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Entry Title: Recycling Packaging EPS* - A Local Solution to a Global Issue
(*Expanded Polystyrene)

Jurisdiction: Sussex County, New Jersey
Population: 142,522 (2016 Census)
Cost per household: Projected cost of $0.16 per Sussex County household
Approximate budget: Estimated SCMUA annual labor costs $12,500
Executive Summary

Expanded polystyrene (EPS) packaging material (commonly known as Styrofoam) has become increasingly more prevalent with the advent of e-commerce and bulk shipping. Conversely, there is limited local recycling access for the recovery of packaging EPS, especially from residential, post-consumer generators, despite demand for the recycled product. The Sussex County Municipal Utilities Authority noted that the increase of packaging EPS had become a more visible material and increasing component to the inbound solid waste stream at the SCMUA Landfill in Lafayette Township, New Jersey. To address this issue, the SCMUA partnered with Foam Cycle, LLC in October 2016 to implement an innovative and patent-pending container recycling system to collect, recycle process and market the EPS. This first-of-its-kind system has been seamlessly integrated into the daily operations of the facility, with over 4 tons of packaging EPS diverted from the landfill and processed for recycling/marketing within the past six months.

Introduction

Sussex County, New Jersey has long been known as an outdoor recreational destination, along with strong agricultural roots. Its unique topography offers everything from mountains to rolling hills, farmlands, lush valleys, rivers and lakes. As one of the more rural counties located in the northwestern corner of NJ, the size of the county is substantial (536 square miles) compared to its population (142,522 – 2016 Census).

An autonomous government agency, the SCMUA owns and operates the Sussex County Solid Waste and Recycling Facility, which provides for the environmentally sound disposal of all Sussex County’s residential and commercial generated waste since 1990. In 2016, the SCMUA Solid Waste Facility accepted 100,780 tons of total solid waste, and a monthly average of approximately 20,000 vehicles utilized the SCMUA Solid Waste and Recycling Facilities. Besides the Landfill, the facility also consists of Residents’ Convenience and Recycling Centers, Vegetative Waste Compost and Woodwaste Mulch areas. On an annual basis the SCMUA recycling programs have diverted approximately 14,945 tons of viable material thereby annually saving an average 1-½ months of landfill space – a valuable commodity.

Design and Planning

Planning Process

Environmental, financial and political stigmas often associated with special wastes can impede the development of any planning process for local governments. New recycling programs are initiated at the SCMUA on a regular basis to develop alternate diversion efforts for County residents and businesses. The stigma of packaging EPS being perceived as a non-recyclable material, with an apparent lack of marketability, frustrated initial recycling efforts such that the only option was “disposal”. The choice to landfill packaging EPS is a common disposal option for public and private solid waste facilities, yet rarely embraced by the totality of customers that they service. More than once it had been brought to our attention by a resident that the symbol embossed in the material reinforces the fact that packaging EPS can be, and is recyclable!
EPS is often and incorrectly referred to as “Styrofoam™”, which is a trademarked material manufactured by the Dow Chemical Company. This lightweight, rigid foam material is commonly used in packaging of electronic devices, food items and electric appliances and is popular because of its water and heat resistant properties. Packaging EPS is an engineered solution which solved many transportation, safety and protection issues because it is a lightweight material with good insulation properties that can save fuel during shipping, and protect goods from breakage.

The SCMUA facilities, located in the eastern region of the U.S., yet in the most northwestern county in NJ is limited in terms of distance to market recyclable materials. Research with local markets reinforced the opinion that the bulkiness and lightweight nature of EPS would further be a hindrance to the recovery/recycle process. Yet, as is the nature of membership with various global (SWANA), state (ANJR & ANJHHWC, Clean Communities) and local (Sussex County SWAC) solid waste/recycling organizations, there are many resources and opportunities to really delve into those difficult questions, such as: “Could recycling EPS at a county Landfill be a sustainable initiative?” (Solid Waste Association of North America, Association of New Jersey Recyclers, Association of New Jersey Household Hazardous Waste Coordinators, Solid Waste Advisory Council). It was one those “What if?” conversations that evolved into: “How can we…?”, and a company called Foam Cycle was conceived by a private recycling vendor. As a new start up company, Foam Cycle, LLC from Augusta, New Jersey configured a one-stop collection, processing and marketing system specifically for packaging EPS that was assimilated into the existing recycling diversion operations at the SCMUA Landfill as a pilot project, at no cost to the agency. It took more than two years of planning between the SCMUA and Foam Cycle from a design concept, into a business plan and then a public-private partnership, for implementing the first test model.

