other solvents** - produces whiter whites, easier to remove water based stains, cleans better than perc for some items
- **Reduces or eliminates EHS concerns & liabilities** associated with other solvents
- Dedicated wet cleaners are **exempt from NYS DEC permit & training** requirements
- Wet cleaners can **market themselves as environmentally friendly**

Garment Cleaning Solvent (chemical abstract service number)		Environmental Impacts ⁵	Potential Human Health Impacts ⁶
Perchloroethylene (127-18-4)		persistent in water, soil, air; very persistent in sediment; unknown aquatic toxicity	affects central nervous system; irritates eyes, skin, respiratory tract
Professional Wet Cleaning (7732-18-5)		not persistent or toxic to the aquatic environment	no known impacts
Acetal (Solvon K4) (2568-90-3) ^a		persistent in sediment, toxic to the aquatic environment	no known impacts
Glycol Ether (Rynex®) (13279-31-2)		may be toxic to the aquatic environment	causes serious eye damage
Hydrocarbon	DF-2000 Fluid (64742-48-9)	very persistent in soil and sediment; highly flammable	affects central nervous system; irritates eyes, skin, respiratory tract
	Sasol LPA 142 (64742-47-8)	not persistent or toxic to the aquatic environment	
	Pure Dry (#not available)	highly flammable, environmental impact not available	
	Eco Solv (68551-17-7)	persistent in sediment; bioaccumulative; very toxic to the aquatic environment; highly flammable	
	Shell Sol 140 HT (111-84-2)	persistent in sediment; very toxic to the aquatic environment; highly flammable	
	Stoddard Solvent (8052-41-3)	highly flammable, environmental impact not available	
Liquid Carbon Dioxide (124-38-9)		not persistent or toxic to the aquatic environment	persistent in air; irritates skin, eyes; frostbite
n-Propyl Bromide (DrySolv®) (106-94-5)		persistent in sediment, very persistent in air, toxic to the aquatic environment	irritates eyes, skin, respiratory tract; affects central nervous, reproductive, & respiratory systems, kidney, & liver
Siloxane D5 (GreenEarth®) (69430-24-6)		persistent in soil and air, very persistent in sediment, toxic to the aquatic environment	mild eye irritation





Garment Cleaning Solvent (chemical abstract service number)		Average Installed System Cost ¹	Avg. Cost for first 5 years of Dry Cleaning Facility ²	Cost per pound Cleaned ³	Avg. Natural Gas Usage per 100 pounds cleaned (therms) ⁴	Avg. Electricity Usage per 100 pounds cleaned (kWh) ⁴
Perchloroethylene (127-18-4)		\$52,000	\$27,376	\$0.63-\$1.94 avg \$1.02	12	26.6
Professional Wet Cleaning (7732-18-5)		\$47,000	\$20,926	\$0.57-\$1.32 avg \$1.10	9	9.3
Acetal (Solvon K4) (2568-90-3) ^a		\$50,000- \$100,000 ⁷	unavailable	unavailable	less than hydrocarbon & perc	similar to hydrocarbon
Glycol Ether (Rynex®) (13279-31-2)		\$56,000 ⁷	\$26,220	\$1.14	unavailable	unavailable
Hydrocarbon	DF-2000 Fluid (64742-48-9)	\$59,000	\$27,911	\$0.73-\$1.02 avg \$0.88	13.1	35.5
	Sasol LPA 142 (64742-47-8)		unavailable			
	Pure Dry (#not available)		\$28,535			
	Eco Solv (68551-17-7)		\$27,872			
	Shell Sol 140 HT (111-84-2)		\$27,755			
	Stoddard Solvent (8052-41-3)		\$28,308			
Liquid Carbon Dioxide (124-38-9)		\$140,000	\$58,881	\$1.40	7.3-14.2	30.9
n-Propyl Bromide (DrySolv®) (106-94-5)		\$40,000- \$60,000 for a new system, lower cost to retrofit existing perc system	unavailable	unavailable	unavailable	unavailable
Siloxane D5 (GreenEarth®) (69430-24-6)		\$61,000	\$32,718	\$1.08-\$2.33 avg \$1.71	13.4	54.2

