

Equipment Report: CO₂ and Professional Wet Cleaning Technologies

The California Environmental Garment Care Program



Date: 6/18/2008

For more information contact us at:

POLLUTION PREVENTION CENTER

UEPI, Occidental College

1600 Campus Road

Los Angeles, CA 90041-3314

Phone: (323) 259-1457

Fax: (323) 259-2734

www.uepi.oxy.edu/ppc

CO₂ Dry Cleaning Technology

The CO₂ process is a sub-critical carbon dioxide based garment cleaning process that has been developed for use by commercial and retail dry-cleaners. CO₂ is a non-flammable, non-toxic, colorless, tasteless, odorless naturally-occurring gas that, when subjected to pressure, becomes a liquid solvent. The CO₂ used in the garment cleaning process is an industrial by-product from existing operations, such as production of ethanol by fermentation and anhydrous ammonia (fertilizer) production. This process does not produce any new CO₂ and, thus, does not contribute to global warming

Description: CO₂ Dry Cleaning

The Cleaning Cycle

- The laundry is placed in the washing chamber of the machine. The chamber is emptied of air.
- The pressure in the washing chamber is raised by injecting gaseous CO₂. Then, liquid CO₂ is pumped into the washing chamber.
- Agitation is achieved by jet streams and/or by a rotating basket. The cleaning cycle lasts about 5 to 15 minutes and the whole process takes place at ambient temperature.
- The liquid CO₂ goes into the fibers and dissolves dirt, fats, and oils. During the washing cycle a filter cleans particles from the liquid.
- At the end of the cleaning process, the liquid CO₂ is pumped back into the storage tank.
- The remaining gaseous CO₂ is pumped back into the storage tank lowering the pressure in the cleaning chamber. On its way to the storage vessel the gas is chilled and once again condensed into its liquid form.
- When the pressure is low enough, the remaining CO₂ is vented to the atmosphere.
- The CO₂ is regularly cleaned by distillation.



CO₂ Machines Listing

COMPANY	MODEL	CAPACITY	LIST PRICE*
Sail Star	Sail Star USA	60 lbs	\$143,000

*All Prices are subject to change. See below for contact information.

EQUIPMENT CONTACTS

COMPANY	DISTRIBUTOR	CONTACT NAME	PHONE	WEBSITE
Sail Star			(704) 393-3257	www.sailstarusa.com

Description: Cleaning Agents

As in the case of other technologies, special detergents designed to work with CO₂ solvents must be used during the cleaning process. These products are readily available, and comparably priced with those used in traditional dry cleaning machines.

A number of pre-spotters have been developed for the CO₂ machine. In practice, it has been found that some pre-spotting is necessary. Because of the low operating temperature, stains are not set into the material, and those stains that don't come out during the cleaning process can be removed with a steam gun, or traditional post-spotting methods.

Cleaning Agents Listing

COMPANY	DETERGENT	SPOTTING CHEMICALS
Kreussler	Available	Available
Washpoint	Available	Available

DETERGENT MANUFACTURER CONTACTS

COMPANY	DISTRIBUTOR	CONTACT NAME	PHONE	WEBSITE
Kreussler	Kreussler	Rich Fitzpatrick	(603) 721-9478	www.kreusslerusa.com
Washpoint	Washpoint	Howard Guy	(404) 668-6439	www.washpoint.com

WET CLEANING TECHNOLOGY

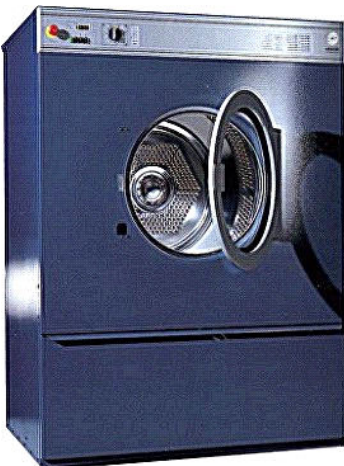
DEFINITION: Professional wet cleaning is a process that uses computer-controlled washers and dryers, specially formulated detergents, and specialized finishing equipment to create a cost-effective alternative to dry cleaning.