One of the greatest concerns with starting a new recycling program is being able to integrate it into the SCMUA daily operations. Some of the many additional operational challenges for starting a packaging EPS recycling program included public education and accessibility, collection and storage of the raw material, possible on-site location for processing the material, weather conditions, and staffing, just to name a few. Even with all the interest by the public to have a drop-off location, it was unknown how much of the material generated by that same public would actually be diverted from their waste streams and brought to the SCMUA. Operational staff at the SCMUA play an integral role in the diversion of special wastes at the Solid Waste/Recycling Facility, when assisting customers and unloading vehicles at our Residents Convenience and Recycling Centers. Could (and would) the SCMUA staff actively divert a sufficient percentage of the balance of the EPS from the county solid waste stream to make a noticeable difference? A test collection over a two week time period was conducted to see how much material was in the mixed solid waste and recycling loads brought by customers. At the end of the two weeks, four 3-cubic yard boxes were firmly packed to overflowing just by the SCMUA staff, without public involvement.
Storage of the raw material quickly became the next issue, since EPS needs to be kept clean and dry to maintain a marketable recycling value. Research into EPS recycling processes confirmed that storage of the voluminous, lightweight raw material has been one of the main deterrents to viable EPS recovery. And yes, even at solid waste facilities, finding unused storage areas can be a real challenge!

Determining available technology options for transforming EPS into a recyclable material with market value, which could be operated by staff, was the next problem addressed for the pilot project. An Elmwood Park, NJ company called Recycletech had designed a number of EPS foam densifier machines of varying production levels in collaboration with Foam Cycle, mainly for post manufactured packaging EPS. Recycletech recommended its most basic densifier, the XT70, able to process 50 pounds of the raw material an hour and reduce EPS volume by nearly 95%.

To address the on-site storage issue, Foam Cycle retrofitted a shipping container that could house the XT70 densifier to process the EPS, along with plenty of space to store the raw material. Placement of the container at the SCMA facility to start the pilot project was the catalyst for approaching this non-traditional recycling program from a different perspective. This one-stop container had the flexibility to be placed at a location anywhere onsite the Solid Waste Facility to store and process the EPS. The bright blue container itself is both an educational tool and a great promotion of the EPS recycling program, with the #6 recycling symbol painted green on the side, easily recognized by the customers.

Another area that needed to be addressed was on-site collection bins for customers to drop off the packaging EPS that could keep the material clean and dry, and promote the program in the simplest, most direct manner. Foam Cycle partnered with RecyclingBin in Fairfield, NJ to design a durable and stylish all weather Foam Collection Bin. This bin has provided an excellent format to inform and educate the public about the program, in addition to collecting the EPS foam in 3-yard supersack canvas bags that can be switched out easily when full from the SCMUA Recycling Center, to the Foam Cycle container for processing.

The availability of local vendors to have a downstream market for the densified material was important to validate the collection and processing costs to the Authority. A NJ based company, Princeton Moulding Group had designed a system to manufacture the densified EPS material into picture frames and moldings and was seeking to purchase processed EPS as a recycled-content feedstock. This was the final impetus to overcome the perceived barriers for the development of an EPS recycling program in Sussex County. Having a local end-market demand for the post-consumer material justified the costs and efforts associated with the SCMUA staff to collect and process the EPS, closing the loop from raw material to recycled product.

Most Important Factors

In the 21st Century, mobile technology has injected internet accessibility into the hands of all consumer groups worldwide. The brick and mortar retail experience has been upgraded to provide for the convenience of online shopping and deliveries. Outdated manufacturing, packaging and shipping models have been scrapped for new logistic ideals, spawning new
industries of automation even in the solid waste and recycling realm. EPS production has increased out of retail economic necessity to address cost-cutting methods to package, store and ship right to a consumer’s front door, due to its light weight and low cost performance properties. Though many negative aspects associated with the production and disposal of EPS has communities introducing regulations in the form of ordinances and bans, to reduce or eliminate the use of EPS products (both packaging and foodservice) within their governing borders. A greater supply of EPS results in more polystyrene waste, which, when disposed of in landfills can occupy significant space because of its bulk. While dedicated governing bodies can issue edicts to eliminate special waste materials, it is often the solid waste industry that must intensify their collective efforts to develop alternate disposal and/or recycling opportunities.

