Recycling Center Equipment and Operational Improvements

Armstrong County
139 Armsdale Road
Kittanning, PA 16201

SCS ENGINEERS

02217011.01 – Task 37 | January 4, 2021

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1 PROJECT DESCRIPTION

The Armstrong Recycling Center (Center) is owned by Armstrong County (County) and serves as a consolidation and processing facility for recyclable materials collected through various residential and commercial programs in the County. In fiscal year 18/19, the Center received and processed over 1.8 million cubic yards of materials. The Center recently transitioned operators. Prior to the transition, a non-profit organization operated the Center and staffed it with individuals with mental and/or physical disabilities. The operator prioritized working with their clients to teach work skills. Recently, the County took over operation of the Center and has prioritized streamlining operations and procuring updated equipment to facilitate efficiency and sustainability.

Recyclable materials consolidated and processed at the Center are collected through the following programs:

- Center Drop-Off – The Center itself serves as a recycling drop-off site for residents. The center uses two trailers to collect the materials at the Center.

- Recycling Trailer Program – The County has deployed five recycling trailers that are strategically located throughout the community for residents to drop-off recyclable materials. Access to these trailers is available 24-hours a day/seven days a week. Municipalities hosting recycling trailers directly haul the trailer and its contents to the Center as needed or the municipality pays the County a fee to collect the trailer and deposit the recyclable materials at the Center.

- Commercial Collection – The County has arranged with select businesses to directly pick-up recyclable materials from their place of business. The County currently provides recycling services to 20 businesses; however, the potential exists to expand this program to additional customers.

The Center is located in a repurposed dairy barn with materials consolidated on the first floor. Most materials are manually sorted on the first floor and gravity fed into horizontal balers on the lower floor. Cardboard is often processed on the lower floor and baled in vertical balers. Baled materials are stored in a warehouse near the Center prior to being sent to various markets. Recycling technical assistance is requested to review Center operations and equipment and provide recommendations on how it could be made more efficient to control costs and better serve the recycling needs of residents.

2 SUMMARY OF WORK

This section summarizes the tasks performed.

Task 1 – Data Request and Review

For this task, SCS requested technical and operational information/data on the County's recycling program and the Center. Some information was received and reviewed prior to conducting a site visit while additional information was obtained during the site visit and field observations (Task 2).

Task 2 – Site Visit and Field Operations

The site visit and field observations occurred over a one-day period and included meeting with County staff and touring the Center. Throughout the site visit, SCS staff asked questions and clarified operational practices and conditions in order to understand the existing recycling program and

operations. SCS also discussed the possibility and feasibility of working with a private contractor to manage and oversee recycling operations in the County.

Task 3 – Recommended Equipment and Operational Improvements

Based on data provided and observations made during the site visit and tour of the Center, SCS recommended equipment needs and process improvements to make the Center's operations more efficient.

Task 4 – Final Report

SCS developed this report that includes the equipment and operational recommendations to make facility operations more efficient.

3 CURRENT PROGRAM

COLLECTION

The Armstrong County Recycling Center is located at 139 Armsdale Road in Kittanning. Two recycling trailers are located on the Center's property for residents' use. Additionally, the County has placed several recycling trailers in municipalities throughout the County that are available for residents to use 24-hours a day/seven days a week. The trailers permit residents to recycle materials without coming to the Center. The Center has a staff of four full time employees.

The trailers have ten compartments for different materials such as newspaper, bi-metal cans, aluminum, office paper, and #1 and #2 plastics. The trailers have two axles and have a similar configuration of containers. Each container has a picture and label for the type of material to be placed within. **Figure 1** provides a photo documentation of the County's recycling program.

Cardboard is received at the Center and through commercial collection but not in the trailers. Glass is accepted only at the Center and is collected in a separate roll-off container for Dlubak Glass (a specialty glass manufacturer).

Residents are required to sort their recyclable materials into the separate compartments at the Center and community-based recycling trailers. County employees report that there are contamination issues at the trailers. Additionally, employees report that after a typical weekend the recycling trailer outside of the Center is full with significant amounts of material placed outside the bins (**Figure 2**). The trailers require continuous maintenance including replacing the axles.

