Report addendum

CIF 829.3

Region of Waterloo

BALER UPGRADE AT THE MATERIAL RECYCLING CENTRE (MRC)

Project Report Addendum, Sept 24 2015

Region of Waterloo

CIF Project number #829.3

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1 INTRODUCTION

This document has been prepared by the Region of Waterloo (Region) as an addendum to the CIF Summary Report (final report) for Project 829.3, dated May 5, 2015. The final report had been prepared by Conestoga-Rovers and Associates (CRA) to report on the monitoring and measurement activities undertaken following the installation of the baler and ancillary equipment at the Region's Material Recycling Centre (MRC) in December 2013. The purpose of this document is to respond to comments and questions from the Continuous Improvement Fund (CIF).

It is noted that the Project Team consisted of Region staff from the Waste Management Division and consulting staff from CRA.

2 ENERGY USE

2.1 Background

As part of the background research, the Project Team reviewed the various options for a new baler at the MRC. The Project Team consulted with various baler manufacturers including Harris™, American Baler, and Bollengraf.

Harris brought the HRB 240 baler to the Project Team's attention as a potential cost-effective baler with a better baling capacity (more powerful and faster) as the incumbent baler. This baler has two 100 hp motors and the baler can be operated using both or one of the two motors. The technical specifications indicated that the baler would have a potential for savings through increased energy efficiency and increased baling speed. This baler also has an energy savings feature, where the motors automatically go into an energy savings mode if there is no activity for more than 5 minutes. When the material is in the hopper, the baler senses the material and the motors start running in production mode again.

The Project Team discussed the technical specifications with Harris. Harris offered to conduct a meter test of a Harris HRB 240T baler that was operating at a material recycling facility in Florida to demonstrate the baler's potential for energy savings. The Project Team was provided with the reading of 34 kW by Harris. However, when the Project Team requested additional information, we were informed that the person who conducted the test had left Harris' employ and as such, the project team was unable to get details on whether the meter test had been completed with one motor or both motors running, and the exact point where the meter was hooked up (i.e. was it right at the baler motor(s) or at the electrical panel that controls the entire baling system).

2.2 Testing

The Region worked with a staff electrician who completed four (4) meter tests of the existing baler. The meter was hooked up to the baler electrical panel in the electrical room. The baler panel included the energy use of the entire baler system including the baler motors, conveyor motor, and the wire tier. The total energy usage of the baler system, including the ancillary equipment, was observed at 83.84 kW.

Table 1: Energy use of MRC Baler

	Gorilla	HRB	
	Base Case	**Projected**	**Actual**
Idling instantaneous power(kW)*	60	34.00	83.84

*this is where most of the savings were assumed to be generated

A meter test was also conducted on one motor operating the baler (hooked up directly to the motor). The instantaneous idling energy usage for a single baler motor was relatively low, averaging 25kW. A meter test was not conducted on the baler energy usage running on both motors but without the ancillary equipment due to the difficulties of operating the baler without this equipment.

The overall energy usage values suggest that there is a potential for the Region to realize additional energy savings by operating on a single motor. Region staff met with the MRC Operator, Green For Life (GFL) onsite supervisor and the baler operator in August 2015 to review the current practices and requested that conveyor motor should be turned off manually when no material is being baled.

The baler operator will also make a judgment call on whether the baler can run on one motor or needs both motors based on the amount of material to be processed on a given day (which varies).

2.3 Energy savings versus projected

Table 2: Initial MRC baler estimated energy costs baseline, projected, and actual – 30 bales per day

	Gorilla	HRB annual costs		HRB annual savings	
	Base Case	*Projected*	*Actual*	*Projected*	*Actual*
Energy Consumption	$20,248.80	$9,444.15	$ 21,758.50	$10,804.65	-$1,509.70

The project team re-calculated the amount of energy that would be used per year by the Gorilla and in the original estimate of the HRB using 40 bales. We also updated the days in this scenario to 260 days per year, instead of 258. The results are as presented in Table 3 below.

