

# **Commercialization of Professional Wet Cleaning:**

## **An Evaluation of the Opportunities and Factors Involved in Switching To a Pollution Prevention Technology in the Garment Care Industry**

**Final Report**  
October 28, 2002

POLLUTION PREVENTION EDUCATION AND RESEARCH CENTER  
URBAN AND ENVIRONMENTAL POLICY INSTITUTE  
OCCIDENTAL COLLEGE

**Peter Sinsheimer**

Director, Pollution Prevention Education and Research Center

**Cyrus Grout**

Senior Research Associate, Pollution Prevention Education and Research Center

**Angela Namkoong**

Senior Research Associate, Pollution Prevention Education and Research Center

**Robert Gottlieb**

Henry R. Luce Professor of Urban and Environmental Policy,  
Director, Urban and Environmental Policy Institute, Occidental College

## Acknowledgements

This report required a wide range of input and technical review. A number of people provided significant support in terms of information, technical review, and comments. In particular we would like to thank Kelly Swegan, former PPERC Outreach Coordinator, for her tireless efforts to make this project a success. We would also like to thank, among others:

Ed Becker, The Gas Company; Tim Carmichael, Coalition for Clean Air; Elaine Chang, South Coast Air Quality Management District; Sylvia Chico, Urban and Environmental Policy Institute; Paul Choe, Korean Dry Cleaners and Launderers Association; Yong Chon, 1Day Cleaners; Liz Church, Western Cleaner & Launderer; Rolando Cruz, Los Angeles Department of Water and Power; Thu Duong, Anawood Cleaners; Gabriel Florez, Beta Technologies; David Fuller, Wascomat; Eli Gichon, Eli's Airport Cleaners; Daniel Goldman, Wascomat; Jorge Gutierrez, The Gas Company; Jim Hoover, Laidlaw Corporation; Mike Hurrell, Southland Laundry Systems; Steve Kanaan, Anawood Cleaners; Helen Kim Yi, Korean Youth and Community Center; Myn Min Kim, Southern California Edison; Hans Kim, Natures Best Cleaners; Steven Kim, Orange County Environmental Health; Abid Latif, South Coast Air Quality Management District; Chung Liu, South Coast Air Quality Management District; Timothy Malloy, UCLA School of Law; Mike Mascaro, 7-Eleven Inc.; Ines Mireles, Del Mar Natural Cleaners; Moon Noh, San Clemente Natural Cleaning Center; Zion Orpaz, Golden State Laundry Systems; Ray Rangwala, Greater Los Angeles Dry Cleaning Association; Cristina Regalado, The California Wellness Foundation; Sandy Ro, Korean Youth and Community Center; Ron Rothman, Golden State Laundry Systems; Rocele Sagario, The California Wellness Foundation; Jeurgen Shaeffer, Miele; Jackie Smith, California Cleaners Association; John Ho Song, Korean Youth and Community Center; Anthony Star, Center for Neighborhood Technology; Yuriko Tanabe, European Finishing Equipment Corp; John Tipps, Clean Concepts Technology, Inc.; Craig Tranby, City of L.A. Environmental Affairs Department; Krishna Verma, Los Angeles Department of Water and Power; Randy Wentz, Western Cleaner & Launderer; Joe Whang, Cypress Natural Cleaners; Jennifer Whang, Cypress Natural Cleaners; Paul Williams, Southern California Edison.

Support for this report was made available through: The South Coast Air Quality Management District, The California Wellness Foundation, The Gas Company, and Southern California Edison.

## **Disclaimer**

The statements and conclusions in this report are those of the Pollution Prevention Education and Research Center and not necessarily those of any institution that has funded this work. The mention of commercial projects, their source, or their use in connection with material reported herein is not to be construed as actual or implied endorsements of such projects.

This report was prepared as a result of work sponsored, paid for, in whole or in part, by the South Coast Air Quality Management District (AQMD). The opinions, findings, conclusions, and recommendations are those of the author and do not necessarily represent the view of AQMD. AQMD, its officers, employees, contractors, and subcontractors make no warranty, expressed or implied, and assume no legal liability for the information in this report. AQMD had not approved or disapproved this report, nor has AQMD passed upon the accuracy or adequacy of the information contained herein.

# Table of Contents

	<u>Page Number</u>
<b>Abstract</b>	
<b>Executive Summary</b>	
<b>1. Introduction</b>	<b>1-1</b>
1.1 From Dry Cleaning to Professional Wet Cleaning	1-1
1.2 Background to the Report: A Pollution Prevention Approach	1-2
1.3 Description of the Professional Wet Cleaning Process	1-3
1.4 Previous Research on the Viability of Professional Wet Cleaning	1-5
1.5 Current Research Focus	1-5
<b>2. Methods</b>	<b>2-1</b>
2.1 Sample Selection	2-1
2.2 Evaluation Criteria	2-1
2.3 Study Design	2-4
<b>3. Results – Cleaner Case Studies</b>	<b>3-1</b>
3.1 San Clemente Dry Cleaning Center Case Study	3-2
3.2 Del Mar Cleaners Case Study	3-8
3.3 Anawood Cleaners Case Study	3-12
3.4 1Day Cleaners Case Study	3-16
3.5 Eli’s Airport Cleaners Case Study	3-22
<b>4. Case Study Summary Analysis</b>	<b>4-1</b>
4.1 Overview	4-1
4.2 Evaluation of Transition to Professional Wet Cleaning	4-2
4.3 Attitudes Of Cleaners Towards Professional Wet Cleaning	4-3
4.4 Performance Evaluation of Professional Wet Cleaning	4-6
4.5 Financial Evaluation of Professional Wet Cleaning	4-9
4.6 Resource Use Assessment	4-12
<b>5. Discussion</b>	<b>5-1</b>
5.1 Comparison With Other Studies	5-1
5.2 Generalizing Results: Keys to Successful Commercialization	5-1
5.3 Conclusion	5-4

## List of Tables

	<u>Page Number</u>
Table 3.1: Garment Profile and Performance at San Clemente Dry Cleaning Center	3-4
Table 3.2: Process Dependent Costs per 100 Garments Cleaned: San Clemente Dry Cleaning Center	3-5
Table 3.3: Garment Profile and Performance at Del Mar Cleaners	3-10
Table 3-4: Garment Profile and Performance at Anawood Cleaners	3-14
Table 3-5: Garment Profile and Performance at 1Day Cleaners	3-18
Table 3-6: Process Dependent Costs per 100 Garments Cleaned: 1Day Cleaners	3-19
Table 3-7: Performance Evaluation: Eli’s Airport Cleaners	3-24
Table 3-8: Process Dependent Costs per 100 Garments Cleaned: Eli’s Airport Cleaners	3-25
Table 4.1: Difficulty Ratings – Transition to Professional Wet Cleaning	4-3
Table 4.2: Cleaners’ Concerns About Wet Cleaning Technology	4-4
Table 4.3: Motives For Switching to Professional Wet Cleaning	4-5
Table 4.4: Owner Satisfaction	4-5
Table 4.5: Number of Cleaners Experiencing Symptoms Association with PCE Exposure	4-6
Table 4.6: Garment Profile and Performance of Professional Wet Cleaners	4-8
Table 4.7: Process Dependent Costs per 100 Garments Cleaned	4-11
Table 4.8: Resource Use Per 100 Garments Cleaned: Dry Cleaning vs. Professional Wet Cleaning	4-14

## List of Figures

	<u>Page Number</u>
Figure 1.1: Professional Wet Cleaning System	1-4

# List of Appendices

	<u>Page Number</u>
<b>Section A: San Clemente Dry Cleaning Center</b>	
Key to Case Study Figures	
Performance Calculations for San Clemente Dry Cleaning Center	A-1
Financial Calculations for San Clemente Dry Cleaning Center	A-2
Resource Use Data	A-7
Interview – Moon Noh	A-10
<b>Section B: Del Mar Cleaners</b>	
Key to Case Study Figures	
Performance Calculations for Del Mar Cleaners	B-1
Interview – Ines Mireles	B-3
<b>Section C: Anawood Cleaners</b>	
Key to Case Study Figures	
Performance Calculations for Anawood Cleaners	C-1
Interview – Steve Kanaan	C-2
<b>Section D: 1Day Cleaners</b>	
Key to Case Study Figures	
Performance Calculations for 1Day Cleaners	D-1
Financial Calculations for 1Day Cleaners	D-2
Resource Use Data	D-7
Interview – Yong Chon	D-12
<b>Section E: Eli’s Airport Cleaners</b>	
Key to Case Study Figures	
Performance Calculations for Eli’s Airport Cleaners	E-1
Financial Calculations for Eli’s Airport Cleaners	E-2
Resource Use Data	E-7
Interview – Eli Gichon	E-9
<b>Section F: Fees and Rate Schedules</b>	
Permitting and License Fees	F-1
LADWP Electricity Rate Schedule	F-2
SDGE Electricity Rate Schedule	F-3
SCE Electricity Rate Schedule	F-4
Southern California Gas Company Rate Schedule	F-5
City of San Clemente Water Rate Schedule	F-6
Moulton Niguel Water District Rate Schedule	F-6
<b>Section G: Memorandum of Understanding</b>	G-1

## **Abstract**

This report, "Commercialization of Professional Wet Cleaning," is one in a series of reports by the Pollution Prevention Education and Research Center evaluating the prospects for pollution prevention in the garment care industry in order to address the significant environmental and health impacts associated with the use of perchloroethylene (PCE), the chemical cleaning solvent used by 85% of all dry cleaners. This report is the first study to evaluate the transition from PCE-based dry cleaning to professional wet cleaning by multiple cleaners. The report analyzed the operations of five privately owned and operated dry cleaners who had switched from PCE-based dry cleaning to professional wet cleaning during the past fifteen months. Each of the five had received an equipment and training grant as part of the Professional Wet Cleaning Commercialization Project. The Commercialization Project, administered by the Pollution Prevention Education and Research Center at Occidental College, was designed to provide grants to cleaners switching from dry cleaning to professional wet cleaning and to evaluate the outcomes associated with that transition. By increasing the number of dedicated professional wet cleaners in the region, the Project sought to identify whether the establishment of a critical mass of professional wet clean facilities could provide demonstration sites as positive models for the garment care industry as well as create the infrastructure necessary to begin a larger transition towards non-PCE based cleaning methods, including professional wet cleaning. The study identified several criteria it employed to evaluate the success of each cleaner's conversion to professional wet cleaning. It also analyzed the factors that facilitate an effective transition to professional wet cleaning. Study results indicate that cleaners switching from PCE dry cleaning to professional wet cleaning can maintain their level of service, reduce their operating costs, and avoid having to comply with complex and potentially onerous PCE regulations and liability concerns. In addition, significant energy benefits were identified. The study also pointed to training, proper installation of equipment and machine programming, as well as the availability of demonstration facilities for new cleaners to observe the cleaning process as the primary factors that can facilitate a transition to this new technology.



# Executive Summary

## Background

This report, “Commercialization of Professional Wet Cleaning,” is one in a series of reports by the Pollution Prevention Education and Research Center evaluating the prospects for pollution prevention in the garment care industry in order to address the significant environmental and health impacts associated with the use of perchloroethylene (PCE or perc), the chemical cleaning solvent used by 85% of all dry cleaners. It is the first study to evaluate the transition from PCE-based dry cleaning to professional wet cleaning by multiple cleaners. The operations of five privately owned and operated dry cleaners who had switched from PCE-based dry cleaning to professional wet cleaning during the past fifteen months were analyzed. Each of the five had received an equipment and training grant as part of the Professional Wet Cleaning Commercialization Project. The Commercialization Project, administered by the Pollution Prevention Education and Research Center at Occidental College, was designed to provide grants to 8 cleaners switching from dry cleaning to professional wet cleaning and to evaluate the outcomes associated with that transition. By increasing the number of dedicated professional wet cleaners in the region, the Project sought to identify whether the establishment of a critical mass of professional wet clean facilities that could serve as demonstration sites would become positive models for the garment care industry as well as create the infrastructure necessary to begin a larger transition towards non-PCE based cleaning methods, including professional wet cleaning.

## Methods

The report provides, through the five case studies, a *plant level analysis* that compares the real world conditions for each cleaner in its transition from dry cleaning to professional wet cleaning. Four key factors were evaluated. Owner satisfaction criteria were used to measure the satisfaction of owners who made the switch. Performance criteria addressed whether a professional wet cleaner could effectively clean the full range of garments normally cleaned in dry cleaning. Financial criteria were used to measure whether the one-time cost of equipment and the ongoing operating expenses associated with professional wet cleaning were similar to costs incurred in PCE dry cleaning. The resource impacts of professional wet cleaning compared to PCE dry cleaning were also measured. A *summary level analysis* was then undertaken to compare the experiences of each of the cleaners converting to professional wet cleaning.

## Results

**Owner Satisfaction:** Each of the cleaners indicated that the switch to professional wet cleaning represented a good business decision and would recommend professional wet cleaning to other cleaners who needed to purchase new cleaning equipment.

- The cleaners interviewed were attracted to wet cleaning because unlike PCE dry cleaning it didn't trigger government regulations and there were no health or environmental issues to worry about. In addition, the cleaners were able to obtain information and observe other successful cleaners who had made the transition.
- After switching, cleaners reported greater work satisfaction and would strongly recommend, if asked, that other cleaners also make a switch to wet cleaning. They reported feeling better physically (no headaches or dizziness) and mentally (no stress from PCE regulations) since switching. All the cleaners considered switching a good business decision, which reflects their confidence in the performance quality of wet cleaning and their confidence in the system's financial viability.
- Lack of reliable information on professional wet cleaning led to concerns about performance and labor, and anxiety about using a new cleaning method for cleaners considering switching. Finding a good technician to install professional wet cleaning equipment was a challenge for cleaners who switched.

**Performance Assessment:** Each of the five cleaners were able to process the full range of garments that had previously been dry cleaned and were able to successfully retain their customer base while switching their cleaning process.

- At each cleaner, more than 62% of garments carry a dry clean label.
- Each of the cleaners was able to successfully wet clean nearly all garments (greater than 96%) brought in by customers.
- For each cleaner, their overall success rate in processing customer garments in wet cleaning was comparable to their success rate as dry cleaners.
- No cleaner reported receiving negative customer responses associated with their switch to professional wet cleaning.
- Each cleaner reported some level of positive response from customers associated with their switch to professional wet cleaning.

**Financial Assessment:** Operating costs were lower for cleaners in professional wet cleaning compared to when they were dry cleaning.

- Process dependent costs were reduced in professional wet cleaning between \$3.59 and \$17.49 per one hundred garments cleaned.
- While detergent costs were higher in wet cleaning, operating costs that were higher in dry cleaning included equipment, machine maintenance, hazardous waste, regulatory fees, electricity, and natural gas.
- The number of hours worked by employees did not increase for any of the five wet cleaners profiled.

**Resource Assessment:** Electricity use was substantially lower in processing garments in professional wet cleaning compared to dry cleaning. Natural gas use was somewhat lower, while water use appeared to be comparable or somewhat higher for wet cleaning, dependent on the volume of laundering done.