PROCESSING

Recycling trailers are transported to the Center and the contents are screened for contamination. The recyclables are sorted and placed in designated one cubic yard containers. The one cubic yard boxes of material take up most of the floor space in the Center. Eventually, the containers of materials are then fed onto a conveyor belt and diverted to an appropriate silo. The silos consist of a large wooden structure in the center of the barn and take up a large amount of the floor space. Once a silo is filled, the County employees load that material into the balers.

The County has a separate prefab steel building where the bales of recyclable materials are stored until there is enough to fill a tractor trailer. Visual observation of the baled materials showed that the bales are clean and free of contamination. This is due to the manual processing of materials that occurs at the Center. The County desires to limit the number of times the materials are being handled and to increase the throughput of the Center.

Figure 1. Photo Documentation of Armstrong County's Recycling Program

Recycling Trailers

Sorting Station

Sorted Material in Cardboard Boxes

Silos of Sorted Materials

Baler Located in Lower Level

Stored Bales

Figure 2. Recycling Trailer at Center after a Typical Weekend

According to the Armstrong Recycling Center Annual Report dated June 30, 2019, the Center processed about 930 tons of material. About 63 percent of the material is collected from residential customers while 37 percent originated from commercial properties. **Table 1** lists the amount of material processed at the Center by category.

Table 1. Center Processing Tonnage Report (FY/19)

Material Category	Quantity (Tons)
Newspapers/magazines	300.60
Clear Glass	45.48
Brown Glass	94.92
Green Glass	17.24
Bi-Metal Cans	27.65
Aluminum	7.73
Cardboard	274.16
Office Paper	24.22
#1/#2 Plastic Containers	138.25
TOTAL	**930.25**

4 FINDINGS

RECOMMENDED EQUIPMENT

Based on observations and discussions during the site visit, the County desires the following:

- Automation to increase the amount of material that can be processed.
- Equipment to tip containers of materials.
- Reduction in the number of times the material is handled by the employees.
- Easier access to the baler by the fork lift.
- Maintaining current staff levels.
- Purchase a piece of equipment each year.

SCS Engineers recommends the County procure and install a manual sort line consisting of a raised conveyor system with bunkers below for the different material types. This would continue to be a manual sorting process but would provide for less physical lifting and reduce the number of times material is handled. Automation such as screens, eddy currents, robots or optical sorters are not necessary for the amount of materials being processed.

In the manual sort line, materials would be loaded onto an inclined conveyor belt. The material would then move across a raised belt with sorting stations and bunkers for each material type below. A separate conveyor belt would be located below the raised belt. The lower belt would be used to feed the baler. Once a bunker is full, the bunker would be emptied onto the lower belt to be fed into the baler.

SCS recommends installing the sort line in the prefab metal building since there are no support columns in the middle of the structure. The existing baler would need to be relocated to connect to the lower conveyor of the system. SCS also recommends removing the silos in the barn building and using either the upper or lower level of the existing Center to store bales. The equipment list for this system includes:

- A Gaylord tipper to tip containers of materials
- Inclined conveyor
- Slider bed conveyor x 60” wide for sorting commodities
- Seven push-through bunkers for storing the commodities
- Chain roller baler feed conveyor to transfer commodities to the baler
- Steel sorting platform with stairwells for ingress/egress
- System Controls

A schematic of the recommended equipment is included in **Appendix A**. **Figure 3** is a picture of a Gaylord box tipper. The configuration and dimensions on the schematic are preliminary and will need to be designed to fit the space the County has for processing. A more detailed engineering design will need to be done to customize the system for the County.

Figure 3. Example Gaylord Box Tipper

The sort line can be operated with current staffing levels and would provide a more efficient processing system where materials would be handled less frequently. The belt can be stopped at any time to allow more time for sorting.