Table 3: Recalculated MRC baler energy costs baseline, projected and actual – 40 bales per day

	Recalculated Estimate	Previous Estimate
Gorilla	$22,651.20	$17,704.86
Projected HRB costs	$12,057.76	$9,444.15
Projected Savings (cost difference):	$10,590.00	$8,260.00
Actual HRB costs	$21,758.50	$21,758.50
Actual savings	**$892.70**	-$1,509.70

From the above calculations, the Region projected savings of approximately $10,000 / year. However, the calculations indicate that by running on two motors, and accounting for the motor for the in-feed conveyor and other ancillary equipment, the overall energy usage is higher than anticipated. The Region is able to project modest savings, in the amount of approximately $900 annually, based on the calculations above, derived from the meter tests. It should be noted that the Region is not able to identify the exact cost of running this equipment as the hydro bills only contain the energy usage for the entire Waterloo Waste Management Facility (which includes the entire MRC facility including the office area, two additional office buildings, pump stations, two blower buildings and other controls. Therefore it is difficult to pinpoint the savings. However the Region hopes that the overall energy reduction will increase over time with the implementation of the energy saving measures for the baler and other equipment at the MRC.

2.4 Strategies to realize savings

The Project Team believes that the upgraded baler will result in a net overall savings in terms of the cost of energy. The decision to bale when there is sufficient material in the bunkers is a judgment call made by the baler operator (who is a GFL employee). The Region has made reducing energy costs a priority to the contractor and provided two methods to the baler operator to help achieve this as an objective.

2.4.1 Low volume operations policy

The Region is working with GFL on implementing procedures where the baler operator can use his/her judgment to operate the baler on a single motor during periods of low volume, rather than operate on both motors.

2.4.2 No volume operations policy

As previously mentioned, the Region and GFL also agreed that the conveyor motor will be turned off manually when there is no material being baled to save on energy usage until the Region implements a more automatic detection system.

In summary, the Region has identified opportunities for improving energy savings as a result of this study. Some of these savings were automatic with the installation of the new baler. Others may be realized in the future with operational and procedural changes over time to be realized through developing practices employed by the Region's MRC contractor.

2.5 Input data variation

Previously, the number of bales produced daily using the Gorilla baler was estimated at 30 per day. The counts of 40 bales per day that were recorded during the energy tests were the result of operational challenges that had interrupted normal daily production over the past number of months. The MRC experienced several operational issues that were not directly related to the baler (such as issues with the existing glass breaker, optical sorter, seasonal impacts, difficulties conveying materials up a steep conveyor during the winter months, etc.). As a result, the contractor sometimes has to work longer shifts and Saturday shifts to process and bale materials. The 40 bales per day resulted from making up for backlogs of materials. The Region is currently working on other capital project upgrades to address the other issues and improve the overall efficiency of the MRC.

Due to the size of the bunkers and storage capacity, the baler must operate every day. The baler is used frequently throughout the day so that the bunkers do not overflow, as such it is not possible to create a policy to turn on the motor later in the day or shut down earlier because the amount of material left at the end of the previous shift varies greatly. As previously mentioned, the baler operator makes a judgment call to push materials from the bunker to the in-feed conveyor. It is noted that the baler will automatically switch to energy savings mode if there has been no material in the hopper for more than 5 minutes.

3 HAULING

3.1 Bale characteristics

The HRB baler makes a larger more densely packed bale compared to the previous baler. It is noted that the transport trucks are restricted by weight instead of volume. As such, the number of bales loaded is based on the total weight that the truck can carry. It is noted that the total weight depends on the type of material being trucked and the type of truck being used (e.g. tractor trailer, c-chest, etc.).

3.2 Analysis

The bale sizes produced by the upgraded new baler are relatively larger and heavier compared to the former baler. However, the trucks carrying capacity are limited by maximum weight restrictions. Overall, the Region ships heavier bales and tries to optimize the weight of materials being shipped to market, working with the truck's maximum weight allowance. Due to other factors such as the variability in commodity prices of materials going to end markets, the Region is unable to calculate a specific cost savings related to just the increase in bale sizes.

4 RESIDUE MANAGEMENT

As described in the final report, the baler runs automatically and therefore, the baler operator has time for other tasks including monitoring quality. Additionally, the Region's Waterloo Waste Management Facility (which includes the MRC) was registered for the ISO 14001 Environmental Management System (EMS). One of the objectives and targets set as part of the EMS was:

"To recover additional recyclable materials in the residue stream at the Materials Recycling Centre to save natural resources (landfill space and raw resources)" by 10% compared to the monthly average values of the previous year.

The Region and the collection contractor implemented auditing protocols for blue box materials collected at the curb to reduce residue. The Region added a contamination clause in the collection contract. The project steps included providing curbside collection truck drivers with information guide and creating a standard operating procedure (SOP) for auditing contamination, developed with the collection contractor and implemented through contract administration. The impact of this project was that the Region was able to achieve and exceed the target. The overall residue reduced from 20 percent to approximately 6 to 8 percent. This practice has continued on to subsequent years, which reduces the need for overall residue management.

