SPRING 2016

GREEN ENGINEERING

SPECIAL EDITION NEWSLETTER

TAKE A LOOK INSIDE

Reducing hazardous material use through

- Innovative Products
- Production Process Improvements
- Community Outreach

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Funding provided by the New York State Department of Environmental Conservation.

HAZARDOUS MATERIALS REDUCTION IN NEW YORK STATE

"Institutes like New York State Pollution Prevention Institute (NYSP2I) along with businesses, non-profits, and communities are making strides towards a more sustainable world for future generations, from water conservation to alternative energy. Arguably, one of the most important issues to address is the reduction in the use of hazardous chemicals. Hazardous materials are used in everyday products and processes we depend on to maintain our way of life. But exposure to hazardous chemicals comes at a cost, including potential health impacts to workers and consumer exposure in products, not to mention the impacts to land, air, and water from their discharge.

Fortunately, technology and policy have come a long way, though there is still much work to do. In this special issue, we share a sample of targeted projects NYSP2I has undertaken to reduce hazardous substance use in New York State. You will notice many of the projects were conducted in collaboration with our RTDC (Regional Technology Development Corporation) or university partners. Please take a look at the articles presented and let us know what you think - we welcome your input. If you have success stories about your actions to reduce hazardous substance use in your town, city or region, we would love to hear them. Together we can help take another step forward in safer chemical use.

- Chuck Ruffing Director, NYSP2I

To date NYSP2I's projects have resulted in reduction of nearly 6 million pounds of hazardous waste and materials.

NYSP2I - HELPING MANUFACTURERS FIND SAFER ALTERNATIVES

NYSP2I Investigates MEK Alternatives

NYSP2I worked with a plastics manufacturer to reduce their use of MEK and possibly find a less-toxic alternative. Methyl ethyl ketone (MEK), also known as 2-butanone, is a widely used industrial solvent and bonding agent for plastics. MEK is a volatile organic compound (VOC) that evaporates into the air causing negative health and environmental effects. The company which employs 125 workers and conducts bonding operations with a value of $7-$8 million per year, had been using 2,000 gallons of 100% MEK annually.

NYSP2I and the Albany-based Center for Economic Growth (CEG) collaborated on ways to reduce VOC emissions, meet new NYSDEC requirements and avoid potentially cost-prohibitive emission controls. NYSP2I investigated several bonding alternatives, including ultrasonic welding, adhesives, and use of other solvents, while considering cost, VOC content, ease of use, and similarity to the properties of MEK (for example, bond strength).

As a result of the investigation, NYSP2I found a custom blend of Methyl Acetate and Methyl n-Propyl Ketone (MPK) that the company could use as a less toxic alternative to MEK. The blend offers a VOC content below the limit required by NYSDEC and is not cost prohibitive. The ability to meet this criteria allows the company to remain competitive and retain jobs in NYS.

E3: ECONOMY, ENERGY, ENVIRONMENT

Tonawanda, NY has one of the highest densities of industrial development in New York State. Publicly available data from the federal Toxic Release Inventory, showed approximately 1 million pounds of toxic materials were released from Tonawanda's ten largest manufacturing facilities.

A concern for air quality in the Tonawanda, NY community helped drive the development of the "Economy, Energy & Environment" (E3) initiative. The E3 program is a partnership between the U.S. Environmental Protection Agency (EPA), the U.S. departments of Energy, Labor, Commerce, Agriculture and the Small Business Administration. The Tonawanda E3 initiative also involves local support including the NYS Department of Environmental Conservation, NYSP2I, the Clean Air Coalition of Western NY, and several other organizations.

E3 provides a model for collaboration among agencies, utility companies, manufacturers and other interested organizations to help incorporate sustainability practices into the community and industry. NYSP2I's role in this E3 initiative is to help area businesses develop and invest in pollution prevention and green engineering technologies. NYSP2I was awarded an EPA grant to conduct projects with four manufacturers to assist them with reducing their environmental impacts.

NYSP2I worked with PeroxyChem (formerly FMC Chemical) a manufacturer in Tonawanda, NY to identify reasons why there were material failures. These failures were preventing the company from replacing toxic metal use with a more environmentally friendly alternative metal material. NYSP2I identified an issue with a protective coating material, as well

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WHAT IS GREEN ENGINEERING ?