1,4 dioxane in Wet Cleaning



- Suffolk County concerned about dioxane in water supply & potential contribution from PWC
 - Detected in more than 40% of SCWA supply wells, values range from ND-5.44 (2015 data)
- Drinking water regulations
 - Not regulated under Safe Water Drinking Act
 - Every 5yr the EPA issues the Unregulated Contaminant Monitoring Rule (UCMR) - UCMR3 monitoring contains sampling and testing requirements for 28 chemicals, including dioxane
- EPA TSCA Work Plan Chemical
 - Problem Formulation and Initial Assessments completed in April 2015
 - Goal: identify scenarios where further risk analysis may be necessary
 1. there are no risks to the general population through exposure to air emissions;
 2. an assessment of risk from drinking water is not needed at this time because 1,4-Dioxane is currently being monitored and EPA will determine whether or not regulatory action is needed as part of its Regulatory Determination Process;
 3. EPA/OPPT will further assess risks to workers and consumers exposed to 1,4-Dioxane through certain uses

1,4 dioxane in Wet Cleaning



- Potential link to wet cleaning detergents
 - byproduct of ethoxylation - combination of low-sudsing ingredients with ethylene oxide, to provide mildness to harsh cleaning ingredients
 - byproduct of sodium lauryl sulfate, a surfactant and an emulsifier, which is an extremely common ingredient in detergents
- Wet cleaning detergents
 - Detergents from Kreussler Inc. are the most widely used for PWC
 - Residual levels could be present as a by-product of alcohol ethoxylates:
 - branched and linear alcohol ethoxylates (CAS # 106232-83-1)
 - alcohols C12-C18 ethoxylated, propoxylated (CAS # 69227-21-0)
 - oleic acid monoethanolamid, ethoxylated (CAS # 26027-37-2)
 - 2-(2-butoxyethoxy)ethanol (CAS # 112-34-5)
 - Unknown if the amount of 1,4-dioxane in the detergents is significant and where the 1,4-dioxane ends up - clothes, wastewater or both
 - Wastewater can become contaminated from either the clothes themselves or the spotting chemicals used to treat stains on the clothes
- Conclusion: only way to determine if 1,4 dioxane in wet cleaning is a concern is to test wastewater from a wet cleaner



Wet Cleaning Technology Virtual Tradeshow

A ONE-STOP SHOP FOR INFORMATION ON AVAILABLE WET CLEANING TECHNOLOGIES.

WET CLEANING TECHNOLOGY Virtual Tradeshow

For Dry Cleaners and Technical Assistance Providers:

- Compare available wet cleaning washers and dryers in a side-by-side format
- Browse machine attributes such as: laundry capacity and physical dimensions, and reductions in water, energy, and waste
- Post reviews on equipment that you've purchased, or submit comments and questions to vendors

For Vendors:

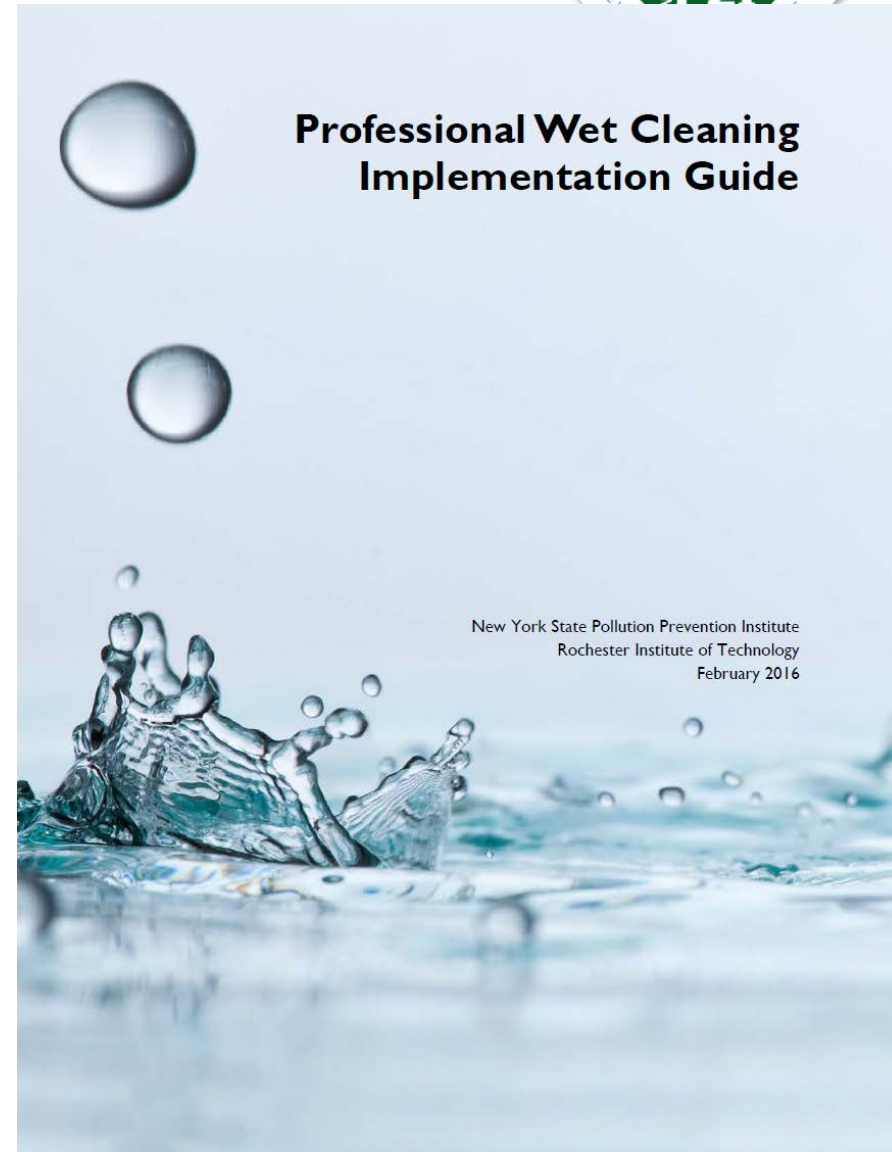
- Provide up-to-date information about your wet cleaning washers and dryers in a secure format
- Promote services that you offer and identify ways in which your technology differs from competitors
- Upload fact sheets, brochures, case studies, photographs, and other marketing materials

Check it out at:
www.newmoa.org/prevention/projects/wetclean

Professional Wet Cleaning Implementation Guide



- Developed by NYSP2I to explain how wet cleaning works, the benefits of PWC, and provide considerations and questions for cleaners to help with the adoption of PWC
- The Guide provides a **comparison of PWC to other dry cleaning solvents** and **considerations for cleaners and technical assistance providers to help with the process of adopting PWC**
- Topic areas:
 - Dry cleaning in NY
 - Overview of garment care technologies
 - Overview of PWC operation
 - Selecting PWC equipment & detergents
 - Installing PWC equipment



All Fabric Cleaners Conversion



History of Cleaning

All Fabric Cleaners, located at 2316 North Ocean Avenue, Farmingville, operated with perc for 15 years. AFC's owner was interested in the promise that PWC is healthier for the environment and employees and can clean many garments better than perc. In 2011, he visited many wet cleaners and attended The Cleanshow to learn more about PWC.

Conversion from Perc to PWC

Their PWC system – consisting of a washer, dryer, top tensioner, and pant tensioner – was installed in Sept. 2011. At the time of installation, the owner planned to gradually convert ops over to PWC. The system proved successful beyond expectations & the dry cleaning system was disconnected in December 2011 and removed in spring 2012.

Equipment cost \$48,886 fully installed + \$1,500 perc machine disposal

- Miele washer - 36lbs Model #PW 6161
- Miele dryer - 36lbs Model #PT7401
- Veit pants topper - Model#8741
- Veit Form finisher - Model#7401

All Fabric Cleaners Conversion



Since converting to wet cleaning, **quality has increased**, as shown by more than a **99.9% reduction in sendouts, redos, and claims**. **Electricity usage has decreased by one third** and **natural gas usage has also decreased**. In addition to saving money, perc use and its associated health and environmental effects as well as hazardous waste are eliminated. All Fabric's **employees are happier operating in a cleaner environment**, without the smell of perc and their **customers are pleased with the quality of cleaned garments**.



