2018 Excellence Award Entry

**Category**
Recycling System

**Entrant**
Penn Waste, Inc.

**Entry**
Penn Waste, Inc, York Pennsylvania
45-tph Single Stream System Retrofit

**Jurisdiction**
South Central Pennsylvania

**Population**
65 Municipalities, 180,000 Households, 4,000 commercial customers, other 3rd party public & private generators

**Cost Per Household**
N/A (Private Venture)

**Budget**
$20M Land, Land Improvements, Buildings, Equipment
$3.5M for Retrofit

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Executive Summary

Since opening our single-stream materials recovery facility (MRF) in 2015, Penn Waste has been committed to excellence. In 2017, our growing customer base and changing material stream led us to realize that a retrofit was in order to continue to achieve excellence.

We invested in technology to boost throughput, recovery and purity. The complete retrofit took only 9 days, and we didn’t lose a ton. The results have led us to continue to expand our reach in what have become turbulent market conditions. We’re running at 100% capacity with lower operating costs, capturing 98% of recyclables while creating sellable products, and doing so with over 98% uptime.

We take pride in our fleet, in our buildings and in our system—but not nearly as much as we do in our people, the first-class service we provide our customers, and the more than 160 charities we’ve been able to support.

45 tons per hour

29% more throughput than original system

98.2% uptime

98% of available recyclables recovered

18,000 tons per month capacity
Planning

When York, Pennsylvania based Penn Waste Inc., opened its new 96,000-square-foot recycling facility in Manchester, Pennsylvania, Penn Waste CEO Scott Wagner said: “Our long-term goal is to continue to find innovative ways to waste less and recycle more by diverting recyclable materials from the waste stream.” That was the case in 2015 and once again in 2017 when the company debuted its $3.5 million retrofit.

2015: 35-tph Single Stream Recycling System

After material audits, forecasting and a fully-diligent vetting of equipment manufacturers, Penn Waste chose Bulk Handling Systems (BHS) to design, manufacture and install its 35-tons-per-hour (tph) recycling system. At the time, the new facility more than tripled Penn Waste’s processing capabilities and was designed to improve its recovery rates and product quality. The new MRF instantly became one of the largest in the region. “Building this new facility reinforces our commitment to the local and surrounding community and to increasing sustainable practices throughout our region,” said Wagner.

Between 2010 and 2014, Penn Waste saw a 50% increase in tonnage, and with growth expected to continue, the
old system had outlived its usefulness. The new building and equipment upgraded Penn Waste’s sorting and processing capability to 35 tons of recyclables per hour, up from the 10 tons per hour the old system handled. Along with an increase in capacity came an increase in technology, including automated metering, wider screens, Nihot air density separation and NRT optical sorters. The latter of which enabled high-speed, high volume recovery of plastics with less contamination.

At the time, Pen Waste was operating a fleet of more than 100 collection trucks to serve more than 175,000 customers in 65 municipalities in five Pennsylvania counties. By 2017, Penn Waste had 125 collection trucks and was servicing 180,000 households and 2,000 commercial customers. The collection of recyclables had increased but so too had the material mix. The recycling system was seeing less paper and more containers. Due to the commercial mix and the “Amazon effect,” cardboard had increased, including smaller 3-dimensional (3D) cardboard that would make its way to the container line. The 2015 system produced exceptional results and enabled the company to grow, but it was clearly time to make some improvements.

2017: Single Stream Retrofit

Penn Waste was impressed with the system’s all-around performance, including throughput, recovery, purity and uptime, and called once again on BHS for the retrofit. The companies developed a strong working relationship and BHS and its subsidiaries are on the leading-edge of the technology curve – and that’s what this retrofit demanded. The major changes to the material mix was a relative increase in containers and smaller, 3D OCC. Purity requirements were also changing and it was Penn Waste's goal to be able to process more material at the required quality levels without adding operations costs.