- Electricity use was between 12% and 46% lower in wet cleaning.
- Natural gas use was between 1% and 36% lower in wet cleaning.
- Water use rose by 17% at one cleaner and fell by 1% at another.

## **Conclusion**

Study results indicate that cleaners switching from PCE dry cleaning to professional wet cleaning can maintain their level of service, reduce their operating costs, and avoid having to comply with complex and potentially onerous PCE regulations and liability concerns. In addition, significant energy benefits are identified. The study also pointed to training, proper installation of equipment and machine programming, and access to demonstration facilities to observe the cleaning process as the primary factors that can facilitate a transition to this new technology.

# 1. Introduction

## 1.1 From Dry Cleaning to Professional Wet Cleaning

This report represents the latest research in a series of reports by the Pollution Prevention Education and Research Center evaluating the prospects for pollution prevention in the garment care industry. This includes the viability and the prospects for commercialization of professional wet cleaning as one potential pollution prevention alternative.

Dry cleaning is a widely recognized method for cleaning delicate garments and a convenient service that is offered in nearly every community in the United States. For more than forty years, the vast majority of dry cleaners have relied on perchloroethylene (PCE) as the solvent used to clean clothes as part of the dry cleaning process. In recent years, however, a wide array of scientific studies and federal, state, and local regulatory actions have focused on PCE in relation to the health and environmental risks that it poses. Costly regulatory and liability actions are becoming increasingly prevalent for this industry, and have created significant economic burdens for cleaners, most of whom are small businesses.

These concerns about the health and environmental effects of PCE, regulatory pressures, and the threat of liability actions have prompted, both inside and outside the garment care industry, a search for alternative cleaning processes. The first pollution prevention technology introduced commercially was *professional wet cleaning* -- a water-based cleaning process that uses computer-controlled washers and dryers, specially formulated detergents, and specialized finishing equipment to facilitate the cleaning of delicate garments in water. Beginning in the mid-1990's, case study evaluations of professional wet cleaners concluded that professional wet cleaning represented a viable pollution prevention technology for the garment care industry.

This report, "Commercialization of Professional Wet Cleaning," is the first study to evaluate the transition from PCE-based dry cleaning to professional wet cleaning by multiple cleaners. The study identifies several criteria that it employs to evaluate the success of each cleaner's conversion to professional wet cleaning. It also analyzes the factors that facilitate an effective transition to professional wet cleaning. Study results indicate that cleaners switching from PCE dry cleaning to professional wet cleaning can maintain their level of service, remain profitable, and avoid having to comply with complex and potentially onerous PCE regulations and liability concerns. In addition, significant energy benefits were identified. Water use varied, dependent in part on the cleaner's previous volume of laundering as a dry cleaner. The study also pointed to training, proper installation of equipment and machine programming as the primary factors that can facilitate a transition to this new technology

## **1.2 Background to the Report: A Pollution Prevention Approach**

The report analyzed the operations of five privately owned and operated dry cleaners who had switched from PCE-based dry cleaning to professional wet cleaning during the past fifteen months. Each of the five received an equipment and training grant as part of the Professional Wet Cleaning Commercialization Project. The Commercialization Project, administered by the Pollution Prevention Education and Research Center at Occidental College, was designed to provide grants to 8 cleaners switching from dry cleaning to professional wet cleaning and to evaluate the outcomes associated with that transition. By increasing the number of dedicated professional wet cleaners in the region, the Project sought to identify whether the establishment of a critical mass of professional wet clean facilities could provide demonstration sites as positive models for the garment care industry as well as create the infrastructure necessary to begin a larger transition towards non-PCE based cleaning methods, including professional wet cleaning. Support for the Professional Wet Cleaning Commercialization Project was provided by the South Coast Air Quality Management District, The California Wellness Foundation, The Gas Company, and Southern California Edison.

The Commercialization Project was developed in part to explore the opportunities for a pollution prevention, rather than pollution control, approach as a more effective environmental strategy in addressing and regulating environmental hazards. The current structure of environmental policy primarily focuses on minimizing pollution that is released into the environment and, to a lesser extent, mitigating workplace or consumer hazards that may result from the use of hazardous materials. This approach has an “end-of-pipe” focus; that is, controlling or mitigating the pollution after it has been created. The “end-of-pipe” or pollution control approach also emphasizes the use of technologies and procedures to control pollution releases, such as new equipment, monitoring and reporting requirements, and proper disposal. This type of regulation may help reduce environmental and occupation health impacts, but it fails to eliminate the source of the hazard or pollutant.

Since the 1980s, an alternative policy approach, popularly known as pollution prevention, has been developed as a way to focus on reducing or eliminating the source of the hazard or pollutant through new technologies, process design change, and/or undertaking various other source reduction-related changes at any stage in a production cycle. Such changes can potentially eliminate the need for end-of-pipe regulatory controls entirely. Pollution prevention strategies may rely on regulatory tools, voluntary action, or economic incentives or disincentives. Pollution prevention potentially offers a new paradigm or framework for action for environmental policy and industry decision-making.

To further that framework for action, the Pollution Prevention Education and Research Center (PPEREC) was established in 1991 as an interdisciplinary research, teaching, technical assistance, and outreach center. PPEREC faculty and staff are housed at Occidental College’s Urban and Environmental Policy Institute. As part of its mission, PPEREC has undertaken a series of industry-specific case studies and policy analyses to identify the opportunities and barriers to a pollution prevention approach. Since 1995,

PPEREC has been involved in an evaluation of pollution prevention opportunities in the garment care industry. This industry has been subject to a protracted and often bitterly debated regulatory process involving end-of-pipe control requirements and liability considerations, and represents an important example of the need to assess the commercialization of this new approach in the specific context of a potential pollution prevention alternative.

### **1.3 Description of the Professional Wet Cleaning Process**

The first clearly identifiable pollution prevention technology in the garment care industry to emerge has been an aqueous-based alternative known as *professional wet cleaning*.<sup>1</sup>

Wet cleaning, a process of hand-laundering delicate garments, had long been practiced by cleaners.<sup>2</sup> Professional wet cleaning industrialized this practice by using computer-controlled washers and dryers, specially formulated detergents, and specialized finishing equipment to create a cost-effective alternative to dry cleaning. The essential technological innovation of professional wet cleaning has been to mechanically simulate hand-laundering by retrofitting front loading commercial laundry machines with a computer to control the rotation of the drum in order to minimize agitation while providing sufficient movement for effective garment cleaning. (Figure 1.1) Wet clean washers are also equipped with a computer programmed detergent injection system, which allows the cleaner to specify the amount and type of wet clean detergent to be used for each load. Biodegradable cleaning agents have been formulated for wet cleaning by detergent manufacturers to maximize cleaning power while minimizing color change and shrinkage. Wet clean dryers include moisture sensors to assure that garments retain a proper amount of moisture after the dry cycle is complete. Specialized tensioning pressing machines are used to enhance the restoration of constructed garments, such as suit jackets, suit pants, and tailored items.

---

<sup>1</sup> In 1991, the German company Miele, introduced machine wet cleaning as an alternative to perc dry cleaning for fabrics labeled “dry clean only”.

<sup>2</sup> *Encyclopedia Americana*, 1970; Vol. 9.

**Figure 1.1: Professional Wet Cleaning System**



**Computer Controlled Washing**

- Ultra gentle agitation
- Low water level & low water temperature
- High extraction speed



**Detergent Dispensing System**

- Detergents remove stains/soils
- Conditioners add smoothness & softness
- Sizing adds body & helps with finishing



**Moisture Sensor Drying**

- Precise moisture control
- Detects residual moisture in garments
- Prevents overdrying



**Finishing Tensioning Equipment**

- Enhances restoration of constructed garments
- Uses steam to relax fibers and tension to reshape garments
- Hot air to dry

## 1.4 Previous Research on the Viability of Professional Wet Cleaning

Soon after the introduction in the U.S. of the first professional wet clean washer and dryer systems in 1992, government agencies began to seek information whether professional wet cleaning constituted a viable substitute for PCE dry cleaning. A number of agencies sponsored a series of empirical evaluations in the United States and Canada to assess the feasibility of professional wet cleaning in a commercial setting.<sup>3</sup> The results from these case studies have collectively provided a base line of information regarding the performance, economic, and environmental viability of the pollution prevention substitute technology.

## 1.5 Current Research Focus

Previous studies focused on cleaners who started up a new professional wet cleaning business. This is the first study to evaluate multiple cleaners who made the switch from PCE-based dry cleaning to professional wet cleaning.

The report analyzes the conversion of five cleaners in the southern California region who made the switch from PCE dry cleaning to professional wet cleaning during the past fifteen months. A *plant level analysis* compares the real world conditions of each cleaner as they converted from dry cleaning to professional wet cleaning. To evaluate the success of each cleaner's switch, four key assessment criteria were developed. Performance criteria addressed whether a professional wet cleaner could effectively clean the full range of garments normally cleaned in dry cleaning. Financial criteria were used to measure whether the one-time cost of equipment and the ongoing operating expenses associated with professional wet cleaning were similar to costs incurred in PCE dry cleaning. The resource impacts of professional wet cleaning compared to PCE dry cleaning were also measured. Owner satisfaction criteria were used to measure the satisfaction of owners who made the switch. A *summary level analysis* was then undertaken to compare the experiences of each of the cleaners converting to professional wet cleaning.

---

<sup>3</sup> Environment Canada; Participants, G. C. P. *Green Clean: Final Report for the Green Clean Project*, Environment Canada, 1995; Patton, J.; Eyring, W. *Alternative Clothes Cleaning Demonstration Shop Final Report*, Center for Neighborhood Technology, 1996; *Pollution Prevention in the Garment Care Industry: Assessing the Viability of Professional Wet Cleaning*, Pollution Prevention Education and Research Center, 1997; Sinsheimer, P.; Cho, J.; Gottlieb, R. *Switching to Pollution Prevention: A Performance and Financial Evaluation of Cypress Plaza Cleaners And The Issues Associated With Converting from Dry Cleaning to Wet Cleaning*, Pollution Prevention Education and Research Center, 1999; Star, A.; Ewing, S. *Real World Wetcleaning: A Study of Three Established Wetcleaning Shops*, Center for Neighborhood Technology, 2000.



## 2. Methods

### 2.1 Sample Selection

The five cleaners evaluated in this study all serve as professional wet cleaning demonstration sites and are part of the Professional Wet Cleaning Commercialization Project.<sup>4</sup> As a demonstration site, each cleaner received an equipment grant of \$12,500, technical assistance in selecting, installing, and operating professional wet clean equipment, and technical training in the operation of a professional wet cleaning facility. Each cleaner also received discounts from equipment manufacturers.<sup>5</sup> As a demonstration site, the cleaners agreed to host tours of their facility as well as to provide performance, financial, and resource use data to evaluate the impact of their switch.

The cleaners evaluated in this study included:

- San Clemente Dry Cleaning Center, San Clemente, CA
- Del Mar Cleaners, Venice, CA
- Anawood Cleaners, Anaheim, CA
- 1Day Cleaners, Mission Viejo, CA
- Eli's Airport Cleaners, Van Nuys, CA

### 2.2 Evaluation Criteria

A series of specific criteria were developed (in the form of questions to be answered) that sought to identify the parameters of what constituted professional wet cleaning viability and owner satisfaction.

#### Performance Criteria

- Can a 100% professional wet cleaner operate successfully; that is, accept the range and types of garments that can be serviced by a professional dry cleaner?
- Can garments be professionally cleaned without significant problems?
- Can garments be professionally cleaned to the customer's satisfaction?
- Can a professional cleaning business maintain its customer base in terms of cleaning performance over time?

---

<sup>4</sup> A sixth cleaner selected as a demonstration site, Rio Vista Cleaners, never operated dry clean equipment at this location prior to installing professional wet cleaning equipment. Before being allowed to operate at the location, the landlord required the current owner to remove an old dry clean machine and prohibited the installation of any new dry clean machines. Because this report focuses on cleaners who switched to professional wet cleaning, this cleaner was not included in this study.

<sup>5</sup> Discounts on wet clean washers and dryers was provided by Wascomat. Discounts on tensioning finishing equipment was provided by the European Finishing Equipment Corporation. Discounts on detergent dispensing systems were provided by Beta Technologies.

### Financial Criteria

- Are capital equipment costs for professional wet cleaning comparable to the costs for dry cleaning equipment?
- Is converting to professional wet cleaning comparable in relation to profitability?
- Do the financial risks associated with the cleaning process or other aspects of the business affect future costs or profit potential?
- Are the costs to consumers comparable?

### Resource Use Criteria

- Are the electricity, natural gas, and water uses in professional wet cleaning comparable to dry cleaning?

### Owner Satisfaction Criteria

- How satisfied are owners of cleaners who switch from dry cleaning to professional wet cleaning with their decision to convert?
- Have owners or workers experienced any adverse health effects associated with their exposure to cleaning chemicals prior to or after their switch to professional wet cleaning?
- How difficult was it for cleaners to convert to professional wet cleaning?

## **2.3 Study Design**

The study design was developed to address these specific performance, financial, resource use, and owner satisfaction criteria. A number of data sources were used in this evaluation, including: Records collected by the cleaners, automatic data loggers installed at individual cleaners, a structured interview questionnaire administered to each cleaner, and direct observation of cleaning operations.<sup>6</sup>

### **2.3.1 Performance Assessment**

For this study, performance capacity refers to the ability of professional wet cleaning to successfully clean garments that would otherwise be brought to a dry cleaner. Three methods were used for assessing performance.

- *A Profile of Customer Garments:* A profile of the customer garments that were cleaned at each of the five wet clean facilities included information about the care labels of the garments (for example, whether a garment was labeled “dry clean only”), the garment type (e.g., pants, jackets, etc.), and the fiber type (e.g., wool,

---

<sup>6</sup> See Appendix A for a copy of the structured interview questionnaire.

rayon, etc.). Customer profile data was gathered through an inventory of customer garments brought into each cleaner.

- *A Profile of Problem Garments:* An analysis of rejected garments (garments the cleaner refused to clean at the facility), redos (garments that were brought back by customers for additional work), and customer claims (money or store credit for ruined or lost garments) provided a quantitative measurement of the extent and type of garments that pose a problem for each cleaner prior to and after switching to professional wet cleaning. Data on a number of characteristics of garment rejects, redos, and claims were collected at each cleaner after the switch took place. A structured interview was conducted to quantify the frequency of problem garments when the cleaner operated as a dry cleaner to serve as a comparison to the data gathered from the wet cleaning operations.
- *Customer Response:* Response by customers to cleaners switching from dry cleaning to professional wet cleaning was evaluated by tracking the customer retention rate, and through a structured interview with each cleaner.

### **2.3.2 Financial Assessment**

For this study, financial capability refers to the extent to which operating a professional wet cleaning facility can be profitable. Because two of the five cleaners removed their dry clean machine one year prior to converting to professional wet cleaning (Anawood Cleaners and Del Mar Cleaners), the financial analysis primarily focuses on the three cleaners who were operating through dry clean equipment up to the point that their professional wet clean equipment was installed (San Clemente Dry Cleaning Center, 1Day Cleaners, and Eli's Airport Cleaners).

