Evaluation of Drycleaning Shops Using SolvonK4 (Part II)

Diana Ceballos, PhD, MS, CIH Steven Ahrenholz, PhD, MS, CIH

Acknowledgments

Local Hazardous Waste Management Program Public Health—Seattle & King County: Stephen Whittaker
HHE Facilities
Bureau Veritas North America
NIOSH: Emily Lee, Marie de Perio, Wei Gong, Kendra Broadwater,
Jennifer Roberts, Robert Streicher, Stephanie Pendergrass,
Fariba Nourian, Jim Arnold, Charles Neumeister
University of Washington: Marty Cohen and Eddie Kasner

2015 WestON Meeting Denver, Colorado September 17-18, 2015



Health Hazard Evaluations (HHEs)

- 2 shops using SolvonK4 (butylal) in different states
- Performed one visit per shop
 - Collected bulk solvent samples for analysis
 - Conducted personal and area air sampling for solvents (including possible byproducts from process)
 - Placed skin patches under protective gloves to assess breakthrough



Sampling Methods

Air sampling

- Butylal and 1-butanol
 - Charcoal tube with custom analysis method
- Formaldehyde
 - OSHA Method 52
 - NIOSH Method 2016 gave false positives

Skin patch sampling

- Butylal
 - Charcoal cloth (PermeaTec) with custom analysis method



Control Banding (CB)

We used CB methods to evaluate the following drycleaning tasks:

- Task 1: Loading/Unloading/Hanging fabrics from the drycleaning machine
- Task 2: Spraying/Brushing fabrics with a spotting solution containing SolvonK4

We used the following risk phrase for butylal R38-Irritating to skin [European Chemical Agency database]