Yong Choi, owner, proudly stands next to his wet cleaning system

Metrics	2012 Estimated Annual Savings	2013 Estimated Annual Savings
Performance	99.98% reduction in quality defects	99.96% reduction in quality defects
Electricity usage	34% reduction	33% reduction
Natural gas usage	1.6% reduction	30% reduction
Detergent & spotter usage	4% increase	11% reduction
Perc used for cleaning	173 gallons, 100% eliminated	173 gallons, 100% eliminated
Filters & maintenance	100% eliminated	100% eliminated
Hazardous waste disposal	766 pounds, 100% eliminated	766 pounds, 100% eliminated
Perc air pollution	852 pounds, 100% eliminated	852 pounds, 100% eliminated
NYSDEC permit	permit eliminated	permit eliminated
Total	12% reduction in operating costs, \$28,700+	13% reduction in operating costs, \$31,600+

Comparing Jan- Dec 2010, Jan-Dec 2012, and Jan-Dec 2013 operating data. Data are normalized to pieces cleaned in 2012.

Rainbow Cleaners Conversion



History of Cleaning

Danny Yoo, owner of Rainbow Cleaners, 36 West 15th Street, New York, recognizes the environmental burden of using perc and was concerned about the potential public health risks as his store is located on the first floor of a twelve story residential building. His landlord and building residents share these health concerns.

Conversion from Perc to PWC

Their PWC system – consisting of a washer, dryer, top tensioner, and pant tensioner – was installed in March 2012. The perc dry cleaning system was removed from the shop at the time of the wet cleaning system installation.

Equipment cost \$60,277.36 fully installed

- Miele Washer, 45 lbs laundry/27 lbs wet cleaning, PW6201
- Miele Dryer, 45 lbs laundry/27 lbs wet cleaning, PT7501
- Miele Steam Valve Kit/Miele Base for PW6201, UG6020
- Veit Tensioning Pants Topper, 8741
- Veit Tensioning Multiform 230V 50-60 Hz, 8356



Rainbow Cleaners Conversion



Since converting to wet cleaning, quality has increased, as shown by more than a **98% reduction in sendouts, redos, and claims**. Since conversion, Rainbow Cleaners cleans 33% less garments as they no longer clean for a drop shop which installed its own dry cleaning system. In addition to **saving over \$1,500 a year in detergent, spotters, and eliminated hazardous waste fees**, perc use and its associated health and environmental effects are removed. Most importantly, the **residents located above Rainbow Cleaners are happy** with the wet cleaning system as there are no known health effects from the wet cleaning system.



Rainbow Cleaners' wet cleaning system

Metrics	Estimated Annual Savings
Performance	98.1% reduction in quality defects
Detergent & spotter usage	\$1,283 reduction; increase 68 gallons detergent
Perc used for cleaning	65 gallons, 100% eliminated
Filters & equipment maintenance	100% eliminated
Hazardous waste disposal	262 pounds, 100% eliminated
Perc air pollution	229 pounds, 100% eliminated
NYSDEC permit & operator training	permit eliminated, \$700+ annual cost

Comparing Jan- Dec 2011 and May 2012-April 2013 operating data. Data are normalized to pieces cleaned in May 2012-April 2013.

I am very happy and glad that I changed to the wet cleaning system. My employees are happy too because there is no smell of dry cleaning solvent in the store. I feel better servicing with the wet cleaning system because it really cleans the garments fully.

- Danny Yoo, owner, Rainbow Cleaners

Questions?



Contact us

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NYS PWC Program

What we learned from wet cleaning conversions, demos, and consumer survey

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May 3, 2016 | NYSDEC Region 2

NYS Professional

Six year program to promote PWC across NYS

Highlights:

- All Fabric Cleaners of Farmingville & Rainbow Cleaners of New York converted from perc to dedicated PWC
- 63 attendees representing 49 cleaners attended 6 demos
- 32 attendees representing 13 stakeholders attended 2 demos
- Wet Cleaning Implementation Guide developed
- Dry cleaner & consumer surveys