- *Professional wet clean washers* use a computer to control the rotation of the cleaning drum in order to minimize agitation while providing sufficient movement for effective garment cleaning. Wet clean washers are also equipped with a computer programmed detergent injection system, which allow the cleaner to specify the amount and type of wet clean detergent used for each load.
- *Biodegradable wet clean detergents* have been formulated by detergent manufacturers to maximize cleaning power while minimizing color change and shrinkage.
- *Wet clean dryers* include computer controls 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.

Currently, there are a number of companies who manufacture professional wet cleaning washer and dryer systems, tensioning equipment presses, and professional wet cleaning detergents and additives. This report provides an overview of the equipment and detergents that are currently available.

Description: Wet Cleaning Washer and Dryer

While there are a number of manufacturers of professional wet cleaning washer and dryer systems, these machines share many common features. Computer control, programmability and other similar features are the essential components of these machines. In addition, in each of these systems, washing and drying are done in separate machines, allowing for greater throughput than advanced dry clean machines, which require washing and drying to occur in the same machine.



Some manufacturers have adopted different sales strategies for a full package system of washer and dryer (and also of finishing equipment) while others sell components and allow the customer to get together a system tailored to their own needs. Some manufacturers include technical training as part of the purchase price, while others provide only basic operating features. Some manufacturers include a computer control system as part of their package, while others expect the detergent companies to provide this. These machines come in a wide range of sizes, design features, and prices. In general, hard mount washers are floor mount machines, but require a custom concrete foundation and are not suitable for up-stallation.



Wet Clean Washers Listing

COMPANY	MODEL NO	WET CLEAN CAPACITY	LAUNDRY CAPACITY	EXTRACTION SPEED	HARD/SOFT MOUNT	LIST PRICE*
Aqua Solo	S-150	30 lbs		40/580	Soft	TBA
Cissell	CHC035		35 lbs	1000 RPM	Soft	\$9,883
	CP040H	20 lbs	40 lbs	885 RPM	Hard	\$10,994
	CHF055		55 lbs	826 RPM	Soft	\$15,250
	CP060H		60 lbs	826 RPM	Hard	\$12,328
	CHF075		75 lbs	1000 RPM	Soft	\$19,457
	CP080H		80 lbs	756 RPM	Hard	\$19,016
Imesa	ICM 23	50 lbs	80 lbs	363G	Soft	Package includes washer & dryer \$27,500
Ipsco	IPH 40H	20 lbs	40 lbs	300G	Hard	\$8,690
	IPH 60H	30 lbs	60 lbs	300G	Hard	\$9,990
	IPH 80H	40 lbs	80 lbs	300G	Hard	\$15,500
	IPH 100H	50 lbs	100 lbs	300G	Hard	\$16,200
	IPH 140H	70 lbs	140 lbs	300G	Hard	\$21,300
Maytag	MFS50PM	30 lbs	50 lbs	310 G	Soft	\$10,800
	MFS80PM	50 lbs	80 lbs	310 G	Soft	\$17,215
Miele*	Pkg 1: WS5191 washer	29 lbs	42 lbs	460G	Soft	Total package \$65,000
	Pkg 2: WS5191 washer	29 lbs	42 lbs	460 G	Soft	Total package \$72,000
	<i>*Package includes washer, dryer, Veit tensioning equipment, Krussler detergents and on site training. See Dryer and Tensioning sections for additional details. Package 1 includes 24kg of soap & conditioner. Package 2 includes 40kg of soap & conditioner.</i>					
Wascomat	EX 630 CA	18 lbs	30 lbs	350G	Soft	\$10,891
	EX 640 CA	25 lbs	40 lbs	350G	Soft	\$12,502
	EX 655 CA	35 lbs	55 lbs	350G	Soft	\$14,721
	EXSM 230 CA	40 lbs	65 lbs	220G	Hard	\$11,825
	EXSM 350 CA	50 lbs	80 lbs	220G	Hard	\$18,883
	EXSM 6135 CA	85 lbs	135 lbs	220G	Hard	\$24,458

*All Prices are subject to change. See back for contact information.