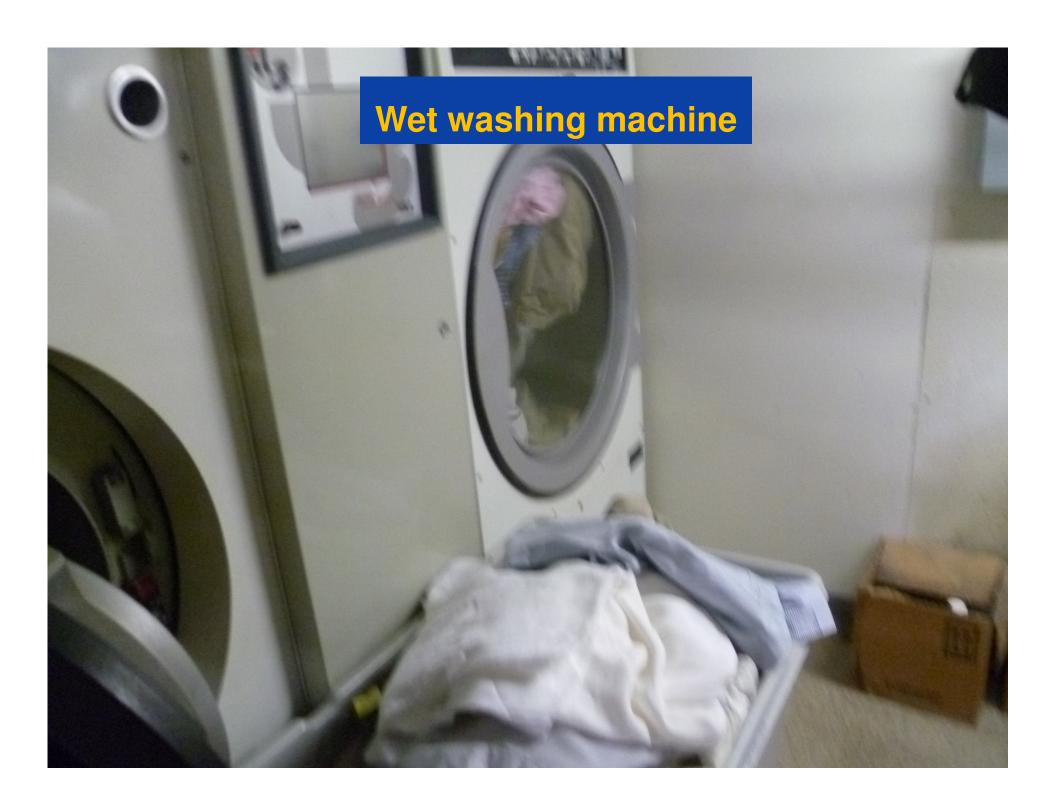
Shop Characteristics

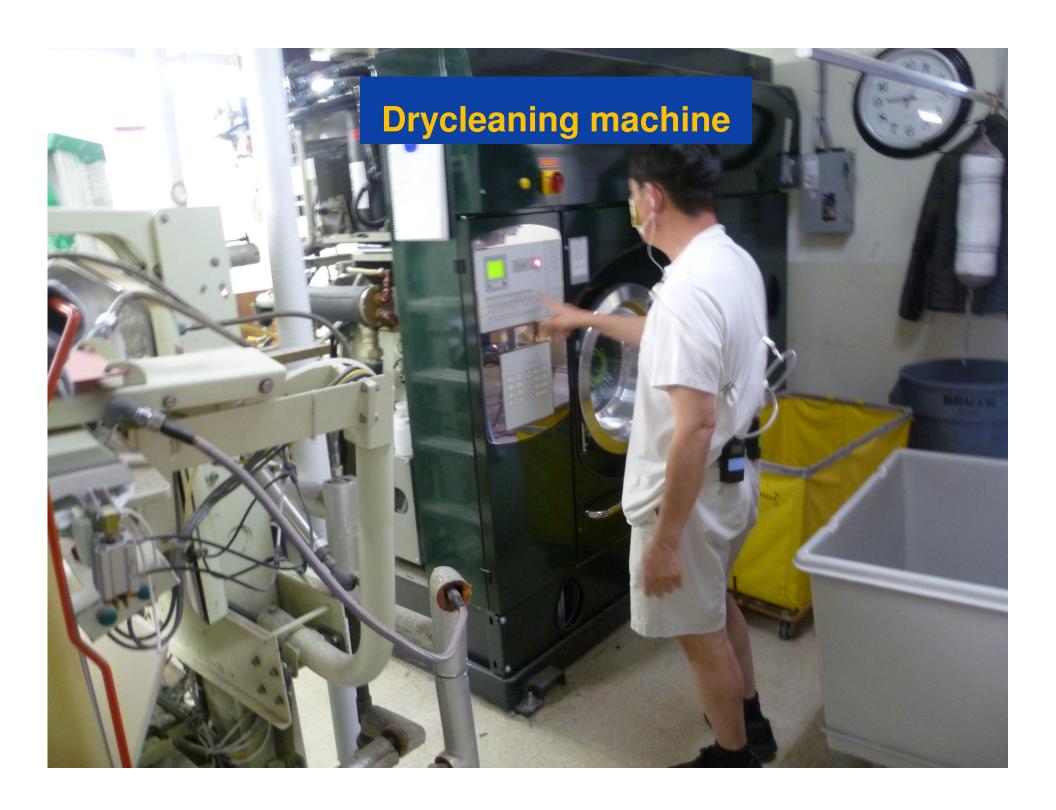
- 1 or 2 owners and 3 to 10 employees per shop
- One dry and one wet cleaning machine per shop
- 20 to 40 loads run per week
- Six pressing stations
- Relied on natural ventilation but one shop had an HVAC system
- Owner languages: Korean or Cantonese
- Employee languages: Cantonese or Spanish