Green engineering is the design, commercialization, and use of processes and products in a way that reduces pollution, promotes sustainability, and minimizes risk to human health and the environment without sacrificing economic viability and efficiency.

Green engineering embraces the concept that decisions to protect human health and the environment can have the greatest impact and cost-effectiveness when applied early, in the design and development phase of a process or product.

(Source: EPA)

(continued from page 2)

as a manufacturing flaw in the alternative metal material. As a result of these findings, NYSP2I conducted a feasibility study to identify a suitable coating material and also provide improved purchasing specifications for the correct alternative metal. Once implemented, there is a potential for PeroxyChem to eliminate the use of toxic chemicals completely, leading to a reduction of over 1,000 pounds of toxic hazardous waste.

NYSP2I also assisted an automotive parts manufacturer with trying to use less solvent adhesive material, reducing associated air emissions, and cost savings. NYSP2I worked closely with the company's Lean Six Sigma team to identify the best solution to achieve these reductions and quantify the potential savings. This collaboration led to a minimum reduction of 38% of solvent adhesive material, a 23% reduction in volatile organic compound air emissions and a savings of over $11,000 per year.

NOCO Energy partnered with NYSP2I to evaluate thermal losses during the transport of heated product through a transport pipeline. These losses had a direct impact on how much fuel was burned to heat the pipeline. NYSP2I determined that by improving the pipeline insulation, NOCO could avoid energy losses equivalent to 1,785 MMBTU/year, which would be a reduction of 210,325 lbs/yr of air emissions including 95 metric tons of greenhouse gas emissions (CO2Eg).

These efforts of assisting all four manufactures through the EPA grant have resulted in solutions that can reduce 102,151 lbs. of hazardous materials, 1,040 lbs. of toxic hazardous waste, 21,320 lbs. of VOC *emissions, over 3 million kWh of electricity, and 3,000 MMBTU of natural gas.*

The resulting solutions were shared at several community events in Tonawanda, NY to encourage adoption of P2 strategies and further build the business-community-government E3 partnership.

PULP & PAPER

Pulp and paper mills have historically discharged toxic substances into the Great Lakes including Benzo(ghi)perylene and Non Ethoxylates (NPEs) which have negative impacts on wildlife and human health.

To reduce impacts to Lake Ontario, and with funding from the EPA's Great Lakes Restoration Initiative, NYSP2I worked with NYS pulp and paper manufacturers to help them reduce toxic releases into the Great Lakes ecosystem. Working with CITEC (The North County region RTDC), NYSP2I conducted projects with four companies in the St. Lawrence Basin.

For one company, NYSP2I explored the feasibility of installing a solvent recovery system which could reduce the purchase of new solvents (primarily acetone and methanol) and reduce solvent disposals.

In addition to this, NYSP2I worked to identify an alternative surfactant for use in paper production that did not contain NPEs, nonionic surfactants used in a wide variety of industrial applications and consumer products (according to USEPA).

DID YOU KNOW?