NYS Professional Wet Cleaning Program



Support NYS Garment Cleaning Industry

Under-
stand

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Share Information

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cleaners
survey

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Materials Developed

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demon-
strations

PWC
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case
studies

Wet
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Brochures,
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2010 Garment Cleaners Survey



Highlights

- PWC environmental benefits well known among cleaners
- >50% interested in using PWC, ~20% customers request PWC
- Correlation btwn. the type of bldg. & location of the cleaner
 - 96% of collocated residential cleaners are downstate
 - 83% of cleaners upstate are in stand alone buildings
- **Biggest holdups: cleaning ability, cost, education**
 - 71% PWC cannot clean all garment types
 - 67% difficult to finish wet cleaned garments
 - 65% other solvents do a better job at cleaning some garments
 - 39% takes longer to wet clean garments than use other cleaners
 - **57% most dry cleaners do not know a lot about PWC**

NYS Professional Wet Cleaning Program



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Wet Cleaning Conversion Program



Two perc cleaners were selected by NYSP2I to receive \$17,500 from EPA Region 2 to help offset the cost of PWC equipment

All Fabric Cleaners, Suffolk Co.

- Installed PWC system in Sept 2011, disconnected perc system in Dec & removed it in spring 2012
- System cost \$48,886 (PWC washer, dryer, pant tensioner, top tensioner, installation)



Rainbow Cleaners, NY

- Installed PWC system in March 2012; removed perc at the same time
- System cost \$60,277 (PWC washer, dryer, pant tensioner, top tensioner, installation)



NYS Professional Wet Cleaning Program



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PWC Demonstrations



- **Cleaners** focus on those aspects critical to running a business – time it takes to clean a load, customer satisfaction, training needs, landlord relations, and most of all, cleaning ability
- **Stakeholders** more interested in potential funding opportunities for cleaners to convert to PWC, methods other states have funded conversion programs, NYSP2I's thoughts to further disseminate PWC information to NYS cleaners, and feedback we have received from cleaners on the demonstrations



PWC Demonstrations for Cleaners



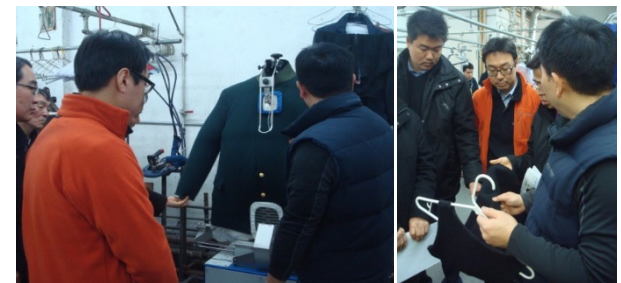
- **Major challenge:** identifying cleaners willing to host
- 63 people representing 49 cleaners attended 6 demos
- Cleaners attended for four reasons:
 1. Main: get a **general understanding of PWC**
 2. **Cleaning ability** as compared to perc, especially wool
 3. Many **landlords** won't allow cleaners to continue to use perc
 4. **Concerns with perc** - cost, regulatory burdens, and customers - are forcing cleaners to consider alternatives



Demo Follow ups



- All attendees mentioned **space and financial constraints** as the main barriers to moving forward with PWC
 - Cost of replacing their system is too high and is difficult for cleaners to justify the expense
 - No state or federal financial incentives
- Perceptions
 - PWC viewed more favorably
 - Some remain skeptical PWC can clean all garment types
 - Few satisfied with their hydrocarbon systems
 - **More likely to install PWC when their system needs to be replaced after attending the demo**



PWC Demonstrations for Stakeholders



- 32 people representing 13 organizations attended two demos
- Attendees learned
 1. Difference btwn laundry & PWC,
 2. Motivations for PWC, and
 3. PWC performs as well as or better than perc



NYS Professional Wet Cleaning Program



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2015 Consumer Survey



Understanding Consumers' Behavior & Knowledge of Professional Garment Cleaning

- Goal to understand
 1. what NYS consumers know about dry cleaning and PWC,
 2. factors that are considered when selecting a cleaner, &
 3. factors that influence the preference for an eco-friendly cleaner

