

MRF Sort Process Improvements Project 933



Final Report
December 16th 2021

Prepared For:
Resource Productivity and Recovery Authority
Continuous Improvement Fund

Prepared By:
Dan Miller
Transition Manager
Quinte Waste Solutions



Acknowledgement

This Project has been delivered with the assistance of Resource Productivity and Recovery Authority's Continuous Improvement Fund, a fund financed by Ontario municipalities and stewards of blue box waste in Ontario. Notwithstanding this support, the views expressed are the views of the author(s), and Resource Productivity and Recovery Authority and Stewardship Ontario accept no responsibility for these views.

© 2021 Resource Productivity and Recovery Authority and Stewardship Ontario

All rights reserved. No part of this publication may be reproduced, recorded or transmitted in any form or by any means, electronic, mechanical, photographic, sound, magnetic or other, without advance written permission from the owner.

Table of Contents

Executive Summary.....	Page 4.
1. Introduction.....	Page 5.
2. Phase 2. Components.....	Page 5.
3. Review and Summary of Data.....	Page 6.
3.1 Replacement of Aluminum Capture Equipment.....	Page 6.
3.2 Data Monitoring.....	Page 8.
3.3 Data Review and Summary.....	Page 8.
4. Project Financial Overview.....	Page 10.
5.	

LIST OF TABLES

Table 1. – Summary of 2021 Aluminum Production Monitoring.....	Page 8.
Table 2. – 4 Year Summary of Aluminum Sales with 20% Average.....	Page 10.
Table 3. – Capital Cost and Projected Payback Summary Table.....	Page 11.

LIST OF FIGURES

Figure 1. – Total Aluminum Bales Produced by Month.....	Page 9.
Figure 2. – KG of Aluminum Produced Per Month.....	Page 9.
Figure 3. – 2021 Aluminum Production Efficiency.....	Page 10.

Executive Summary

Quinte Waste Solutions operates a two-stream recycling program which plays a key role in waste diversion across the Quinte Region of Ontario. Curbside material composition, condition of capital assets and sort process efficiencies all contribute to potential revenue generation as well as costs incurred through residue generation. Project 933 focuses on the effective value capture within the container sort process. Phase One of this project involved an assessment of existing processing operations and equipment, an audit of the material left after sorting and an assessment of available markets. Through review and consultation, it was made clear that there were areas which would benefit from capital investment. Although this project initially focused on two areas of improvement, the final study focused the aluminum capture process due to time constraints and projected impact. The Aluminum capture equipment was replaced with new, larger equipment following specialist recommendations. Aluminum capture data was monitored closely for the 2021 operating year prior to and following the addition of the new equipment. Although the post installation data window is relatively small the results clearly show an improvement of ~20% capture efficiency per sort hour. Further, the projected revenue realised with this addition indicates a payback period on capital investment within 4 years with a projected increase of \$42,665 per year.

1. Introduction

Quinte Waste Solutions operates a two-stream recycling program servicing nine member municipalities in the Quinte region of Ontario. The program contributes to local waste diversion while focusing on a balance between efficiency and cost and is dedicated to continuous review and improvement based on changing material composition, program funding and regulatory requirements. Equipment age and condition can have an impact on how effectively the value of material can be captured. The final phase of Project 933 focused specifically on the aluminum capture process and monitored the capture efficiency following installation of new equipment in late August of 2021. Specifically, this report will summarize the aluminum captured per sort hour as well as resulting revenue projections.

2. Phase Two Components

Phase Two of this project involved the implementation of targeted equipment improvements as well as corresponding data monitoring and analysis. The creation of this summary report encompassed the final stage of the project to highlight project results.

- **Replacement of Aluminum Capture Equipment**
 - o Existing Eddy Current used for aluminum capture was removed and sold.
 - o Following a competitive bid process, a new and larger Eddy current was purchased and installed based on consultant recommendations from Phase One.
 - o Alterations to the container sort line catwalk to allow for larger Eddy current.
 - o Electrical work and permits for new equipment.
 - o Replacement of Aluminum transfer piping after Eddy current.

- **Data Monitoring – Included Metrics**
 - o **Sort Hours/Month**
 - o **Total Number of Bales Produced**
 - o **Bales Produced Per Hour**
 - o **Average Bale Weight**
 - o **KG Produced Per Hour**
 - o **Monthly Tons Produced**
 - o **Potential Production**
Calculated: new avg. KG/Hr post Eddy install multiplied by total monthly sort hours.
 - o **Price of Aluminum Per Month**
Based on monthly competitive bids.
 - o **Missed KG**
Calculated: Potential KG less Production KG.

- **Missed Revenue.**
Calculated through Missed KG multiplied by \$/Tonne

3. Review and Summary of Data

From September to November of 2021 data was collected on the effective operation of the newly installed Eddy Current. This data was then compared to records prior to installation in the same year. The monitored metrics were reviewed, assessed and summarized in order to highlight the results of the project.