- *Equipment Cost:* The type and cost of professional wet cleaning equipment purchased by each cleaner was described. The type and cost of dry cleaning equipment in use at each cleaner prior to the switch was also described.
- *Process Cost Comparison:* A comparison of operating costs of professional wet cleaning compared to dry cleaning was also undertaken. The purpose of this analysis was to assess the relative profitability of operating each facility as a dry cleaner and as a professional wet cleaner. This analysis isolates those costs that vary in the two processes, or the “process dependent costs”, thus identifying the relative costs of operating a professional wet cleaning facility. This analysis draws on financial records provided by each facility, information from industry sources and reports from regulatory agencies, as well as through a structured interview and follow-up interviews with each cleaner.

### 2.3.3 Resource Assessment

An assessment of electricity, natural gas, and water use was undertaken to compare the relative resource demand of professional wet cleaning compared to dry cleaning.

- *Electricity and Natural Gas Use:* Monthly billing records for natural gas and electricity were evaluated at the three facilities operating dry cleaning machines immediately prior to switching to professional wet cleaning. In addition, natural gas and electricity meters were installed at two demonstration facilities prior to and after switching to professional wet cleaning.<sup>7</sup>
- *Water Use:* Monthly billing records for water use were evaluated at two of the three facilities operating dry cleaning machines immediately prior to switching to professional wet cleaning – San Clemente Dry Cleaning Center and 1Day Cleaners. Eli’s Airport Cleaners is not metered and does not pay a water bill.

### 2.3.4 Owner Satisfaction Assessment

An assessment of owner satisfaction with the decision to switch to professional wet cleaning was carried out as part of a structured interview with each cleaner.

- *Overall Satisfaction:* To gain an understanding of the degree of satisfaction with their new cleaning process, each cleaner was asked a series of questions, including: whether they felt it was a good business decision to switch, whether they would make the same decision again, how strongly they would recommend professional wet cleaning to another cleaner considering a possible switch, how they experienced any specific acute health effects they could identify in relation to each cleaning process, and how they would rate their overall level of satisfaction as a professional wet cleaner compared to their satisfaction as a dry cleaner.
- *Transition Issues:* To understand the difficulty of converting to professional wet cleaning, a series of questions were posed, including: concerns the cleaner had about converting before they actually converted, the degree of difficulty in actually converting, the biggest difficulties experienced by the cleaner in converting, the degree of difficulty in learning a new cleaning process, and the importance of technical training.

---

<sup>7</sup> At 1Day Cleaners, Southern California Edison installed and read electricity sub-meters prior to and after the cleaner switched to professional wet cleaning. The Gas Company installed natural gas sub-meters, which were read on a regular basis by the cleaner. At Eli’s Airport Cleaners, the Los Angeles Department of Water and Power installed and read electricity sub-meters prior to and after the cleaner switched to professional wet cleaning. The Gas Company installed natural gas sub-meters, which were read on a regular basis by the cleaner.

### **3. Results**

A case study evaluation was conducted for each of the five demonstration site cleaners who switch from dry cleaning to professional wet cleaning. Each case study includes: a background of the cleaner, including their motivation to switch; an evaluation of owner satisfaction in making the decision to switch; an evaluation of the transition process; a performance evaluation, and a financial evaluation (for the cases where financial data on costs before and after the switch were available).

### 3.1 San Clemente Dry Cleaning Center Case Study

<b>San Clemente Natural Cleaning Center</b>		<b>OWNER: MOON NOH</b>
<b>913 S. EL CAMINO REAL, SAN CLEMENTE, CA</b>		<b>Switch Date: 7/1/2001</b>
	<b>Wet Clean Washer</b>	Aqua Clean, 40 lb
	<b>Wet Clean Dryer</b>	Aqua Clean, 75 lb
	<b>Tensioning Pants Topper</b>	High Steam PAM510
	<b>Tensioning Jacket Topper</b>	High Steam JAM510
	<b>Detergent</b>	Laidlaw
	<b>Daily Volume</b>	220 garments
	<b>Staff</b>	1 presser 1 shirt presser 1 counter/presser 1 counter/operator (owner)

#### 3.1.1 Background

San Clemente Dry Cleaning Center is an owner-operator facility. The owner, Mr. Moon Noh, had been a dry cleaner for 27 years prior to switching to professional wet cleaning. He started his business in the same shop he owns today, which he bought after completing dry cleaning school (previously a requirement for obtaining a license). His interest in professional wet cleaning was due to the fact that his perc machine was reaching the end point of its useful life (10 years), and he wanted to switch to a technology that would free him from regulation. Mr. Noh decided to switch to professional wet cleaning after learning about the professional wet cleaning grant program and attending a demonstration workshop.

On June 30, 2001 Mr. Noh's dry clean machine was removed from his shop. A new wet clean system was installed over July 1-3, and professional wet cleaning training was completed in this same period. By July 3, 2001, San Clemente Dry Cleaning Center was able to offer full service professional wet cleaning.

#### 3.1.2 Transition Process Evaluation

Before switching, Mr. Noh's biggest concerns about professional wet cleaning were shrinkage of wool and silk garments, bleeding of silk garments, the fear that the overall quality of cleaning would not be as good as dry cleaning, and the fear of paying additional claims for ruined garments.<sup>8</sup> He stated that making the switch was somewhat

<sup>8</sup> See Appendix A for empirical data use in San Clemente Dry Cleaning Center case study.

difficult during the first two months due to problems with developing the correct programs for the washer and training employees in the use of the tensioning equipment. Mr. Noh stated that while learning how to wet clean garments was not difficult, training was very important in making a successful transition. The most important aspects of training for Mr. Noh were: learning how to operate and maintain the washer, dryer, and tensioning equipment; and learning how to talk with customers about the switch to the new cleaning technology.

### **3.1.3 Owner Satisfaction Evaluation**

Mr. Noh felt that switching to wet cleaning was an excellent business decision, and said he would make the same decision over again. He would strongly recommend wet cleaning to another cleaner who needs to buy new cleaning equipment.<sup>9</sup> The primary reasons for Mr. Noh's high level of satisfaction with professional wet cleaning include: the quality of cleaning is the same as before, he is free from regulation, he enjoys the work more, he is able to do his cleaning in the afternoon and on weekends,<sup>10</sup> and he feels better physically. In relation to acute health effects, Mr. Noh, when operating as a perc dry cleaner, reported experiencing symptoms of dizziness, headache, fatigue, a runny nose, and heightened allergic reactions. Since switching, Mr. Noh has not experienced any of these symptoms. One of Mr. Noh's pressers reported experiencing a runny nose when the cleaner operated as a dry cleaner. Since switching, the presser reported that this symptom has not re-occurred.

### **3.1.4 Performance Analysis**

#### Garment Profile

*Garments Wet Cleaned:* Of the 220 garments processed at this facility each day, approximately 100 are professionally wet cleaned.<sup>11</sup> The remainder of the garments are either laundered or hand washed. A total of 32,250 items or approximately 2,150 garments per month, have been professional wet cleaned at the facility in the fifteen months of operations since the switch to wet cleaning.

*Care Label:* Of the garments professionally cleaned at the facility, nearly three-quarters (73%) carry a dry clean label.<sup>12</sup>

---

<sup>9</sup> The cleaner stated that for a cleaner thinking about switching to professional wet cleaning: "Good for your conscience, good for the environment, good for health, and good for customers."

<sup>10</sup> Because the dry clean machines are attached to the boiler, dry cleaners traditionally do their cleaning in the morning hours. Because the wet clean system uses natural gas for heating, the cleaner is free to wet clean garments in the afternoon, after the boiler is turned off.

<sup>11</sup> See Appendix A, p. A-1 for performance data.

<sup>12</sup> Profile based on the labels of garments dry cleaned at San Clemente Dry Cleaning Center on 6/27/2001.

**Table 3.1: Garment Profile and Performance at San Clemente Dry Cleaning Center**

	<b>Dry Cleaning</b>	<b>Wet Cleaning</b>
<b>Garment Profile</b>		
Dry Clean Label	73%	<sup>13</sup> --
<b>Problem Garments</b>		
Returned	0.21%	0.21%
Sent Out	0.039%	0.019%
Claims	0.012%	0.009%
Success Rate	99.74%	99.76%
<b>Customer Response</b>		
Retention Rate	N/A	99.71%
Negative Customer Response	N/A	0%

Problem Garment Analysis

*Returned:* Since switching, one percent of garments have been returned by customers for additional work – the same rate as when the cleaner used a dry clean machine. (Table 3.1) Shrinkage and stain removal are now the primary reason for redos in professional wet cleaning. When the cleaner was operating as dry cleaner, stain removal and pressing were the most common reasons for redos .

*Garments Sent Out:* Similar to when the cleaner was dry cleaning, the only items the cleaner does not process in his shop are leather. Two ties were sent out soon after switching, before the cleaner learned to process these items in professional wet cleaning.

*Claims:* Since switching, the cleaner has paid three claims for damaged garments – two due to shrinkage and one due to color fading. The two claims for shrinkage occurred soon after switching, and the cleaner attributes the damage to incorrect programming on the professional wet cleaning washer – a problem subsequently corrected.

*Overall Success Rate:* Since switching to professional wet cleaning, the cleaner has successfully processed 98.8% of items brought in by customers – a percent comparable to when the facility was operating as a dry cleaner (98.7%).

Customer Response

*Customer Retention:* Since making the switch to professional wet cleaning, the cleaner has lost one customer due to a claim out of a customer base of 350; thereby retaining nearly all (99.7%) of the customers he had prior to switching to professional wet

---

<sup>13</sup> Figures on garment care label were not compiled at this and the other wet clean facilities after the switch since the customer base remained the same, assuming an equivalent garment profile.



cleaning.<sup>14</sup> In addition to retaining his customers, Mr. Noh reported a 5% gain or approximately 20 new customers.

*Customer Response:* Mr. Noh changed the name of his shop to San Clemente Natural Cleaning Center in order to promote the environmental benefits of the new cleaning method. The cleaner notifies customers about his switch to professional wet cleaning through signs and brochures displayed in the shop, and an information sign installed two months after the switch. The customers’ response to wet cleaning has been positive overall. Although there were re-do’s and claims processed since the switch, Mr. Noh’s customers have not expressed concerns about the effectiveness of professional wet cleaning. Some customers have identified their preference for wet cleaning as non-toxic and environmentally preferable.

### 3.1.5 Financial Analysis

To measure the relative profitability at San Clemente Dry Cleaning Center as a professional wet cleaning facility compared to its operation as a dry cleaning facility, specific line item expenses were measured.<sup>15</sup> Expenses that differ between the two cleaning processes are identified as “process dependent costs”. These costs have been standardized per 100 garments cleaned and summarized in the table below.

**Table 3.2: Process Dependent Costs per 100 Garments Cleaned: San Clemente Dry Cleaning Center**

	Dry Clean	Wet Clean
<b>Variable Expenses</b>		
Labor <sup>16</sup>	n.a.	n.a.
Solvent	\$1.06	\$0.00
Detergent	\$1.13	\$1.87
Water	\$0.92	\$0.91
Electricity	\$1.79	\$0.97
Gas	\$4.99	\$4.81
Filter cost	\$1.27	\$0.00
Hazardous waste disposal	\$2.11	\$0.00
Machine Maintenance.	\$3.26	\$0.56
<b>Fixed Expenses</b>		
Regulatory fees	\$2.29	\$0.00
Equipment	\$6.22	\$3.11
<b>TOTAL</b>	<b>\$25.04</b>	<b>\$12.23</b>

<sup>14</sup> See Appendix A, p.10 (Wet Clean Survey) for customer response data.

<sup>15</sup> Appendix A, p. A-2. for financial data.

<sup>16</sup> Mr. Noh did not provide information on overall labor costs, but estimated that the labor utilized for dry cleaning averaged approximately 3 hours more per day (over a five day work week) than wet cleaning. The differential was related to the reduced time on pressing in wet cleaning spent by Mr. Noh’s two pressers related to the advanced pressing equipment purchased as part of the switch.

## Total Process Dependent Costs Comparison

Total process dependent costs at San Clemente Dry Cleaning Center have been cut by more than 50% since switching to professional wet cleaning -- \$25.04 in the dry cleaning operation versus \$12.23 per 100 garments cleaned in wet cleaning.

### Costs Greater in Dry Cleaning

*Perc and Hazardous Waste:* As a dry cleaner, Mr. Noh experienced a number of costs associated with the use of PCE solvent and the hazardous waste and air emissions it produces. He purchased approximately 80 gallons a year of PCE solvent at a cost of \$7.50 a gallon. Mr. Noh estimated that it cost him \$1,200 a year to dispose of the waste produced by using PCE solvent, which includes perc sludge and used filters. A PCE dry cleaner is also required to pay fees and purchase a number of permits from regulatory agencies because of the production and storage of hazardous waste, and the emission of hazardous air pollutants. These permits and fees cost Mr. Noh a total of \$1,297.39 a year.

*Equipment and Maintenance Costs:* The list prices of the equipment purchased by Mr. Noh in order to switch to professional wet cleaning totaled \$35,383. This included a 40 lb washer, 75 lb dryer, a tensioning pants topper, and a tensioning jacket topper. Mr. Noh purchased his dry clean machine for over \$52,000 in 2002 dollars. In addition to the initial costs being lower, a wet clean system has a longer life span (20 years) than a dry clean machine (15 years), and it costs less to maintain. Industry estimates for the maintenance of a PCE dry clean machine<sup>17</sup>, based on a percentage of revenue, would be over \$1,800 a year for Mr. Noh compared to \$320 a year for the maintenance of wet clean equipment.

*Energy Use:* Mr. Noh has significantly reduced his consumption of electricity (46%) since switching to wet cleaning. The average monthly cost to Mr. Noh for electricity as a dry cleaner was \$84.51, compared to \$45.66 as a wet cleaner.<sup>18</sup> Natural gas use has been slightly reduced (4%) by 15 therms or \$8.52 a month.

### Costs Greater in Wet Cleaning

*Detergent:* Mr. Noh spends an average of \$88 a month on 15 gallons of detergents as a wet cleaner.<sup>19</sup> Wet clean detergent costs between \$10.95 and \$13.30 a gallon. As a dry cleaner, less than four gallons of detergent were used a month, at a cost of \$16.00 a gallon.

---

<sup>17</sup> An annual maintenance cost for PCE dry clean machines of 0.88% of revenue, based on IFI and NCAI estimates, was used for this study.

<sup>18</sup> Mr. Noh consumed an average of 1132.10 kWh a month as a dry cleaner, and 611.34 kWh as a wet cleaner.

<sup>19</sup> Based on United Fabricare billing records from 10/01 to 8/02.