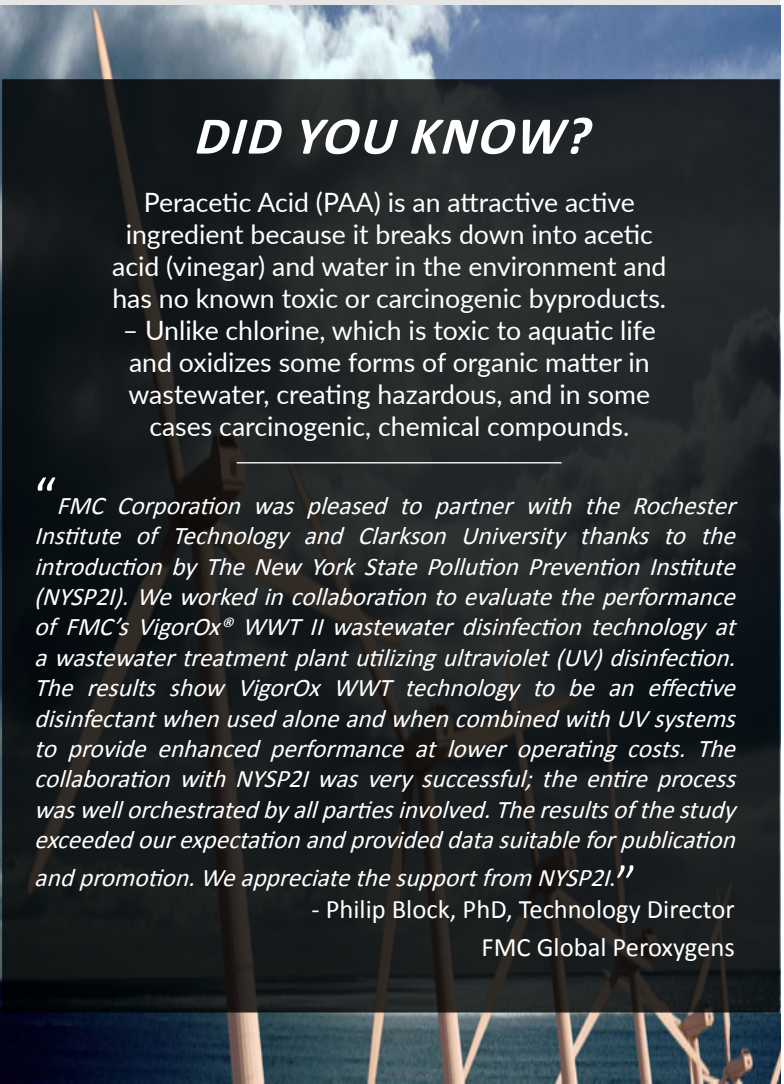
NPEs are highly toxic to aquatic organisms, and will degrade into toxic substances in the environment.

To help with the NPE issue, NYSP2I recommended installing a simple distillation unit. The cost was approximately $15,000, but had an expected payback within about two years. This unit enabled the company to reduce waste solvent disposal costs and avoid purchasing new solvent by recovering the solvents.

VIGOR OX® WWT II: A TREATMENT ALTERNATIVE TO CHLORINE?

NYSP2I teamed with Clarkson University to assist FMC Corporation accelerate the commercialization of their new product, VigorOx® WWT II – a new wastewater treatment biocide that can be can be used in place of chlorine. VigorOx can be used in combination with UV disinfection to replace chlorine. The VigorOx WWT II is desirable from an environmental perspective, because it contains peracetic acid (PAA) - approved by the EPA for wastewater disinfection. The research team conducted full-scale testing at the Potsdam, NY Sewage Treatment Plant, where the VigorOx WWT II technology was found to exceed NYS disinfection requirements. The addition of VigorOx WWT II had a synergistic effect on UV disinfection: Laboratory analysis demonstrated that adding 1.0 mg/L PAA could reduce the required UV dose by up to 50%.

This evaluation helped FMC Corporation further demonstrate the disinfection performance of VigorOx WWT II, and could support broader acceptance of this new technology by both the regulatory community and treatment plants across New York State. PeroxyChem is now responsible for marketing the product.



DID YOU KNOW?

Peracetic Acid (PAA) is an attractive active ingredient because it breaks down into acetic acid (vinegar) and water in the environment and has no known toxic or carcinogenic byproducts. – Unlike chlorine, which is toxic to aquatic life and oxidizes some forms of organic matter in wastewater, creating hazardous, and in some cases carcinogenic, chemical compounds.

"FMC Corporation was pleased to partner with the Rochester Institute of Technology and Clarkson University thanks to the introduction by The New York State Pollution Prevention Institute (NYSP2I). We worked in collaboration to evaluate the performance of FMC's VigorOx® WWT II wastewater disinfection technology at a wastewater treatment plant utilizing ultraviolet (UV) disinfection. The results show VigorOx WWT technology to be an effective disinfectant when used alone and when combined with UV systems to provide enhanced performance at lower operating costs. The collaboration with NYSP2I was very successful; the entire process was well orchestrated by all parties involved. The results of the study exceeded our expectation and provided data suitable for publication and promotion. We appreciate the support from NYSP2I."

- Philip Block, PhD, Technology Director
FMC Global Peroxygens

GREEN HOMES FOR CLEANER LAKES WORKSHOP SERIES

Toxic contaminants are a significant environmental health issue in the Great Lakes. For example, according to the U.S. Environmental Protection Agency, many fish in the Great Lakes have accumulated high concentrations of pollutants (thousands or even millions of times higher than levels in the water), making them unsafe for people and wildlife to eat.