In a quest for a viable recycling option for packaging EPS the SCMUA has been fortunate to partner with Foam Cycle for the design and development of a unique collection and recycling program, that addresses both the community’s environmental concerns and the facility’s disposal limitations. The goal of SCMUA packaging EPS recycling program was to provide a local disposal alternative for a special waste material.

**Program as Part of the Facility**

The SCMUA Solid Waste Complex consists of more than 250 acres in Lafayette Township near the intersection of Routes 15 and 94. The Solid Waste Facility consists of a fifty-four acre, 3 Phase Sanitary Landfill, Residents' Convenience and Recycling Center (RC/RC), Vegetative Waste Composting Facility, and Woodwaste Mulching Facility, permitted by the NJ Department of Environmental Protection (NJDEP).

Since the sanitary landfill's opening in 1990, over 2,388,728 tons of Sussex County’s solid waste has been accepted for disposal. The SCMUA recycling operations accepts traditional Class A Recyclables (glass, plastic and metal containers and cardboard, newspapers, office paper, etc.) Additionally, the Solid Waste Facility accepts Class B recyclables such as metals, white goods including refrigerators and stoves, tires, rigid plastic items, boat shrink wrap (seasonally) and propane tanks. The SCMUA's Class C or Vegetative Waste Facility accepts leaves, grass clippings brush and tree parts, processed into compost and mulch for County residents and businesses. The SCMUA annually sponsors two (2) Household Hazardous Waste Disposal Events and four (4) Computer/Electronic Waste Recycling Events, as well as monthly Secure Paper Shred Events and Medical Waste Disposal Events. On a monthly basis, over 20,000 residents/businesses access the Solid Waste Facilities for their waste disposal and recycling needs.
There was truly limited space at the facility for the startup of a new program needing access to residents and businesses, dry and clean area for storage of the raw material and the densifying equipment, along with a power source. The use of a retrofitted shipping container to house the one-stop Foam Cycle system was a game changer in the ability to integrate collection, processing and recycling of a special waste into the daily operations. The configuration of the container allows for easy access to store and process the EPS, depending on weather conditions and quantity of material that is processed, with two overhead doors retrofitted in front, and standard double doors on the left side of the container. The bright blue painted container stands out among its surroundings, with the stylish green recycling graphics, SCMUA and Foam Cycle logos. Because of its location at the facility the container is not meant to be accessible to the general public, though a sign was needed to be installed outside the container so that customers understood it was not the drop off location to bring their EPS!

At the far north corner of the facility the SCMUA has a Residents Convenience Area that local residents and businesses can drive to dispose of their solid waste (charged a per pound rate), and a Recycling Center for recyclables (no charge). At each location there are SCMUA staff that direct and assist the customers as they unload their vehicles. These locations and the involvement of the staff are key elements in the diversion efforts of the solid waste facility. At any given day of operation, staff are pulling, sorting and packaging various metals, tires, lead acid batteries, cylinders, tanks, electronics, wire, clean wood, rigid plastic items and cardboard from mixed solid waste loads at the Convenience Center. Residents bring previously segregated material to the Recycling Center that staff help unload, including mixed fiber, newspaper, cardboard, commingled containers, cellphones, American flags, rechargeable batteries, used motor oil and antifreeze. Foam Cycle supplied bins at each of these locations to aid SCMUA staff, and to educate our customers for the proper collection of the packaging EPS material. The bins have been an additional, crucial element to both inform and provide access to the customers about the new program, by generating a real interest and excitement to collect and recycle a previously misconceived special waste.

**Program’s Role in County’s Integrated Solid Waste Management Effort**

The SCMUA is an Ex-Officio (staff) member of SWAC, the Solid Waste Advisory Council representing all twenty-four Sussex County municipalities that advise the Board of Chosen Freeholders on solid waste, recycling issues and facility permitting within the County. As the
only permitted landfill in the region, the Authority’s Chief Engineer and County Recycling Coordinator report on the facility’s waste generation status and diversion initiatives to SWAC on a monthly basis. In addition, both Authority staff members collaborate with County Planning and Public and Environmental Health Departments regarding solid waste/recycling infrastructure development, management and enforcement within Sussex County. The SWAC is charged with the development and maintenance of the county’s integrated Solid Waste Management Plan (SWMP).

