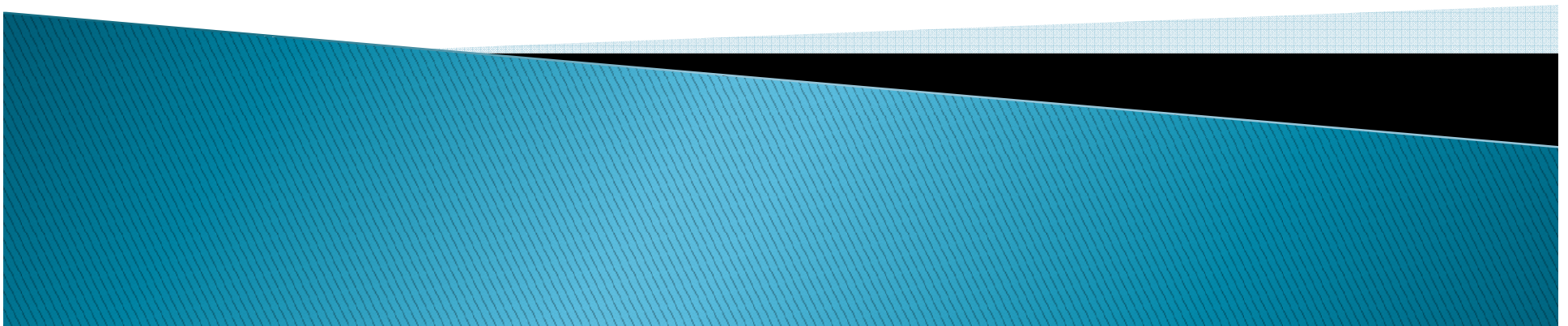


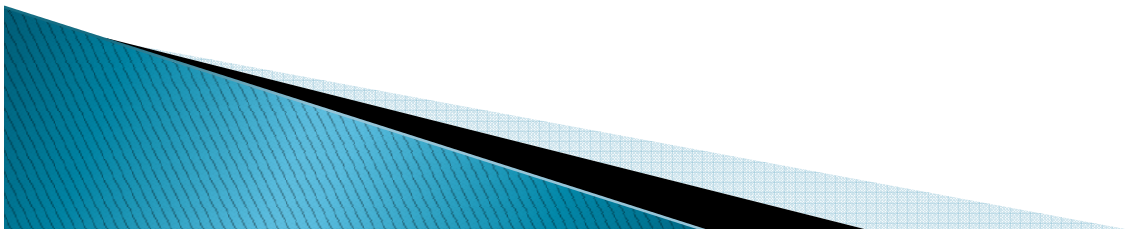
Slides prepared by Peter Sinsheimer, Ph.D., MPH  
Executive Director: UCLA Sustainable Technology & Policy  
Program  
Principal Investigator:  
Environmental Garment Care Demonstration Project



# Phase Out of Toxic Dry Cleaning

## ▶ Model for GUMI

- Southern California–based story
- Scientific evaluation of the viability of green non–toxic alternative to toxic dry cleaning chemical.
- Promotion of use of non–toxic alternative
- NGO successfully promoted policy to phase out of toxic process and phase in of non–toxic alternative



# Background of Garment Care Industry

30,000+ dry cleaners in the U.S.

- 85% use perchloroethylene (PERC)
- Most are small Mom and Pop shops
- 50% Korean ownership in Los Angeles
- 5,000 dry cleaners in California

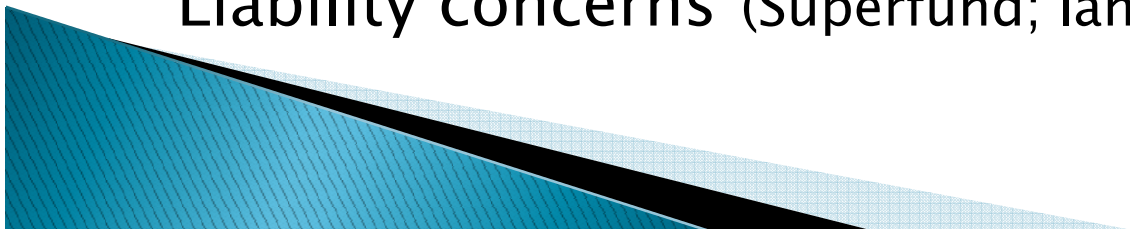


Adverse health & environmental effects of PERC

- Probable human carcinogen (IARC)
- Dizziness, headaches, impaired judgment
- Toxic air contaminant, groundwater pollutant