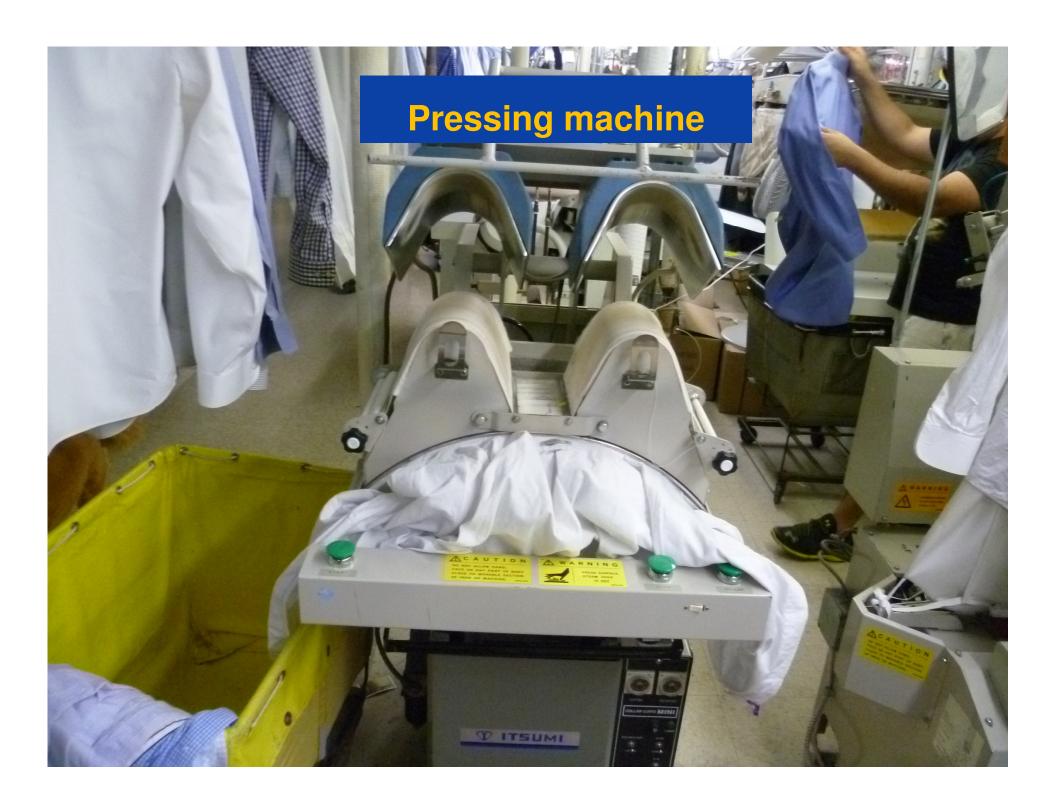


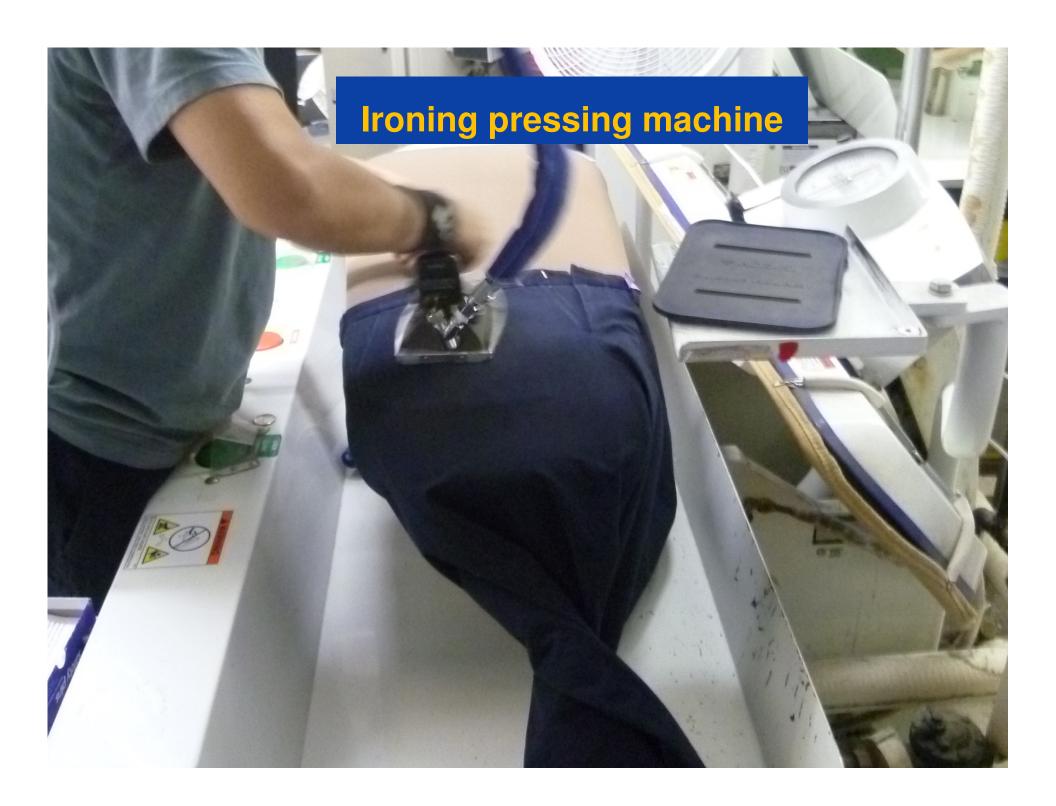












Air Sampling Results

- Full-shift personal airborne exposures
 - Butylal 0.0017 ppm to 0.83 parts per million (ppm)
 - Formaldehyde very low or not detected (< 0.008 ppm)
 - 1-butanol very low or not detected (< 0.001 ppm)</p>

Air Sampling Results

- Highest full-shift airborne exposures
 - Closest to the drycleaning machine
- Highest task-based exposures
 - Closest to the drycleaning machine
 - Pressing fabrics

Skin Patch Sampling Results

- SolvonK4 still bottom cleaning
 - Employee reused leather gloves (not appropriate)
 - Low levels of butylal on all four patch samples

Ventilation and Comfort Measure Results

- Both shops relied on natural ventilation and on an extraction fan
- One shop had a functioning ventilation system that was turned on when the drycleaning machine was turned off
- Comfort conditions suggested potential for heat stress

Control Banding Results

- Task 1: Loading/unloading/hanging fabrics from the drycleaning machine
 - Inhalation COSSH Essential tools
 - Control strategy 1 (general ventilation)
 - Inhalation Stoffenmanager tool
 - Low risk score

Control Banding Results, cont.

- Task 2: Spraying/brushing fabrics with a spotting solution containing solvonk4
