

A Cooperative
Project between
the U.S. Environmental
Protection Agency and
the Garment and
Textile Care
Industry

design^{FOR} THE ENVIRONMENT



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Garment and Textile Care Program



Case Study: Water-Based Cleaning System for Suede and Leather

As part of a cooperative effort between the Environmental Protection Agency (EPA) and the professional garment and textile care industry, the EPA Design for the Environment (DfE) Program recognizes water-based cleaning systems (wetcleaning) as one example of an environmentally-preferable technology that can effectively clean suede and leather garments.

Currently, most of the Nation's 34,000 commercial drycleaners use perchloroethylene (PCE or perc) as a solvent to clean garments. Since 1992, in response to growing health and environmental concerns about perc, EPA has been working in a voluntary partnership with the drycleaning industry to reduce exposures to perc. EPA's DfE Garment and Textile Care Program (GTCP) encourages professional clothes cleaners to explore environmentally-preferable technologies capable of cleaning garments labelled "dryclean only." Numerous companies in the garment and textile care

industry have begun using wetcleaning to clean woven and knit fabrics. This process has also been applied in the industry's leather and suede segment, and one company, Kirk's Suede-Life, Inc. (KSL), has developed a process to effectively clean leather products using machine wetcleaning.

Company Background

The C.K. Kirkpatrick Specialty Company began cleaning leather goods in 1935 and grew from businesses located in New York, Chicago, and Los Angeles. It had acquired an international clientele by the early 1960s.

In the late 1960s, the rival Suede-Life Company developed a new process to clean leather using continuous-solvent filtration and heated drying. The two companies merged in 1970 to form Kirk's Suede-Life, Inc.

In the 1980s, KSL began to research alternatives to traditional methods of suede and leather cleaning. KSL's research stemmed from the company's own environmental stewardship and concerns relating to the use of perc. After 4 years of testing, KSL marketed its water-based "Clean & Green" process in 1993. That same year, perc drycleaners were required to upgrade to expensive closed-loop systems, making a switch to KSL especially attractive. The Clean & Green process is now used by all 100 KSL licensees located on six continents. In addition, KSL's share of the U.S. leather cleaning market amounts to more than 70 percent.

In the near future, KSL will begin research on the use of liquid carbon dioxide as a leather cleaning solvent.

KSL's Partnership with Retailers

In 1994, Kirk's Suede-Life, Inc. (KSL) began an innovative care label program. The labels advise purchasers of new leather garments to ensure that they are cleaned by a professional

DISCLAIMER: This case study has been reviewed by the U.S. Environmental Protection Agency (EPA) and approved for publication. It is based on experiences gained from projects conducted by EPA's Design for the Environment program in collaboration with partners from industry, public interest groups, and research/educational institutions. The information contained in this document does not constitute EPA policy. Further, mention of trade names or commercial products does not imply endorsement or recommendation for use. All product performance information was supplied by the manufacturer(s) and has not been independently corroborated by EPA.

KSL leather cleaner. The program originated at J.C. Penney Company, and has expanded throughout the retailing industry. In 1996, nearly 10 percent of all leather garments sold in the U.S. carried the label. This represents more than five million garments.