3.1 Replacement of Aluminum Capture Equipment

Replacing the Aluminum Capture Equipment in 2021 posed several challenges primarily due to COVID19 restrictions and supply chain issues. Initially, installation was scheduled for late May. As a result of raw material shortages, cross border shipping bottlenecks and supplier issues the ordered equipment did not arrive in Ontario until Mid-July. A first installation attempt at the end of July was also hindered by equipment permit/certification issues. The new Eddy Current was installed at the end of August. The transfer piping that moves captured aluminum to a storage bunker was also drastically delayed and had to be improvised until final installation in early December of 2021. Photos are provided below to illustrate the process.



Image 1. Original Eddy Current



Image 2. New Eddy Current



Image 3. Installation of new Eddy Current



Image 4. New Eddy Current and Sort Line



3.2 Data Monitoring

The Phase One Monitoring Plan was adapted with CIF input to effectively track the data that was specific to the Aluminum Capture Process. The 2021 Operating Season was used as the primary data window as it showed a period with the original Aluminum Capture Process (January-August) as well as the data period with the new Equipment (September-November). It is noted that the processing contractor responsible for the sort staff and operations in the MRF changed in the second week of November. As a majority of the MRF staff remained the same during this change and the data remained consistent, this change is considered negligible on the results of this study. Monitoring methodology included a daily review of key metrics throughout the 2021 season as well as weekly and monthly summary sessions to organize data. A summary of the monitored metrics can be found below.

Month	Sort Hours	Bales Produced	Bales/Hr	Avg Bale Weight	KG/Hr	Production KG	Potential Production	Aluminum \$/Tonne	Missed KG	Missed \$
Jan	199	27	0.135	415.56	56.382	11220.12	19773.126	1683.16	8553.006	14396.08
Feb	184.5	35	0.189	338.41	64.197	11844.35	18332.370	1741.43	6488.020	11298.43
Mar	180	41	0.227	369.44	84.150	15147.04	17885.239	1883.21	2738.199	5156.605
Apr	175	42	0.24	345.53	82.927	14512.26	17388.427	1930.52	2876.167	5552.499
May	171	43	0.251	385	96.812	16555	16990.977	1807.77	435.977	788.147
Jun	193	52	0.269	340	86.567	16707.6	19176.951	1543.22	2469.351	3810.753
Jul	172	38	0.22	345.56	76.344	13131.28	17090.340	1683.16	3959.060	6663.732
Aug	184	44	0.239	332	79.391	14608	18282.689	2044.07	3674.689	7511.323
Sep	185	49	0.264	378.75	100.317	18558.75	18558.75		0	
Oct	152	39	0.256	381.76	97.951	14888.64	14888.64		0	
Nov	154	36	0.233	427	99.818	15372	15372		0	
Dec									0	
		Original Avg (KG/Hr)	78.346	New Avg (KG/Hr)	99.362	Difference (%)	21.150	Total	31194.472	55177.57

Table 1. – Summary of 2021 Aluminum Production Monitoring

3.3 Data Review and Summary

Following the installation and operation of the new Eddy Current the expected result was the production of additional aluminum bales. However, it was apparent that the number of bales did not consistently increase with the addition of the new equipment. Rather, after an initial increase in September, monthly bale production decreased. It was subsequently discovered that the weight of shipped aluminum was increasing despite the decrease in total bales. This suggested that the density of the bales had increased and following a discussion with MRF staff this was confirmed. Once the new equipment was installed the number of bales produced was becoming unmanageable and to address this the aluminum was compacted to a greater density for efficient storage. Figure 1. below illustrates the bale production throughout 2021 including the slight rise in September followed by a decrease in the following two months.