The town representatives often bring the concerns of their residents and businesses to the meetings for discussion, clarification and guidance. The SWMP is referenced to determine if there are sufficient guidelines for both proper disposal of solid waste, and diversion methodology of recyclables. Annual recycling rates are also reported on municipal, county and state levels.

As a rural, farming community with limited commercial and industrial infrastructure within the municipalities, Sussex County has faced challenges in attempting to increase its recycling rates compared to the state (source: NJDEP) mandated goals of 50% MSW (municipal solid waste), and 60% TSW (total solid waste) diversion rates. By working with SWAC as well as Municipal Recycling Coordinators, a renewed focus has been directed for a better understanding of the community’s solid waste and recycling challenges and advantages. As a result of individual municipal environmental awareness among the towns, the county as a whole has benefitted with consistently improved recycling rates.

The introduction of collecting special wastes should be a natural progression for integration of Sussex County’s SWMP, as another material to divert from municipal trash. However, most towns in the county don’t have the finances, infrastructure or volume of potential recyclables to justify pursuing individual/local special waste collection programs. In addition, more than half of the towns in the county do not have a municipal solid waste or recycling collection program, leaving the responsibility to the local residents and businesses to contract individually with solid waste and recycling haulers. As a result, implementation of new recycling programs are typically conducted on a regional/county level at the SCMUA Solid Waste and Recycling Facility. In the recent years the following SCMUA special waste recycling programs have been successfully integrated into the county’s solid waste management plan, including electronics, shredded paper, boat shrink wrap, milk/juice cartons, chipboard, cell phones, rechargeable batteries and rigid plastic. All of the materials listed are diverted on a daily basis at the SCMUA solid waste facility, saving valuable landfill space.

The concept of collecting and recycling EPS in Sussex County, either food service or packaging material, appeared to be beyond the respective realm of the SCMUA diversion efforts or capabilities. With the progression of discussions at SWAC and Recycling Coordinator meetings, it was abundantly clear that there was both a demand and desire among the communities to do something else with the “Styrofoam” besides landfill it.
Initially, the SCMUA and Foam Cycle made a conscious decision to concentrate only on collecting packaging EPS foam, as the unprocessed material takes up the most space in the landfill, and is potentially the least contaminated (and most valuable market-wise) to handle and process, compared to food service EPS and packaging peanuts. A soft launch of the program was conducted at the SCMUA in October 2016 to assess the public’s interest to divert the material from their trash. A heavy cardstock 2-sided pamphlet outlined the program with specific details of what was considered acceptable and non-acceptable packaging EPS for recycling, with similar information posted on the SCMUA website. Sussex County municipalities also provided information and links on their websites. Within the past six months since the initiation of the pilot program, all twenty-four towns in the county have registered an increased interest among residents and businesses for diversion specifically of packaging EPS.

Though still a demonstration project to determine the viability of permanently including the recycling program into the SCMUA facility and County SWMP, the initial success has factored into the likely integration of diverting this special waste from residential solid waste in Sussex County.

**Overall Merits of the Program**

Numerous recycling industry articles have confirmed that EPS is a very recyclable and desirable material. According to the EPS Industry Alliance (FPS-IAA), EPS is made up of 98 percent air. This recently released EPS-IA video best explains the use of foam material.

Ironically the same virtues that have made packaging EPS popular has also made it a challenge to recycle due in part because it is remarkably expensive to collect and transport in its loose form. Those communities around the country that have been successful in recycling EPS have created a collection system in which the EPS is shipped over short distances to a facility where material can be compressed, or densified. The SCMUA grass roots approach of developing a recycling program completely based in New Jersey has gained momentum and acknowledgement by way of the interest of other NJ municipalities, counties, solid waste facilities and agencies, as well as communities elsewhere within the US.