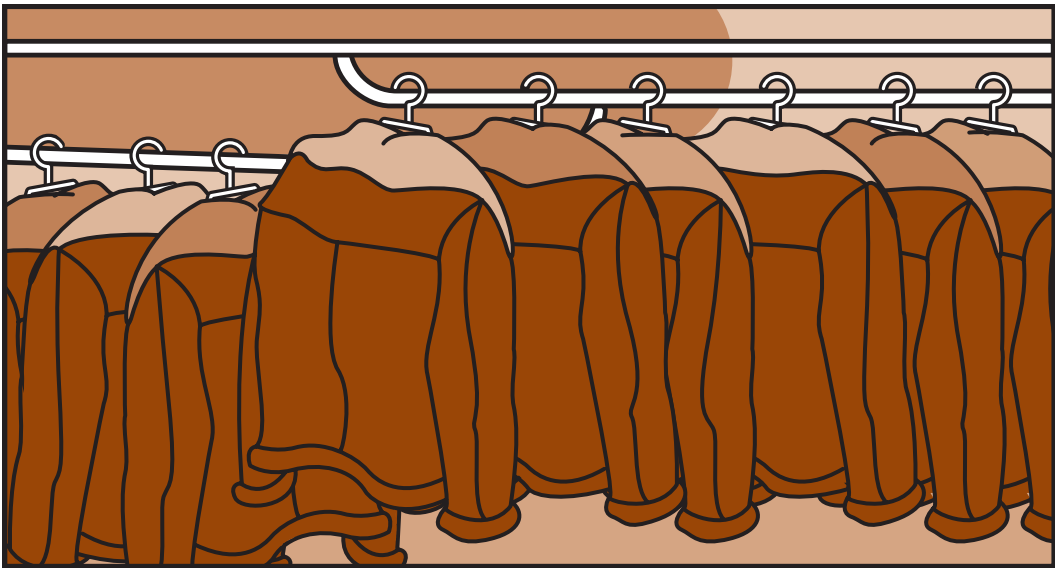
How Wetcleaning Works

Wetcleaning is a new process that uses detergents and water to clean garments. It requires technologically-advanced machines, specialized detergents and additives, and trained personnel. Unlike conventional clothes washing machines, state-of-the-art commercial wetcleaning machines use sophisticated controls to tailor prespotting, washing, and post-spotting cycles to a specific fabric. The machines are so specialized that they can be programmed for various functions, including agitation, water and drying temperature, and water and detergent volume. A number of cleaners can clean up to 100 percent of all garments (that used to be drycleaned) using these automated, state-of-the-art wet-cleaning techniques and well-trained personnel.

In the case of wetcleaning leather and suede, and using the KSL example, a cleaner places clothes in a washer with specially formulated cleaning agents. While still wet, the cleaned garments are hung to dry overnight, then briefly tumble-dried at very low heat. Steam and air from finishing and pressing completes the work cycle. Cleaners use KSL cleaning agents, a KSL or UniMac wetcleaning machine, a tumble dryer with a stainless steel reversing basket, regulated temperature control, and finishing equipment.

Cleaning Agents

KSL uses four biodegradable Clean & Green products in conjunction with its cleaning process. Prewash is added to reduce dye transfer and to protect lining materials from swelling, fraying, and wrinkling. Sulpho-tex 2000 removes oil-based stains.



Cleaning Compound cleans remaining soils while restoring the leather's oils to original tanning levels. Final Rinse provides water repellency, stain resistance, and sizing to restore garments to their original feel. The amount of each cleaning agent added is precisely metered by the washer's microprocessor. KSL employs its own prespotters, but the need for them is greatly lessened with the use of KSL cleaning agents.

Wetcleaning Machinery

The KSL system can be used with either a small or large wet-cleaning machine. To properly process work volume, KSL recommends using both small and large machines. For loads less than 25 pounds, a standard commercial washer is used. The company recommends the 35-lb UniMac UW35P3AU1. Since the washer must meet specific requirements, operators intending to use a different machine are advised to consult with KSL beforehand. For 35- to 85-lb loads, the 100-lb KSL/Midwest Clean & Green Washer-Extractor must be used. It is heavy duty, has dual temperature controls, has infinitely variable wash and extract speeds, and has both fully automatic and manual override features. Cold water is used during washing.

Drying and Finishing

Leather garments are hung to dry overnight and then tumbled at about 90°F for up to 30 minutes to soften and activate water repellent agents. The pressing and finishing hardware and process are the same as for traditional solvent cleaning. Both processes have similar shaping and finishing requirements.

Operation

Both the KSL and UniMac machines require minimal maintenance. Training is offered by KSL.

Performance

No independent performance testing has been conducted or is being planned. The performance information that is presented in this case study was provided by representatives of KSL.