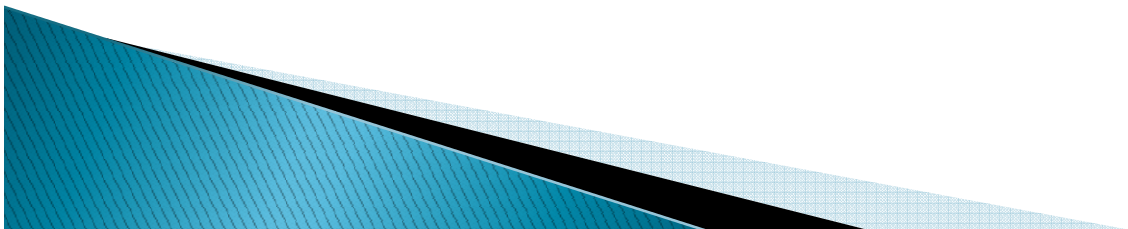
PCE dry cleaning highly regulated

Liability concerns (Superfund; landlord restrictions)



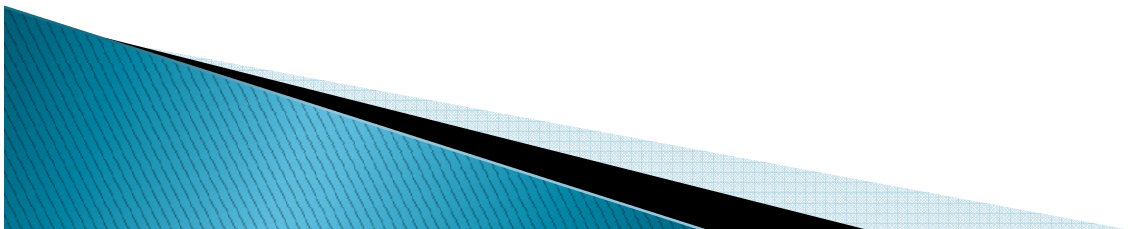
# Adverse Health Effects Associated with Perchloroethylene

- ▶ Acute exposure associated with dizziness, headaches, nausea, impaired judgment, impaired perception.
- ▶ Chronic exposure associated with damage to the liver and kidneys, and respiratory disease.
- ▶ Exposure associated with neurotoxicity, reproductive toxicity, and developmental toxicity.
- ▶ Cancer risks include: bladder, stomach, esophageal, intestinal, and pancreatic.



# Risk Classification of PERC

- *Group 2A Carcinogen* (i.e., a probable human carcinogen)  
– International Agency for Research on Cancer.
- *Potential Human Carcinogen* – National Institute of Occupational Safety and Health (NIOSH).
- *Hazardous Air Pollutant* – Clean Air Act.



# Non-Compliance with Regulations

<b>Location/ Year</b>	<b># Facilities Inspected</b>	<b># Facilities in Compliance</b>	<b>Rate of Non- compliance</b>
Sacramento 1996	30	4	87%
South Coast 1997	208	21	90%
South Coast 1999	340	17	95%
Bay Area 1998	41	9	79%
New York 1998	200	3	98%
Massachusetts 1998	100	6	94%
Pennsylvania 2006	--	--	100%

# Non-PERC Dry Cleaning Alternatives

## Hydrocarbon

- Exxon-Mobil, Shell, Chevron.
- Higher capital costs.
- Fire Hazard, Hazardous waste; VOC emissions.
- More energy intensive.

## Silicone

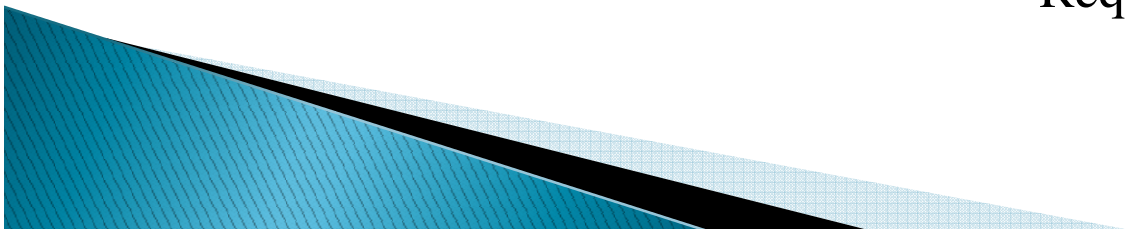
- General Electric.
- Higher capital costs, Annual fee.
- Fire Hazard; Hazardous waste.
- Recent evidence of toxicity.
- More energy intensive.