Results Summary

- 86% don't know what their cleaner uses in the cleaning process
- 50% of those that have used a PWC did so specifically bec. they wet clean
- Online articles and friends and/or family are the most popular methods respondents have received PWC information
- Location and price are the most significant factors when choosing a garment cleaner; professional wet cleaning ranked 5 out of 7

2015 Consumer Survey



Understanding Consumers' Behavior & Knowledge of Professional Garment Cleaning

“Environmentally Friendly” messaging is critical

- 52% *most likely or definitely* would use garment cleaning services more if they were advertised as environmentally friendly
- 35% have *no preference* in advertising terms; 30% prefer *natural*, 15% prefer *organic*, and 6% prefer *professional wet cleaning*
- About 50% are willing to pay 10% more for a cleaner advertised as environmentally friendly
- Consumers are more willing to spend 10% more than travel to a less preferred location for an environmentally friendly garment cleaner

NYS Professional Wet Cleaning Program



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Business & Commercial Users



- Targeting commercial users has a larger potential impact than targeting individual consumers
- ~3,000 NYS businesses that use garment cleaning as part of their operations
 - Formal wear & costume rental companies
 - Hotels & motels with sales of at least \$1MM
 - Theater companies

Wet is the new dry
did you know there's a **BETTER** alternative to dry cleaning?



Professional Wet Cleaning Means Safe Cleaning



Designers
and
garment
manufacturers
are switching over to
Wet Cleaning

Benefits of using Wet Cleaning include:

- Garments last longer. Clothes are cleaned at exactly the correct temperature, with the smallest amount of agitation and perfect mix of detergents
- Safe on "dry clean only" clothing
- Prevents shrinking and color loss
- Whites turn out whiter
- Cost competitive
- Significantly reduces—and in some cases eliminates—the health and environmental concerns often seen with dry cleaning

There is nothing dry about dry cleaning

Dry cleaning typically involves cleaning delicate garments in a liquid chemical solvent called perc.
Perc has been proven to be harmful to your health and the environment.

Every year, the average
dry cleaner uses  **68**
GALLONS
OF PERC

releases more than
400 POUNDS
of perc into the air

- Generates more than **1,660 pounds** of hazardous waste
- Generates more than **190 pounds** of contaminated wastewater

Once in the environment, perc takes a long time to break down, causing damage while it persists in water and soil. In NYS alone, it is estimated that about **1,000** dry cleaner sites are contaminated with perc.

**MAKE THE
SWITCH TODAY!**

Find a wet cleaner in your area
<http://bit.ly/1OpS31K>

Questions about Wet Cleaning

Call Kate Winnebeck,
Senior Environment Health and Safety Specialist, NYSP2I
585-475-2512



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Any opinions, results, findings, and

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PWC Locator – in process



- Web based map of ~90 NYS wet cleaners
- Goal is to provide a reliable source for consumers to locate wet cleaners across the state
- Include both dedicated and mixed shop facilities
- Information populated by DEC records, equipment purchasing records, P2I experience with specific shops, and word of mouth
- Targeted facebook ad campaign to advertise tool

Summary of Challenges & Needs



- Lack of funding for conversions
- Upstate wet cleaners not willing to host demonstrations – view PWC as competitive advantage (can often charge more) & don't want to give up their secrets
- Fear among some customers to use PWC as they don't understand what it is
- Some cleaners remain skeptical that PWC can clean all garment types

Future Work



- Develop a public education and outreach campaign
 - Aimed at many types of users
 - Results of the 2015 Customer Survey will be used to drive development
- Continue to connect with NYS cleaners
- Continue to share conversion case studies & info learned at the demonstrations
- Continue to connect & collaborate with others working in this space to broaden our reach and pool resources & expertise

Questions?



Contact us

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Department of
Environmental
Conservation

Alternative Dry Cleaning Solvent Review Process

Don Ward

NYSDEC – Air Toxics Section

Wet Cleaning Workshop
Pollution Prevention Institute
May 3, 2016



Overview

- Perc Usage vs Alternatives to Perc
- Review Process/Requested Information
- Alternative Dry Cleaning Solvent Reviews

The BIG Picture

- 3 key take home messages from this presentation.
- Demonstrate the importance of the alternative dry cleaning solvent review process.