To address the increased and evolving tonnage, Penn Waste added a larger Nihot glass cleanup (GCUS) system, three NRT optical sorters and a Max-Al® AQC (for Autonomous Quality Control). One NRT optical sorter at the onset of the container line removed fiber, solving the “Amazon effect” and increasing the availability and performance of the rest of the container line. The other optical sorters increased recovery, purity and automation, thereby lowering operational expenses. The Max-Al AQC has had a similar effect, acting in a quality control (QC) role on the PET ejected
from the NRT optical sorter, it makes up to 65 picks per minute to recover non-PET containers and remove residue. It also works over both of the MRF’s shifts. The larger optical sorters on the front-end allowed Penn Waste to repurpose an existing unit, equipped with a metal sensor, to target metals and plastic containers on the container line’s residue output, sending anything of value back for recovery.

In total, the additions have created a more efficient, better system that is processing nearly 30% more than before the retrofit (45 tph compared to 35 tph). Thanks to well-planned and collaborative effort with BHS, the entire retrofit took only 9 days and Penn Waste did not lose a single ton of material during this time, storing it to process once up and running. In fact, the system’s new capabilities has allowed the company to pursue new contracts while some others in the region struggle to keep up with changing quality requirements and material.

“While others are slowly adapting to the new reality, our system is running more material than ever,” said Penn Waste Director of Recycling Operations Tim Horkay. “This upgrade was accomplished in just nine days and thanks to our partnership with BHS, we did not have to divert even a single load of material. The new container logic allows us to react to our new container-rich waste stream and capture more materials at higher levels of quality – with fewer sorters. Commercial recycling isn’t easy right now, but thanks to this system and its upgrades, we are out in front and in a position to take on more material.”
System Layout: Step by Step

1. Metering Bin
   Provides an even, steady flow of material into the system.

2. OCC Separator® & Fines Screen
   Separates cardboard from paper, containers and fines, including glass.

3. Nihot Single Drum Separator
   Separates glass from fiber fines.

4. NewSorters® (2)
   Separates newspaper from mixed paper and containers.

5. Polishing Screen
   Separates into 3 materials: mixed paper, containers, fines.

6. Magnet
   Separates out ferrous metals.

7. NRT NIR Optical Sorters (5)
   Uses infrared light and software algorithms to rapidly scan and identify specific plastics; air jets eject targeted plastics.

8. NRT Color Optical Sorter
   Uses camera-based technology to recognize and eject specific colors.

9. Max-AI™ AQC
   Advanced technology uses a vision system, artificial intelligence and a robot for PET line QC.

10. Eddy Current Separator
    Separates aluminum cans from the material stream.

11. Balers (2)
    Compresses final products into bales.

STEP BY STEP SYSTEM VIDEO
State-of-the-Art Technology

Penn Waste is always looking for technology to improve its operations and when longtime partners BHS and NRT launched the Max-AI AQC, Penn Waste placed the first order. The AQC differs from traditional sensor technologies, including those found in optical sorters, in that it detects materials using a camera and artificial intelligence (instead of a spectrometer or electromagnetic sensor) and a high-speed robotic sorter to grab and place items. At Penn Waste, the NRT unit handles the high-volume sortation of PET and the AQC finishes creating the high-quality product by removing contamination and containers, which return to the onset of the container line for recovery. The AQC works over multiple shifts to increase quality and worker safety while decreasing operational costs. The technology itself offers recognition capabilities that open the door for additional capabilities and MRF intelligence, and after being an early adopter, Penn Waste is looking forward to welcoming more “Max” equipment in the near future.
Recycling Program Impact & Merits

Penn Waste prioritizes its “highest and best use” philosophy to its own business practices and encourages subcontractors to adopt and implement the same philosophy. As an environmentally responsible and sustainable company, Penn Waste works to find highest and best use solutions for recyclable materials, preferring to market materials domestically to reduce the carbon footprint of shipping commodities and also supporting the local economy.

Penn Waste is committed to giving back to the communities we service. In 2017, Penn Waste donated time, resources, and services to over 160 non-profit organizations in our community. In addition to financially partnering with organizations in our community, community recycling education continues to be one of our main goals. Penn Waste utilizes an integrated marketing plan to ensure all customers are receiving information on how to properly recycle.