## Liquid Carbon Dioxide

- Non-toxic, zero-emission.
- Performance capability unproven.
- Very high capital costs.

## Professional Wet Cleaning

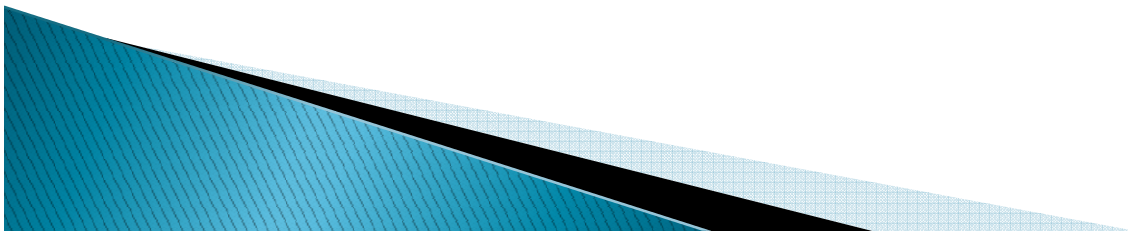
- Zero-emission, non-toxic, energy efficient.
- Lower capital and operating costs.
- Requires additional training.



# Definition of Professional Wet Cleaning

“Wet cleaning is a process for cleaning sensitive textiles (wool, silk, rayon, natural and man-made fibers) in water by professionals using a special technology and detergents that lead to minimum fabric shrinkage and damage. It is followed by an appropriate tumble drying and restorative finishing procedure.”

(European Wet Cleaning Committee)





# Professional Wet Cleaning Washer/Dryer System

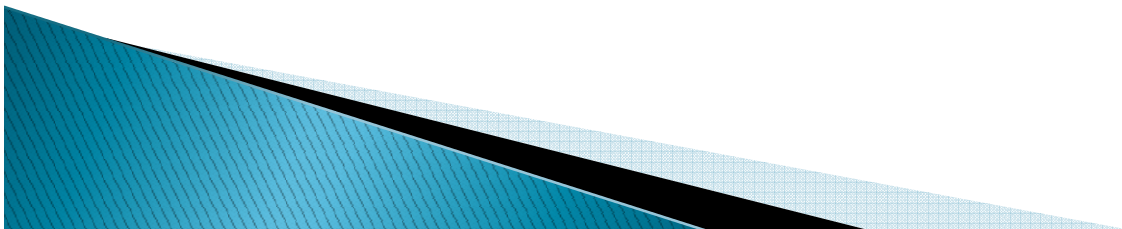


## ← Computer-Controlled Washing

- Ultra gentle agitation simulates hand washing
- Low water level and low water temperature
- High extraction speed

## Moisture Sensor Drying →

- Precise moisture control
- Detects moisture in garment
- Prevents over drying



# Professional Wet Cleaning Detergent Dispensing

**Dispensing System:** Precise amount of bio-degradable cleaning agents mixed with water before release into the cleaning drum.



**Cleaning Agents:** Formulated to maximize cleaning power while minimizing color change and shrinkage.

- *Detergents* remove stains/soils.
- *Conditioners* smooth and soften.
- *Sizing* adds body and enhances finishing.

# Specialized Tensioning Presses

**Tensioning Presses:** used to enhance restoration of constructed garments, such as suit jackets, suit pants, and tailored items.

- ▶ Steam to relax fibers, Tension to restore length and form, Hot air to dry.

