

SB32 (GreenEarth)

Waste Streams / Air Sampling Test Protocol

Background and Objectives

GreenEarth announced in June 1999 that extensive testing would be done at drycleaning plants using SB32 in daily operation on the four key areas that affect the drycleaning industry: still bottoms, filter cartridges, wastewater, and personal air sampling relative to employee exposure.

At the time of the announcement, GreenEarth stated that all testing information would be shared with the US Environmental Protection Agency, the International Fabricare Institute, and affiliated equipment manufacturers.

GreenEarth contracted with Severn Trent Laboratories, one of the largest and most respected certified testing laboratories in the United States, to perform independent testing on SB32 as used in daily operation at GreenEarth sites. They tested still bottoms, filter cartridges and wastewater. For air sampling, California Industrial Hygiene Services, also a certified independent testing organization, was contracted to perform extensive air sampling tests at operating GreenEarth sites. Waste stream and air sampling was done at intervals over a four-month period.

Waste Streams Testing

The basics of the testing methods for waste streams are as follows:

1. **Still Bottoms**: The SB32 was transferred to a still where the distilled SB32 was returned to the solvent storage tank and the still bottoms were placed into a virgin bucket or drum (preferably with a plastic liner to avoid cross-contamination).
2. **Filters**: Each machine was fitted with a cartridge type of filter to continuously filter dirt and grit from the SB32 while in use. Spent filters were removed from the machines and, after proper draining (24 hours), the filters were made available to the waste sample collector for analysis.
3. **Wastewater**: Residual moisture was removed during the drying process in a condenser. The wastewater was separated from the SB32 and was made available to the waste sample collector for analysis in a virgin vessel to avoid cross contamination.

This sampling and analysis program was designed to meet the following key objectives:

- ? Accurate characterization of each of the three waste streams to determine regulatory classification for disposal (to federal requirements).
- ? Evaluate changes in characteristics, if any, over time.
- ? Determination of the presence of trace contaminants in each waste stream.
- ? Sufficient sample characterization to allow for representative statistical analysis of all measured parameters (including test blanks and duplicate testing for quality control purposes).

Samples were collected by laboratory personnel according to prescribed sampling protocol with a strict chain of custody from sampling to laboratory.

Air Sampling

With respect to air sampling of SB32, California Industrial Hygienist Services conducted extensive sampling at Affirmation Sites.

The goal of the sampling strategy was to study the air concentrations of SB32. This strategy focused on developing a consistent method for gathering an appropriate number of samples, which represented the entirety of employee exposure within the plant to the SB32 materials. As such, it was critical to collect personal samples (for all machine operators, spotters, pressers, and counter staff). Additional samples (STEL) were taken for any functional activities, changing filters, cleaning of button and lint traps, and maintenance related tasks, such as working on the separator and handling drycleaning waste products.

Area samples were taken in the area of the dry cleaning machines (in front and in back), the spotting area, the pressing area(s), the counter area, and outside the building.

The sampling was performed to assess the 8-hour time-weighted average (TWA) concentrations and short-term concentrations (where applicable). Particular concentrations were measured during transfer of damp articles to the recovery dryer and unloading dry loads from the recovery dryer (where applicable).

Personal sampling was performed according to techniques prescribed by the Occupational Safety and Health Administration (OSHA) and the National Institute for Occupational Safety & Health (NIOSH). This involved monitoring the airborne concentration of SB32 in the employee's breathing zone.

The Personal Sampling Methodology used is as follows. The sampling media was affixed near the lapel and the air was drawn through the media by a sampling pump worn at the waist and connected to the media via tygon tubing. The pumps were operated by a flow rate proscribed by the method, established using a rotameter calibrated against a primary standard. The quantity of SB32 collected by the media was determined by laboratory analysis. The results of the analysis reported by the laboratory were utilized by CIH to calculate the employee's exposure.

Area samples were collected at breathing zone height or near the source to determine the contribution of the source to SB32 levels in the area.

Summary of Findings

1. The average employee exposure level was less than 1 ppm on an 8-hour time-weighted average (TWA). The maximum employee exposure level seen was 3.5 ppm at the point of transfer when clothes were moved from washer to dryer in a transfer plant. Even in this plant, the 8-hour time-weighted average was less than 2 ppm, well within all recommended standards for employee exposure levels. Thus, the GreenEarth Cleaning process easily meets all federal, state, and local requirements.

Note: The American Conference of Government Industrial Hygienists (ACGIH) and the Occupational Safety and Health Administration (OSHA) determine government exposure limits as measured in Threshold Limits Values (TLV) or Permissible Exposure Limits (PEL). The safety limits as set by ACGIH TLV and OSHA PEL do not regulate SB32 solvent and no guidelines are set. Also, SB32 is not regulated by RCRA or CERCLA and is exempt from California Proposition 65. In addition, the chemical name for SB32 is specifically cited in the EPA's Significant New Alternative Program (SNAP) (59 FR 13044) as a substitute for ozone-depleting substances. General Electric Silicones has suggested a maximum TWA exposure limit of 10 ppm based on toxicological tests and practices. These same standards would limit perchloroethylene exposure limits to .1 ppm.

2. The wastewater that is generated from the use of GreenEarth alone was determined to be nonhazardous. However, trichloroethane (1,1,1) appeared in the wastewater at a few sites. This was determined to be caused by the use of certain spotting chemicals at those sites.
3. The still bottoms and filter cartridge waste that result from the use of GreenEarth alone were determined to be nonhazardous. It should be noted that the still bottoms and filter cartridges in some cases may be ignitable and should be disposed of in accordance with any applicable federal, state and/or local requirements. Ignitability is not a factor in determining whether waste is hazardous.

The results of all of the testing showed that SB32 (GreenEarth) by itself and also when used in conjunction with appropriate additives (detergent, spotting chemicals, etc.) is not a hazardous waste under federal or state laws. However, there are chemicals (detergents, spotting chemicals, etc.) that can cause the wastewater, still bottoms and filter cartridges to become hazardous if they are introduced into the cleaning process. (Use of appropriate commercially available chemicals with the GreenEarth Cleaning System is always advised.) Even if the residues are nonhazardous, cleaners should check the regulations in their state to determine specific disposal requirements.

Conclusion

GreenEarth Cleaning was well aware that any new alternative drycleaning process will necessarily be closely scrutinized. Therefore, GreenEarth exceeded all regulatory requirements and expectations by performing these tests so that the drycleaning industry, the US EPA, OSHA, and individual drycleaners would have confidence that SB32 is safe.

We are pleased to provide the attached sample results. After reviewing these results, it becomes obvious that the use of SB32 in the actual drycleaning process is everything we would have hoped it to be.

It is important to note that, although SB32 can be viewed as very safe from an environmental contamination standpoint and from an exposure level, the results are site-specific. This means that the SB32 by itself is quite safe, but if a drycleaner uses detergents, additives or spotting agents that contain hydrocarbon or perc, those chemicals may appear in the waste streams.

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