Environmental Protection & Impact

Due to increased material quality standards and an influx of new and diverse material, Penn Waste identified the need to significantly increase its throughput capacity while improving the quality of salable commodities. Since the initial investment in the recycling facility, Penn Waste and BHS have partnered to implement significant innovations. BHS equipment and software are of the highest quality and feature the most advanced technology, and selecting BHS allows our team to operate familiar equipment with built-in redundancies (including the ability to stock like spare parts for wear items and having system optimization experts on hand to evaluate all equipment on site).
Use of Equipment & Technology

Many of the system’s advanced features have been described in the design and layout, including the new Max-AI® technology used in the AQC robotic sorter for PET purity. This section will further explain the additional technologies that contribute to the success of the Penn Waste system.

**BHS Tri-Disc™ Technology**

Proprietary BHS Tri-Disc technology is the foundation of the five screens in this system, and responsible for separating OCC, news, mixed paper, containers and glass-rich fines. The Tri-Disc’s unique shape creates a precise IFO for consistently accurate sizing. The aggressive, wavelike agitation imparted on material provides a high degree of sorting efficiency in a relatively small and energy-efficient footprint. Patented gear timing and variable speed drives clear any potential jams and allow for fine-tuning for various processing needs. Hardened steel discs of the OCC Separator and the DRS quickly break and remove glass from the system. Uniquely, Tri-Discs on NewSorter and Polishing Screen quickly move fiber up and over the screens, while a ballistic effect will send even flat bottles tumbling down.

**Nihot Air Density Technology**

During the company’s 70-year history, Nihot has mastered air separation. The SDS 800-i at Penn Waste had widespread success in markets throughout the world and is the leading solution for producing a highly-marketable glass product. The equipment is extremely flexible, allowing operators to fine-tune separation to meet their needs. The equipment is different in that it uses suction to pull lighter materials into the expansion chamber, creating a steady, even flow of air across the material width. In a closed loop, air is recirculated and dust filtered, promoting a clean working environment. In addition to the unit’s precise and flexible separation, it is extremely dependable and requires almost zero maintenance.

**NRT Optical Sorting**

NRT invented In-Flight Sorting™ technology, which detects and ejects materials in flight. This is hugely advantageous, eliminating loss due to bottle roll and conveyor belt interference, while also enabling transmissive detection. Transmissive detection, whereby containers pass between the light source and detection source, provides a 100x stronger signal than reflective detection. Transmissive detection, combined with PET Boost™ allows Penn Waste to accurately detect and eject full-label containers, “wet” PET and thin-walled PET.
Equipment: Safety Comes First

BHS' Product Development Manager, Jim Webb, is a member of the American National Standards Institute (ANSI) Z245 Accredited Standards Committee as well as two subcommittees, including 245.41, responsible for “Facilities for the Processing of Commingled Recyclable Materials – Safety Requirements.” BHS not only follows OSHA and the more stringent ANSI requirements, but is a change leader and driving force for increased safety in these facilities. The latest safety improvements are featured prominently in this system, including:

Maintenance Access

The system was designed with the safety of maintenance workers in mind. The screen angles are adjustable during operations to maximize performance, but in maintenance mode, they automatically lock in place at the lowest incline, providing the safest screen deck possible.

- Ergonomic sort stations and conveyors allow sorters to slide material, rather than lifting over a flat edge; extra-large bins eliminate material jams
- Auto-close gates on ladders and protective cages at every applicable location - OSHA safety standards require cages on ladders above 20 feet - at Penn Waste, ladders are caged at 12 feet and higher
- Platforms and walkways feature continuous handrails. Wide platforms provide wrap-around access to equipment and safe exit routes
- Guards cover all rotating shafts on drive and non-drive sides and all conveyors below 7 feet are guarded. All conveyor ‘nip points’ are guarded
- Electrical panels are accessible for diagnostics without opening the doors, limiting exposure to the electrical system. Controls feature NEMA 12 safety enclosures with 3-phase indicators on outside panels
- Emergency stops to all conveyors are strategically located throughout the plant within 3-feet of a manned station. Emergency stops meet or exceed ANSI standards
- Disconnects for every motor are located in easily accessible areas. All doors to equipment feature interlocks that will stop equipment and trigger an alarm if a door is opened during operations
- Climate-controlled control room is located above sorters and has excellent visibility of operations
Pennsylvania Act 101