The recommended sort line would still be mostly manual utilizing existing staff; however, the system has the flexibility to become automated at a later date if the County desires and/or should the quantity of recyclable materials requiring processing increase. With additional staff, the system could also be operated as a single stream system, whereby the County would not have to require residents sort their materials. This would allow the County to replace the current trailer system with roll off boxes where all recyclable materials could be mixed together.

The system cannot be purchased one piece at a time because each component is required for the system to operate properly. The capital cost for this manual sort line is approximately $700,000 and includes mechanical installation, electrical wiring and freight. The Gaylord tipper costs between $10,000 and $12,000 and could be purchased separately and would improve current operations almost immediately.

RECOMMENDED OPERATION IMPROVEMENTS

The recommendations in this section are based on existing Center operations and not for the sort line system described above. Currently, residents that use the Center to drop off their recyclable materials use the area in front of the Center to access the two trailers. This area also is used by Center employees to move boxes from the trailers using a fork lift. On Monday mornings this area is overfilled and littered with trash and recyclables. The following recommendations would improve the resident drop off at the Center:

- Designate a separate area for residential drop off further away from the front of the Center.
- Staff the Center during set hours on Saturday to assist residents with proper recycling.

- Prohibit access to the Center drop off containers during non-staffed hours to reduce and limit the site becoming a dumping ground.

- Remove the silos to provide more work space.

- Purchase the Gaylord tipper.

The trailers frequently require maintenance and repair to keep them in operation and in circulation. The trailers are integral to the current operations as they provide separate bins for each material. SCS recommends keeping more spare parts for the trailers. If the County chooses to go to a single stream system in the future, roll off containers could replace the trailers. Roll off containers are easier to maintain and are more durable.

Processed materials are temporarily stored in containers throughout the main level before being loaded into the silos. This requires the material to be loaded into the silos and then handled again to take the material to the baler. SCS recommends that the silos be removed to provide more work area. Material should be stored in containers but in designated areas of the Center based on material type. Once there are enough containers to make a bale the material can be baled.