While industry contributes to these pollutants, the products we use at home are also a concern. To build awareness and reduce impacts from NYS residents, NYSP2I developed and hosted the Green Homes for Cleaner Lakes workshop series. Supported by funding from the NYS Department of Environmental Conservation and the EPA, these free workshops educate homeowners on everyday ways to improve water quality of the Great Lakes through choosing and using safer household products. Workshop sessions were held in Buffalo, Rochester, Syracuse and Massena, New York with 450 people attending.

NYSP2I was able to raise awareness of the presence of chemicals, provide suggestions for alternatives, and help consumers make safer decisions. The Workshop sessions focused on the dangers of everyday household products on human health and the environment, specifically targeting those products which affect water quality. Workshops include:

HOW GREEN IS YOUR CLEAN?

This workshop focused on reducing hazardous materials in many household cleaning products and effective alternatives to make homes clean and safe.

SAFER HOUSEHOLD PRODUCTS

Explored the dangers in everyday products, such as cookware, plastics, flooring, furniture, and pesticides, and how to limit exposure and make better choices without sacrificing your budget.

HAZARDOUS WASTE AT HOME attendees learned how to protect their family and pets by storing and disposing of hazardous waste found around the home properly. Ewaste, pharmaceuticals, paints, and other liquids were the focus of the session.

HIDDEN DANGERS OF PERSONAL CARE PRODUCTS explains body care product ingredients that may be harmful to people and the environment.

Workshop materials, including presentations, handouts, and recorded webinars, can be found on the NYSP2I website.

For more information on this topic, contact Kate McArdle, program manager, at kwmp2i@rit.edu or 585-475-5390.
http://www.epa.gov/greatlakes/glindicators/air/airb.html

ECOVATIVE

A SUCCESSFUL LIFE CYCLE ASSESSMENT

Did you know commonly available foam packaging, such as Styrofoam "peanuts," is slow to degrade and persists in the environment and harms the wildlife? NYSP2I performed a Life-Cycle Assessment (LCA) for Ecovative, of Green Island, NY. The LCA studied the company's new Mushroom® Materials packaging that uses fungal mycelium (mushroom "roots") bonded with locally sourced agricultural byproducts to form packing parts, as a substitute for foam packaging. The material is organic, fully compostable, and its production process generates less pollution than most plastic packaging producers, as the Ecovative materials are naturally grown, rather than manufactured.

Ecovative wanted an impartial, third-party assessment of their product so they could make more informed comparisons to traditional packaging and to identify opportunities in the process where they may be able to make the product even more environmentally friendly.

NYSP2I worked with researchers at RIT's Golisano Institute for Sustainability to evaluate the full environmental impact of the Mushroom® Materials production processes and the relative contribution of Ecovative's energy use and transportation emissions to the material's overall environmental impact. The LCA found the part-drying process to make the Mushroom® Materials packaging was the cause of more than half of the entire carbon footprint. This led Ecovative to test an alternate drying process that uses two-thirds less energy and dries faster. NYSP2I also identified that shifting to different local raw materials for use in the technology could increase performance. Ecovative continues to use the LCA performed by NYSP2I to compare their technology advancement to common foam packaging to continue to offer a "greener" product.

"The NYSP2I...was a perfect fit for Ecovative's needs to understand and optimize a unique new biomaterials manufacturing process. Ecovative uses growing fungal mycelium (mushroom "roots") to bond together locally sourced agricultural byproducts into materials called Myco Foam for use as packaging, insulation and more. Ecovative worked with Life Cycle Assessment experts from RIT to measure, model and analyze the environmental impacts of the Myco Foam pilot manufacturing system. This invaluable work has impacted decisions across the company, leading to process improvements and energy efficiency gains, and is projected to create an additional 14 new jobs and support our current 46 positions."