Take Home Messages

- Alternative solvents will very likely see increased use (potentially substantial) with the continued phasing out of perc.

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- NYSDEC needs to determine that the toxicity of the alternative solvent is sufficiently low.

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- Alternative solvents will very likely see increased use (potentially substantial) with the continued phasing out of perc.
- NYSDEC needs to determine that the toxicity of the alternative solvent is sufficiently low.
- NYSDEC needs to determine that the alternative solvent's chemical composition is consistently the same as what was reviewed.

Perc Use by Dry Cleaners

- Perc is still the most widely used dry cleaning solvent (estimated to be at 70% in 2009).
- However, its use has been declining.
- Perc usage is believed to continue decreasing and potentially at even more accelerated rates in the future.

Reasons for perc being phased out

- Its adverse health effects are well known.
- The upcoming federal USEPA ban on its use in collocated residential dry cleaning facilities in 12/2020.



Reasons for alternative solvents increased usage

- Decreased use of perc.
- Reduced toxicity of the NYS approved alternative dry cleaning solvents compared to perc.
- A common perception of wet cleaning's inability to be a facility's sole method of cleaning exists.

Reasons for the perceived notions about wet cleaning

- Concerns about “dry clean only” labeled garments and the ability to provide post-wash tensioning to constructed garments (e.g. highly expensive suits).
- Concerns about the cost to switch to becoming a wet cleaner.
- Concerns about wet cleaning having a comparable level of cleaning ability.

Criteria for NYS Approval

- Flash Point > 140°F
- Low or Moderate Toxicity Air Contaminant Classification as defined under Part 212
- Batch-to-Batch Consistency of the Solvent's Chemical Composition

Requested Information

- CAS#(s)
 - % Composition by individual chemicals
 - Include any minor constituents (e.g. stabilizers, additives) at levels ≥ 1000 PPM (0.1% by weight)
- Physical and chemical properties (e.g. flash point, vapor pressure)
- **Product Testing Lab Reports**
Characterizing Batch-to-batch uniformity

Requested Information

- **Information submitted to USEPA under the Toxics Substance Control Act (TSCA)**
- **Toxicity testing** (e.g., acute including LD/LC50s, chronic, subchronic, genotoxicity, carcinogenicity, ecotoxicity)
- Any environmental fate information (e.g. atmospheric half-life, degradation in water, bioconcentration factor)

Review Process Summary

- Comprehensive review of the submittal.
- Re-request any missing information.
- Extend the review beyond the submittal.

Review Process Summary

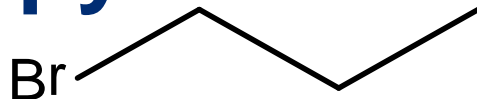
- Extend the review beyond the submittal:
 - Complete literature search for any additional toxicity studies.
 - Search for any missing chemical properties and environmental fate information.
 - Search for any human exposure information and industrial hygiene data of workplace indoor air concentrations measured.
 - Perform this information search for analogous compounds if necessary.

Potential Concerns



- Flammability – Many of NYS's dry cleaners are collocated (especially in NYC where the highest number and concentration exist).
- Collocated facilities also have a much higher risk of their emissions resulting in receptor exposures.
- Improper machine maintenance and/or work practices is common.

Company X's n-Propyl Bromide Solvent



- Marketed as being “non-regulated”, “non-toxic”, “green”, “organic”, and “environmentally friendly” due to the lack of regulations and certain toxicity designations.
- Usage indicated to be increasing 10 to 15% per year overall in 2011.
- If allowed, use will likely increase further with upcoming federal (12/2020) and state regulations banning perc usage at collocated dry cleaning facilities.

n-Propyl Bromide Solvent

- Marketed as a direct “drop-in” perc replacement that can be used in existing perc machine.
 - Attractive option because it is the least expensive.
 - Incompatible with the materials of many of the dry cleaning machine components.
 - Reacts with the dry cleaning process water to form the very toxic and corrosive acid gas hydrogen bromide.
- Very volatile: 6 to >11 times greater than perc.
 - Machine settings such as temperature and pressure need to be adjusted accordingly.

