

NYSP2I

Substitution Case Studies

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New York State Pollution Prevention Institute

New York State Pollution Prevention Institute (NYSP2I)

Vision:

The vision of the NYS P2I is to foster the transformation and development of sustainable businesses and organizations in New York State in a collaborative program committed to making the State a leader in environmental stewardship.

Mission:

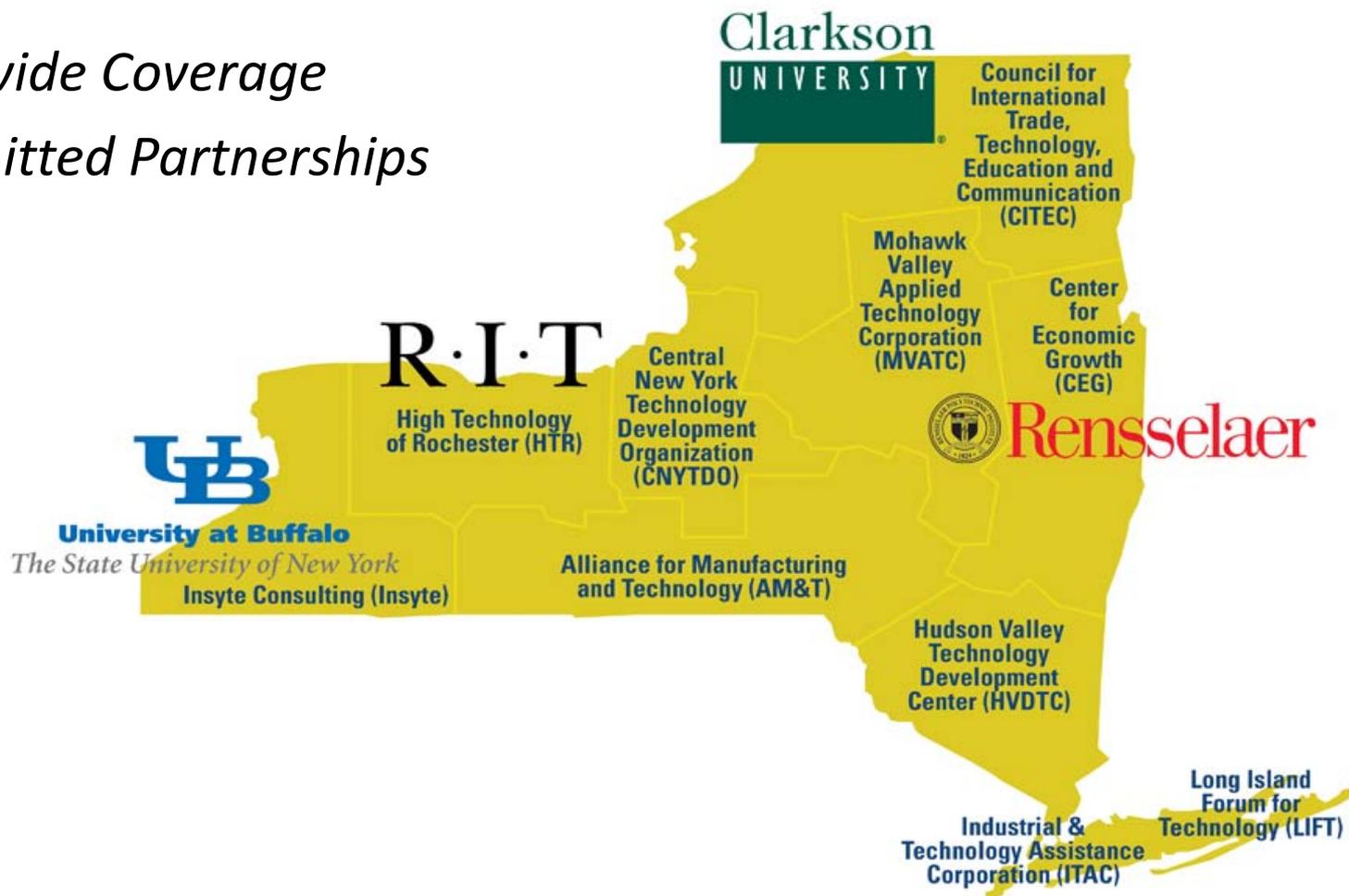
The mission of the Institute is to provide a high-impact, comprehensive and integrated program of technology research development and diffusion, outreach, training and education aimed at making New York State more sustainable for workers, the public, the environment and the economy through:

- reductions in toxic chemical use
- reductions in emissions to the environment and waste generation
- the efficient use of raw materials, energy and water