Similar to endorsements given by cleaners of woven or knit fabrics, KSL asserts that its main benefits, relative to traditional solvents, are the ability to process almost all garments, better color retention, no solvent odor, and improved stain removal. The process also



replaces vital oils important to leather appearance and wear. KSL states that it can now clean more than 95 percent of all leather and suede garments. Of the remaining 5 percent, half could be better processed using other solvents (e.g., excessive grease and oil stains) while the other half cannot be safely cleaned by any method (e.g., burns and ink dyes).

- *Problem stains.* Relative to perc cleaning systems, the KSL machine wetcleaning process is superior at removing water soluble stains such as blood and other bodily fluids. The perc process is better at removing fatty stains, grease, paint, and varnish.

- *Problem fabrics.* The KSL process is superior at removing stains from vinyl, while perc is better at removing stains from rayon. Both are outstanding at removing stains from wool, polyester, silk, and leather.

- *Garment damage.* The KSL process and traditional perc processes are safe on fabrics. However, the KSL process causes considerably less damage to buttons, fasteners, coloring, and adhesives, resulting in significant labor savings.

- *Shrinkage/Wrinkling.* The KSL process and perc processes rarely result in shrinkage or wrinkling.

- *Prespotting.* Both the KSL process, and perc processes, require about the same amount of prespotting.

- *Color retention.* Machine wetcleaning is a superior process with respect to resistance to discoloration, color loss, dye bleeding, and ability to process multicolor garments. Perc processes often result in color loss.

- *Hand and feel.* The KSL process was designed to restore leather to its original softness and feel.

- *Solvent odor.* The KSL process leaves no residual odor.

- *Cycle Time—Washing.* The KSL process requires a 30- to 40-minute wash cycle whereas the perc processes require only 15 to 20 minutes.

- *Cycle Time—Drying.* Leather garments cleaned by the KSL process are hung overnight followed by brief tumbling, whereas garments cleaned via the perc process are machine-dried in 1 hour.

- *Labor For Finishing.* Garments cleaned by the KSL process require 15 percent more finishing labor than garments cleaned by the perc processes.

- *Pilling.* The KSL process substantially reduces pilling (a result of air drying). Perc processes require tumbling during the drying phase, which can easily cause pilling.

- *Adhesives.* The KSL process has no effect on the adhesives used in leather garments. The perc process dissolves adhesives often creating stains or requiring regluing.

- *Oil replacement.* The KSL process replaces necessary oils that are lost during the use of a suede or leather garment. Perc functions as a degreaser, causing garments to lose the oil and lubricants applied during tanning.

Environmental, Safety, & Health Impacts

The environmental, human health, and human safety impacts resulting from the wetcleaning process are less than the impacts associated with the use of traditional solvents. However, the volume of water used for wetcleaning is greater than that required for traditional drycleaning processes. Wetcleaning wastewater, if left untreated and discharged directly into a lake, river, or stream, could pose risks to aquatic life. However, it is normally the case that such wastewater is discharged into a public sewer system and treated at the local publicly-owned wastewater treatment facility in accordance with Federal Clean Water Act requirements. Under these normal circumstances, risks to aquatic life are minimized. Potential human health and safety impacts are essentially limited to minor skin and eye irritation. Skin and eye exposure to the cleaning agents can be minimized through adherence to proper operational procedures.

The wetcleaning process does not produce hazardous wastes, hazardous air emissions, greenhouse gases, or ozone depleting substances. The spotter and four cleaning agents are nonsolvent formulations that are biodegradable and generally benign, although eye contact should be avoided due to potential irritation. Because the KSL system does not generate hazardous waste, the regulatory burden associated with wetcleaning is much less than the regulatory burden associated with traditional drycleaning processes.

The KSL process consumes up to 35 percent less energy compared to traditional solvent processing because it does not require heated water or substantial heat for drying purposes. Water consumption (150 to 200 gallons per 100-lb. load) is about the same as that associated with the perc process, which requires water for cooling.