Professional Wet Clean Dryers Listing

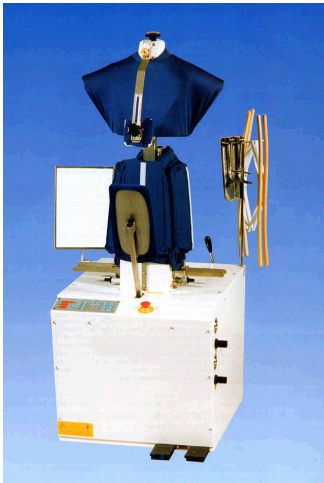
COMPANY	MODEL	CAPACITY	HEATING	RESIDUAL MOISTURE SENSOR	LIST PRICE*
American Dryer Corp	SL-50	50 lbs	Gas/Steam/ Electric	Sensor in drum	Gas: \$4,300 Electric: \$4,500 Steam: \$5,130
	SL-75	75 lbs	Gas/Steam/ Electric	Sensor in drum	Gas: \$4,600 Electric: \$5,200 Steam: \$5,600
Imesa	IMC170	75 lb	Gas/Steam/ Electric	Sensor in drum	Washer+dryer \$27,500
Miele	Pkg 1: T6551	54 lbs	Steam/ Electric	Sensor in drum	See pg 5
	Pkg 2: T6551	54 lbs	Steam/ Electric	Sensor in drum	See pg 5
Wascomat	TD 30 RMC	30 lbs	Gas/Steam/ Electric	Sensor in drum	\$4,012
	TD 50 RMC	50 lbs	Gas/Steam/ Electric	Sensor in drum	\$4,700
	TD 75 RMC	75 lbs	Gas/Steam/ Electric	Sensor in drum	\$5,065

*All Prices are subject to change. See below for contact information.

EQUIPMENT CONTACTS

COMPANY	DISTRIBUTOR	CONTACT NAME	PHONE	WEBSITE
Aqua Solo		Young Kim	(908) 370-9883	www.wetcleanaqua.com
American Dryer		Zion Orpaz	(508) 678-9000 (714) 943-3261	www.amdry.com
Imesa			(562) 942-9700	www.imesa.it
Ipsos			(920) 748-3121	www.ipsosusa.com
Maytag		Zion Orpaz	(800) 662-3587 (714) 689-0068	www.maytagcommercial-
Miele	BOGO	Hans Kim	(909) 921-2256	www.wetcleaning.com
Natura				
Wascomat	Justin Ha Taylor Houseman	LA Area only Bay Area only	(800) 465-8300 (800) 464-6866	www.wascomat.com

Description: Tensioning Equipment



Tensioning Form Finisher

Wet cleaned garments can be finished using either conventional pressing equipment or specialized tensioning finishing equipment. Tensioning presses are designed to reverse or prevent shrinkage and/or seam crumbling and creasing of garments by applying widthwise and lengthwise tension on garments during the pressing process. Tensioning finishing equipment is increasingly recognized as an essential component of professional wet cleaning. Performance tests have shown that professional wet cleaning is effective in the actual cleaning of clothes, but that dimensional change (shrinking and stretching) can sometimes be a problem if the cleaner does not use tensioning equipment. In addition, tensioning finishing equipment has been shown to reduce the pressing labor time at professional wet cleaning facilities.



Tensioning Pants Topper

There are two main types of tensioning equipment, form finishers and pants toppers. Both pieces of equipment function by using steam to relax fibers, moving parts to stretch and shape clothes and hot air to dry.

Tensioning Equipment Listing

MANUFACTURER	EQUIPMENT TYPE	MODEL	TYPES OF GARMENTS	LIST PRICE*
Clean Concepts	Tensioning Form Finisher	314	Coats, jackets, blouses & dresses	\$17,900
	Tensioning Form Finisher	375	Pants	\$10,900
	Tensioning Form Finisher	376	Coats, dresses, various garments	\$12,900
Forenta	Tensioning Pants Topper	TPT-503	Pants	\$9,500
	Tensioning Form Finisher	TFF-507	Pants	\$11,500