Tensioning Form Finisher

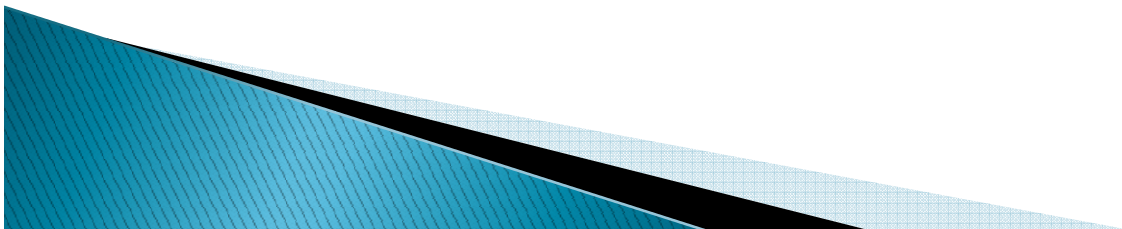


Tensioning Pants Topper



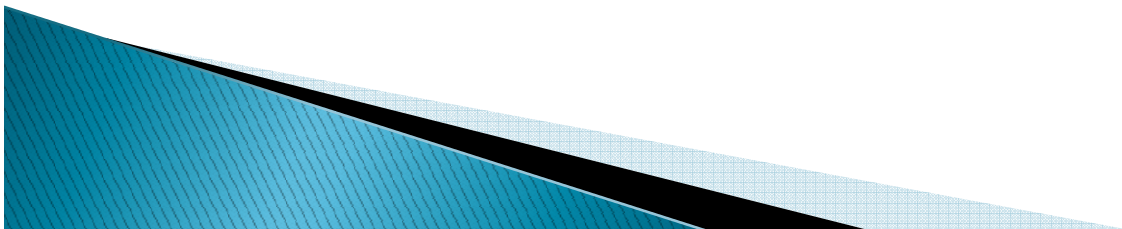
# Professional Wet Cleaning Commercialization Project

- ▶ Provide grant funding and technical assistance to dry cleaners willing to switch to professional wet cleaning and serve as demonstration sites.
- ▶ Demonstrate technology to other cleaners.
- ▶ Evaluate ability to successfully switch.



# Professional Wet Cleaning Commercialization Project

- ▶ Provide grant funding and technical assistance to dry cleaners willing to switch to professional wet cleaning and serve as demonstration sites.
- ▶ Demonstrate technology to other cleaners.
- ▶ Evaluate ability to successfully switch.



# Project Timeline

1996: Established first professional wet cleaner in California.

1998: Established first dry cleaner to switch to professional wet cleaning.

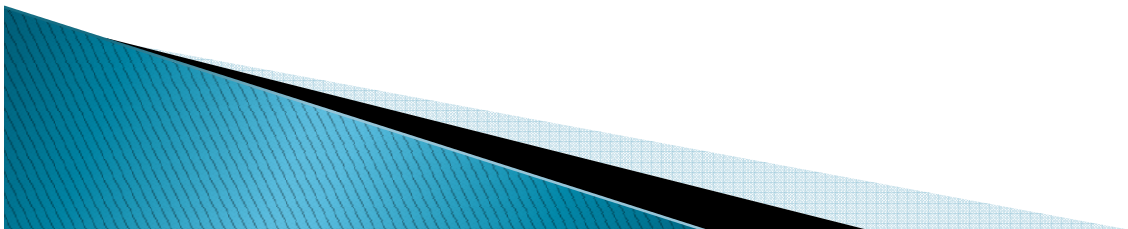
2000: Established large-scale professional wet cleaning demonstration program in the Los Angeles region.

2002: Report on viability of professional wet cleaning used as basis for phase out of PCE dry cleaning in greater Los Angeles region.

2003: California law provides PCE dry cleaners incentives to switch to environmental technologies.

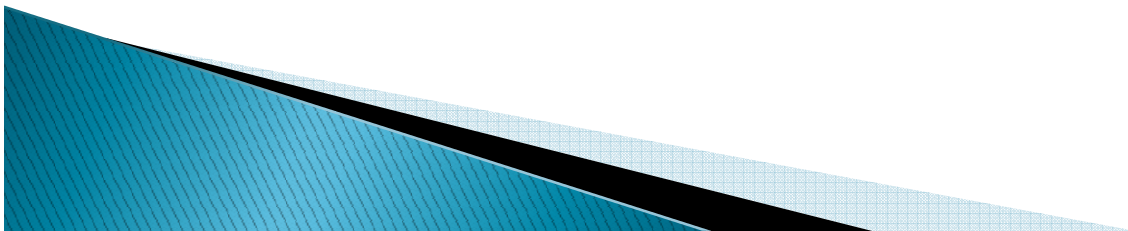
2005: Began demonstration program for San Francisco Bay Area and San Diego for professional wet cleaning and CO<sub>2</sub> dry cleaning.

2007: Began demonstration program for professional wet cleaning and CO<sub>2</sub> dry cleaning throughout California.



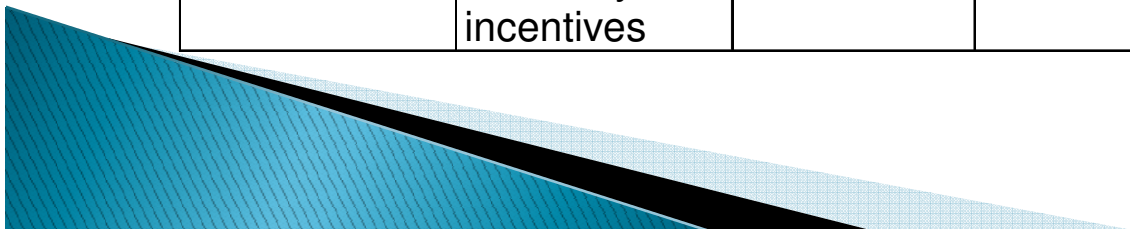
# Technical Evaluation of Cleaners Switching to Professional Wet Cleaning

- ▶ **Technical Performance:** Cleaners able to successfully process the full range of garments they had previously dry cleaned.
- ▶ **Financial Viability:** Capital and operating costs lower in professional wet cleaning.
- ▶ **Environmental Impact:** Electricity consumption significantly lower after the switch.



