CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2019
DateRun:	05/14/2019
Experimenters:	Alicia McCarthy
ClientType:	Maintenance Shop
ProjectNumber:	Project #1
Substrates:	Aluminum, Nickel, Stainless Steel, Painted metal
PartType:	Part
Contaminants:	Greases, Lubricating/Lapping Oils, Dirt
Cleaning Methods:	Ultrasonics
Analytical Methods:	Visual
Purpose:	Final report on bike cleaning project at UML

Experimental Procedure:

The Toxics Use Reduction Institute (TURI) Cleaning Laboratory provides performance testing for safer cleaning products. The lab partnered with the UMass Lowell Free Wheelers bike shop, located on campus, to evaluate its current cleaners.

Free Wheelers and the lab were interested in identifying cleaning products and processes that would protect the health and safety of the shop workers and enhance the shop's contribution to the University's sustainability efforts. The lab conducted a comprehensive evaluation of cleaners and degreasers currently used by the shop to remove common contaminants found on bike frames, chains, and wheels. Products were screened for effectiveness and safety; some cleaners were removed from inventory.

The shop learned how to provide excellent service without compromising the health and safety of its student workers. By using safer cleaners, Free Wheelers knows it can now provide a professional and welcoming space for workers and customers while still providing the same quality of service.

Background

During the assessment, the lab learned that the bikes are cleaned as needed for upkeep, and the bike shop cleans all of the bikes before bringing them in for storage during the winter months. Bikes are cleaned manually using brushes, rags, and chain scrubbing tools.

Performance Testing

The lab tasked the shop with identifying every cleaning product being used, no matter how little was used. An evaluation matrix, shown in the table below, was developed for the bike shop to rate the

cleaners on soil removal quality and ease of use in the workshop. During the bike shop's preparation for winter storage, students from the lab worked with the bike shop employees to clean the bikes and collect data on the products' performance. Cleaners that did not pass the performance testing were immediately removed from the inventory.

Performance Evaluation Matrix for Free Wheelers Alternative Assessment		
Initial Cleanliness Rating (1-3)	Soil Removal Performance (1-3)	Cleaner Residue (1-3)
3 = Not dirty	3 = Total removal of soil	3 = No chemical residue left behind / No extra cleaning to remove
2 = Somewhat dirty	2 = Some removal of soil	2 = Some chemical residue left behind / Some extra cleaning to remove
1 = Very dirty	1 = No removal of soil	1 = A lot of chemical residue left behind / Extra cleaning to remove

This ratings matrix can be used by other bike shops as a performance evaluation tool. Products that score a 2.5 or lower in the "soil removal performance" and "cleaner residue" columns can be removed from their inventory immediately due to poor performance. Any products that had higher score in those areas can then be evaluated for environmental health and safety (EHS).

CLEANING LABORATORY EVALUATION SUMMARY



Bike shop on UML Campus working to improve worker safety while maintaining cleaning performance

Results:

Environmental Health & Safety Evaluation

Ergonomics

In an attempt to improve cleaning performance and reduce cleaning times, the lab worked with the bike shop to expand cleaning beyond the simple manual cleaning process. Based on lab testing results, the bike shop considered using a countertop ultrasonic tank as a way to reduce some of the ergonomic hazards related to manual cleaning of bike chains. The ultrasonic tank worked well at reducing the cleaning time by 20-30 minutes, but the bike shop decided against using the ultrasonic tank because of space constraints. It could be a good alternative for other shops with more surface space.

Product Safety

The health and safety of its student workers was a major motivating factor for Free Wheelers to work with TURI. In addition to how well the products worked, the lab conducted a hazard evaluation of the cleaners using TURI's Pollution Prevention Options Analysis System (P2OASys). The evaluations utilized information obtained from Safety Data Sheets (SDSs).

Health and Environmental Hazards

Cleaning products were eliminated if they exhibited health or environmental hazards:

- Aerosols (inhalation hazard)
- Combustible liquids / high flammability
- Toxic if inhaled / causes respiratory irritation or sensitization
- Reactive in contact with skin / skin sensitization
- Harmful to aquatic life and the environment
- Suspected carcinogens/carcinogens, mutagens, neurotoxins, reproductive or developmental toxins

Concentrates vs. Ready to Use Products

Products that needed to be diluted by employees were considered a higher risk of exposure as compared to products that were bought Ready to Use (RTU). A majority of the degreasers evaluated needed to be diluted by the employees, triggering guidelines for the use of personal protective equipment.