Tensioning Equipment Listing

MANUFACTURER	EQUIPMENT TYPE	MODEL	TYPES OF GARMENTS	LIST PRICE*
Hi-Steam	Tensioning Form Finisher	JAM510	Jackets, overcoats, dresses, blouses, and skirts	\$12,299
	Tensioning Form Finisher	JAM510 (Rotating)	Jackets, overcoats, dresses, blouses, and skirts	\$12,950
	Tensioning Pants Topper	PAM510	Pants	\$10,725
	Tensioning Pants Topper	PAM510 with Pleat Paddles	Pants	\$12,299
Hoffman/ NewYorker	Tensioning Pants Finisher	Topmaster II-PP	Khakis, dress pants, uniform rentals, pleated pants and jeans	\$11,200
	Tensioning Form Finisher	JUDI II	Jackets, blouses, coats, sweaters and outerwear	\$10,500
Trevil		Model 5120	Jackets, overcoats, dresses, golf shirts	\$12,995
	Tensioning Pants Topper	Model 5304	Pants	\$11,000
Itsumi	Tensioning Form Finisher	GF-3 Mini Former	Jackets, overcoats, dresses, blouses, and skirts	\$9,250
	Tensioning Pants Topper	TO-322A	Pants	\$8,000
Unipress	Tensioning Form	TUF-P	Coats, jackets, blouses, dresses, skirts	\$11,400
	Tensioning Pants Topper	TPF	Pants	\$9,800
Veit	Multiform Finisher	8356	Coats, jackets, blouses, dresses, skirts	\$12,108
	Multiform Finisher	8362	Additional vacuum to assist positioning	\$19,277
	Tensioning Pants Topper	8741	Pants	\$11,410
Miele Packages 1 & 2 include:	Multiform Finisher	8362		See pg 4
	Tensioning Pants Topper	8741		See pg 4

*All Prices are subject to change. See next page for contact information.

Tensioning Equipment Listing

MANUFACTURER	EQUIPMENT TYPE	MODEL	TYPES OF GARMENTS	LIST PRICE*
Sankosha	Tensioning Form Finisher	DS 50U	Jackets, overcoats, dresses, blouses, and skirts	\$9,250
	Tensioning Multi-Form Tensioning Garment Finisher	DS 550U	Jackets, overcoats, dresses, blouses, and skirts	\$22,000
	Tensioning Pants Topper	DS 740U	Pants	\$9,500

EQUIPMENT CONTACTS

COMPANY	DISTRIBUTOR	CONTACT NAME	PHONE	WEBSITE
Clean Concepts	Clean Concepts	John Tipps	(972) 406-8107	www.cleanconcepts.net
Forenta	Laundry & Dry Cleaning Equipment Equiptech Services		(650) 588-8800 (510) 639-7409	www.forentausa.com
Hi-Steam		Taylor Houseman	(888) 460-9292 (800) 464-6866	www.histeam.com
Hoffman/New Yorker	Hoffman New Yorker	Scott Blackwell	(928) 855-3306/ (909) 851-4581	www.hoffman-newyorker.com
Trevil			(877) 873-8451	www.trevil.com
Itsumi	Western Multitex Kellerher Equipment JKE Equipment	J. Anthony Kim	(714) 871-8890 (800) 894-1555 TBA	www.kelleherequipment.com/
Unipress			(813) 623-3731	www.unipresscorp.com
Veit	DK Equipment	Unis Griffin	(510) 293-8964	www.veit.de/en
Sankosha	Sankomatic Corp.	Jason Lee	(626) 384-0188	www.sankosha-inc.com

Description: Detergent Dispensing System

The detergent dispensing system comes with a computer program that injects the detergent into the washer, allowing the operator to specify the amount and type of wet clean detergent to be used for each load. This is an essential part of the wet cleaning system, as it maximizes the effectiveness and performance of wet cleaning detergents.

Dispensing Systems Listing

MANUFACTURER	SYSTEM DESCRIPTION	MODEL	LIST PRICE*
Beta Technology	Summit, 6 pump dispenser w/ internal trigger		\$757.50
	Summit programmer		\$128.30
	Low level alarm lances		\$42.00 each (6 per order)
Knight	4 Pump Dispenser w/Remote Control, with Pumps 23 oz/min*	MF-4804RC & KP-8120AX	\$1,213
	5 Pump Dispenser w/Remote Control with Pumps 23 oz/min*	MF-4805RC & KP-8120AX	\$1,686
	6 Pump Dispenser w/Remote Control with Pumps 23 oz/min*	MF-4806RC & KP-8120AX	\$1,911

*All Prices are subject to change. See next page for contact information.