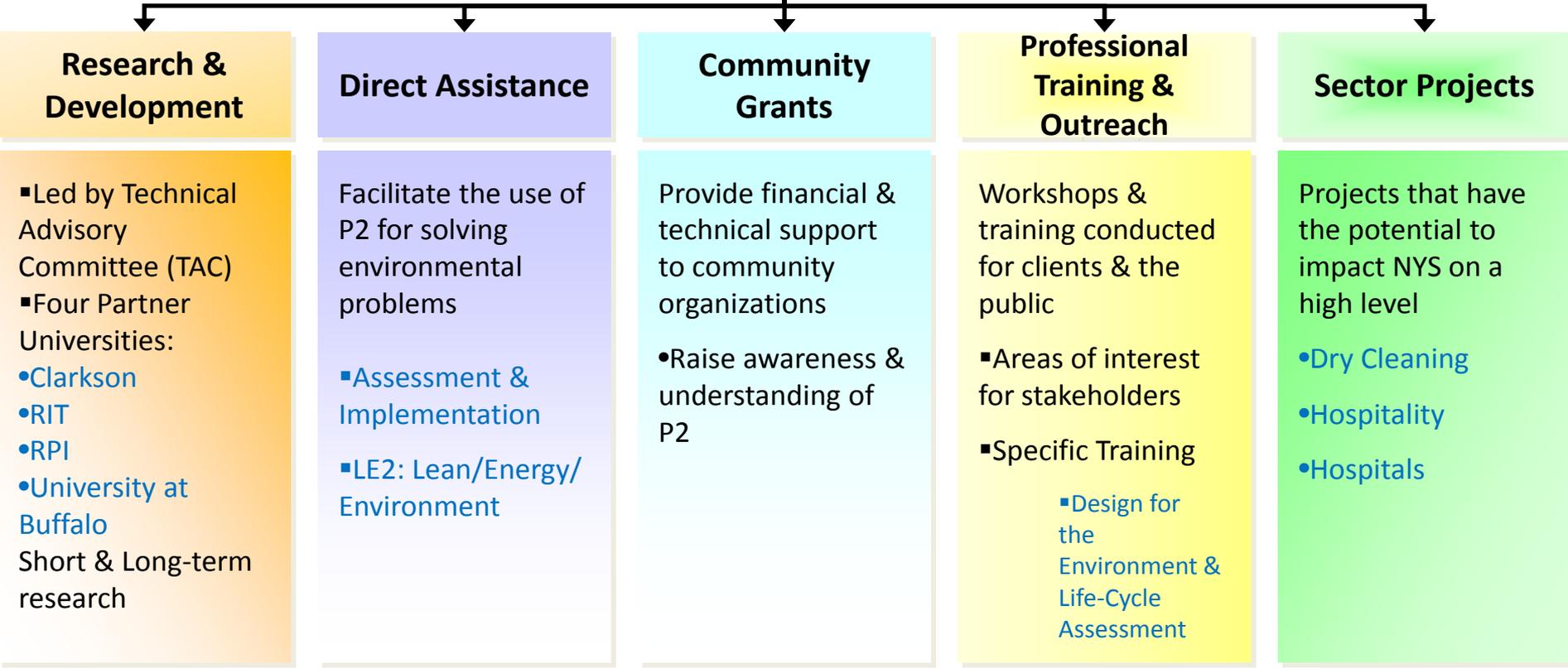
New York State Pollution Prevention Institute

- *Statewide Coverage*
- *Committed Partnerships*



New York State Pollution Prevention Institute

NYP2I



Tangible results towards... ..a sustainable New York!



Two Case Studies

Alternative Dry Cleaning
Technologies
Using LCA to assist with
product design



What is dry cleaning?

- Process of washing delicate garments that uses perchloroethylene (perc) instead of water
- Similar to a combination washer and dryer you may have at home
- Problems with dry cleaning
 - Health effects of perc: probable carcinogen, suspected developmental, gastrointestinal, kidney, reproductive, respiratory, and skin or sense organ toxicant
 - Environmental effects: persistent in air, water, and soil



Dry Cleaning Alternatives

- Many cleaners have converted from perc to hydrocarbon
 - Requires equipment changeover & investment
 - Many are flammable, present safety & health hazards
- Few convert from perc to professional wet cleaning

Perchloroethylene (perc): traditional dry cleaning solvent; also used in other industry sectors including degreasing operations, paints and coatings, and industrial and consumer products

Hydrocarbon (DF-2000™, Ecosolv®): volatile organic compounds (VOC) which contribute to the formation of ozone which is linked to ill-health effects including respiratory irritation, asthma, and premature death; flammable