### Costs Unchanged

*Labor:* Since switching to wet cleaning, the pressers at San Clemente Dry Cleaning Center are now working three less hours a day. As the operator, Mr. Noh said that he puts the same amount of effort into running his shop as he did before switching.<sup>20</sup>

*Water:* Water consumption has dropped slightly since switching to wet cleaning (1%, or about 150 gallons a month). Consumption had been falling steadily prior to switching to wet cleaning, so this reduction may be attributed in part to the continuation of that trend. No significant cost savings are gained, given the size of the reduction and the relatively low cost of water.

---

<sup>20</sup> In response to interview question 10/1/02

### 3.2 Del Mar Cleaners Case Study

<b>Del Mar Natural Cleaners</b>		<b>OWNER: INES MIRELES</b>
<b>701 WASHINGTON BLVD., MARINA DEL REY, CA</b>		<b>Switch Date: 2/7/2002</b>
	<b>Wet Clean Washer</b>	Aqua Clean, 40 lb.
	<b>Wet Clean Dryer</b>	Aqua Clean, 75 lb.
	<b>Tensioning Pants Topper</b>	High Steam PAM510
	<b>Tensioning Jacket Topper</b>	High Steam JAM510
	<b>Detergent</b>	Laidlaw
	<b>Daily Volume</b>	175 garments
	<b>Staff</b>	2 pressers, 1 counter/delivery, 1 counter/bagging, 1 operator, 1 owner (counter)

#### 3.2.1 Background

Del Mar Natural Cleaners, located in Marina Del Rey, is owned by Ines Mireles, a first generation Mexican immigrant. Ms. Mireles, a professional cleaner for over seven years, became the sole owner of the shop in January of 2002. She was the second dry cleaner in the South Coast region to make the switch from PCE dry cleaning to professional wet cleaning as part of the Professional Wet Cleaning Commercialization Project. Two years earlier, it was discovered that the soil at the plant site was contaminated with PCE. Due to this problem, Ms. Mireles was forced to discard her perc machine and thus became a drop shop for over a year. However, her landlord still refused to renew the lease if Ms. Mireles continued using perc, so she began looking at alternative technologies. Ms. Mireles decided to switch to wet cleaning after attending a workshop at Cypress Plaza Cleaners in Spring 2001.

Training began for Ms. Mireles and a member of her pressing staff in January 2002, with a session at San Clemente Dry Cleaning Center observing how garments are processed in professional wet cleaning. Equipment was installed and in-store training was completed at Del Mar Cleaners February 1-3. Ms. Mireles began wet cleaning garments the day after training.

#### 3.2.2 Transition Process Evaluation

Before switching, Ms. Mireles' major concerns about professional wet cleaning included learning a new cleaning method, shrinkage of wool garments, and that it would take

longer to finish garments.<sup>21</sup> Actual difficulties with the switch included problems with proper installation of equipment, problems with how the wet clean washer was programmed, and training employees in the use of the tensioning equipment.<sup>22</sup> Technical training was seen as very important in making a successful transition to professional wet cleaning; since it provided the cleaner with more confidence in processing garments on her own.

### 3.2.3 Owner Satisfaction Evaluation

Ms. Mireles now feels that switching to professional wet cleaning was a good business decision, but was not sure in the beginning because of problems with quality control.<sup>23</sup> In spite of these early problems, she states that she would make the same decision to switch to wet cleaning again, and would strongly recommend wet cleaning to another cleaner who needs to buy new cleaning equipment.. Ms. Mireles rates her level of satisfaction as a wet cleaner to be higher in comparison to her level of satisfaction as a dry cleaner, because she doesn't worry any more about inspections or inhaling perc fumes. In relation to acute health effects, Ms. Mireles did not operate her dry cleaning machine, and did not experience any symptoms from perc exposure. Her operator, however, suffered from dizziness and headaches when dry cleaning. These symptoms have disappeared since switching to wet cleaning.

### 3.2.4 Performance Analysis

#### Garment Profile:

*Garments Wet Cleaned:* Of the 245 garments cleaned at the shop every day, about 175 are professionally wet cleaned.<sup>24</sup> A total of 31,605 garments have been professionally wet cleaned at the facility.<sup>25</sup>

*Care Label:* Of the garments professionally cleaned at the facility, 63% carry a dry clean label.<sup>26</sup>

---

<sup>21</sup> See Appendix B for empirical data used in Del Mar Cleaners case study.

<sup>22</sup> The cleaner reports that it took three days to train a new employee in the use of the tensioning form finisher. The new employee was provided basic instruction in the use of the machine, and the cleaner needed to return a number of garments for additional pressing during the first three days. After three days, the new presser learned the proper method and the need for intensive quality control was no longer necessary.

<sup>23</sup> See Problem Garment Analysis below.

<sup>24</sup> See Appendix B, p. B-1 for performance data.

<sup>25</sup> Ms. Mireles professionally wet cleans about 4,515 garments a month, and has been a wet cleaner for over 7 months.

<sup>26</sup> Profile based on the labels of garments dry cleaned at Del Mar Cleaners on 12/19/01. See Appendix B, p. 1 for performance data.

**Table 3.3: Garment Profile and Performance at Del Mar Cleaners**

	<b>Dry Cleaning</b>	<b>Wet Cleaning</b>
<b>Garment Profile</b>		
Dry Clean Label	63%	<sup>27</sup> --
<b>Problem Garments</b>		
Returned	0.33%	0.07%
Sent Out	0.18%	1.3%
Claims	0.012%	0.0098%
Success Rate	99.5%	98.6%
<b>Customer Response</b>		
Retention Rate	N/A	98.9%
Negative Customer Response	N/A	0%

Problem Garment Analysis

*Garments Returned:* Since successfully reprogramming the wet clean washer, only 3 garments a month, on average, are returned for additional work.<sup>28</sup> As a dry cleaner, customers brought back 3 to 4 garments a week. Initially, there was a higher return rate in wet cleaning due to problems with shrinking in wool and rayon pants and jackets. This was resolved by reprogramming the wet clean machine’s computer. As a dry cleaner, most returns were due to trouble getting spots out.

*Garments Sent Out:* As a dry cleaner, only leather items were sent out (about 8 a month). Now, leather items and ties are sent out (leather – 8 a month, ties – 12 a month). Ms. Mireles recently purchased equipment (tie forms) and is awaiting training in this area to begin processing ties in house.

*Claims:* Before reprogramming the wet clean washer, the cleaner paid six claims; four were due to shrinkage, and two others were associated with shrinkage problems the cleaner felt to be without merit though she paid the claims to maintain goodwill with the customer. After reprogramming the washer, the cleaner has paid two claims; both due to shrinkage. As a dry cleaner, six to seven claims were paid every year, usually for discoloration or damage due to spot removal.

*Overall Success Rate:* Since switching to professional wet cleaning, 98.7% of garments have been successfully wet cleaned, which is 0.4% lower than the success rate when dry cleaning. This lower success rate is primarily due to the number of ties being sent out.

<sup>27</sup> Figures on garment care label were not compiled after the switch since the customer base remained the same, assuming an equivalent garment profile.

<sup>28</sup> Problem garment analysis focuses on the experience of Del Mar Cleaners in the period of time after errors in her wet clean program were corrected at the end of May 2002.

### Customer Response:

*Customer Retention:* The cleaner has retained nearly all (98.9%) of the customers she had before the switch to wet cleaning. Five or six regular customers, according to Ms. Mireles, were lost due to claims out of a customer base of 500. Since the switch, Del Mar Cleaners has gained twenty new customers, which Ms. Mireles attributes in large part to the sign outside the facility advertising “natural cleaning.”

*Customer Response:* Once Ms. Mireles became comfortable operating the new cleaning system, she decided to change the name of her shop, from Del Mar Cleaners, to Del Mar Natural Cleaners, which reflected the environmental benefits associated with the technology. Currently, customers are notified of the wet cleaning process through a sign at the counter, information brochures, and a sign outside above the parking lot. These signs promote the use of an environmentally preferable process, and a *Good Earthkeeping Award*, received from the city of Los Angeles, is displayed near the counter. Customers’ initial reaction to the switch has been increased interest in the cleaning process. None of the customers have expressed concerns about the quality of wet cleaning. Even in cases where there was damage to garments, the customers have not attributed the problem to the cleaning process.

### **3.2.5 Financial and Resource Use Analysis**

Data was not able to be compiled for a comparative financial analysis since Del Mar Cleaners had removed their dry clean machine one year prior to installing professional wet clean equipment.

### **3.2.6 Resource Use Analysis**

Data was not able to be compiled for a comparative resource use analysis since Del Mar Cleaners had removed their dry clean machine one year prior to installing professional wet clean equipment.

### 3.3 Anawood Cleaners Case Study

<b>Anawood Cleaners, All Natural</b>		<b>OWNERS: STEVE KANAAN &amp; THU DUONG</b>
<b>1223 S. EUCLID ST., ANAHEIM, CA</b>		<b>Switch Date: 7/19/2002</b>
	<b>Wet Clean Washer</b>	Aqua Clean, 40 lb
	<b>Wet Clean Dryer</b>	Aqua Clean, 75 lb
	<b>Tensioning Pants Topper</b>	High Steam PAM510
	<b>Tensioning Jacket Topper</b>	High Steam JAM510
	<b>Pressing Equipment</b>	2 leggers, puffer, suzy, flat board, 2 shirt presses
	<b>Detergent</b>	Laidlaw
	<b>Daily Volume</b>	300 garments
	<b>Staff</b>	3 Pressers full time 1 co-owners (operator) 1 co-owner (counter)

#### 3.3.1 Background

Anawood Cleaners is located in Anaheim, and has two co-owners, Steve Kanaan and Thu Duong. Steve Kanaan, who facilitated the switch to wet cleaning, entered the dry cleaning business two and half years ago, and has co-owned his current shop for two years. For most of the past year, however, Anawood had been operating solely as a drop shop since the landlord was not willing to renew its lease while a PCE dry cleaning machine was used on the premises. In the summer of 2001 Mr. Kanaan and Ms. Duong attended a wet cleaning demonstration at Cypress Plaza Cleaners and decided to apply for the Professional Wet Clean Commercialization grant that they received in the Spring of 2002.

In the week prior to installing professional wet cleaning equipment, the pressing staff and the cleaner spent a day observing the professional wet cleaning process at San Clemente Natural Cleaning Center. On July 13-14, 2002, professional wet cleaning equipment was installed. On-site technical training was completed on July 19. Anawood cleaners began processing all of its customers' garments in the professional wet cleaning system the day after training on July 20, 2002.

#### 3.3.2 Transition Process Evaluation

Before switching, the cleaner expressed concern about garment shrinkage and whether he would be able to learn enough from the training to be able to process all garments right



away.<sup>29</sup> The only difficulties identified by the cleaner in making the switch was finding a good installer, and correcting two installation problems; the gas line for the dryer was too small and an electrical circuit on the tensioning pants topper needed service. The cleaner expected the switch to wet cleaning to be very difficult, but did not find the kind of difficulties anticipated when the switch occurred. The cleaner attributes the relative ease in making the switch to the quality of technical training. A key to the success of the training was an extended session observing the professional wet cleaning process at the trainer's cleaners for both the cleaner and for the pressing staff that included a thorough explanation of how to operate the machines after they were installed.

### 3.3.3 Owner Satisfaction

Mr. Kanaan now feels that switching to wet cleaning was a good business decision, but said it had been a hard decision to make. He would, however, make the same decision again, and strongly recommends wet cleaning to any cleaner who needs to buy new cleaning equipment, citing the environmental benefits, chemical dangers of perc, and freedom from regulation as his reasons. In relation to acute health effects, Mr. Kanaan experienced headaches in the evening as a dry cleaner, but hasn't since switching to wet cleaning. Mr. Kanaan rates his overall level of satisfaction as a wet cleaner as higher than when he was a dry cleaner.<sup>30</sup>

### 3.3.4 Performance Analysis

#### Garment Profile:

*Garments Wet Cleaned:* Of the 320 garments cleaned at this facility each day, approximately 60 are professionally wet cleaned.<sup>31</sup> A total of 3,960 garments have been professionally wet cleaned at Anawood Cleaners.<sup>32</sup>

*Care Label:* Of the garments professionally cleaned at the facility, over 90% have a dry clean label.<sup>33</sup>

#### Problem Garment Analysis

*Garments Returned:* Since switching, no garments have been returned by customers for additional work, an improvement from the cleaner's 2% rate of return as a dry cleaner. Mr. Kanaan attributes this primarily to more quality control. As a dry cleaner, returned items usually needed further stain removal.

---

<sup>29</sup> See Appendix C for empirical data used in Anawood cleaners case study.

<sup>30</sup> Ibid: Said he didn't like the smell of PCE in the shop when dry cleaning

<sup>31</sup> See Appendix C, p. C-1 for performance data.

<sup>32</sup> Mr. Kanaan professionally wet cleans about 360 garments a week, and has been a wet cleaner for over 11 weeks.

<sup>33</sup> Label profile estimated by Mr. Kanaan, who reads the label on everything he cleans.

*Garments Sent Out:* As with dry cleaning, the only items the cleaner does not process in house are leathers. About three to four leather items were sent out every month as a dry cleaner, and about three a month have been sent out as a wet cleaner.

*Claims:* No claims have been paid since switching three months ago. As a dry cleaner, only one claim was paid over two years for \$20 related to a stain issue.

*Overall Success Rate:* Since switching to wet cleaning, the cleaner has successfully cleaned 99.8% of garments brought in by customers – two percent higher than when the facility was operating as a dry cleaner.

**Table 3-4: Garment Profile and Performance at Anawood Cleaners**

	<b>Dry Cleaning</b>	<b>Wet Cleaning</b>
<b>Garment Profile</b>		
Dry Clean Label	<sup>34</sup> --	92%
<b>Problem Garments</b>		
Returned	2%	0%
Sent Out	0.19%	0.19%
Claims	0.0027%	0.00%
Success Rate	97.8%	99.8%
<b>Customer Response</b>		
Retention Rate	N/A	100%
Negative Customer Response	N/A	0%

Customer Response

*Customer Retention:* The cleaner has not lost any of his customer base since switching to wet cleaning.

*Customer Response:* The cleaner immediately notified customers of the switch to professional wet cleaning with an information flyer on the counter, and has discussed what he considers to be the benefits of wet cleaning (e.g. chemical free, environmental benefits, no odor) with some his regular customers. In addition, the owners have placed an information brochure in a visible area of the shop, and are in the process changing the outside sign to read “Anawood Cleaners, All Natural.” By marketing their new process, they are hoping to attract customers concerned with the environment. The customers informed of the switch have not mentioned any concerns about performance issues regarding wet cleaning. The owner states that customers in general have not noticed a

---

<sup>34</sup> Label profile was not compiled for the dry clean operation since it had not been operating on site immediately prior to the switch.

difference in quality, although they comment that clothes look cleaner and smell better once they have become aware of the switch (a factor that could also be associated with their environmental preferences as well).


### **3.3.5 Financial and Resource Use Analysis**

Data was not able to be compiled for a comparative financial analysis since Anawood Cleaners had removed their dry clean machine one year prior to installing professional wet clean equipment.