Cleaner Final Assessment Table

Cleaners were kept if they passed the performance assessment and had manageable hazards that could be prevented using safety glasses and proper gloves.

Review of Cleaners			
Product Name	*Task*	*Keep/ Remove*	*Reason(s)*
Pedro's Green Fizz	Bike Frame	Keep	Performance: Passed Hazards: • § Causes serious eye irritation
Pedro's Degreaser 13	Chains/ Parts	Keep	Performance: Passed Hazards: • § Skin and eye irritation • § Harmful with repeated exposure with ingestion
WD40 Bike Wash	Bike Frame	Remove	Performance: Failed

CLEANING LABORATORY EVALUATION SUMMARY

			Hazards: • § Causes serious eye irritation
Goo Gone Spray	Bike Frame	Remove	Performance: Failed Hazards: • May cause skin and eye irritation • May cause sensitization by skin contact • May cause respiratory irritation and be aspirated into lungs and cause chemical pneumonitis
Simple Green	Bike Frame	Remove	Performance: Failed Hazards: • May cause upset stomach with ingestion
ProGold Lubricants Degreaser & Wash	Chains	Remove	Performance: Failed Hazards: • Eye, skin, and respiratory irritation • Prolonged contact may cause more severe irritation with pain, local redness and swelling and possible tissue destruction

CLEANING LABORATORY EVALUATION SUMMARY

Pedro's Orange Peelz	Chains/ Parts	Remove	Performance: Passed Hazards: • Toxic if inhaled • Combustible liquid • May be fatal if swallowed and enters airways • May cause allergic reaction
White Lightning Clean Streak Degreaser	Chains	Remove	Performance: Passed Hazards: • Aerosol (inhalation hazard) • Extremely flammable • Emits hazardous solvent vapors and causes central nervous system health effects

Additional Considerations

To help promote safer working conditions, the UMass Lowell Environmental Health and Safety (EHS) Department worked alongside TURI to assist the bike shop in training on best practices.

Personal Protective Equipment

The bike shop employees wear safety glasses on the work floor and use the correct gloves (nitrile gloves) recommended by UMass Lowell's EHS Department based on the SDS information for chemical cleaning and degreasing products. Aerosol chemicals were eliminated from the inventory to avoid having to use face masks.

Waste Disposal

Free Wheelers also needed to consider the disposal requirements of cleaning rags soaked with cleaning chemicals and the cleaning chemicals themselves. Depending on cleaning products used and the soil removed, these materials could pose a fire or aquatic hazard. In consultation with the UMass Lowell EHS Department, the project team was able to create a location for EHS to manage the waste rags and used chemicals for the shop.

Assessing Future Cleaners

In every field of cleaning, new products are constantly developed and marketed. Both TURI and the bike shop realized that the shop needed a quick and easy way to be able to assess future cleaners. A product assessment table was developed for the bike shop that can be updated easily. Elements from SDSs are used to populate the fields of the assessment table so that the shop can make a determination about using a new product.

Summary:

Substrates:	Aluminum, Nickel, Stainless Steel, Painted metal				
Contaminants:	Greases, Lubricating/Lapping Oils, Dirt				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Pedro's	Green Fizz		0.00	☑	
Pedro's	Degreaser 13		0.00	☑	
WD 40 Company	WD 40 Foaming Bike Wash		0.00	☐	

CLEANING LABORATORY EVALUATION SUMMARY

Goo Gone	Goo Gone Original		0.00	☐	
Environmental Inteligence	Simple Green Cleaner & Degreaser		0.00	☐	
Abc Compounding	Pro-gold Degreaser		0.00	☐	
Pedro's	Oranj Peelz		0.00	☐	
White Lightning	Clean Streak (Aerosol)		0.00	☐	

Conclusion:

The bike shop went from using eight cleaning products to just two cleaners: a bike frame cleaner and a general degreaser. Cost savings were not the main driver for this project, and Free Wheelers believes the long-term benefits of reducing worker exposure and gaining workplace safety knowledge is a significant outcome.

Based on this work with the TURI lab, other bike shops can implement the following measures:

- Inventory cleaning chemicals in the shop and determine if there are unused products and dispose of them appropriately.
- Identify and select safer cleaners.
- Provide training to employees on proper use of approved cleaners and personal protection.
- Maintain an up-to-date binder with SDSs of approved cleaning products and instructions on proper use and personal protection.
- Ensure waste rags and chemicals are properly disposed of.