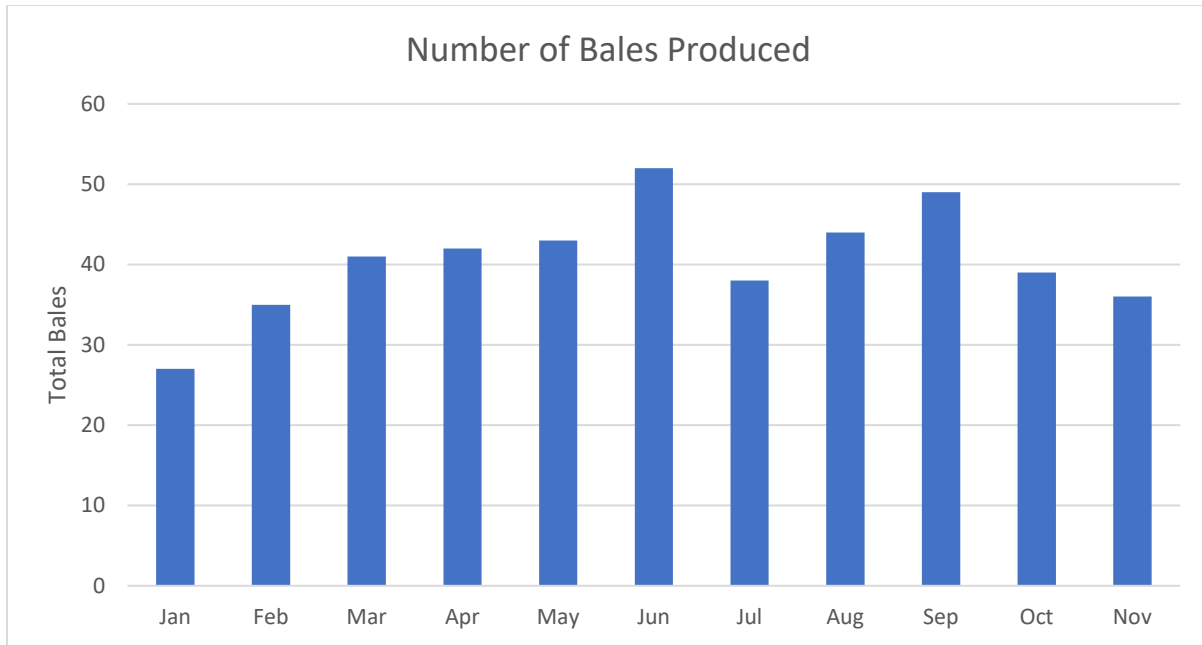


Figure 1. – Total Aluminum Bales Produced by Month

A second metric that was monitored was the overall weight (KG) of material that was produced in each month. It was initially predicted that the production weight would increase with the increased production capacity of the new equipment. Figure 2. below illustrates that the predicted trend did not occur. This was determined to be as a result of fluctuating processing hours. In months where the sort line was for longer periods, the total production weight was higher. This indicated that a more detailed metric was needed to assess overall productivity during operational hours.