Typically special waste programs highlight public convenience and agency cost effectiveness, both important considerations to determine whether a concept can develop into a sustainable initiative. Though often overlooked, it is also the promotion of partnerships that develop the basis to which successful recycling platforms can be built upon. Partnerships should not be strictly viewed as “private-public”, or “corporate”, but rather as conceptual affiliations among stakeholders, mutually supportive and beneficial to achieve a predetermined goal. Partnerships developed over the years between solid waste/recycling industry organizations such as SWANA, ANJR, Clean Communities, ANJHHWC and SWAC are the associations to which enterprises and joint ventures can be fully explored and vetted, between conservative public agencies and motivated private corporations. As progressive communities pursue new waste diversion opportunities, and strategize to overcome real and perceived challenges, support will continue to grow for local recycling initiatives such as packaging EPS.

The concept of “recycling” even special wastes in the U.S. is expected among consumers, and the residents and businesses in Sussex County, NJ are no exception. Providing a packaging EPS
recycling program has been a welcome addition to the existing range of services for SCMUA customers. Many of our customers initially started bringing their recyclables to the SCMUA Recycling Center to avoid disposal costs, and have since become committed to increasing their diversion efforts. It is these same stakeholders that expressed concern for disposing of materials they diverted from their trash because they thought it would be “recyclable”. Known limitations in the solid waste industry such as collection, storage and marketing of EPS are viewed as placates by educated consumers, with internet access to learn about innovative recycling programs.

The SCMUA and Foam Cycle have partnered to embark on a creative new frontier regarding the conceptualization, design and implementation of an integrated collection and processing system for a special waste recycling program that can be assimilated into public facilities of all types, including municipalities and counties, schools and colleges, as well as private businesses such as malls, warehouses and senior living communities. The act of equating of recycling packaging EPS as a special waste to a different type of modality, and being able to integrate the new system in an existing infrastructure that is modular and portable, instead of being stationary and limited in terms of marketability and accessibility, that elevates this program to the “excellence” level. Developing recycling programs for special wastes isn’t something necessarily new, however it is the modality in the development of the program that provides a local solution to a global disposal issue.

**Use of Equipment/Systems and Technologies**

The challenge of recycling a non-biodegradable product made up of 95% air required an innovative approach to explore new technologies that could be implemented close to the waste source, hence a “local” solution to a global issue. The optimal technology solution was to install a densification equipment unit because of the lightweight nature of EPS foam and the high cost of transporting the bulky materials to market.

One of the goals in the design of the Foam Cycle collection container was to strengthen the links in the recycling chain system from initial source separation, to downstream marketing of quality material. Having the densification process performed by the Authority’s staff aids in the recovery of clean material with virtually no contamination, due to continuous effective training and monitoring.

The shipping container was specially equipped with a 220 volt power source for the densifier unit, electrical hook ups, interior lighting and an exhaust fan. The power source was supplied by the SCMUA, with Foam Cycle providing connection to power the container and the densifier.
The container allows for storage and processing of the foam, regardless of weather conditions. The doors on the container can also be secured and easily locked by staff when not in use. The container is located on an existing concrete pad by the outside rear corner of the SCMUA’s Bulky Waste/Recycling Building, along the main exit route by which the majority of SCMUA customers traverse. The BW/RB is used to stockpile large quantities of various Class A & B recyclable materials that are delivered to local markets.

A small paved area around the pad provides the extra space needed for facility staff to park vehicles to unload the raw material into the container, and store the processed material on pallets outside the container. The XT70 Foam Densifier from RecycleTech is capable of processing 50 pounds of packaging EPS per hour, yielding an effective 90 -1 reduction of material volume. Once densified, the processed EPS material can be stored outside, exposed to rain or snow with protection from the sun’s UV rays.

A standard operating procedure has been developed by SCMUA staff to collect and process approximately 6 - 8 supersacks of raw packaging material twice weekly. It takes two staff members around 2 - 3 hours to process the material each time. About 1 & 1/2 supersacks of raw material equals 1 ingot, which can weigh anywhere from 25 – 40 pounds, depending on the density of form.
Resource conservation and significant environmental impacts are evident with the densification process reducing the packaging EPS foam by more than 90 percent, to a final end product. It is estimated that a full 53-ft trailer load of loosely stacked EPS foam usually weighs approximately 3,500 pounds, equal to 3 pallets of compacted EPS foam that has been processed with the XT70 densifier.