### **3.3.6 Resource Use Analysis**

Data was not able to be compiled for a comparative resource use analysis since Anawood Cleaners had removed their dry clean machine one year prior to installing professional wet clean equipment.

### 3.4 1Day Cleaners Case Study

<b>1Day Cleaners</b>		<b>OWNER: YONG CHON</b>
<b>23002 LOS ALISOS, MISSION VIEJO, CA</b>		<b>Switch Date: 07/20/02</b>
	<b>Wet Clean Washer</b>	Aqua Clean, 40 lb
	<b>Wet Clean Dryer</b>	Aqua Clean, 75 lb
	<b>Tensioning Pants Topper</b>	High Steam, PAM510
	<b>Tensioning Jacket Topper</b>	High Steam, JAM510
	<b>Detergent</b>	Laidlaw
	<b>Daily Volume</b>	400 garments
	<b>Staff</b>	2 presser 1 seamstress 1 operator (owner) 1 counter (owner)

#### 3.4.1 Background

1Day Cleaners, operated by Yong Chon, a first generation Korean immigrant, is located in Mission Viejo. Mr. Chon became a dry cleaner ten years ago; part of a career change decision. Although he had no previous experience in the industry, he was a knowledgeable entrepreneur and therefore felt confident that he could become a successful cleaner. As a result, he bought 1Day Cleaners, to enter the garment care business.

After having suffered a stroke, Mr. Chon began to consider alternatives to perc due to concerns about possible health effects from exposure to perc. In addition, his landlord, 7-Eleven, Inc., had established a new policy whereby it would refuse to renew all leases for on-site dry cleaning plants at any of its facilities. Mr. Chon was then given the option of continuing his business as a drop off/pickup facility. Mr. Chon had heard from other cleaners about professional wet cleaning and attended a PPERC demonstration. Impressed by the technology and the possible health and environmental benefits associated with the process, Mr. Chon successfully applied to become one of the new professional wet cleaning demonstration sites. Mr. Chon subsequently asked PPERC to contact 7-Eleven, Inc. in order to explore the option of replacing his dry cleaning machine with professional wet cleaning equipment as a basis for extending his lease. PPERC submitted a memo to 7-Eleven Inc., through the property manager, and after an internal environmental review by 7-Eleven, Mr. Chon was granted a lease extension to operate as a wet cleaning plant. On July 19, 2002 Mr. Chon's dry cleaning equipment was removed from his facility. On July 20-22, professional wet cleaning equipment was installed. On-site technical training was completed July 23. Mr. Chon began processing all of his customers' garments in the professional wet cleaning system the day after the training on July 24.

### 3.4.2 Transition Process Evaluation

Prior to switching, the only concern Yong Chon had about professional wet cleaning was how difficult it would be to remove oil based stains.<sup>35</sup> The biggest difficulties making the switch included the installation of new equipment, learning the mechanics of the machines, and getting rid of the old perc machine. While the cleaner found it instructive to visit three professional wet cleaning facilities before making the switch, he did not feel that the training was significant in making a successful transition. He did state that he would like to receive specific training to learn how to program the wet clean washer.

### 3.4.3 Owner Satisfaction Evaluation

Mr. Chon feels that the decision to switch to wet cleaning was a good business decision, and he would make the same decision over again. He emphasizes operational cost savings and freedom from regulation and liability concerns. Mr. Chon is considering opening another professional wet cleaning operation that would be accompanied by a strong advertising campaign. In relation to acute health effects, Mr. Chon, when operating as a dry cleaner, experienced dizziness, headaches, fatigue and a runny nose. He also suffered from a stroke, which his doctor told him might have been a consequence of sleeping in the shop and breathing in perc fumes. Mr. Chon's wife, Joyce Chon, also experienced dizziness and headaches when they were operating as a dry cleaner. None of these symptoms have been experienced since switching to professional wet cleaning. Overall, Mr. Chon rates his level of satisfaction as a wet cleaner to be much higher than his level of satisfaction as a dry cleaner.

### 4.4.4 Performance Analysis

#### Garment Profile:

*Garments Wet Cleaned:* Of the 290 garments cleaned daily at this facility, approximately 85 are professionally wet cleaned, with the remainder laundered.<sup>36</sup> A total of 6,579 garments have been professionally wet cleaned at 1Day Cleaners in the three months since the switch.

*Care Label:* Of the garments professionally cleaned at the facility, 68% carry a dry clean label.<sup>37</sup>

---

<sup>35</sup> See Appendix D for empirical data used in 1Day Cleaners case study.

<sup>36</sup> See Appendix D, p. D-1 for performance data. Figure based on volume data collected 8/16/2002 – 9/30/2002. Mr. Chon also runs a large shirt laundry operation at the facility.

<sup>37</sup> Profile is based on labels of garments dry cleaned at 1Day Cleaners on June 27, 2001.

**Table 3-5: Garment Profile and Performance at 1Day Cleaners**

	<b>Dry Cleaning</b>	<b>Wet Cleaning</b>
<b>Garment Profile</b>		
Dry Clean Label	68%	<sup>38</sup> --
<b>Problem Garments</b>		
Returned	0.05%	0%
Sent Out	0.29%	0.29%
Claims	0.0038%	0.015%
Success Rate	99.66%	99.69%
<b>Customer Response</b>		
Retention Rate	N/A	100%
Negative Customer Response	N/A	0%

Problem Garment Analysis

*Garments Returned:* Since switching, no garments have been returned for additional work. As a dry cleaner 0.05% of garments were returned for additional work. Stains and spots were common reasons for garments’ return when dry cleaning.

*Garments Sent Out:* As with dry cleaning, the only items not processed on site are leathers and rugs. The cleaner has been sending out the same number of leathers and rugs as a wet cleaner that were being sent out when dry cleaning.

*Claims:* One claim has been paid since switching due to a color transfer problem with a garment. As a dry cleaner, about one claim a year was paid, usually due to color transfer.

*Overall Success Rate:* Since switching to wet cleaning, the cleaner has successfully wet cleaned 99.7% of garments brought in by customers, a rate nearly identical to the 99.6% success rate as a dry cleaner.

Customer Response

*Customer Retention:* The cleaner has retained 100% of his customer base since switching to professional wet cleaning.

*Customer Response:* Mr. Chon has not notified customers of his switch to wet cleaning. He is waiting until the end of the year before initiating his marketing plans. He is hoping

---

<sup>38</sup> Figures on garment care label were not compiled after the switch since the customer base remained the same, assuming an equivalent garment profile.

to open an additional wet cleaner and advertise the environmentally preferable, non-toxic qualities of this alternative technology.

Although Mr. Chon has not informed his customers that he is using professional wet cleaning, a number of people (eight) have responded positively, due to the elimination of odor problems and more effective cleaning. Although one claim has been paid since using the professional wet cleaning system, the customer did not attribute it to wet cleaning although she was not aware of a change in the cleaning method.

#### 4.4.5 Financial Analysis

To measure the relative profitability at 1Day Cleaners as a professional wet clean facility compared to its operations as a dry cleaner, specific line item expenses incurred at the facility and process dependent costs were measured.<sup>39</sup> Expenses that differ between the two cleaning processes are identified as “process dependent costs”. These costs have been standardized per 100 garments cleaned and summarized in the table below.

##### Total Process Dependent Costs Comparison

Total process dependent costs at 1Day Cleaners have been cut by more than 15% since switching to professional wet cleaning -- \$21.11 in the dry cleaning operation versus \$17.52 per 100 garments cleaned in wet cleaning.

**Table 3-6: Process Dependent Costs per 100 Garments Cleaned: 1Day Cleaners**

	Dry Clean	Wet Clean
<b>Variable Expenses</b>		
Labor	No change	No change
Solvent	\$1.33	\$0.00
Detergent	\$0.21	\$4.41
Water	\$0.22	\$0.34
Electricity	\$5.43	\$4.77
Gas	\$5.72	\$5.68
Filter cost	\$0.33	\$0.00
Hazardous waste disposal	\$0.72	\$0.00
Machine Maintenance.	\$2.43	\$0.36
<b>Fixed Expenses</b>		
Regulatory fees	\$1.45	\$0.00
Equipment	\$3.27	\$1.96
<b>TOTAL</b>	<b>\$21.11</b>	<b>\$17.52</b>

<sup>39</sup> See Appendix D, p.2-11 for financial data.

### Expenses Greater as a Dry Cleaner

*Perc and Hazardous Waste:* As a dry cleaner Mr. Chon faced a number of costs associated with the use of perc solvent and the hazardous waste and air emissions it produces. He purchased approximately 160 gallons of perc every year at \$7.50 a gallon, and estimated that he spent \$650 disposing of the hazardous waste he produced (80 gallons) every year. As a producer of hazardous waste and air emissions, Mr. Chon was required to purchase permits and pay fees totaling to \$1,297.39 every year.

*Equipment and Maintenance Costs:* The list prices of the equipment purchased by Mr. Chon in order to switch to professional wet cleaning totaled to \$35,277. This included a 40 lb washer and 75 lb dryer, a tensioning pants topper, and a tensioning jacket topper. Mr. Chon did not purchase the dry clean machine he used prior to switching. The estimated cost of this machine is \$44,116.<sup>40</sup> Operating costs are considerably lower for wet cleaning when also factoring in the longer life span of wet cleaning equipment (20 years) than dry cleaning equipment (15 years), in addition to lower maintenance costs. Industry estimates for the maintenance of a perc dry clean machine,<sup>41</sup> based on a percentage of revenue, would be over \$2,100 a year for Mr. Chon compared to \$320 a year for the maintenance of wet clean equipment.

*Energy Use:* Mr. Chon has reduced his consumption of electricity by 12% since switching to wet cleaning. The average monthly cost to Mr. Chon for electricity as a dry cleaner was \$407, compared to \$357 as a wet cleaner.<sup>42</sup>

### Costs Greater in Wet Cleaning

*Detergent:* Mr. Chon has purchased 80 gallons of wet cleaning detergent for \$991.25 since switching to wet cleaning three months ago (\$330 per month). Wet clean detergents cost between \$11 and \$13 a gallon. As a dry cleaner, Mr. Chon used one gallon a month of dry clean detergent, which cost \$16 a gallon.

*Water:* Since switching to wet cleaning, water consumption has increased 17%. Mr. Chon uses 19,074 gallons a month of water as a wet cleaner compared to 16,240 gallons a month as a dry cleaner. The financial impact of this increase is small -- \$4 a month.

### Costs Unchanged

*Labor:* The number of hours worked by employees at 1Day Cleaners has not changed since the switch to wet cleaning. Mr. Chon reported that he spends the same amount of

---

<sup>40</sup> Based on a dry to dry with CA (PCE-B2) machine.

<sup>41</sup> An annual maintenance cost for PCE dry clean machines of 0.88% of revenue, based on IFI and NCAI estimates, was used for this study.

<sup>42</sup> Mr. Chon consumed an average of 2,415 kWh a month as a dry cleaner, and 2,122 kWh a month since switching to wet cleaning, according to estimates based on metering done at his shop before and after the switch.



time in the shop, but enjoys his work more as a wet cleaner in spite of having to work a little harder compared to when he was dry cleaning.

*Natural Gas:* Based on daily meter readings taken before and after the switch, natural gas consumption at 1Day Cleaners has essentially remained the same. Average daily use before the switch was 28.6 therms compared to 28.4 therms after the switch. A longer time period of data collection will reveal a more certain picture of the effect that switching wet cleaning is having on natural gas use.

### 3.5 Eli's Airport Cleaners Case Study

<b>Eli's Airport Cleaners</b>		<b>OWNER: ELI GICHON</b>
<b>16500 SHERMAN WAY, VAN NUYS, CA</b>		<b>Switch Date: 7/27/2002</b>
	<b>Wet Clean Washer</b>	Aqua Clean, 40 lb.
	<b>Wet Clean Dryer</b>	Aqua Clean, 75 lb
	<b>Tensioning Pants Topper</b>	High Steam, PAM510
	<b>Tensioning Jacket Topper</b>	High Steam, JAM510
	<b>Detergent</b>	Laidlaw
	<b>Daily Volume</b>	92 garment
	<b>Staff</b>	1 operator (owner) 1 presser/counter

#### 3.5.1 Background

Eli's Airport Cleaners, operated by Mr. Eli Gichon, is located in Van Nuys. Mr. Gichon began operating his dry cleaning business in 1993. His decision to switch to wet cleaning was motivated primarily by the concerns about exposure to perc for himself and his employee, including a concern about potential negative long term effects. He also received a few complaints by customers about perc odors on their garments. Additionally, he felt that regulatory restrictions and fees were affecting the shop's income. Mr. Gichon first learned about professional wet cleaning through an informational flier, and subsequently attended a Commercialization Project workshop in the Summer 2001. He also visited a number of other dedicated professional wet cleaning facilities.

After Mr. Gichon applied for a professional wet cleaning demonstration project grant in the August 2001, he spent a full morning observing the professional wet cleaning process at San Clemente Natural Cleaning Center. Mr. Gichon reported that this session was essential to his understanding of how to process the full range of garments using professional wet cleaning technology. On July 26-27, 2002 Mr. Gichon's dry cleaning equipment was disconnected and the professional wet cleaning equipment was installed. On-site technical training was completed on July 28, 2002. Mr. Gichon began processing all of his customers' garments in the professional wet cleaning system the day after training on July 29, 2002.

### 3.5.2 Transition Process Evaluation

Before switching, Mr. Gichon's biggest concerns about professional wet cleaning were shrinkage, especially in garments with an inner lining, as well as concerns about the quality of cleaning.<sup>43</sup> The cleaner stated that he had considered wet cleaning to be "very scary."<sup>44</sup> Difficulties identified by the cleaner in making the switch included: learning how to use the washer computer, making adjustments to the wash programs, learning how to sort garments, learning which wash cycles to use, and not having enough qualified technicians around. Yet, overall, the cleaner reported that making the switch was easy and that training was very important in making a successful transition to professional wet cleaning. The cleaner stated that "without training it would have taken a couple of days of just experimenting." As part of training, the cleaner stated that it was important to go see it work at a demonstration site before installing the equipment.

### 3.5.3 Owner Satisfaction Evaluation

Mr. Gichon feels that switching to wet cleaning was a good business decision, and he would make the same decision over again. He would recommend wet cleaning to another cleaner needing to purchase new cleaning equipment: "I think everyone in the dry cleaning business should consider it, if not for full operation, at least as a supplement to dry cleaning."<sup>45</sup> Mr. Gichon also rates his level of satisfaction as a wet cleaner higher in comparison to his level of satisfaction as a dry cleaner, based in part on his concern with perc exposures. In response to the issue of acute health effects, Mr. Gichon noted that as a dry cleaner he would experience dizziness and nausea when cleaning the still of his dry clean machine, and his presser regularly suffered from headaches. No stills need to be cleaned at the shop any longer, and the pressers' headaches have gone away since the transition to wet cleaning.