n-Propyl Bromide Solvent

- Adverse health effects from n-PB exposures are numerous affecting many end points including:
 - Carcinogenicity (NTP rodent bioassay)
 - Reproductive and Developmental Toxicity
 - Neurological Toxicity
 - Immunotoxicity and Toxicity of the Liver, Kidneys, Red Blood Cells, and Hemoglobin



n-Propyl Bromide Solvent

- Numerous exposure incidences documented:
 - Poisonings occurring with different uses including:
 - Spray adhesives
 - Degreasing applications
 - Dry cleaners
 - Irreversible adverse neurological health effects from permanent nervous system damage indicated in several instances.
 - Exposure concentrations measured at dry cleaners exceed current occupational exposure limits even before being based on the cancer end point.



n-Propyl Bromide Solvent

- Recent Actions:
 - Submitted a Petition to EPA to add n-PB to their CAA Section 112 HAP List.
 - Worked with the NYS DOH to derive a new AGC derived based upon the cancer end point.
 - The USEPA released a draft TSCA n-PB Chemical Risk Assessment for public review and comment.
 - The USEPA determined that the risks to humans for all three end uses evaluated (spray adhesives, dry cleaning, and degreasing) were unacceptable due to the elevated exposures demonstrated.



Company Y's Solvents

- Product A/Highly Refined Petroleum
 - Being marketed under several trade names.
 - 65% of mixture is a previously approved chemical.
 - 35% is a Propylene Glycol Ether like DPGnBE.
 - However, a very deficient submittal with many discrepancies was provided.
 - Never received the lab analyses documenting batch-to-batch consistency.
 - Use of one trade name was immediately disallowed because it was already being used.

Company Y's Solvents

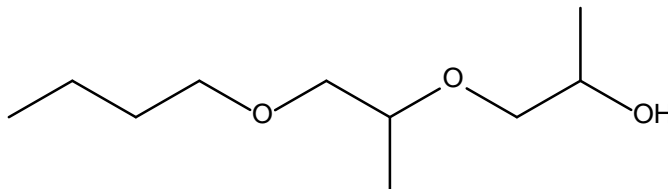
- Product B
 - Chemical formulation originally provided changed as the review was on-going.
 - “New” chemical formulation was identical to already approved (requested and received verification of this).
- Solvents indicated to have low toxicity and would likely be approved with necessary info.

Company Y's Solvents



Solvair/Dipropylene Glycol n-Butyl Ether(DPGnBE) Solvent

- Low toxicity.
- High flash point.
- No HAPs.
- Solvair technology results in low emissions.
- Analogous chemicals also have low toxicity.
- Propylene glycol ethers are widely used in consumer products.
- Substantially lower drying temperature.

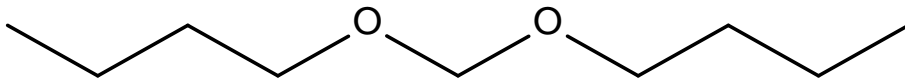


DPGnBE Solvent

- Only reclaimed CO₂ is used.
- Solvent recovery for reuse is maximized.
- Supplier takes back used solvent.
- Readily biodegradable.
- Low bioconcentration potential.
- Short estimated atmospheric half-life.
- Low acute aquatic toxicity.
- Approved for use in all NYS dry-cleaners.
- Only need to obtain an Air Facility Registration.



SolvonK4/Butylal Solvent



- Low toxicity.
- HAP content \leq 100 PPM (0.01% BW).
- Analogous chemicals also have low toxicity.
- Acetals are widely used as food additive flavoring substances.
- Several acetals occur naturally in certain foods.
- Metabolize into innocuous products.

Butylal Solvent

- Low end-of-cycle machine drum residual solvent concentration.
- Biodegradable.
- Low predicted bioconcentration potential.
- Short estimated atmospheric half-life.
- Low acute aquatic toxicity expected.
- Approved for use in all NYS dry-cleaners.
- Only need to obtain an Air Facility Registration.

NYS Dry Cleaning Rule (Part 232) is being Updated

- Alternative dry cleaning solvent review process is being put into regulation.
- Review process is currently suspended until the rule comes out.
 - Recently received several requests for NYS approval of solvents after a lull.



Thank You!

Questions?

<http://www.dec.ny.gov/chemical/72273.html>