 - Inhalation COSSH Essential tools
 - Control strategy 1 (general ventilation)
 - Inhalation Stoffenmanager tool
 - Low risk score

Control Banding Results, cont.

- Task 2: Spraying/brushing fabrics with a spotting solution containing solvonk4
 - Dermal RISKOFDERM tool
 - Moderate local effect
 - Hands were considered to have a "necessity of skin care requiring primarily exposure reduction to the chemical"
 - No systemic effect
 - Dermal Stoffenmanager tool
 - Medium risk local effect
 - Low risk level systemic effect

Recommendations

- Brush pre-treatment instead of spraying
- Wear appropriate personal protective equipment
 - Polyvinyl chloride or polyethylene gloves with butylal
 - Safety glasses
 - No use of surgical masks
- Wash hands
- Improve or add mechanical ventilation to reduce the SolvonK4 odor and improve thermal comfort

Conclusions

- SolvonK4 is not a chlorinated solvent and is believed to be safer than PERC, but:
 - There are gaps in SolvonK4 toxicity data
 - No human health information
 - No occupational exposure limit
 - Appropriate personal protective equipment is needed when handling the solvent and removing still bottoms to minimize skin contact
 - Workpractices such as brushing rather than spraying should be done to minimize unnecessary airborne and skin exposures (and a safety hazard)