Capital Costs

KSL sells wetcleaning washers and dryers separately. The 100-lb KSL/Midwest Clean & Green Washer-Extractor is priced at approximately \$19,500. The 35-lb UniMac UW35P3AU1 washer and microprocessor are priced at approximately \$7,600. The company recommends using dryers with a 50- to 100-lb capacity, a stainless steel basket, reversing motion, and rigid temperature control. Dryers are priced at approximately \$5,000. KSL requires the same finishing equipment that is required for drycleaning and can recommend pressing and finishing equipment.

Operational Costs

KSL indicates that relative to drycleaning, KSL licensees find the company's process to be less costly to operate. This is due to lower costs for labor, energy, prespotting, and the elimination of solvent supply and disposal costs. Processing costs are 4 to 21 percent lower than perc systems and 12 percent less to 4 percent higher than petroleum systems. Electrical and natural gas costs average 35 percent less than drycleaning costs because KSL does not require heated water or substantial heat for drying. Finishing requires 15 percent more time, but overall labor is lower than that associated with perc processes as there is less damage and fewer reglues are required. Floor space requirements are the same for each process. Large-volume KSL operators have reduced operational costs by 20 percent. Smaller cleaners have reduced these costs by smaller margins.

Impact on Businesses

According to KSL representatives, the KSL process performs better than traditional drycleaning, reduces environmental impacts, reduces human health and safety impacts, costs less to operate than traditional drycleaning, and removes 95 percent of all stains and soils. The cleaning cost per leather garment is competitive with traditional drycleaning—approximately \$30 to \$40.

Relative to traditional drycleaning, the environmental regulatory burden associated with the KSL process is significantly reduced. The need to comply with the Federal and state hazardous waste regulations and with the Federal and state water quality regulations is eliminated.

What is Design for the Environment?

EPA's Design for the Environment (DfE) Program is a voluntary initiative that forges cooperative partnerships among government, industry, academia, and environmental groups. One of the primary objectives is to incorporate environmental concerns into the design and redesign of products, processes, and technical management systems.

One of the goals of the DfE Garment and Textile Care Program (GTCP) is to provide cleaners with information that can help them run their facilities in a way that is safer for workers, more environmentally sound, and more cost effective. To accomplish this goal, the program utilizes EPA expertise and leadership to evaluate the environmental and human health risks, performance, and cost tradeoffs among clothes cleaning technologies. DfE disseminates information to all interested parties and assists businesses in implementing cleaner technologies.

The GTCP is preparing several documents addressing environmentally-preferable clothes cleaning technologies. In the near future, these and other case studies will be available on the GTCP web site and in hardcopy and include:

- *Case Study: Liquid Carbon Dioxide Surfactant System for Garment Care* (EPA 744-F-99-002)
- *Case Study: Wetcleaning Systems for Garment Care* (EPA 744-F-98-016)

For More Information

- For more information about Kirk's Suede-Life Clean & Green, contact:
Bob Stewart
Kirk's Suede-Life, Inc.
2501 West Fulton Street
Chicago, IL 60612
Telephone: (800) 447-5475
Fax: (800) 441-8640
E-mail: leatherman@prodigy.com
Visit Kirk's Suede Life's web site: <http://www.ksl-c-g.com>
- Contact the EPA Pollution Prevention Information Clearinghouse (PPIC) to receive an information packet about EPA's DfE Program or the Garment and Textile Care Program, or to request single copies of DfE documents, or a revised DfE Publications list:
- Pollution Prevention Information Clearinghouse (PPIC)
U.S. Environmental Protection Agency
401 M Street, SW (7407)
Washington, DC 20460
Telephone: (202) 260-1023
Fax: (202) 260-4659
E-mail: ppic@epa.gov
- Visit the EPA DfE Garment and Textile Care Program web site: <http://www.epa.gov/dfe/garment/garment.html>
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