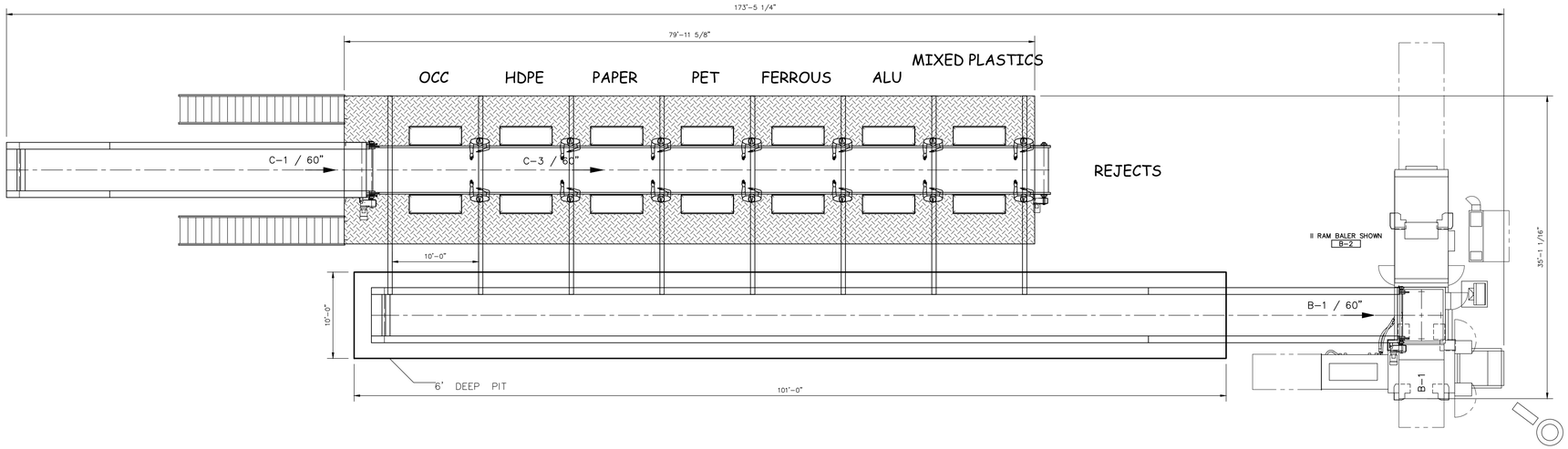
5 CONCLUSION

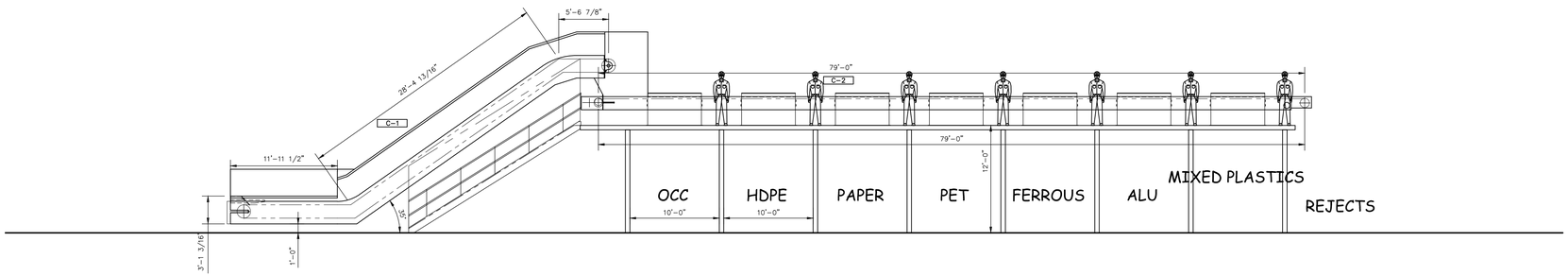
Overall, the County's recycling program provides important services to residents. The current operations are manually intensive and require the materials to be handled several times. Reducing the number of times that material is handled will increase the throughput at the Center.

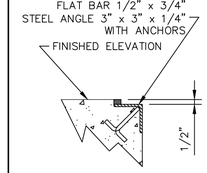
The County can improve the throughput while maintaining the current quality by purchasing and installing the manual sorting line shown in **Appendix A.** The capital cost of this equipment is approximately $700,000. More automation can be added to this system at a later date as the County's recycling program evolves and changes.

Alternatively, the County can make a few improvements to the existing system that will reduce the number of times that the material is handled. This includes removing the silos and utilizing existing containers to store the materials prior to baling. These improvements will not likely increase the throughput at the Center.

Appendix A
Manual Sort Line Schematic







PIT EDGES DETAILS
(BY CUSTOMER)

DWG ISSUED ON : 01-12-2020
DWG ISSUED BY : SIMON-PIERRE THERRIEN
PROJECT DIRECTOR

APPROVED ☐
NOT APPROVED ☐
APPROVED WITH MODIFICATION ☐

FIRM :
SIGNATURE :
DATE :

IMPORTANT : ALL PIT DIMENSIONS ARE TO THE FINISHED INSIDE SURFACE PIT.
SUGGESTION : THE PITS FLOOR COULD HAVE AN INCLINATION OF 1%.

DWG. No.	TITLE	No.	DESCRIPTION	DATE	BY
*		0	RELEASED FOR REVIEW	01-12-2020	SPT

REFERENCE DRAWINGS | REVISIONS

STAMP | STAMP

SCALE : 3/32" = 12"
DESIGNED : SPT — DATE : 01-12-2020
DRAWN : SPT — DATE : 01-12-2020
CHECKED : — DATE :
APPROVED : — DATE :

DESIGNED BY :
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MACHINEX

CLIENT : ARMSTRONG COUNTY, PA

MATERIAL RECOVERY FACILITY
MANUAL SORTING LINE
GENERIC ARRANGEMENT

CLIENT — PROJECT NO : — DRAWING NO :
MACHINEX — PROJECT NO : — DRAWING NO :

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REV. 0

simonpierre