- Sam Harrington, Marketing and Sales Manager, Ecovative Design

NYSP2I WORKSHOP SERIES

ENVIRONMENTAL HEALTH FOR YOUNG CHILDREN & NEW PARENTS

With support from both the NYS Department of Environmental Conservation and the U.S. Environmental Protection Agency, NYSP2I developed the Environmental Health for Young Children & New Parents Workshop Series. The goal of this initiative was to give expectant and new parents and their partners, together with grandparents and child caregivers, the skills needed to make informed environmental decisions when purchasing and using products for and around children. A series of workshops were offered through Rochester General Hospital's prenatal education program and were conducted for pregnant and parenting students enrolled in the Rochester City School District's Interim Health Academy. Rochester-area organizations such as the Breast Cancer Coalition of Rochester and MOMS groups also hosted workshops. Information about these workshops can be found on our website under "Environmental Health for New Parents Workshops."

In the Environmental Health at Home and in the Nursery workshop, participants learned which cleaning products, cookware, furniture, mattresses, and paint contain toxic chemicals that can impact health and the environment, and came away with knowledge to choose safer alternatives.

The Environmental Health and Children's Products & Toys workshop focused on understanding the potential impacts of children's products and toys on health and the environment. Participants learned how to choose environmentally preferable products and how to safely use conventional products like bottles and feeding products, bibs, personal care products, and toys. Sources for toy testing, product recalls and purchasing tips were also provided and can be found on our website.

Approximately 300 parents and caregivers attended the workshops, resulting in a plan to take action, including:

- Avoiding phthalates, hazardous flame retardants, indoor pesticides, metals in paint on toys, Teflon and Stainguard Products
- Purchasing fragrance free and VOC free products
- Making their own cleaners
- Airing out items before use, such as crib mattresses
- Reading labels and being more aware of ingredients in products

NYS PROFESSIONAL
WET CLEANING PROGRAM

For eight decades, the dry cleaning industry has relied on the chemical perchloroethylene ("perc" for short) as its main garment cleaning solvent. Perc has excellent cleaning power, but exposure may cause cancer in humans. Perc is a persistent contaminant in soil, water supplies, and especially the air. To reduce the use of perc within the NYS dry cleaning industry, NYSP2I developed the Professional Wet Cleaning Program and secured funding from the DEC and the EPA to educate cleaners and help them switch to professional wet cleaning.

NYSP2I conducted on-site demonstrations at wet cleaners across New York State. The demonstrations enabled garment cleaners and interested stakeholders to see professional wet cleaning in action and talk to current wet cleaners about their operations, including cleaning effectiveness, fabric integrity, and cost savings. As a result, Rainbow Cleaners of Manhattan and All Fabric Cleaners of Farmingville converted their operations from perc to dedicated professional wet cleaning. Since the conversion, All Fabrics Cleaners has seen increased quality of cleaned garments, increased efficiency, reductions in electricity and natural gas usage, and the total elimination of perc and its associated hazardous waste and air pollution.

For more information and materials for our Professional Wet Cleaning Program, visit our website or contact Kate Winnebeck, Wet Cleaning Program Manager, at kmhasp@rit.edu or 585-475-5390.

DID YOU KNOW?

Professional wet cleaning is a process that uses sophisticated equipment to clean clothes in water and biodegradable detergent that would normally be dry cleaned with perc.

CLIMATE RESILIENCY

A growing number of New York City residents are at risk of chemical exposure through unintentional release by storm water surges, flooding, and severe weather events like Hurricane Sandy. Residents and workers in low-income NYC waterfront communities are especially vulnerable.

To mitigate this risk, NYSP2I is teaming with Region 2 of the New York State Department of Environmental Conservation (NYSDEC) and the New York City Environmental Justice Alliance (NYC-EJA) on the New York City Industrial Waterfront Communities Pollution Prevention Toxics Reduction and Resiliency Planning Project. The goal is to create and deliver pollution prevention (P2) strategies, including engineering and design approaches, related to manufacturing and commercial operations in the South Bronx "Significant Maritime and Industrial Area" (SMIA), which is in a storm surge zone. The project team is assessing small and medium sized businesses for potential P2 opportunities and providing support for two businesses to implement improvements. Once the businesses implement, their improvements will be showcased at public workshops to educate other businesses located in the community and encourage the use of safer alternatives to toxics in order to reduce the overall risk should accidental release occur.

The team is also developing a toolkit that will be distributed throughout the SMIA to assist industrial companies in reducing their risk in case of a severe weather event.

"An ounce of prevention is worth a pound of cure."
— Benjamin Franklin

To learn how NYSP2I can assist your company with reducing hazardous materials, contact us: (585) 475-2512; nysp2i@rit.edu.