EQUIPMENT CONTACTS

COMPANY	DISTRIBUTOR	CONTACT NAME	PHONE	WEBSITE
Beta Technologies	Beta Technology Inc	Douglas Bragdon	(800) 858-2382	www.beta-technology.com
Knight	Knight Systems	Chris March	(800) 854-3764	www.knightequip.com

Description: Cleaning Agents

A wide range of specially designed detergents, conditioners, and sizing agents have been developed for professional wet cleaning. The computer controls on wet clean washers are designed to maximize the effectiveness of these cleaning agents.

Detergents: Specialized wet cleaning detergents are formulated with additives to minimize shrinkage and color loss.

Conditioners: Wet cleaning conditioners smooth and soften garments, and coating fibers to minimize shrinkage.

Sizing Agents: Wet cleaning sizing agents add body to garments and improve creases which helps with finishing.

Combinations: Some chemical manufacturers offer a conditioner and sizing agent in one or a detergent, conditioner, and sizing agent in one.

Spotting Agents: In addition to cleaning chemicals, specially formulated biodegradable pre-spotting agents for professional wet cleaning have been developed, since waste water from wet cleaning machines are disposed through municipal sewer drains.

Specific Information on Chemical Manufacturers: Information on type and price of cleaning agents was developed for this report (see table on next page). Additional information from chemical manufacturers includes: availability and prices of detergent dispenser pumps, cost of shipping, refund policies, and support services.

*Peristaltic pumps with 23 oz/min capacity are available for Knight Inc at \$103.00 each. In addition, peristaltic pumps with 10 oz/min capacity are also available at \$90.00 each.

Cleaning Agents Listing

COMPANY	DETERGENT (\$/GALLON)	CONDITIONER (\$/GALLON)	SIZING (\$/GALLON)	CONDITIONER & SIZING (\$/GALLON)	DETERGENT, CONDITIONER, SIZING (\$/GALLON)	SPOTTING AGENTS
Adco	X			X	X	X
A.L. Wilson						X
Bufa	X			X		X
Fiber Tech	X	X	X			
Gurtler						X
Kleerwite Chemicals					X	X
Krussler	X	X				X
Laidlaw	X	X	X			X
MEGS	X	X		X		
Pariser Industries, Inc	X	X				X
R.R. Street	X	X	X			X
Sanitone	X			X		
Seitz	X	X	X			X
Stamformd	X		X			

See next page for contact information and pricing.

EQUIPMENT CONTACTS

COMPANY	CONTACT NAME	PHONE	WEBSITE
Adco		(660) 826-3300	www.adco-inc.com
A.L. Wilson		(800) 526-1188	www.alwilson.com
Fiber Tech		(888) 833-6181	
Gurtler	Tom Yahn	(800) 638-7300 or (708) 331-2550	www.gurtler.com
Keerwite	Mike Levine	(703) 625-9879 or (877) 553-3794	www.dry-clean.com
Krussler		(813) 884-1499	www.kreussler-chemie.de
Laidlaw	Mike Achin	(508) 699-5521 or (508) 878-8739	www.laidlawcorp.com
MEGS Enviro Tech	Zion Orpaz	(714) 689-0068	www.megswetcleaning.com
Pariser		(973) 569-9090	www.pariserchem.com
RR Street	Tim Racette	(630) 416-4244	www.4streets.com
Sanitone		(800) 543-0406	www.sanitone.com
Stamford	Steve Nagel	(606) 781-8200	http://www.fabritec.com/ stamford/index.html
Seitz	Kurt Wickiser	(813) 886-2700	www.seitz24.com



Pollution
Prevention
Center

Urban & Environmental
Policy Institute

OCCIDENTAL COLLEGE

1600 Campus Road
Los Angeles, CA 90041
Phone: 323-259-1457
Fax: 323-259-2734
www.uepi.oxy.edu