In 1988, Pennsylvania passed PA Act 101 in an effort to reduce waste and increase recycling. Act 101 requires that all municipalities within the state create waste management programs that include recycling. Penn Waste helps the communities it serves comply by offering free commercial recycling audits and consultation. Penn Waste is also very active educating the community at all levels, and even has information on how residents can best recycle on every truck.

Penn Waste is committed promoting a highest and best use philosophy. Our system is designed to recover single-stream recyclables at a high rate and with high quality to ensure they become new products. By law the MRF cannot accept medical waste and electronic waste and spends significant time and resources to educate the public, not only to make sure those materials make it to the proper location to find their highest and best use, but to make sure this hazardous material doesn’t contaminate other recyclables that can be captured for reuse by our technology. Penn Waste does this through content creation (print, web, media, social, etc.).

In addition to state and local laws, Penn Waste goes above and beyond to make sure the recycling center does all it can to avoid breaching any written or unwritten rules, including. For example, the facility is 100% enclosed and all processing is done inside. This keeps the surrounding area cleaner, and prevents any impact on storm water inlets. The grounds are also kept with the community in mind. The building is pressure washed twice a year, both inside and out. We even staff two dedicated workers in charge of litter control and indoor and outdoor sweeping. To avoid odors and material congestion, most material that enters the MRF is processed and shipped within 48 hours of receipt.

Under state law, Penn Waste is not a permitted facility because it does not handle municipal waste through the plant. Penn Waste has a perfect compliance record with regards to storm water discharge, noise, nuisance, air, safety and general environmental regulations.
Worker Heath & Safety

Operational Safety Considerations
Penn Waste enforces an established Health and Safety Program to ensure all workers operate in safe working environments. Penn Waste promotes a family atmosphere and values its employee and their safety. It’s important to the Penn Waste ownership and management team to foster a proactive operational approach to safety, including its 12-month safety program led by management that covers in detail the following 21 educational topics:

- LO/TO (lockout/tagout)
- Hazard Communication
- First Aid/CPR
- Walking and Working Surfaces
- Confined Space
- Hot Work Permitting
- Heat Stress
- Bale Stacking
- Cell Phone/Driving Distractions
- Sorting Safety
- Injury and accident Reporting
- Machine Guarding
- Hazardous Material
- Personal Protective Equipment
- Lifting
- Fire Prevention
- Emergency action Plan
- Fall Protection
- Electrical Safety
- Cold Stress
- Pre and Post equipment inspections

In addition to the rigorous safety education, Penn Waste holds regular safety meetings with staff and management, and hosts stretching exercises for employees before each shift.

Equipment Safety Considerations
All equipment meets all ANSI and OSHA safety requirements. In addition, the Penn Waste MRF contains various safety features including continuous handrails; walkways & platforms, emergency stops (buttons and pull cords); equipment access/guarding and lockout/tagout procedures.

For more, see Equipment Safety on Page 9.
Measuring Success

As a private company, we do not disclose financial figures. That being said, it would be difficult to pin down where we are for 2018 at the time of submitting this application. Markets have changed dramatically due to international material bans, and remain unpredictable as the industry adjusts. The retrofit increased recovery (thereby decreasing tipping fees as residue) and end-product quality; the recycling system was 15% ahead of our internal ROI projections to close out 2017. In 2018 restrictions have increased and competition is tight as supply has surpassed demand but with the investment in technology, we have been able to create high-quality, sellable commodities. While the system is outperforming our internal projections and pay-back schedule, it’s also important to compare our performance as it relates to our competitive landscape and market share. The following measurements, both qualitative and quantitative, elaborate on the success of our system as we define it:

The $3.5mm system retrofit is accomplishing the six goals we set prior to our investment:
• Adapt the container line to accommodate the higher volume of containers while adding the process and technology to remain flexible for future market or material changes
• Increase system throughput to 45 tph
• Lower operating cost
• Improve Purity, Capture & Uptime
• Throughput is at 100% capacity of 45 tph – an increase of nearly 30% capacity and we haven’t slowed down
• We are capturing 98% of available recyclables, as the retrofit has allowed us to target small OCC, increase capacity on the container line, and add an optical QC to return containers that would be sent to landfill back for capture
• Operating costs per ton have decreased 30% since the retrofit
• Retrofit allowed us to secure 17% additional volume while having a minimal effect on total operating cost. While others are slowing down belts and pushing their equipment, we are in a position to take on more volume, and have done so, increasing market share
• Installation was done with minimal impact to operations: We did not lose one ton of material to another system or landfill!
• Despite current market changes, we are creating marketable products. We continue to be flexible and produce a group of products that are accepted into alternative domestic and global markets. [See April, 2018 Recycling Today and InsideWaste (Australia) that featured Penn Waste as an example for others in US and Internationally]

Penn Waste tracks and reviews analytics on a shift-by-shift basis, every day. We have enormous amounts of data and the systems to analyze it, including BHS SCADA, scales, upstream and downstream customers, drivers, inventory, material audits, financial, etc. Our uptime has increased each year of running the system and the goal has always been 95% or above. Throughout 2018, as measured by SCADA, our average uptime has been 98.2%. Our operations team is constantly at work training our employees to run the system and safely and efficiently as possible. Some other measures we take to ensure and measure success:
Customer Service

The Penn Waste Recycling Center serves a variety of customers including residential, commercial, schools, and other haulers. Penn Waste utilizes an integrated marketing plan to ensure all customers are receiving information on how to properly recycle including:

1. Billboards
2. Billing Inserts with specific recycling info
3. Penn Waste team members give presentations and provide tours of the Penn Waste recycling facility to promote recycling awareness and educate the community & customers on how their recyclables are processed.
4. Penn Waste team members do recycling presentations on location at our customers’ businesses.
5. We sponsor community events and include a Penn Waste booth with information on recycling. We’re also the official recycling partner for two local baseball organizations.
6. Our mascot, Penny, goes to community events to promote the importance of recycling
7. Our blog, website, email blasts, and social media accounts feature information about recycling and include educational videos
8. We wrap our trucks with educational recycling messages
9. We reach out to local news outlets during important times of the year to promote recycling.
Public Acceptance & Community Outreach

Being a Good Neighbor

Penn Waste is committed to giving back to the communities we service. In 2017, Penn Waste donated time, resources, and services to more than 160 non-profit organizations in our community. In addition to financially partnering with local organizations, community recycling education continues to be one of our main goals. Our team attends numerous community events, promoting recycling, often with our mascot, Penny. In addition, the Penn Waste YouTube channel has a slate of educational videos. Link to Community Education Videos.

Facility Cleanliness & Aesthetics

We have a phrase we live by here at Penn Waste and that is, “Image is everything.” Our President and Owner, Scott Wagner, is a self-described “neat freak” and is very conscious of making sure we as a company are presented well in the community. Our trucks do not leak, in fact, most are turned over every 5 years to make sure they are updated with the latest technologies and safety equipment. We have truck bays on the premises where trucks can be cleaned. We also routinely pressure wash the outside of our facilities.

In addition, we invest in our equipment. Penn Waste team members are encouraged to report when containers start to look worn. We contract with a welding and paint company that keeps our containers looking in pristine condition. Our containers are frequently swapped out to be fixed or updated with new equipment.
Supplemental Information

Articles, Project Profile, Videos

Penn Waste: Community Education

Videos

2017 RECYCLING SYSTEM RETROFIT

Penn Waste: Community Giving