CLEANING LABORATORY EVALUATION SUMMARY

SCL #:	2019
DateRun:	09/14/2019
Experimenters:	Alicia McCarthy, Hayley Byra
ClientType:	Technical School
ProjectNumber:	Project #1
Substrates:	Aluminum, Stainless Steel, Steel
PartType:	Part
Contaminants:	Greases, Rust/Scale, Dirt, Oxides, Oil
Cleaning Methods:	Manual Wipe
Analytical Methods:	Gravimetric, Visual
Purpose:	Evaluate io-based parts washing systems, eliminating the washing station and greatly reducing the use of the aerosol products.

Experimental Procedure:

Overview

The Regional Technical High School Automotive Technology (Auto Tech) Program is creating a safer and healthier work environment for students by replacing harsh solvents with a microbe-based (bio-based) technology to clean dirty parts. The Auto Tech Program received a grant from the Massachusetts Toxics Use Reduction Institute (TURI) in 2018 to purchase safer parts washers. The shop previously used a parts washing station and aerosol products that contained toxic chemicals. With the grant, they purchased bio-based parts washing systems, eliminating the washing station and greatly reducing the use of the aerosol products. The shop now uses three SmartWasher® systems with a cleaning solution called OzzyJuice®, yielding excellent results.

The Program

The Auto Tech Program prepares students to meet the challenges of the future by providing a rigorous and relevant education in a safe and secure environment resulting in academic, career and technical proficiency. Students learn how to service and repair automobiles, including engines, brakes, and other auto systems, as well as electrical and electronic systems. The department is NATEF Master Certified through the National Automotive Technicians Education Foundation. Ensuring Performance, the school wants its students not only to be the best candidates for hire because of their technical expertise, but also to be knowledgeable about health, safety and environmental best practices. However, before making the investment in the new technology, the Auto Tech shop needed to know the new system could do the job. The lead teacher of the Auto Tech program researched current industry standard practices to identify the SmartWasher system as an effective replacement for the solvent parts washing and aerosol cleaners. Bio-Technology students also conducted performance testing at the TURI lab to determine that the bio-based cleaner would work as effectively as the old solvent cleaners to remove dirt and grease.



Auto Tech Students

Results:

Existing Products

Two cleaning products were previously used at the shop to clean dirty parts; one was in liquid form used in a wash station, and the other was an aerosol. The parts washer was a Safety-Kleen® unit. It was used to clean large components that could be removed from the vehicles and taken to the wash station. The Safety-Kleen parts washer used a petroleum distillate as its cleaning solution. The use of petroleum distillates carries several health concerns.[1]

- Breathing petroleum vapors can cause nervous system effects (such as headache, nausea, and dizziness) and respiratory irritation.
- Very high exposure can cause coma and death. Liquid petroleum products which come in contact with the skin can cause irritation and some can be absorbed through the skin.
- Chronic exposure to petroleum products may affect the nervous system, blood and kidneys.

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The aerosol product, Brakleen®, was used to spot clean components attached to the vehicle. Brakleen contains tetrachloroethylene (or perchloroethylene or perc for short). Perc is associated with a variety of adverse human health effects. It is a probable human carcinogen with acute toxicity characteristics and negative impacts on the central nervous system, and there are worker exposure concerns associated with its volatile nature.[2] Using either product required stringent use of Personal Protective Equipment (PPE). The table below shows the amount of each product used during a year.

Amount of Product Used Per Year	
Safety-Kleen parts washer (petroleum distillates)	Aerosol Brakleen
40 gallons	52.5 gallons (480 14-ounce cans)

A New Bio-Based Solution

The SmartWasher system and the OzzyJuice degreasing solution was identified as the best alternative based on performance, student health and safety and environmental wellbeing. The SmartWasher cleans parts using a particulate trap and a degreasing solution in a parts washer. The particulate trap catches the large particles washed off the car parts. The degreasing solution or OzzyJuice contains microbes that break down the oils and greases washed off of the car parts. The solution is pH neutral, non-flammable and contains biodegradable detergents and emulsifiers. Users are, however, advised to avoid contact with eyes, skin and breathing in the vapors or mists.

To keep the microbes alive, the SmartWasher unit needs to be kept at 50 degrees Fahrenheit. The Auto Tech program is able to keep their units plugged in at the shop to maintain the appropriate temperature. This does mean that the units need to be kept near outlets at the outside edge of the shop. The units can be wheeled under cars, however, using extension cords. At the end of the school year, the units are unplugged. The systems are set up with a new supply of OzzyJuice at the beginning of the new school year.

Financial Analysis

It is important not only that the new system clean well, but also that it is affordable. The table below shows a cost comparison of the old methods to the new system. The annual cost to use the Safety-Kleen machine and the aerosol cans was $3,300. The annual cost for the SmartWasher is $182. Energy use is comparable between the two. This equates to an annual savings of $3,118. Using an average cost for a new SmartWasher system, the payback period for switching is just over 10 months. There are still some aerosol cans in use at the shop, but a very small number compared to the amount used previously.

Comparison			
Factor	Old Methods		New Method
	Safety-Klean	Brakleen	OzzyJuice
Amount used annually	40 gallons	52.5 gallons	10 gallons per machine
Capital cost	n/a	n/a	$2,750 (average cost - depends on small or large units)
Annual cost	$800 for lease/ contract which includes materials and disposal	$2,500	$182
Cost of waste hauling	Included in contract	None	None
PPE needed	Heavy gloves, face shield/ safety glasses	Nitrile gloves, safety glasses, respirator	Nitrile gloves, safety glasses

Summary:

Substrates:	Aluminum, Stainless Steel, Steel				
Contaminants:	Greases, Rust/Scale, Dirt, Oxides, Oil				
Company Name:	**Product Name:**	**Conc.:**	**Efficiency:**	**Effective:**	**Observations:**
Chem Free Corporation	SW-1 Ozzy Juice	10	0.00	☑	

Conclusion:

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The Assabet Auto Tech program could have continued to clean car parts with the old methods of a Safety-Kleen parts washer and Brakleen aerosol cans. Instead, the teachers and administration at the school advocated for and secured grant funding to purchase equipment that provides a safer and healthier environment for the students. By doing so, they are also setting an example for the students and teaching them new practices they will take with them into the professional world after graduation. The new bio-based systems work as well as the old methods and are saving money that can be reinvested into other areas of the program.