Glycol ether (Rynex®, Solvair®): biodegradable volatile organic solvent with low volatility and a high flash point

Liquid carbon dioxide: non-flammable, non-toxic, naturally-occurring gas that becomes a liquid solvent when pressurized; no expected health risk to the general public from these processes; CO₂ is obtained from large combustion sources, so there is no net increase in greenhouse gas emissions due to this process

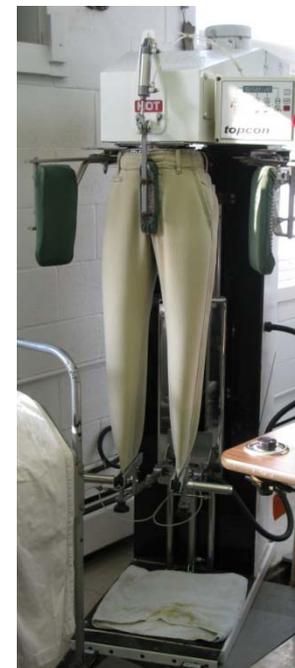
Siloxane D5 (GreenEarth®): silicone based solvent; non flammable; potential health effects are somewhat controversial

Mineral spirits or Stoddard solvent: highly flammable organic solvent typically used in painting

Professional wet cleaning: water and sophisticated equipment is used to clean clothes that would normally be dry cleaned



Professional Wet Cleaning



Wash

Garments are loaded into sophisticated washers and cleaned with biodegradable detergents



Dry

Garments are transferred to dryers where they tumble through a column of air to dry them



Finish

Garments are tensioned to ensure the proper size and shape



Comparing Dry Cleaning Alternatives

Garment Cleaning Solvent	Average Installed System Cost ¹	Avg. Natural Gas Usage per Month (therms) ²	Avg. Electricity Usage per load (kWh) ²	Avg. Cost for first 5 years of Typical Size Dry Cleaning Facility ²
Perchloroethylene	\$52,000	531	6.2	\$27,376
Hydrocarbon	\$59,000	243	6.2	not applicable
DF-2000 Fluid	not available	not available	not available	\$27,911
Pure Dry	not available	not available	not available	\$28,535
Eco Solv	not available	not available	not available	\$27,872
Shell Sol 140 HT	not available	not available	not available	\$27,755
Stoddard Solvent	not available	not available	not available	\$28,308
GreenEarth	\$61,000	297	6.2	\$32,718
Liquid Carbon Dioxide	\$140,000	156	9.3 – 9.7	\$58,881
Professional Wet Cleaning	\$47,000	388	3.2 washer 5.8 dryer	\$20,926

¹ Alternatives to Perchloroethylene Use in Drycleaning, City of Los Angeles Environmental Business and Neighborhood Services Division.

² California Dry Cleaning Industry Technical Assessment Report, State of California Air Resources Board, February 2006.



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Additional Benefits of PWC

- **Wet cleaning cleans better than perc.** It has been shown to produce whiter whites, is easier to remove water based stains, and performs better than perc for some items such as heavily soiled garments
- A wet cleaning system is made up of sophisticated equipment, including **washing machines that simulate handwashing and dryers that don't overdry.** Tensioning finishers ensure jackets, pants, and other structured garments are properly **finished without shrinking.**
- Wet cleaners can market their business as **green or environmentally friendly.**

MA Perc Cleaner saves \$3K a year Wet Cleaning

Silver Hanger Cleaners in Bellingham Massachusetts converted their operations from perc to 100% professional wet cleaning in 2008. Data was collected for one year operating with perc and one year operating with wet cleaning. **The cleaner saves \$2,700 a year with wet cleaning.**