The SCMUA’s special waste screening procedures for source reduction of packaging EPS are successful mainly due to public and staff commitment for clean materials diverted/colllected. The blue collection bins with eye catching graphics are constructed of lightweight aluminum and corrugated plastic panels that house the 3-yard supersacks. The bags can be easily changed out when full of the raw material and transported a short distance by truck to the Foam Cycle container.

Once the collection and consolidation of the packaging EPS was figured out, processing and recycling of the material has become fairly routine and effective. Under the pilot phase of the program, future exploration will be conducted to quantify the volume of EPS collected and diverted from the landfill, processing rates, and reduction percentages of the raw material to the finished product, including labor and transportation costs.

The SCMUA grass roots approach to handling a special waste has the potential to gain momentum as public facilities partner with private companies to pursue new recycling opportunities, while overcoming equipment challenges and encouraging local support.

**Environmental Benefits and Regulatory Compliance**

As a county solid waste facility in the State of New Jersey, this SCMUA recycling program has not only complied with all NJ solid waste disposal and recycling regulations; but actually
exceeds the intent of the county SWMP, along with state environmental regulations. By NJ law, foam products are considered a waste stream, and can be legally commingled with other solid waste and disposed of in the landfill (recycling not required). The SCMUA has chosen to segment and divert the EPS material from our inbound waste stream and recycle it into a marketable byproduct for reuse. As with other disposal facilities in NJ, the SCMUA could have chosen to do nothing (no action alternative) and still would have satisfied all applicable state environmental regulations. Our innovative approach exceeds regulatory expectations. Beyond that, the SCMUA packaging EPS recycling program is in full compliance with applicable county and state environmental laws and regulations.

Awards, Letters of Support

Although still a relatively new start-up and specialized recycling program, the SCMUA packaging EPS collection program in partnership with Foam Cycle, has been highlighted in a number of industry articles, reviews and recognitions:

Plastics Recycling Update, A Resource Recycling, Inc. publication highlighted the details of the SCMUA EPS recycling program, and unique equipment and services provided by Foam Cycle, https://resource-recycling.com/plastics/2017/03/31/equipment-spotlight-complete-setup-foam-collection-program/ posted March 31, 2017

Waste 360’s Jun 7, 2017 article http://www.waste360.com/plastics/how-new-jersey-county-tackling-foam-recycling delved into “How a New Jersey County is Tackling Foam Recycling” as a strategy to divert a problem material from the county’s solid waste, save landfill space, recycle and market a valuable product.

In addition, Foam Cycle LLC was recognized with the 2016 Excellence in EPS Recycling Award by the EPS Industry Alliance http://www.epsindustry.org/eps-sustainability/excellence-eps-recycling-award for the development of the innovative and patent-pending Foam Cycle container system utilized in SCMUA’s application.

Worker Health & Safety

As a county Solid Waste Facility, the Sussex County Municipal Utilities Authority’s safety requirements are governed by PEOSHA (Public Employee Occupation Safety Health Act). The SCMUA strives to establish safe and healthful working conditions and policies for the Authority’s staff, with regular safety training programs.

Employee training for the implementation of the packaging EPS Recycling Program entailed:

- Segregation and collection of raw material
- Operation of the XT70 Densifier*
- Processing of material and maintenance of the Foam Cycle container

After the initial orientation, SCMUA staff have received ongoing operational and safety guidance from Foam Cycle and SCMUA supervisors. Operation and safety guidelines were provided with on-site training and are posted in the Foam Cycle container. (*Also posted is an air quality/emission test summary in conformance with NIOSH and OSH safety standards).
Performance, Economics and Cost Effectiveness

There are two performance metrics that the SCMUA and Foam Cycle have focused on with the implementation of the pilot packaging EPS recycling program, specifically the actual realized value associated with marketing the processed material, and also the conceptual landfill space savings associated with the diversion of the raw material (EPS volume).

Landfill Space Saved
A trailer load of EPS foam though lightweight, is rigid and voluminous, despite 95% of its content being air. Diversion versus disposal of this material in a landfill translates to a cost avoidance scenario associated with the amount of air space the raw material occupies. Utilizing the previous estimate of a 125 cubic-yard trailer load equaling 3,500 pounds of loosely stacked EPS foam, the SCMUA has diverted about 200 cubic yards of raw material in the six-month program, which projects to an annual total of 400 cubic yards of diverted EPS material. Conservatively assuming a 50% compaction rate, the annual landfill air space saved by EPS diversion is 200 cubic yards. The value of this landfill space can be calculated by utilizing in-place solid waste density @ 1600 lbs/cubic yard (as supported by annual topographic analysis) and SCMUA’s blended tip fee rate of $108/ton, yielding an average landfill value of $86.40/cubic yard. The SCMUA has therefore estimated a total landfill air space savings (cost avoidance) for EPS diversion of $17,280.