# Alternatives Assessment Matrix of Garment Care Technologies

	<b>Professional Wet Cleaning</b>	<b>Perc</b>	<b>Petroleum</b>	<b>Silicone</b>	<b>CO2</b>
<b>Performance</b>	Comparable	Standard	Comparable	Comparable	Comparable
<b>Typical cost, installed</b>	\$47,000	\$52,000	\$59,000	\$61,000	\$100,000
<b>Operating cost (\$/lb)</b>	\$0.21-\$0.28	\$0.37-\$0.45	\$0.28-\$0.36	\$0.32-\$0.43	\$0.31-\$0.43
<b>Training</b>	Vendor, local demonstration sites & outreach program	Compliance certification; vendor and trade groups	Vendor and trade groups	Vendor and user network	Vendor, demonstration site is planned
<b>Funding</b>	AB998=\$10K; demo site grant funding; energy-efficiency incentives	Vendor equipment leasing arrangements available	Vendor equipment leasing arrangements available	Vendor equipment leasing arrangements available	AB998=\$10K; demonstration site grant funding

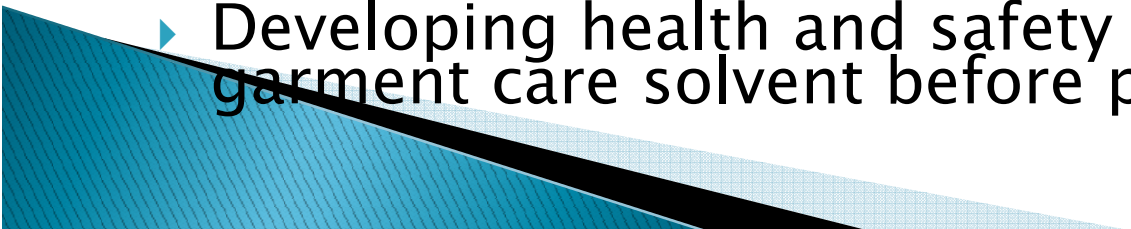




# Alternatives Assessment Matrix (cont)

	<b>Professional Wet Cleaning</b>	<b>Perc</b>	<b>Petroleum</b>	<b>Silicone</b>	<b>CO2</b>
<b>Worker health and safety</b>	No	Carcinogen, acute/chronic exposure	Potential neurotoxin, Fire hazard	Tumor promoter, Fire hazard	Pressure vessel permit and maintenance
<b>Air permits</b>	No	Hazardous Air Pollutant	Smog; Global warming	Possible if toxicity confirmed	No
<b>Fire permits</b>	No	Yes	Yes	Yes	Yes
<b>Energy</b>	Low	High	High	High	High
<b>Water</b>	Possibly higher, no cooling tower	Cooling tower issues	Cooling tower issues	Cooling tower issues	Cooling tower issues
<b>Waste water quality</b>	Safe with non-haz. spotters; cross contam. with mixed	Waste discharge prohibited; cross contam.	Waste discharge prohibited; cross contam.	Discharge potential problem; cross contam.	Testing of waste required
<b>Hazardous waste</b>	No, if non-hazardous spotting chemicals used	Yes	Yes	Potential toxicity	Need testing of cleaning agents and spotting chemicals

# Conclusion/Recommendations

- ▶ Professional wet cleaning and CO<sub>2</sub> dry cleaning viable non-toxic technologies with no other anticipated adverse environmental health impacts.
  - ▶ Significant environmental health issues identified for PERC, hydrocarbon, and silicone.
  - ▶ Phase out PERC dry cleaning and hydrocarbon dry cleaning.
  - ▶ Freeze silicone dry cleaning until safety established.
  - ▶ Phase out hazardous spotting chemicals.
  - ▶ Create detergent and spotting chemical certification programs.
  - ▶ Developing health and safety testing for any new garment care solvent before permitting use.
- 

# AB1879

- ▶ Toxic dry clean example good model for AB1879
  - Identify hazardous product → alternatives analysis to identify safer substitute → phase out of hazardous product

