



## Comparison of Hazards, Regulatory Concerns, and Costs for Alternative Dry Cleaning Technologies



	Technology <sup>1</sup>	Total Annual Cost (for first 5 years) <sup>2</sup>	Primary Human Health and Environmental Hazards	Air Regulations (Bay Area Air Quality Management District)	Health Regulations (Department of Public Health)	Fire Regulations (Fire Department)	Other Considerations
	PROFESSIONAL WET CLEANING	\$20,926	• None Identified	N/A	<ul style="list-style-type: none"> <li>Detergent, spotters should be chosen to minimize environmental concerns</li> <li>Possible annual fee for hazardous material storage (if ≥55 gal hazardous detergent stored on site)</li> </ul>	N/A	• CARB offers \$10,000 grants for conversion (AB 998)
	CO <sub>2</sub> cleaning <sup>2</sup>	\$58,881	• None Identified	N/A	<ul style="list-style-type: none"> <li>Possible annual fee based on volume of CO<sub>2</sub> gas stored on site</li> </ul>	<ul style="list-style-type: none"> <li>SFFD operational permit and annual licensing fee required</li> <li>Use of Class I alkane co-solvent prohibited per CA Fire Code 1204.1</li> </ul>	<ul style="list-style-type: none"> <li>CARB's offers \$10,000 grants for conversion (AB 998)</li> <li>Machine must be maintained to avoid CO<sub>2</sub> leaks</li> </ul>
	Hydrocarbon solvents: •DF-2000™ •EcoSolv® •Shell Sol •PureDry®	\$27,755 - \$28,535	<ul style="list-style-type: none"> <li>Neurotoxicity, eye, skin and respiratory irritation</li> <li>Potential concerns for persistence and aquatic toxicity</li> <li>Complex mixtures which may contain other ingredients of concern</li> </ul>	<ul style="list-style-type: none"> <li>Regulated under BAAQMD Rule 8-17</li> <li>Closed-loop machine required</li> <li>Registration required</li> <li>Permit required if &gt;200 gal/yr gross solvent used</li> </ul>	<ul style="list-style-type: none"> <li>Annual fee for hazardous waste generated</li> <li>Annual fee for hazardous material storage (≥55 gal stored on site) &amp; compressed gas storage (if ≥200 ft<sup>3</sup> N<sub>2</sub>)</li> </ul>	<ul style="list-style-type: none"> <li>SFFD operational permit and annual licensing fee required</li> <li>Combustible liquid (Class IIIA)</li> <li>Ventilation, automatic sprinkler system, fire extinguishers as specified in Fire Code Ch 12</li> </ul>	• Emits smog forming volatile organic compounds (VOCs)
	GreenEarth® (D5) solvent	\$32,718	<ul style="list-style-type: none"> <li>Suspected carcinogen, reproductive toxin</li> <li>Liver, immune and nervous system effects</li> <li>Persistent in environment; detected in fish</li> </ul>	<ul style="list-style-type: none"> <li>Regulated under BAAQMD Rule 8-17</li> <li>Closed-loop machine required</li> <li>Registration required</li> <li>Permit required if &gt;200 gal/yr gross solvent used</li> </ul>	<ul style="list-style-type: none"> <li>Annual fee for hazardous waste generated</li> <li>Annual fee for hazardous material storage (≥55 gal stored on site)</li> </ul>	<ul style="list-style-type: none"> <li>SFFD operational permit and annual licensing fee required</li> <li>Combustible liquid (Class IIIA)<sup>4</sup></li> <li>Ventilation, automatic sprinkler system, fire extinguishers as specified in Fire Code Ch 12</li> </ul>	---
	CO <sub>2</sub> cleaning <sup>2</sup> with Micell Technologies	\$58,881	• Possible use of perfluorooctanoic acid (PFOA) in Micell technology raises concerns for endocrine disruption, reproductive and developmental effects and persistence/bioaccumulation	N/A	<ul style="list-style-type: none"> <li>Possible annual fee based on volume of CO<sub>2</sub> gas stored on site</li> </ul>	<ul style="list-style-type: none"> <li>SFFD operational permit and annual licensing fee required</li> <li>Use of Class I alkane co-solvent prohibited per CA Fire Code 1204.1</li> </ul>	• Machine must be maintained to avoid CO <sub>2</sub> leaks