Market Value
Costs associated with diverting and transporting the packaging EPS can be lowered considerably by reducing the volume of the waste, preferably at the point of origin, before conveying to recycling facilities. The XT70 densification equipment has the potential to offset the original investment of SCMUA labor costs with revenue generated from the sale of the densified material. Market prices may vary depending on the quality of the material. Princeton Moulding inspected the SCMUA’s compacted EPS and determined it was “Grade A” with a market value of $350 - $400 per ton, delivered FOB. With the weight of the packaging EPS material processed to date scaled at 4,000+ pounds, the total estimated market value could range from $700 - $800. SCMUA labor costs are estimated to be $12,500 annually, as based on 2 staff x 6 man-hours per week. Without accounting for landfill space savings, the cost effectiveness of the EPS recycling program is projected to be $12,500 cost and $2,240 revenue, for a net annual program cost of $10,260. This results in a projected overall cost per household of $0.16 for Sussex County residents, which is quite reasonable for the benefits achieved.

As there are limited applications across the country regarding post-consumer collection of packaging EPS, present methodology and data sources are insufficient for comparison with the SCMUA/Foam Cycle operational model at this time. The natural progression of full integration of the program into SCMUA operations would eventually include analysis of collection volumes diverted, processing schedules, compaction rates, quantity of product generated. From an economic perspective, the development of the EPS recycling/marketing program is successful for a number of reasons. The SCMUA is saving limited landfill space by diverting a former waste (recyclable) material, generating a revenue stream by marketing high quality processed material, and also addressing an emerging environmental issue.
The flexibility in which SCMUA staff can collect and process the raw packaging EPS material has been an important factor in assimilating the program into the daily operations at the facility. Depending on the volume of material collected at the Resident’s Convenience and Recycling Centers, weather conditions, and availability of staff, there are many options available for scheduling the collections and processing. With staff having the opportunity to control the scheduling, it has had a positive impact on eliminating any downtime associated with managing the SCMUA packaging EPS recycling program.

**Customer Service**

The greatest measure of any new program’s success is the interest, understanding and excitement generated with its introduction. The SCMUA packaging EPS Recycling Program has been met with great support from the customers that utilize the Solid Waste/Recycling Facility. In addition the program has provided environmental alternatives to the local residents, businesses and municipalities that the SCMUA services, for their disposal and recycling needs.

In specifically fostering customer service for the program, Foam Cycle was a co-sponsor of the 2016 SCMUA’s Earth Energy Day on April 27th, where over 370 local students (grades K – 4th) took part in an interactive, environmental awareness educational event. The thank you cards sent by the students affirm how much the program had an impact on them – Enjoy!

**Operational Performance**

Overall, the operations of the SCMUA packaging EPS Recycling program has basically equaled and exceeded expectations of the SCMUA, and our partner Foam Cycle. The public response has been positive and supportive. SCMUA staff have been able to consistently collect substantial quantities of the raw material, and regularly process the end product for market purposes. The collection system and processing equipment have served the program well. However, as with any developmental program, there were some tweaks that are needed to be made for the continued implementation of the program, including:

- Options needed for to recycle food service EPS and packaging peanuts
- Staff being able to determine which of the many different types of packing EPS foam is/isn’t part of the program
- Space limitations for storing the processed material

Figure #20 & #21: Thank you letters from students
The lessons learned for EPS recycling were a result of improvements that were made to the program, such as:

- Developing an informational pamphlet that includes sources for diversion and recycling of food service and packaging EPS
- Raw packaging EPS material samples were used as part of the educational training so that SCMUA staff would be able to determine the correct material.
- Research was conducted online for processing methods resulting in using a rectangle plastic form to mold the finished product in. The resulting ingots have proven to be simple to mold, easy to handle, stack and palletize while storing for delivery to market.

