St. Lawrence TECHNOLOGIES

ABSTRACT

The many new restrictions on the use of perchloroethylene, a chemical solvent used in the dry cleaning industry, have created an interest in water-based, clothes-cleaning technologies that use biodegradable detergents.

The use of a wet cleaning process at the dry cleaning plant of Chatel Votre Nettoyeur Inc. has demonstrated the effectiveness of the process in terms of:

- Quality of cleaning,
- Customer satisfaction,
- Quality of wastewater,
- Reduced water and energy consumption and detergent costs.

Operation of the wet cleaning process nonetheless demands a thorough knowledge of how different fabrics react to immersion in water, and operators must be especially careful at the selection and cleaning stages. Wet cleaning is not suitable for all fabrics.

INDUSTRIAL WASTEWATER

A WET CLEANING PROCESS FOR CLOTHES

MAIN FEATURES

- **Technology**
  - Compact installation controlled by microprocessor
  - Process uses biodegradable detergents
  - Suitable for cleaning fine washables
- **Environment**
  - Reduced use of perchloroethylene
  - Wastewater respects Montreal Urban Community (MUC) standards
  - No hazardous waste generated
  - High public acceptance (based on a survey)
- **Cost**
  - Reduced water and electricity consumption
  - Lower detergent and equipment costs
  - Longer finishing time and higher costs for certain garments

Saint-Laurent Vision 2000

Environment Canada Protection Québec Region

Environnement Canada Protection Région du Québec

Chatel votre nettoyeur

Federal Office of Regional Development (Québec)

Bureau fédéral de Développement régional (Québec)

PROJECT OBJECTIVES

Testing of the wet-cleaning process at a dry cleaning facility in Quebec is intended to promote the use of this water-based technology throughout the province. It is hoped that dry cleaners will embrace this process as an alternative to conventional perchloroethylene-based systems when purchasing new cleaning equipment.

The objectives of the project were as follows:

1. To demonstrate the effectiveness of this new clothes cleaning technology to dry cleaners and consumers alike.
2. To assess the quality of process wastewater.
3. To compare the operating costs of water-based and dry cleaning processes.
4. To compare the quality of cleaning and customer satisfaction.

BACKGROUND

Of the 3500 dry cleaning plants in Canada, 1000 are in Quebec, and they account for approximately one-third of all the perchloroethylene used in Canada. More than 50% of existing dry cleaning equipment does not meet environmental standards and will have to be modified or replaced once the revised version of the Quebec Regulation respecting air quality goes into effect. This regulation is expected to be adopted sometime in 1998. Plant operators, in selecting new cleaning equipment, will have to give due consideration to wet cleaning units because the process represents both an environmentally sound and an economical alternative to dry cleaning.

TECHNOLOGY

The wet cleaning process was demonstrated on the Wascomat Aqua Clean system. This washer is equipped with programs to control wash cycle time, detergent load, mechanical action of the tank, temperature and spin cycle speed. The tumbler dryer is equipped with a microprocessor that controls humidity and temperature.

Higher-capacity equipment (water-heater, vacuum pump, and air compressor) was required for installation of this system. A water softener that dispenses ionic salt was added to help keep water-hardness levels between 16 and 50 mg/L for optimal use of detergent.

Washer and dryer used in wet cleaning process for clothes.

RESULTS

Analytic Results

The analytic results of three samplings indicate that chemical concentrations in the wastewater do not exceed the standards set out in the Montreal Urban Community *By-law respecting wastewater disposal into sewer systems and waterways.*

Compound samples better reflect the composition of effluent discharged to municipal sewers than do individual samples because the dry cleaning facility has an equalization tank.

Concentrations of the substances being analysed vary less in compound samples than they do in individual samples, and contaminant concentrations are lower. Metals were found at levels below analytic detection limits. The parameters that varied the most during the different sampling campaigns were oil and grease, total Kjeldahl nitrogen (TKN), BOD_5 and COD. The oil and grease as well as nitrogen in dirt, sweat, stains and other forms of soiling, in conjunction with organic substances like dye pigments and natural fibres, increased the concentrations of BOD_5 and COD somewhat.

Cost Estimates

Using five kilograms of clothes cleaned as a base load for comparison, the cost of electricity and detergents used in wet cleaning represented 36% and 80%, respectively, of the costs of dry cleaning, and water consumption was 18 times lower. Overall savings are estimated at 6%. The purchase price of a wet cleaning system with a 22.7 kg capacity is approximately 33% less than an equivalent fourth-generation perchloroethylene machine.

However, more time may be necessary to restore some clothes such as coats, jackets and wool suits.

Customer Satisfaction

A survey has shown that 94% of customers are satisfied with the quality of garment cleaning and the resulting appearance, scent and finish.

SOME ANALYTICAL RESULTS OF THE WASHER EFFLUENT

Parameters	Units	MUC standards[1]	Average results May 7	Average results June 26	Average results November 5
Total Kjeldahl nitrogen	mg/L	—	6.23	34.9	24.3
BOD_5	mg O_2/L	—	101	216	205
COD	mg O_2/L	—	322	1143	596
Total oil and grease	mg/L	250	23.7	40.0	24.3
Arsenic	mg/L	1	<0.001	—	—
Cadmium	mg/L	2	<0.05	—	—
Chromium	mg/L	5	<0.05	—	—
Copper	mg/L	5	0.14	—	—
Mercury	mg/L	0.05	0.0003	—	—
Nickel	mg/L	5	<0.05	—	—
Lead	mg/L	2	0.03	—	—
Sulfide	mg S/L	5	0.01	—	—
Zinc	mg/L	10	0.56	—	—

[1] Article 10 of the Montreal Urban Community *By-law respecting wastewater disposal into sewer systems and waterways.*

POTENTIAL AND LIMITATIONS

This wet cleaning study demonstrated the ability of Chatel Inc., following an initial orientation period, to wet clean up to 30% of the garments brought in to be cleaned. As the firm gains more experience, this percentage may increase. However, wet cleaning does require greater care and better knowledge of fabrics and soiling than does dry cleaning, and a training program is necessary for designated staff.

Wet cleaning could capture a significant portion of the garment cleaning market in coming years, given that many cleaners in Quebec will have to replace obsolete dry cleaning equipment and given the economic and environmental advantages of wet cleaning.

It may be possible to clean some garments that are too delicate for dry cleaning. However, all of the clothes brought to the cleaners will not be wet cleaned due to the expertise required to use this technology and the sensitivity of certain fabrics to immersion in water.

INFORMATION

This technology data sheet is based on the results of a technology demonstration project carried out by Chatel Votre Nettoyeur Inc. in cooperation with Équipements Paul Langevin and Wascomat of Canada. The project received funding and technical assistance from Environment Canada and the Federal Office of Regional Development (Quebec).

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St. Lawrence Technologies data sheets are intended for all companies, industries, organizations and individuals interested in new environmental technologies. They are produced by the Eco-Technology Innovation Section, Environment Canada, as part of the St-Lawrence Vision 2000. They serve to disseminate the results of technology development and demonstration projects conducted in the following five sectors: industrial wastewater; contaminated soil; hazardous wastes; contaminated sediment and innovative tool.

Data sheets may be obtained from:
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http://www.qc.doe.ca

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Printer:
J. B. Deschamps Inc.

Published by authority of the Minister of the Environment

Cat. No.: En 1-17 / 29-1997E
ISSN: 1188-8903
ISBN: 0-662-26162-3

November 1997

Cette fiche est également disponible en français sous le titre:
L'aquanettoyage des vêtements

Canada