	Rynex™ solvent	\$26,220	<ul style="list-style-type: none"> <li>Chemical identity withheld as trade secret</li> <li>Primary ingredient likely to be dipropylene glycol t-butyl ether (DGTBE)</li> <li>DGTBE structurally related to a listed Proposition 65 carcinogen and predicted to be persistent</li> </ul>	<ul style="list-style-type: none"> <li>Regulated under BAAQMD Rule 8-17</li> <li>Closed-loop machine required</li> <li>Registration required</li> <li>Permit required if &gt;200 gal/yr gross solvent used</li> </ul>	<ul style="list-style-type: none"> <li>Annual fee for hazardous waste generated</li> <li>Annual fee for hazardous material storage (≥55 gal stored on site)</li> </ul>	<ul style="list-style-type: none"> <li>SFFD operational permit and annual licensing fee required</li> <li>Combustible liquid (Class IIIB)</li> <li>Ventilation, automatic sprinkler system, fire extinguishers as specified in Fire Code Ch 12</li> </ul>	<ul style="list-style-type: none"> <li>Emits smog forming VOCs</li> <li>Complete assessment not possible without information on identity and hazards of chemical ingredients</li> </ul>
	Hydrocarbon solvent: Stoddard solvent blend	\$28,308	<ul style="list-style-type: none"> <li>Contains aromatic hydrocarbons (e.g. benzene, a carcinogen)</li> <li>Neurotoxic, eye, skin and respiratory irritation</li> <li>Potential concerns for bioaccumulation and aquatic toxicity</li> </ul>	<ul style="list-style-type: none"> <li>Regulated under BAAQMD Rule 8-17</li> <li>Closed-loop machine required</li> <li>Registration required</li> <li>Permit required if &gt;200 gal/yr gross solvent used</li> </ul>	<ul style="list-style-type: none"> <li>Annual fee for hazardous waste generated</li> <li>Annual fee for hazardous material storage (≥55 gal stored on site)</li> </ul>	<ul style="list-style-type: none"> <li>SFFD operational permit and annual licensing fee required</li> <li>Combustible liquid (Class II)</li> <li>Ventilation, automatic sprinkler system, fire extinguishers as specified in Fire Code Ch 12</li> </ul>	• Emits smog forming VOCs
	Perchloroethylene	\$27,376	<ul style="list-style-type: none"> <li>Carcinogen (California's Proposition 65 list)</li> <li>Liver and kidney effects</li> <li>Neurotoxic, eye, skin and respiratory irritation</li> <li>Persistent in the environment</li> </ul>	<ul style="list-style-type: none"> <li>Regulated under BAAQMD Rule 11-16</li> <li>Secondary control technology required</li> <li>Registration required</li> <li>Permit required</li> <li>Mandatory phase out in progress</li> </ul>	<ul style="list-style-type: none"> <li>Annual fee for hazardous waste generated</li> <li>Annual fee for hazardous material storage (≥55 gal stored on site)</li> </ul>	N/A	---
	1- Propyl bromide	---	<ul style="list-style-type: none"> <li>Male and female reproductive toxicant and developmental toxicant (California's Proposition 65 list)</li> <li>Neurotoxic, eye, skin and respiratory irritation</li> </ul>	<ul style="list-style-type: none"> <li>Regulated under BAAQMD Rule 11-16</li> <li>Secondary control technology required</li> <li>Registration required</li> <li>Permit required</li> </ul>	<ul style="list-style-type: none"> <li>Annual fee for hazardous waste generated</li> <li>Annual fee for hazardous material storage (≥55 gal stored on site)</li> </ul>	<ul style="list-style-type: none"> <li>ILLEGAL per CA Fire Code 1204.1</li> <li>Flammable liquid (Class I), NFPA rating 3</li> </ul>	• Use without sufficient stabilizer likely to cause corrosion and damage to cleaning equipment <sup>5</sup>

<sup>1</sup>Green Jet refreshing technology can be used to supplement an existing professional wet or dry cleaning machine: [www.drywetcleaning.com](http://www.drywetcleaning.com)

<sup>2</sup>This technology uses reclaimed CO<sub>2</sub> so no new greenhouse gases are generated.

<sup>3</sup>Cost/year for first 5 yrs based on machine, solvent, detergent, spotting agent, electricity, natural gas, waste disposal, filter/gasket, maintenance costs (CARB, 2006)

<sup>4</sup>Class determined based on flash point listed in MSDS for each solvent

<sup>5</sup>Wolf, Katy. 2006. n-Propyl Bromide Destroys Equipment in Dry Cleaning Plant. <http://irta.us/>