**Cost Effectiveness**

The SCMUA anticipates offsetting the labor and equipment costs associated with packaging EPS recycling program by eventual bulk marketing of the end product. SCMUA plans to continue to monitor the quality of the raw material diverted from the solid waste stream to ensure the highest quality processed material, thereby obtaining the highest monetary value for the end product. According to the EPS Industry Alliance, 127 million pounds of EPS was recycled in the U.S. in 2013. The vast majority was clean protective packaging material, which justifies the continuous volume of raw material needing to be recycled, even at a county government solid waste facility.

Recycling packaging at the SCMUA has already showed great promise in realizing the potential of diverting other special wastes from the landfill in the future. Hopefully, the development of alternate waste disposal technologies will foster and encourage companies, organizations and governments to step up comprehensive recycling efforts towards the goal of having a cleaner planet. By enhancing educational outreach beyond the solid waste/recycling facility, local consumers have embraced the ability to recycle EPS foam with the readily available collection outlet.

There are also positive side effects in the development of such an innovative recycling program in which the community realizes there are alternatives that they can take part in to reduce litter in the streets, parks and surrounding countryside, pollution of waterways threatening animal and marine life. Public education has been critical to the program’s success, and will only continue to expand with the continuance of an enhanced informational campaign. Future community environmental endeavors will include developing public engagement strategies and residential outreach, as the impact of one section of the recycling chain can positively affect other sustainable links.

**Public Acceptance, Appearance and Aesthetics**

The SCMUA Solid Waste Recycling Facility prides itself in being an integral neighbor within Sussex County. A brief summary of our public relations programs include the SCMUA website with email links for questions, providing information for the county Facebook page, tweets on Twitter and other social media, to notify all age levels about new waste diversion programs. In addition the SCMUA is proud to ensure there are staff members to personally answer the numerous phone calls on a daily basis. One public education initiative to help the community understand the SCMUA’s role has been to prepare the annual facility pamphlet and other printed
literature specifically for the “uninformed public”. Tours of, and presentations about the facility are conducted as requested by local civic, educational and environmental groups, to promote resource recovery. The SCMUA also utilizes various media including newspaper and radio advertising, email blasts, faxes (yes a lot of educational and governmental agencies still use the fax machine!), with direct mailings to municipalities to disseminate facility information.

Additionally, SCMUA continues to support its residential and commercial customers through the implementation of this, and other recycling initiatives/programs, all of which are provided free as part of SCMUA’s comprehensive solid waste and recycling related services.

*EPS Recycling Program*  
*E-waste Recycling Events (4/year)*  
*Textile Recycling program*  
*American Flag Retirement Program*  
*Household Hazardous Waste Collection Events (2/year)*  
*Class A Recycling Program*  
*Class D Recycling Program*  
*Cell Phone for Soldiers Program*

**Community Concerns for Packaging EPS Recycling Program**

Disposal of EPS in landfills is considered by layman and environmentalists alike to be harmful for our environment because EPS does not biodegrade. As consumer demands drive increased global production of plastic products such as packaging EPS, the need for innovative strategies for improving environmental sustainability continues to grow.

To address potential disposal and pollution issues associated with landfilling EPS, some communities have focused on eliminating or reducing potential products from the waste stream, by fostering legislation to ban the reduction of polystyrene foam within municipal borders. While these methods focus on preventing pollution at its sources, the SCMUA solid waste disposal facility can attest that it traditionally would not result in significant trash reduction of the products due to the unlimited packaging EPS material sources outside the governing agency’s legislative control. As long as non-degradable plastics are produced such as packaging EPS, the development of improved recycling techniques must continue in order to reduce the volume of non-degradable plastic waste content in landfills.

There needs to be a shift in the disposal and recycling mindset to consider significant environmental impacts, and to be on track with the pace in which the new technologies are being designed and manufactured. Still in the pilot phase of implementing the program, the SCMUA is continuing to assess and optimize the Foam Cycle collection and recycling system.

**SCMUA Solid Waste Facility**

One of the most common responses for first time customers and those who tour the SCMUA Solid Waste Recycling Facility is the level of cleanliness for the site. This adherence to an orderly and well maintained appearance is once again due to the pride of operational SCMUA staff, from supervisors to seasonal employees. From landscaped and mowed greenery to proper signage and traffic control patterns, it is understood that the public that the SCMUA serves will continue to utilize the facility if its elements are convenient and accessible, and the site is kept in good condition.