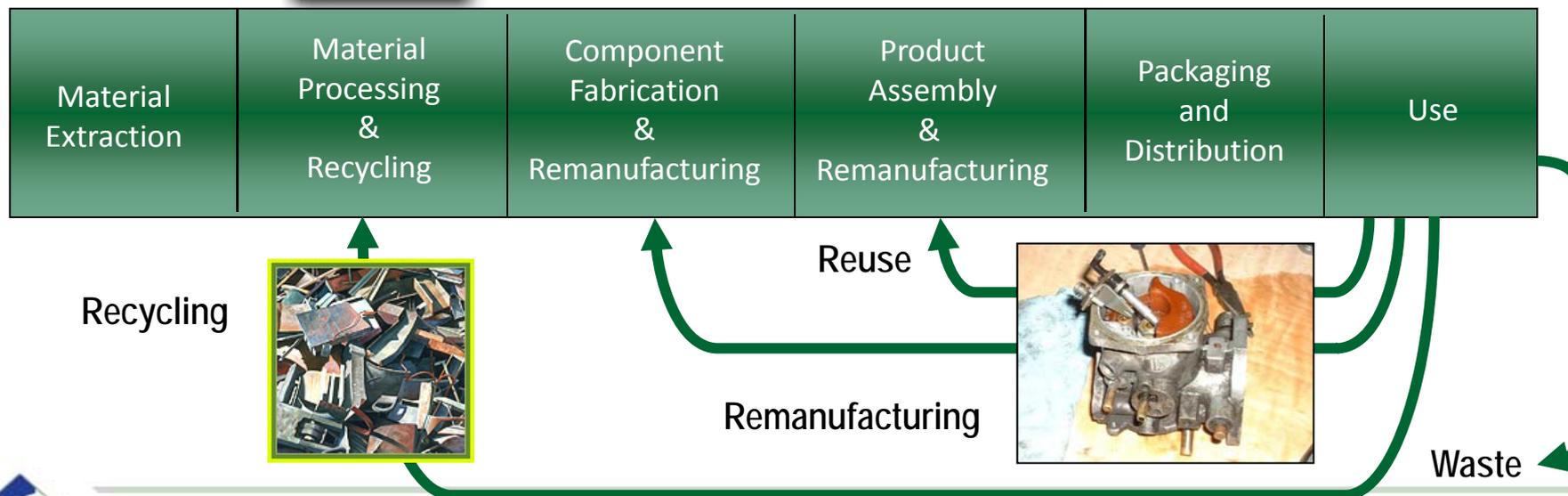
- Wet cleaning and laundering electricity decreased 20%
- Heating and cooling system electricity decreased 20%
- Cleaning and laundering water decreased 3%
- Natural gas for steam and hot water decreased 14%
- Maintenance costs decreased \$227/month
- Filters, solvent, hazardous waste disposal and regulatory fees were eliminated at \$356/month
- Detergent & spotting agent costs increased \$672/month
- Equipment costs reduced by \$500 per year
- Claim costs reduced by \$1,000 per year

Source: Toxics Use Reduction Institute, Eliminating the use of Toxic Chemicals in Dry Cleaning, Case Study of Silver Hanger Cleaners, Bellingham, MA



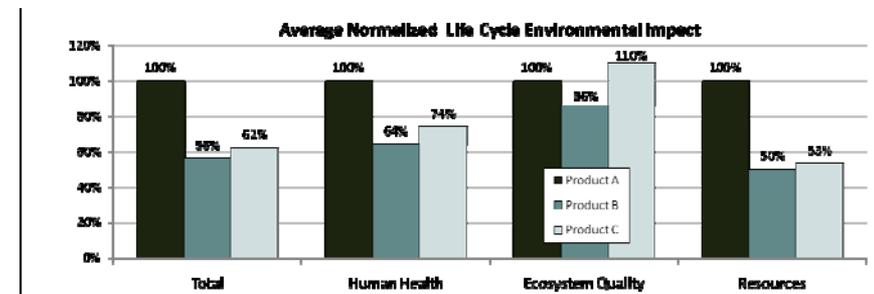
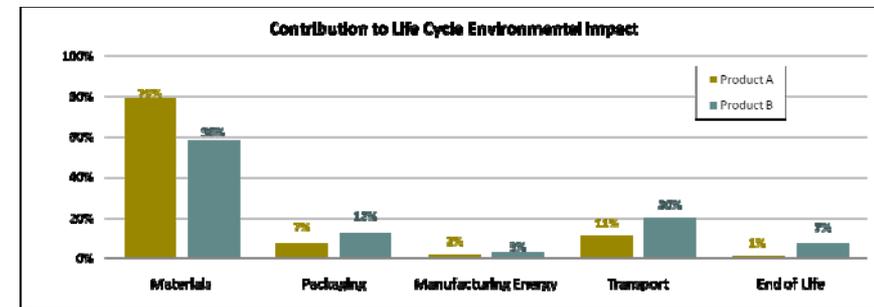
Life Cycle Assessment

Life Cycle Assessment (LCA) is a technique used to quantify the environmental impact of a product from raw material acquisition through end of life disposition. (cradle-to-grave)



Comparing Multiple Blood Pressure Cuff Designs using LCA

- Compare three designs and explore multiple end of life scenarios to determine which is ideal for each cuff
- Results were used to
 - Validate the dematerialization and material choices that were made
 - Identify operations throughout the life cycle which contribute significant environmental impact, allowing the design team to focus on those processes to further reduce the environmental impact of future designs





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