### 3.5.4 Performance Analysis

#### Garment Profile:

*Garments Wet Cleaned:* Of the 90 garments cleaned daily at this facility, approximately 40 are professionally wet cleaned, with the remainder laundered.<sup>46</sup> A total of 2,200 garments have been professionally wet cleaned at Eli's Airport Cleaners in the first eleven weeks after switching to wet cleaning.

*Care Label:* Of the garments professionally cleaned at the facility, over three-quarters (76%) have a dry clean label.<sup>47</sup>

---

<sup>43</sup> See Appendix E for empirical data used in Del Mar Cleaners case study.

<sup>44</sup> Interview 9/25/2002.

<sup>45</sup> Interview 9/25/2002.

<sup>46</sup> See Appendix E, p. E-1 for performance data.

<sup>47</sup> Profile is based on labels of garments dry cleaned at Eli's Airport Cleaners during the time period of 3/8/2002 to 3/20/2002.

**Table 3-7: Performance Evaluation: Eli’s Airport Cleaners**

	<b>Dry Cleaning</b>	<b>Wet Cleaning</b>
<b>Garment Profile</b>		
Dry Clean Label	76%	<sup>48</sup> --
<b>Problem Garments</b>		
Returned	3%	3%
Sent Out	0.83%	0.83%
Claims	0.01%	0.00%
Overall Success Rate	96.16%	96.17%
<b>Customer Response</b>		
Retention Rate	N/A	100%
Negative Customer Response	N/A	0%

Problem Garment Analysis

*Returned:* Since switching, 3% of garments have been returned for additional work, which is identical to the shop’s return rate as a dry cleaning operation. In both cases, garments have primarily been returned due to problems related to stain removal. Mr. Gichon noted the oily stains on cotton and silk are difficult to remove with wet cleaning, but that stains in wool disappear better with wet cleaning.

*Garments Sent Out:* As with dry cleaning, the only items not processed on site are leather. The cleaner has been sending out the same amount of leather as a wet cleaner (one or two items a week) that he had sent out as a dry cleaner.

*Claims:* No claims have been made by customers since the switch to wet cleaning. Only about one claim a year was paid when dry cleaning, usually related to color transfer problems.

*Overall Success Rate:* Since switching to wet cleaning, the cleaner has successfully wet cleaned 96.2% of garments, a rate comparable to his success rate as a dry cleaner.

Customer Response

*Customer Retention:* No customers have been lost since switching to wet cleaning.

*Customer Response:* Mr. Gichon decided early on to switch the name of his cleaners to Airport Natural Cleaners to describe the water-based process of wet cleaning. Customers have been notified of the new cleaning method since the beginning of wet cleaning

---

<sup>48</sup> Figures on garment care label were not compiled after the switch since the customer base remained the same, assuming an equivalent garment profile.

operations. Mr. Gichon has flyers at the front counter, has placed flyers with the cleaned clothes of new customers, and is offering discount coupons through large supermarkets such as Ralphs and Food 4 Less. In addition, he is considering increasing advertising efforts through direct mailing. Once informed of the switch, customers have not expressed concerns regarding quality issues with wet cleaning. According to Mr. Gichon, “customers only care if clothes look good when they pick them up,”<sup>49</sup> and wet cleaning has been keeping them satisfied. The shop has gained a few new customers, but it isn’t clear whether or not they came specifically for the wet cleaning. A charter airline company that sends its linens to the shop for cleaning is considering marketing the health benefits of its wet cleaned napkins and tablecloths to customers.

### 3.5.5 Financial Analysis

To measure the relative profitability at Eli’s Airport Cleaners in operating as a professional wet cleaner compared to his profitability as a dry cleaner, specific line item expenses were measured.<sup>50</sup> Expenses that differ between the two cleaning processes are identified as “process dependent costs”. These costs have been standardized per 100 garments cleaned and summarized in the table below.

**Table 3-8: Process Dependent Costs per 100 Garments Cleaned: Eli’s Airport Cleaners**

	<b>Dry Cleaning</b>	<b>Wet Cleaning</b>
<b>Variable Expenses</b>		
Labor	No change	No change
Solvent	\$4.41	\$0.00
Detergent	\$1.02	\$5.81
Water	\$0.00	\$0.00
Electricity	\$9.10	\$7.35
Gas	\$9.02	\$6.07
Filter cost	\$0.52	\$0.00
Hazardous waste disposal	\$1.96	\$0.00
Machine Maintenance	\$3.25	\$0.56
<b>Fixed Expenses</b>		
Regulatory fees	\$3.95	\$0.00
Equipment	\$11.25	\$7.20
<b>TOTAL</b>	<b>\$44.48</b>	<b>\$26.99</b>

<sup>49</sup> Interview 9/25/02

<sup>50</sup> See Appendix E, p. E2-E8 for financial data for this cleaner.

## Total Process Dependent Costs Comparison

Total process dependent costs at Eli's Airport Cleaners were cut nearly in half since switching to professional wet cleaning -- \$44.48 per 100 garments cleaned with dry cleaning versus \$26.99 per 100 garments cleaned with wet cleaning.

### *Expenses Greater as a Dry Cleaner*

*Perc and Hazardous Waste:* As a dry cleaner, Mr. Gichon faced a number of costs associated with the use of perc solvent and the hazardous waste and air emissions it produces. He purchased approximately 12 gallons of perc solvent a month at a cost of \$7.50 a gallon. Mr. Gichon paid \$120 every three months (\$480 a year) to dispose of the 60 gallons of hazardous waste produced every year. A perc dry cleaner is also required to pay a number of fees and obtain permits from regulatory agencies because of the production of hazardous waste, the storage of hazardous materials, and the emission of hazardous air pollutants. These permits cost Mr. Gichon a total of \$968.39 a year.

*Equipment and Maintenance Costs:* The list prices of the equipment purchased by Mr. Gichon in order to switch to professional wet cleaning totaled \$35,277. This included a 40 lb washer and 75 lb dryer, a tensioning pants topper, and a tensioning jacket topper. Mr. Gichon's dry clean machine came with the shop he purchased in 1995, and he estimated that it would have cost approximately \$35,000, (\$41,364 in 2002 dollars). In addition to initial equipment costs being lower, a wet clean system has a longer life span (20 years) than a dry clean machine (15 years), and costs less to maintain. Industry estimates for the maintenance of a perc dry clean machine<sup>51</sup>, based on a percentage of revenue, would be \$800 a year for Mr. Gichon compared to \$320 a year for the maintenance of wet clean equipment.

*Energy Use:* Mr. Gichon has significantly reduced his electricity (23%) and natural gas use (36%) since switching to wet cleaning. The average monthly cost to Mr. Gichon for electricity when dry cleaning was \$185.93, compared to \$150.23 after the switch.<sup>52</sup> The average monthly cost for natural gas when dry cleaning was \$184.20, compared to \$123.95 after the switch.<sup>53</sup>

## Costs Greater in Wet Cleaning

*Detergent:* Since switching to wet cleaning, Mr. Gichon has purchased 25 gallons wet of wet clean detergent for \$303.50, costing him approximately \$120 a month. As a dry cleaner the monthly detergent cost was significantly lower at \$20 a month.

---

<sup>51</sup> An annual maintenance cost for PCE dry clean machines of 0.88% of revenue, based on IFI and NCAI estimates, was used for this study.

<sup>52</sup> Mr. Gichon consumed an average of 1,514 kWh a month dry cleaning, and 1,173 kWh a month wet cleaning. Demand fell from 17.3 kW to 16 kW.

<sup>53</sup> Mr. Gichon consumed an average of 296 therms a month dry cleaning, and 189.5 therms a month wet cleaning.

### Costs Unchanged

*Labor:* Mr. Gichon reported that his employee does not work more hours now than when he was dry cleaning. He said that he puts in approximately the same amount of time when running his shop as a wet cleaner than as a dry cleaner.

*Water:* It is not known how water consumption has been affected by the switch to wet cleaning because Eli's shop is not individually metered. Financially, there has been no impact because Eli is not billed for water use.

## 4. Case Study Summary Analysis

### 4.1 Overview

This chapter summarizes the data evaluated in the individual case studies of dry cleaners that switched to professional wet cleaning. The summary analysis includes:

- *Evaluation of Transition to Professional Wet Cleaning:* evaluates factors related to making an effective switch to professional wet cleaning
  - Indicates problems with installation and technical training for first two cleaners to convert
  - Shows that these problems were resolved for last three cleaners to convert
  - Indicates the importance of proper installation and technical training to successful conversion.
- *Attitudes of Cleaners Towards Switch to Professional Wet Cleaning:* identifies concerns cleaners had about professional wet cleaning before converting to this technology, how these concerns were resolved after the switch, and the satisfaction level of cleaners after their transition.
  - Shows concern about quality of cleaning, and ability to learn new cleaning process before cleaners switch.
  - Indicates lack of regulation, lease issues, and information provided at demonstration tours as the biggest motives to switch.
  - Reveals high level of owner satisfaction with switch.
- *Performance Evaluation of Professional Wet Cleaning:* assesses the ability of cleaners to successfully wet clean garments they had previously dry cleaned.
  - Show that problem garments (i.e. items returned for additional work, ruined, or sent out) occurred at a similar rate in wet cleaning and dry cleaning.
  - Indicates the importance of proper programming of wet clean washer in avoiding problems (i.e. returned or ruined items)
  - Shows few or no negative customer reactions to cleaners switching to a new cleaning process.
- *Financial Evaluation of Professional Wet Cleaning:* evaluates relative operating costs in processing garments in wet cleaning compared to dry cleaning.
  - Shows a reduction in operating costs after cleaners switched to professional wet cleaning.
- *Resource Evaluation of Professional Wet Cleaning:* evaluates electricity, natural gas, and water use in professional wet cleaning compared to dry cleaning.
  - Shows sizable reduction in electricity use, a small to large decrease in natural gas use, and no change to a moderate increase in water consumption.



## **4.2 Evaluation of Transition to Professional Wet Cleaning**

An evaluation of the transition process was conducted to understand issues related to making a smooth switch from dry cleaning to professional wet cleaning.<sup>54</sup>

### **4.2.1 Problem Areas Identified in Transition**

Two problem areas were identified from experiences of cleaners making the transition to professional wet cleaning: problems related to the installation of equipment and issues related to technical training

#### Equipment Installation

Each of the cleaners experienced at least some problem with the installation of professional wet cleaning equipment. All but one of the cleaners experienced problems with the installation of the washer. These problems included: incorrect bolting to floor, inadequate drainage system for wastewater, incorrect wiring of detergent dispensing system, lack of a soft water system, and incorrect programming of washer. Two of the cleaners experienced programs with installation of the dryer; these problems included installing a natural gas supply line too small for the dryer and ineffective venting of exhaust. Four of the five experienced at least some problem with the installation of tensioning equipment. These problems included: incomplete electrical wiring, improper temperature setting, and incorrect installation of steam traps.

While most of the problems with installation were corrected relatively quickly, two cleaners (San Clemente Natural Cleaning Center and Del Mar Cleaners) attributed an increase in problems processing garments to errors in the initial programming of the equipment.

#### Training

Three of the five cleaners interviewed stated that training was very important in making a successful transition from dry cleaning to wet cleaning. One of the cleaners commented that without training the transition period would have been longer since it was new equipment and he didn't know how to use it. Four of the cleaners stated that learning how to use and adjust the computer programs for the washer and dryer were one of the biggest difficulties in making the switch to wet cleaning.

---

<sup>54</sup> This section evaluates issues identified through the structured interview process (Appendix A-E, Wet Clean Surveys) as well as direct observation at the cleaners during the installation process.

### 4.2.3 Cleaners' Characterization of Transition

According to the survey, the owners of San Clemente Dry Cleaning Center and Del Mar Cleaners, the first two cleaners who switched, stated that making the switch was somewhat difficult and not too difficult respectively. By contrast, the last three cleaners to convert reported that making the switch was not at all difficult. The difference in response can be attributed to the fact that by the time the third cleaner converted, most of the major problems with installation and training had been identified and resolved. (See Table 4.1)

**Table 4.1: Difficulty Ratings – Transition to Professional Wet Cleaning**

	Not at all difficult	Not too difficult	Somewhat difficult	Very difficult
How difficult did you think it would be to make the switch to professional wet cleaning?	3	0	1	1
How difficult did you think it actually was to switch to professional wet cleaning?	3	1	1	0
How difficult would you say it was to learn to do wet cleaning?	4	1	0	0

### 4.3 Attitudes Of Cleaners Towards Professional Wet Cleaning

The following analysis evaluates the attitudes of cleaners toward professional wet cleaning before and after cleaners switched.<sup>55</sup>

#### 4.3.1 Cleaners' Concerns About Wet Cleaning Technology

*Concerns About Performance Issues:* Four of the five cleaners interviewed mentioned anxiety about low performance quality as their main concern before switching to professional wet cleaning; all cited fear of shrinkage, especially with wool and silk garments. One cleaner also mentioned concerns about silk bleeding. (Table 4.2)

*Concern About Using A New Process:* One cleaner expressed anxiety over the effectiveness of the technology while another cleaner mentioned fear of destroying garments through this process.

*Labor Concerns:* One of the high volume cleaners listed fear of increased labor costs as a major concern before switching to wet cleaning.

---

<sup>55</sup> This section evaluates issues identified through the structured interview process. See Appendix A-E, Wet Clean Surveys)

**Table 4.2: Cleaners' Concerns About Wet Cleaning Technology**

	<b>San Clemente Natural Cln Center</b>	<b>Del Mar Cleaners</b>	<b>Anawood Cleaners</b>	<b>1Day Cleaners</b>	<b>Eli's Airport Cleaners</b>
Fear of Poor Performance	√	√	√		√
Concern About Using a New System	√		√		
Concerns About Increased Labor		√			

**4.3.2 Motives For Switching to Professional Wet Cleaning**

The cleaners cited several reasons for choosing wet cleaning over other alternative technologies. (See Table 4.3).

*Regulatory Compliance:* Four of the cleaners were initially attracted to wet cleaning's lack of governmental regulations and fees otherwise required for perc and hydrocarbon machines. They stated that as dry cleaners, it was difficult to comply with all of the regulations regarding perc and were often stressed by inspections and fines due to regulatory violation fines. They believed that a switch to wet cleaning would enable them to avoid dealing with present and future regulations imposed on dry cleaners.

*Acute Health Effects of Perchloroethylene:* All of the cleaners mentioned health concerns related to perc emissions as one of the reasons for preferring wet cleaning to perc dry cleaning machines. Two of the cleaners cited health concerns as the biggest incentive for switching. Each of the owners expressed relief at having a non-toxic alternative for themselves and/or their staffs, due to a range of acute health effects such as regular headaches experienced when dry cleaning.

*Contamination Issues/Lease Renewal:* Three of the five cleaners stated that they chose wet cleaning technology because it was an environmentally preferable alternative to perc and hydrocarbon. These cleaners were forced to close down their dry cleaning plants to stay in business, since their landlords were concerned about possible site contamination. They were able to resume cleaning operations as a wet cleaning plant due to the non-toxic attributes of the new cleaning system.