Current and Future Efforts

NIOSH Science Blog open for comments

http://blogs.cdc.gov/niosh-science-blog/2015/02/24/drycleaning-solvents/

NIOSH website for complete reports

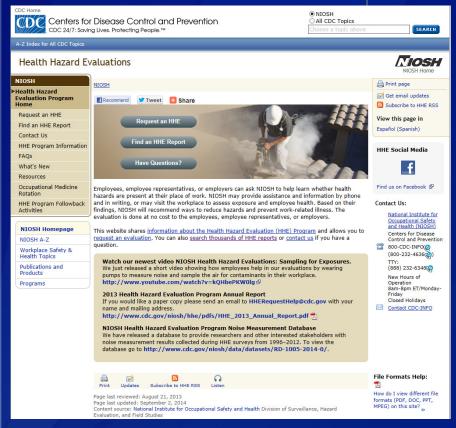
http://www2a.cdc.gov/hhe/search.asp

Search for "drycleaning"

Interest in evaluating other new solvents



HealthHazard Evaluation Program



To learn more about the NIOSH HHE program please visit: www.cdc.gov/niosh/hhe

Email:

HHERequestHelp@cdc.gov

Phone:

513-841-4382

Mailing address:

NIOSH HHE Program 1090 Tusculum Avenue Cincinnati, OH 45226

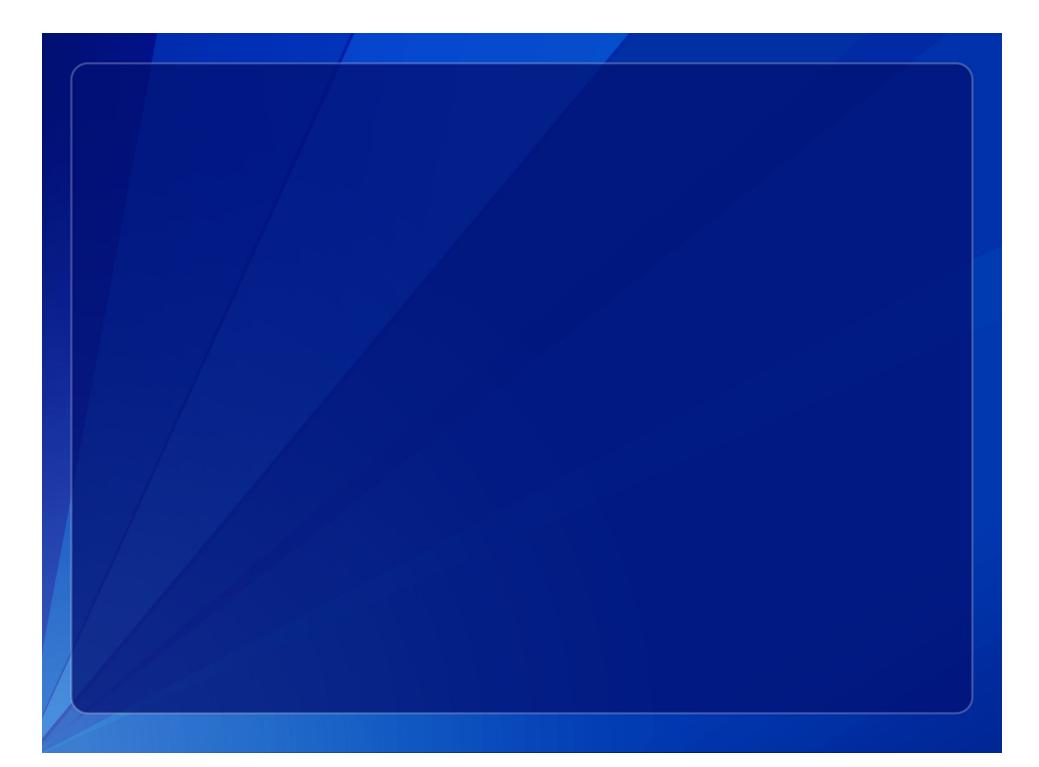
For more information contact:

Steven Ahrenholz at sahrenholz@cdc.gov

The findings and conclusions in this presentation have not been formally disseminated by the National Institute for Occupational Safety and Health and should not be construed to represent agency determination of policy.

National Institute for Occupational Safety and Health

Hazard Evaluations and Technical Assistance Branch



The NIOSH Dream Team I



The NIOSH Dream Team II