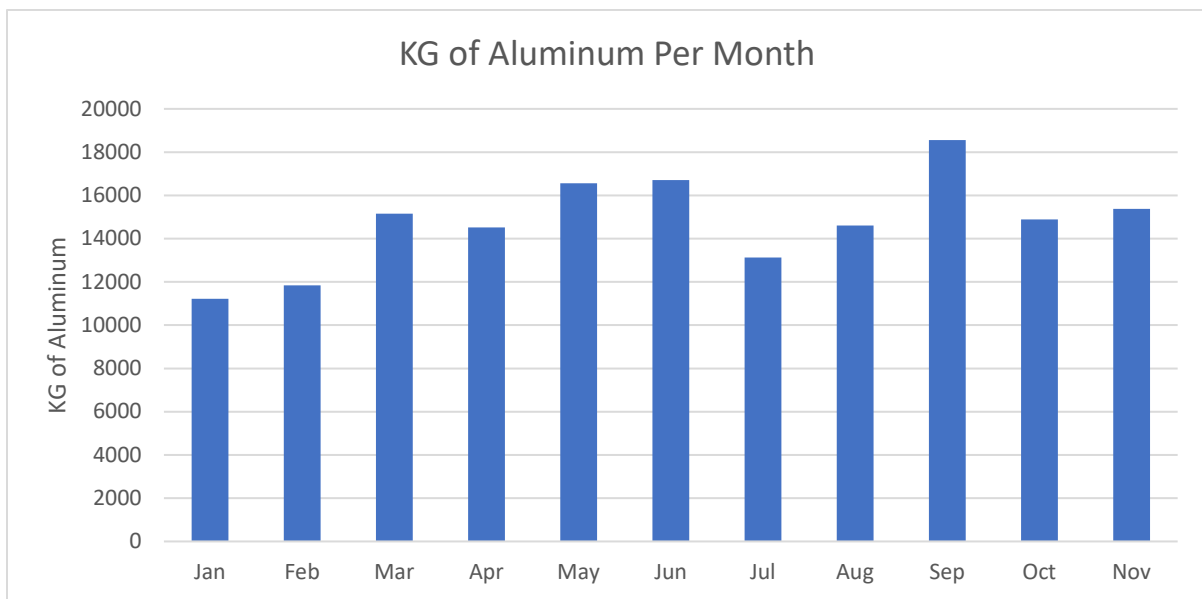


Figure 2. – KG of Aluminum Produced Per Month

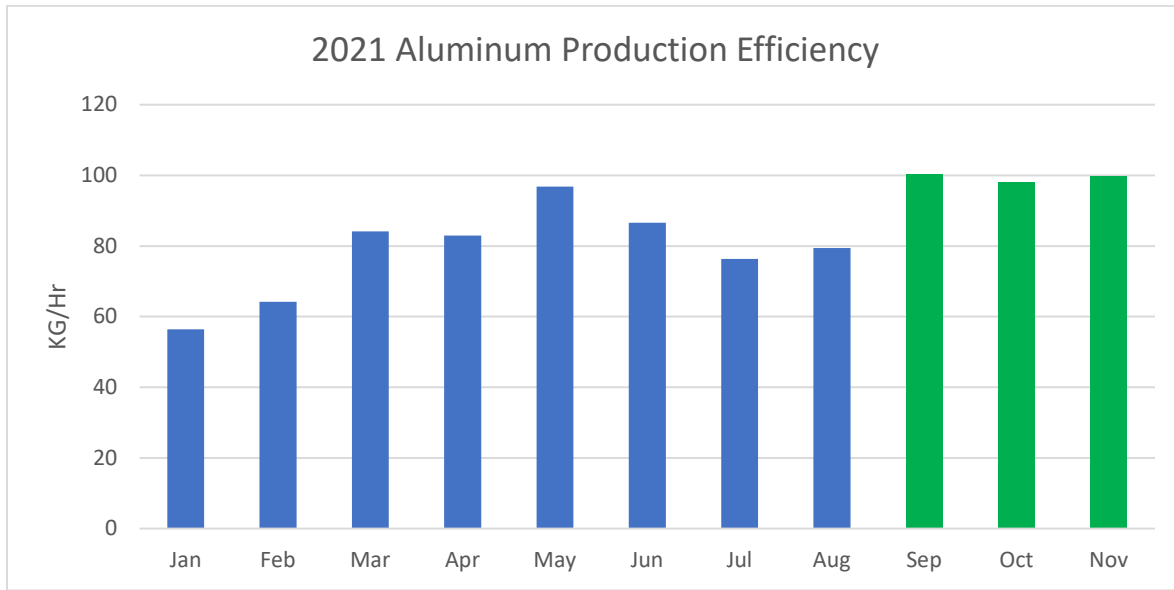


Figure 3. – 2021 Aluminum Production Efficiency

In order to get an accurate view of the efficiency of the new equipment and to determine its projected impact on material sales the metric of KG/Hr was developed. This was accomplished by dividing the total monthly production weight by the number of hours the sort line was operating (as provided by the contract plant manager). By reviewing these two key features it is clear that the new Eddy Current has had a major impact on the efficiency of aluminum production. The new and consistently high production efficiency can be seen in the months of September – November in Figure 3. above.

Year	Aluminum Sales
2017	\$201,071.18
2018	\$210,249.05
2019	\$275,699.63
2020	\$166,280.34
Avg	\$213,325.05
20% of Avg. Sales	\$42,665.01

Table 2. – 4 Year Summary of Aluminum Sales with 20% Average

4. Project Financial Overview

In the Phase One report it was anticipated that, based on a visual audit and a technical material audit, 20-40% of aluminum was being missed.

The report indicated that a payback period of 1.2 years was possible if the capture rate was increased by 30%. Following installation this figure has been updated to include a 20% improvement and the payback period has been updated in table BLANK below. Table BLANK below provides a summary of aluminum sales over the last 4 years, excluding 2021. This table shows the average impact of a 20% increase in material sales to provide a conservative figure.

Improvement	Anticipated Cost	Actual Cost	Benefit	Payback Timeline
Install Tipping Floor Divider	Cancelled as divider wall already in place.			
Replace Eddy Current	\$150,000	\$150,955.3	Improved Aluminum Capture by ~20%	Additional Aluminum Capture @ \$42,665.01/year equates to a 3.7 year payback period.
Replace Aluminum Hopper/Pipes	\$5,000	\$5,250.00		
Total Capital Improvement Cost	\$155,000	\$156,205.3		

Table 3. – Capital Cost and Projected Payback Summary Table

5. Conclusion

The final phase of Project 933 focused specifically on the aluminum capture process and monitored the capture efficiency following installation of new equipment in late August of 2021. The existing Eddy Current and Aluminum Transfer System were completely replaced following an assessment of system deficiencies in Phase One of this project.

With thorough review, the data shows that the addition of the new Aluminum Capture system has improved overall efficiency of the sort process. This improved capture efficiency will have a positive impact on revenue generation. A review of the data gathered prior to, and post installation indicates an improvement of ~20%. Given the operating period between installation of improvements and QWS Transition Date in July of 2025 repayment of capital costs will be possible prior to transition. Given the increase in aluminum price in the last year, it should be noted that the estimate increase at \$42,655.01 is considered conservative as it includes comparatively low value years. If aluminum value remains elevated the payback window will decrease. The result of this project will be improved value capture, increased overall efficiency and a positive impact on operations for years to come.