*Information Obtained at Demonstration Tours:* Three of the five cleaners stated that a major motivation for switching was seeing other wet cleaning plants and talking to the operators about their experience. Another cleaner recommended that other cleaners go see a demonstration site if they are considering switching to a non-perc alternative. According to the cleaners, the demonstration tours gave them confidence in the technology and in their ability to learn a new system.

**Table 4.3: Motives For Switching to Professional Wet Cleaning**

	<b>San Clemente Natural Cln Center</b>	<b>Del Mar Cleaners</b>	<b>Anawood Cleaners</b>	<b>1Day Cleaners</b>	<b>Eli's Airport Cleaners</b>
No Need For Regulations	√	√	√		√
Positive Health Effects				√	√
Ability to Renew Lease		√	√	√	
Useful Info from Tours	√			√	√

**4.3.3 Owner Satisfaction**

A number of questions were asked regarding the owner's overall satisfaction with switching to professional wet cleaning. (See Table 4.4) All five cleaners stated that switching to wet cleaning had been a good decision, and that they would make the same decision again. Four of the five stated that their level of satisfaction as a wet cleaner was higher than as a dry cleaner. When asked whether they would recommend wet cleaning to other cleaners who need to buy new cleaning equipment, all five said they would strongly recommend professional wet cleaning.

**Table 4.4: Owner Satisfaction**

	<b>San Clemente Natural Cln Center</b>	<b>Del Mar Cleaners</b>	<b>Anawood Cleaners</b>	<b>1Day Cleaners</b>	<b>Eli's Airport Cleaners</b>
Switching as a Good Business Decision	√	√	√	√	√
Would Make the Same Decision Again	√	√	√	√	√
Higher Level of Satisfaction as Wet Cleaner		√	√	√	√
Would Strongly Recommend Wet Cleaning	√	√	√	√	√

A number of factors appear to underlie this high level of satisfaction.

*Comparable Quality:* All five of the cleaners stated that the quality of their cleaning service as at least as good the quality of their service as a dry cleaner; two stated that the quality was better because they now offer customers a non-toxic or odor free service.

*Free of Regulation:* Four out of five cleaners mentioned being free from regulations as one of the reasons why they would recommend wet cleaning to other cleaners. Three of the cleaners expressed relief that they didn't have to worry about perc regulations.

*Better Health:* All five operators experienced one or more of the symptoms associated with PCE exposure (e.g. headaches, dizziness) when operating as dry cleaners. In addition to the machine operator, two of the cleaners' workers in the shop also experienced one or more of these symptoms. All symptoms have disappeared since switching to professional wet cleaning (See Table 4.5).

**Table 4.5 Number of Cleaners Experiencing Symptoms Association with PCE Exposure**

	Headache	Dizziness	Runny Nose	Fatigue	Nausea
Symptoms when operating as dry cleaner	5	4	2	2	1
Symptoms since switching to wet cleaning?	0	0	0	0	0

## 4.4 Performance Evaluation of Professional Wet Cleaning

The performance evaluation of professional wet cleaning facilities focused on the extent to which the demonstration facilities were able to successfully wet clean the full range of garments they had previously dry cleaned. (See Table 4.6) Generally, the cleaners' overall success rates as wet cleaners have been comparable to their success rates as dry cleaners.

### 4.4.1 Types of Garments Cleaned

A *customer garment profile* was used to assess the types of garments serviced at each professional wet cleaner. Most garments professionally cleaned at the demonstration facilities were labeled "dry clean" or "dry clean only" (greater than 60%).

#### **4.4.2 Problem Garments**

A *problem garment profile* was used to evaluate three types of problems typically encountered by a professional cleaner: garments sent out – garments the cleaner did not feel capable of cleaning; garment redos – garments brought back by customers for additional work; and garment claims – garments irreversibly damaged during the cleaning process.

*Garments Sent Out:* In all but one case, the only garments sent out by the cleaners, when dry cleaning or after switching to wet cleaning, were leather items. A couple of cleaners are intending to process leather on site, once special leather detergents designed for wet cleaning become available. Besides leather, Del Mar Cleaners also sends out ties for dry cleaning, but recently expressed interest in processing ties in house, purchased special tie forms and is awaiting additional training.

*Returned Garments:* The rate at which garments are returned by customers for additional work has dropped or remained the same at each cleaner since switching to professional wet cleaning. In the cases where the return rate was lower, the cleaner reported fewer garments returned for spot or stain removal since switching to professional wet cleaning. These lower rates may also be attributed to higher levels of internal quality control.

*Claims:* The claims rate for each cleaner since switching to professional wet cleaning is comparable to when they were dry cleaning. The first two cleaners to switch (San Clemente and Del Mar), experienced most claims shortly after installing wet cleaning equipment, when there were problems developing the correct washer programs. Del Mar Cleaners had six claims before reprogramming, and has had two since then. The last three cleaners to switch have had one claim among them. Since the last three cleaners all installed the improved washer programs, suggests that correct programming of the wet clean washer plays an important role in preventing garments from being damaged in professional wet cleaning.

*Overall Success Rate:* The overall success rate of garments cleaned can be calculated by subtracting out the garments where problems occurred – i.e., garments rejected, garments returned, and claims. Each wet cleaner was able to successfully process over 96% of customer garments; a rate comparable to when they were dry cleaning.

#### **4.4.3 Customer Response**

Performance of professional wet cleaning can also be measured by analyzing how customers have responded to the cleaning service – this is especially important in a service sector such as the garment care industry.

*Customer Retention Rate:* The cleaners who switched from dry cleaning to professional wet cleaning were able to retain virtually all of their customers.

*Response to Cleaning Technology:* Four of the five cleaners informed their customers of their switch immediately after installing the professional wet cleaning equipment. Of the customers who informed their customers, none reported negative customer reactions and each has received some form of positive feedback. Two cleaners who have been wet cleaning for over six months have had success at attracting new customers interested in using an environmentally preferable cleaning method, increasing their customer base by 4% or more.

**Table 4.6: Garment Profile and Performance of Professional Wet Cleaners**

	<b>San Clemente Dry Cleaning Center</b>		<b>Del Mar Cleaners</b>		<b>Anawood Cleaners</b>		<b>1Day Cleaners</b>		<b>Eli's Airport Cleaners</b>	
	Dry Clean	Wet Clean	Dry Clean	Wet Clean	Dry Clean	Wet Clean	Dry Clean	Wet Clean	Dry Clean	Wet Clean
<b>Garment Profile</b>										
Dry Clean Label	73%	--	63%	--	--	92%	68%	--	76%	--
<b>Problem Garments</b>										
Returned	0.21%	0.21%	0.33%	0.07%	2%	0%	0.05%	0%	3%	3%
Sent Out	.039%	0.019%	0.18%	1.3%	0.19%	0.19%	0.29%	0.29%	0.83%	0.83%
Claims	.012%	0.009%	.012%	.0098%	.0027%	0.00%	.0038%	.015%	0.01%	0.00%
Overall Success Rate	99.74%	99.76%	99.5%	98.6%	97.8%	99.8%	99.66%	99.69%	96.16%	96.17%
<b>Customer Response</b>										
Retention Rate	N/A	99.71%	N/A	98.9%	N/A	100%	N/A	100%	--	100%
Negative Customer Response	N/A	0%	N/A	0%	N/A	0%	N/A	0%	--	0%

## 4.5 Financial Evaluation of Professional Wet Cleaning

The financial evaluation of dedicated professional wet cleaning focused on how the capital costs of purchasing equipment and ongoing operating expenses in professional wet cleaning compared to dry cleaning. Two of the cleaners (Anawood and Del Mar) operated as drop shops for a period of time in between operations as dry cleaners and professional wet cleaners. This made it difficult to obtain utility and purchase records far back enough in time to be able to compare dry cleaning and wet cleaning costs. Therefore, the financial analysis was limited to San Clemente Dry Cleaning Center, 1Day Cleaners, and Eli's Airport Cleaners.

### 4.5.1 Total Process Dependent Costs

Overall, the cost of processing garments was lower in professional wet cleaning than dry cleaning. (See Table 4.7) Eli's Airport Cleaners experienced the greatest reduction in operating cost (\$17.49 per 100 garments cleaned, followed by San Clemente Natural Cleaning Center (\$12.81 per 100 garments cleaned), and 1Day Cleaners (\$3.59 per 100 garments cleaned).

### 4.5.2 Costs Greater in Dry Cleaning

*Perc and Hazardous Waste:* There are a number of costs paid by dry cleaners associated with the use of perc solvent and the hazardous waste and air emissions it produces. In terms of the purchase of perchloroethylene itself, the cleaners used between 60 and 160 gallons of solvent a year, at a cost of \$7.50 a gallon. Waste generated from a perc dry clean machine is classified as hazardous, and the cleaner must pay for it to be hauled away. Waste disposal costs were estimated to be between \$480 and \$1200 a year. Permits must be obtained for having hazardous waste on site and for emitting hazardous air pollutants, at a cost of between \$750 and \$1,297 per year.<sup>56</sup>

*Equipment and Maintenance Costs:* Based on the list price of equipment purchased by cleaners in the case studies, the cost of purchasing a 40 pound professional wet clean washer, 75 pound dryer, and tensioning finishing machines was about \$35,000. These capital costs were lower than the cost for a comparably-sized perchloroethylene dry cleaning machine with primary and secondary vapor control systems, which ranged in price from \$41,000-\$47,000.<sup>57</sup> As an operating expense, wet cleaning equipment costs are substantially lower than dry cleaning machines, due to the longer useful life of wet cleaning equipment – 20 years on average for wet cleaning equipment and 15 years for

---

<sup>56</sup> Not analyzed in this study are the costs of complying with regulations or fines paid by cleaners for non-compliance.

<sup>57</sup> A 35 pound wet clean washer, has a minimum throughput of 84 pounds of garments cleaned per hour (assuming a 25 minute cycle time). A 50 pound dry clean machine, with an average cycle time of 45 minutes, has an average throughput of 67 pounds per hour.



dry cleaning machines.<sup>58</sup> Maintenance and repair costs in operating dry clean machines are substantially higher than for wet clean equipment. This is due, almost exclusively, to the upkeep and repair of complex pollution control devices on dry clean machines, such as refrigerated condensing systems and distillation units; devices not found in wet clean machines.

*Energy Use:* All three cleaners have reduced their consumption of electricity and natural gas since switching to professional wet cleaning. The consumption of electricity has decreased between 12% and 46%. Natural gas use decreased a small amount for two cleaners, but fell significantly (36%) for the third cleaner. The ability for each to reduce energy use will vary depending on how operations were run before and after switching. For example, the cleaner experiencing a substantial decrease in natural gas use, Eli's Airport Cleaners, wet cleans garments in the afternoon, dries these garments to 20% residual moisture, and hangs them to air-dry the remaining amount overnight. The other two cleaners, 1Day and San Clemente, often process their garments for same day service, requiring them to use their dryer to remove the remaining moisture; a practice which uses more natural gas and electricity compared to an air-dry technique.

#### **4.5.3 Costs Greater in Wet Cleaning**

*Detergent:* Dry cleaners use a relatively small amount of detergent in addition to perc solvent. Detergent costs were greater in wet cleaning for each cleaner, but to varying degrees. Wet clean detergent costs at 1Day Cleaners were nearly five times greater than at San Clemente Dry Cleaning Center. Mr. Noh in San Clemente has been reducing his detergent use by manipulating his programming without affecting cleaning quality.

*Water:* While professional cleaners use a substantial amount of water to create steam for finishing equipment as well as for washing machines, if they are part of a shopping complex, they often do not pay a separate water bill. This was the case of Eli's Airport Cleaners. At 1Day Cleaners, water use increased by 17% (from 217 to 254 gallons per 100 garments cleaned). At San Clemente Dry Cleaning Center, water use decreased by 1% (from 374 to 367 gallons per 100 garments cleaned).

---

<sup>58</sup> In interviews with equipment manufacturers and repair technicians, 15 years was given as the upper end estimate for dry clean machines (and only if preventive maintenance is practiced) and 20 years as the average useful life of wet clean machines. (Pollution Prevention in the Garment Care Industry: Assessing the Viability of Professional Wet Cleaning, Pollution Prevention Education and Research Center, 1997, Appendix 4-F). U.S. House. 2000. Committee on Small Business, Subcommittee on Tax, Finance and Exports. In testimony before Congress on July 20, 2000, Bill Fisher, Chief Executive Officer for the International Fabricare Institute (IFI), the largest national garment care association in the United States, testified that the anticipated life of new PCE dry clean machines was typically between 8 and 14 years *Helping Small Dry Cleaners Adopt Safer Technology: Without Losing Your Shirt*. 106<sup>th</sup> Cong., 2nd sess. 20 July.

#### 4.5.4 Costs Unchanged

*Labor:* None of the five cleaners profiled reported any increase in the number of hours worked by employees, and one cleaner (Mr. Noh) reported a reduction of three hours a day worked by employees. Another cleaner (Mr. Chon) reported that while he works the same number of hours, he has to work a little harder than when we had his dry clean machine.

The greater labor efficiency at San Clemente Natural Cleaning Center may be due to the fact that this cleaner was the first cleaner converted and therefore has had the greatest experience as a wet cleaner. Mr. Chon's observation that he works somewhat harder may be due, in part to the fact that he measures all jackets (in the length, width, and sleeve) before and after the wash cycle to verify that the dimension of these garments has not changed.

**Table 4.7: Process Dependent Costs per 100 Garments Cleaned**

	Eli's Airport Cleaners		1Day Cleaners		San Clemente Dry Cleaning Center	
	Dry Clean	Wet Clean	Dry Clean	Wet Clean	Dry Clean	Wet Clean
<b>Variable Expenses</b>						
Labor *	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Solvent	\$4.41	\$0.00	\$1.33	\$0.00	\$1.06	\$0.00
Detergent	\$1.02	\$5.81	\$0.21	\$4.41	\$1.13	\$1.87
Water **	n.a.	n.a.	\$0.22	\$0.34	\$0.92	\$0.91
Electricity	\$9.10	\$7.35	\$5.43	\$4.77	\$1.79	\$0.97
Gas	\$9.02	\$6.07	\$5.72	\$5.68	\$4.99	\$4.81
Filter cost	\$0.52	\$0.00	\$0.33	\$0.00	\$1.27	\$0.00
Hazardous waste disposal	\$1.96	\$0.00	\$0.72	\$0.00	\$2.11	\$0.00
<b>Fixed Expenses</b>						
Regulatory fees	\$3.95	\$0.00	\$1.45	\$0.00	\$2.29	\$0.00
Machine Maint.	\$3.25	\$0.56	\$2.43	\$0.36	\$3.26	\$0.56
Equipment	\$11.25	\$7.20	\$3.27	\$1.96	\$6.22	\$3.11
<b>TOTAL</b>	<b>\$44.48</b>	<b>\$26.99</b>	<b>\$21.11</b>	<b>\$17.52</b>	<b>\$25.04</b>	<b>\$12.23</b>

\* No difference was reported for employee labor cost.

\*\* A separate water bill was not paid by Eli's Airport Cleaners

## 4.6 Resource Use Assessment

The resource use analysis compared the electricity, natural gas and water use of three of the demonstration facilities when they operated a perc dry cleaners and after they switched to professional wet cleaning. (See Table 4.8) At each of the facilities (San Clemente Dry Cleaning Center, 1Day Cleaners, and Eli's Airport Cleaners), monthly billing records were obtained from utility companies for a period of time before and after the cleaners switch. To evaluate energy use on a daily basis, electricity and natural gas submeters were installed at two of the cleaning plants -- 1Day Cleaners and Eli's Airport Cleaners.<sup>59</sup>

### 4.6.1 Electricity Use

At professional cleaners, electricity runs a number of pieces of equipment including: washers, dryers, air compressors and vacuum pump, and pressing equipment. A dry clean machine requires additional electricity to operate pollution control devices, including: refrigerated condensers, distillation units, and wastewater evaporators.

At each cleaner evaluated, electricity use dropped substantially immediately after the cleaner stopped using his perc dry clean machine and started using professional wet cleaning equipment. At San Clemente Dry Cleaning Center, electricity use dropped from 24 to 13 kWh per 100 garments cleaned – a reduction of 46%. At Eli's Airport Cleaners, electricity use dropped 23% -- from 74 to 57 kWh per 100 garment cleaned. At 1Day cleaners, electricity use dropped 12% -- from 32 to 28 kWh per 100 garments cleaned.

In terms of absolute reduction, Eli's Airport Cleaners experienced the largest reduction (16.7 kWh/100 garments cleaned), followed by San Clemente Dry Cleaning Center (11 kWh/100 garments cleaned), followed by 1Day Cleaners (3.9 kWh/100 garments cleaned). The greater reduction at Eli's Airport Cleaners may be due to the fact that the dry clean machine used at this facility was a newer model machine and used a refrigerated condenser to cool solvent vapor – the dry clean machines at the other two cleaners used cooling towers to cool solvent vapor; a less energy intensive device. The greater electricity reduction at San Clemente Dry Cleaning Center compared with 1Day Cleaners may, in part, be due to the actual operation of the vapor cooling system. 1Day Cleaners reported that their cooling tower was not operating immediately prior to switching to professional wet cleaning.

---

<sup>59</sup> At 1Day Cleaners, Southern California Edison installed and read electricity sub-meters prior to and after the cleaner switched to professional wet cleaning. The Gas Company installed natural gas sub-meters, which were read on a regular basis by the cleaner. At Eli's Airport Cleaners, the Los Angeles Department of Water and Power installed and read electricity sub-meters prior to and after the cleaner switched to professional wet cleaning. The Gas Company installed natural gas sub-meters, which were read on a regular basis by the cleaner.

The data is consistent with previous research, indicating a greater electricity use in dry cleaning. Our previous research estimated electricity use would be 24% lower at a professional wet clean facility compared to a dry cleaning plant.<sup>60</sup>

#### **4.6.2 Natural Gas Use**

At professional cleaners, natural gas is used by a boiler, which generates steam used by pressing equipment, and a spotting board. Dry clean machines use steam as a source of heat used during the drying cycle. Steam can also be used to generate hot water for laundry or wet clean washers as well as to generate heat for laundry or wet clean dryers. More typically, laundry or wet clean washers use a natural gas hot water heater as a source for hot water and dryers heated directly by natural gas.

At each cleaner evaluated, natural gas use dropped immediately after the cleaner stopped using their perc dry clean machine and started using professional wet cleaning equipment. At Eli's Airport Cleaners, natural gas use dropped 36% -- from 14.5 to 9.3 therms per 100 garment cleaned. At San Clemente Natural Cleaners, natural gas use dropped 4% -- from 8.3 to 8.0 therms per 100 garments cleaned. At 1Day Cleaners, natural gas use dropped 0.7% -- from 10.0-9.9 therms per 100 garments cleaned.

As with electricity use, Eli's Airport Cleaners experienced the greater absolute reduction in natural gas use – 5.2 therms per 100 garments cleaned; both San Clemente and 1Day experienced a reduction of less than 1 therm per 100 garments cleaned. The greater absolute reduction at Eli's may also be due to the amount of natural gas demanded from the newer dry clean machine compared to older systems.

Previous research conducted by PPERC estimated that natural gas use would be greater (23%) in professional wet cleaning compared to dry cleaning.<sup>61</sup> The estimate of natural gas use in dry cleaning was based on industry estimates and research assumptions and not on the experience of cleaners switching from dry cleaning to professional wet cleaning.

#### **4.6.3 Water Use**

In professional wet cleaning, water is used as the solvent. Yet, the pollution control devices on dry clean machines also require water use; refrigerated condensers use water in cooling the refrigerant, cooling towers evaporate water in the process of cooling PCE, carbon adsorbers are steam stripped; some distillation systems are equipped with steam injection. In both professional wet cleaning and dry cleaning, water is used by the boiler, laundry washers, and water conditioning systems.

---

<sup>60</sup> Pollution Prevention in the Garment Care Industry: Assessing the Viability of Professional Wet Cleaning, Pollution Prevention Education and Research Center, 1997, p. 5-18.

<sup>61</sup> Pollution Prevention in the Garment Care Industry: Assessing the Viability of Professional Wet Cleaning, Pollution Prevention Education and Research Center, 1997, p. 5-18.

At 1Day Cleaners, water use increased by 17% after switching to professional wet – rising from 217 to 254 gallons per 100 garments cleaned. At San Clemente Natural Cleaning Center, water used dropped slightly after switching: from 374 to 367 gallons per 100 garments cleaned.

Previous research conducted by PPERC estimated water use at a professional wet cleaning facility to be 77% greater than at a dry clean shop.<sup>62</sup> Yet this previous research was based on industry estimates and research assumptions, not on actual water use at a dry cleaner switching to professional wet cleaning. The data from the current analysis suggest that the regional impact on water demand associated with a switch to professional wet cleaning is likely to be substantially smaller than previously estimated.

**Table 4.8: Resource Use Per 100 Garments Cleaned: Dry Cleaning vs. Professional Wet Cleaning**

	Electric Energy Use			Natural Gas Use			Water Use		
	KWh Per 100 Garments Cleaned			Therms per 100 Garments Cleaned			Gallons per 100 Garments Cleaned		
	Dry Clean	Wet Clean	% Change	Dry Clean	Wet Clean	% Change	Dry Clean	Wet Clean	% Change
<b>San Clemente Natural Cl Ctr</b>	23.93	12.92	-46%	8.28	7.95	-4%	374	367	-2%
<b>1Day Cleaners</b>	32.28	28.36	-12.1%	10.01	9.9	-0.7%	217	254	+17%
<b>Eli's Airport Cleaners</b>	74.13	57.44	-22.5%	14.48	9.28	-36%	n.a.*	n.a.	n.a.

\* Water use is not metered at this facility.

<sup>62</sup> Pollution Prevention in the Garment Care Industry: Assessing the Viability of Professional Wet Cleaning, Pollution Prevention Education and Research Center, 1997, p. 5-8.

## 5. Discussion

### 5.1 Comparison With Other Studies

The results from this study reinforce prior findings from case studies of professional wet cleaning in terms of performance capability and financial viability of this pollution prevention technology. What is unique to this study is that it focuses on the experience of existing perchloroethylene dry cleaners switching to professional wet cleaning. Cleaners evaluated in prior case studies were either mixed facilities (using both dry cleaning and wet cleaning),<sup>63</sup> start-up cleaners with no prior experience in garment care,<sup>64</sup> or those using a dry cleaning solvent other than PCE.<sup>65</sup>

By documenting the experience of a number of dry cleaners switching to professional wet cleaning, this study is able compare the experience of each cleaner to identify key factors associated with making a successful conversion. In addition, because our Center provided technical assistance to each cleaner, we were able to identify problems with the conversion process as each new cleaner was converted. For example, problems with programming the wet clean washer occurred for the first two cleaners converted (San Clemente Natural Cleaning Center and Del Mar Cleaners). By installing wet clean washer programs immediately after the washer was installed, programming was not a problem for the last three cleaners converted (Anawood Cleaners, 1Day Cleaners, and Eli's Airport Cleaners).

### 5.2 Generalizing Results: Keys to Successful Commercialization

Through the experience of a series of cleaners converting to professional wet cleaning, we have identified a number of key factors that are likely to be important for any cleaner making a switch to this technology.

#### Technical Training

Technical training provided to each cleaner converting to professional wet cleaning included observational training at another professional wet cleaning facility, half-day on-site training at the new facility immediately following installation, half-day on-site follow-up training (if necessary), and telephone consultation. This training was planned

---

<sup>63</sup> Environment Canada; Participants, G. C. P. *Green Clean: Final Report for the Green Clean Project*, Environment Canada, 1995.

<sup>64</sup> Patton, J.; Eyring, W. *Alternative Clothes Cleaning Demonstration Shop Final Report*, Center for Neighborhood Technology, 1996; *Pollution Prevention in the Garment Care Industry: Assessing the Viability of Professional Wet Cleaning*, Pollution Prevention Education and Research Center, 1997; Star, A.; Ewing, S. *Real World Wetcleaning: A Study of Three Established Wetcleaning Shops*, Center for Neighborhood Technology, 2000.

<sup>65</sup> Sinsheimer, P.; Cho, J.; Gottlieb, R. *Switching to Pollution Prevention: A Performance and Financial Evaluation of Cypress Plaza Cleaners And The Issues Associated With Converting from Dry Cleaning to Wet Cleaning*, Pollution Prevention Education and Research Center, 1999

around the daily schedule of the cleaners converting, creating minimal disruption, with initial on-site training taking place on a Sunday – a day most cleaners are not open for business.

A number of key factors associated with successful training of cleaners converting to professional wet cleaning were identified. These include:

- Observational training at an existing facility prior to installation.
- Programming washer, dryer, and tensioning equipment.
- Techniques for proper sorting, washing, drying, finishing.
- Techniques for processing specific garment types: ties, jackets, lined garments.
- Techniques for maintaining equipment: daily cleaning of dryer lint filter; checking lubrication of tensioning equipment.
- Techniques for spot removal.

Recommendations for improving technical training for cleaners converting to professional wet cleaning include:

- Developing a technical training manual.
- Developing a Training Certification Program for professional wet cleaners who want to learn to train other cleaners making the switch.
- Encourage wet clean manufacturers to develop a training program. One manufacturer, Miele, offers training for any cleaner purchasing their equipment.

### Installation

Each of the cleaners in this study were able to remove their dry clean equipment and install professional wet cleaning equipment over a two to three day period – starting on a Friday and ending on Saturday or Sunday morning. Given that most cleaners only have one cleaning machine for delicate garments in their shop, it is critical for a smooth transition to professional wet cleaning that the equipment switch-out be done over a weekend.

A number of key factors associated with successful installation of professional wet cleaning equipment were identified. These include:

- Design layout of professional wet cleaning equipment in plant to maximize efficient flow of garments through the system.
- Test equipment to verify proper installation.
- Ability to remove dry clean equipment and install wet clean system over a two-three day period.

Recommendations for improving installation for cleaners converting to professional wet cleaning include:

- Manufacturers and vendors of equipment developing a list of qualified installers of their equipment
- Developing a Qualified Installer Program.

## Demonstration Sites

Each of the cleaners evaluated visited at least one other dedicated professional wet cleaning facility prior to installing equipment at their own plant. The initial visit to a demonstration site, seeing the equipment first hand and talking to an operator, provided essential information necessary in making the decision to switch. Each of the cleaners reported concerns about professional wet cleaning in terms of garment shrinkage and increased labor time; fears that were substantially dispelled after an initial or follow-up visit to a demonstration facility. Once the cleaners made the decision to switch, follow-up visits to demonstration sites were essential to learn the technical details of the professional wet cleaning process prior to installation of the equipment at each new facility.

Keys to successful demonstration of professional wet cleaning include:

- Observing the complete cleaning process including: spotting, sorting, washing, drying, and finishing.
- Observing the processing of the full range of garment types and fabrics.
- Talking to the cleaner and pressing staff to address questions and concerns.
- Observing how cleaners interact with customers.
- Opportunities for cleaners to have hands on experience using wet clean equipment.

The number of professional wet cleaning demonstration facilities in the greater Los Angeles region will be expanded from eight to twenty over the next two years to provide additional venues for cleaners to observe the wet cleaning process first hand. In addition, Southern California Edison, an investor-owned utility, will be installing professional wet cleaning equipment at their Customer Technology Application Center (CTAC) facility in Irwindale, California. The CTAC installation will be available for any cleaner who wants hands-on experience using professional wet cleaning equipment.

## Financial Incentives

Each of the cleaners in this study received financial incentives to be part of a demonstration project. Even through cleaners switching to professional wet cleaning are able to successfully process the same garments they had previously dry cleaned, and do so at a lower cost than dry cleaning, developing financial incentives may induce more cleaners to switch. Two funding sources appear to be most appropriate to develop financial incentives for professional wet cleaning:

- Energy rebate programs. Given the data suggesting substantial energy savings associated with a switch to professional wet cleaning, rebate programs through the utilities should be developed.<sup>66</sup>

---

<sup>66</sup> Our center is currently working with The Gas Company and Southern California Edison on developing an energy rebate program for professional wet cleaning equipment.



- Funds created from regulatory fines. Because dry cleaners have had difficulty complying with environmental regulation both in the southern California region and throughout the United States, fines have been exacted on cleaners violating their permit conditions. Using these fines as a resource to provide incentives for professional wet cleaning is appropriate because switching to professional wet cleaning eliminates the need for regulatory oversight altogether.

### Transition Planning Manual

Each of the demonstration site cleaners received a professional wet cleaning technical information packet after attending a demonstration site workshop. The packet included basic information on professional wet cleaning, an equipment report providing list pricing of wet clean equipment, and brochures from different equipment manufacturers. A more detailed Transition Planning Manual should be developed to assist any cleaner interested in making a transition to professional wet cleaning. The manual should include information on how to choose equipment to purchase, how to assure proper installation of equipment, what financial incentives are available, and what information needs to be learned during training to make the process of switching from dry cleaning to professional wet cleaning smooth, quick, and successful.

## **5.3 Conclusion**

As the above discussion indicates, a transition from dry cleaning to professional wet cleaning can take place as a benefit to cleaners while also providing significant environmental benefits. The discussion also provided a set of programmatic initiatives that could facilitate such a transition. In addition, regulatory actions may further intensify the need for such a transition.

The evaluation of the experiences of the five cleaners provides a valuable base line of information for cleaners, regulators, and the general public. As cleaners seek to make a transition to a non-perc based system, it is important that such real-world information be made available. We would welcome the opportunity to extend this comparison to other non-perc based systems as well (e.g., Green Earth, CO<sub>2</sub>, and hydrocarbon-based systems as the most developed of such alternatives).

To pursue a path of pollution prevention change effectively requires this kind of hands-on information about the nature of the change, as well as an ability to evaluate and address health and environmental impacts and the overall viability of each of the systems involved. It is a path worth taking for regulator and regulated alike.