Following the implementation of the SOP, the feedback from GFL to the Region was positive. GFL specifically noted increased sorting efficiency on line, increased quality of material, and decreased down time, which had overall positive benefits for the entire MRC processing line.

It is noted that the Region and GFL are continually looking for potential opportunities to further reduce residue at the MRC but currently do not have a specific program.

5 EVALUATION OF FIBRE BALING

The Region issued a competitive request for tender (RFT) for managing fibres in late 2014. The Region was prepared to bale fibres if this was the more cost-effective solution. A specific price for baling fibres was requested in bids, determined as a function of the feed, bale, and load rates and the estimated annual tonnes of this material. The outcome of the RFP process was that continuing to ship unbaled fibres to the Niagara Region is the most cost-effective option, instead of adding a second shift to the MRC operation to bale fibres.

6 ADDITIONAL MATERIALS

The Region looked into baling additional materials as part of the blue box program; tubs, lids, film plastic, spiral wound containers. At this time, the limitations of the existing glass breaker and optical sorter does not make it feasible to introduce additional streams. However, the Region plans to upgrade the glass breaker and optical sorter in the next two years. The Region anticipates that the upgrades will result in having the ability to sort more streams of materials and will specifically be considering adding tubs and lids.

During the contract negotiation with the Niagara Region for the fibre contract, the Region included film plastic (e.g. plastic bags) to be shipped with the fibre. As such, the Region now collects plastic bags and other film plastics in the blue box program and ships to Niagara for further processing.

7 CONTRACT PROVISIONS TO REALIZE BALING EFFICIENCIES

In the Fall of 2014, the Region issued a new Request for Tender (RFT) to retain a third party contractor for operation of the MRC. The terms of reference for the RFT was on the basis that the Region pay the operating contractor a "per tonne fee" for processing recyclables and a fixed monthly cost. The fixed monthly cost includes sorting and management personnel, receiving fibre and container materials, shipping, and consumables (including baling wires). The bidders were also asked to provide an hourly standby rate that the Region pays the contractor if the MRC is shut down due to various unexpected issues.

7.1 Baler operator duties

The performance of the baler was taken into account along with the rest of the equipment at the MRC when developing the terms of reference for the RFT. GFL indicated that the baler operator spends approximately 30% of his time on the baler operating platform - typically for changing the type of material to be baled. This is a significant reduction compared to the previous baler when the baler operator needed to spend approximately 80 to 85% of the time at the baler platform. As part of the new duties, the Region has provided the baler operator with a daily checklist related to inspecting and completing more housekeeping and preventative maintenance of the new baler. The baler operator is also asked to complete a monthly and annual checklist. The checklists and the steps taken for preventative maintenance have reduced the need for unexpected baler repairs. The Region also retains a different contractor to complete monthly and quarterly preventative maintenance of the baler.

7.2 Baling wire

As noted above, the contractor's cost for baling wires is included with the fixed monthly fee that the Region pays the contractor. The contractor purchases baling wires on a weight basis which is variable because the cost of the baling wires is commodity based. The variability in pricing the wires does not impact the price that the Region pays, however it is assumed that the cost of supplying baling wire for operations is a consideration made by contract bidders in establishing the fixed monthly fee. It is noted that the new wire tier that was installed with the new baler uses a thinner 12-gauge baling wire instead of the 10-gauge baling wire that was used by the previous wire tier. Due to the thinner gauge, there is more wire available in a spool. Additionally, the wire tier only uses two loops of wire per tie. The former GFL supervisor at the MRC noted that he was buying less spools of wire with the introduction of the 12-gauge wire and the CRA report has estimated this cost to have been reduced by approximately $30,000 annually ($51,288.95 – Gorilla versus $22,582.09 – HRB). As such, it is reasonable to assume that the bids submitted for the processing contract reflected this change.

8 SUMMARY

This project received funding from the CIF under the cost savings portfolio. The Region expects to realize cost savings in three distinct areas either directly or indirectly from the installation of the new baler.

Area	Direct or Indirect and source	Impact
Energy savings	A reduction in the energy costs to operate the bailer is a direct savings for the Region	Savings of approximately $892 annually are estimated through project testing. Project savings are anticipated to increase with proposed baler operating policies
Baler operator duties	A reduction in the baling duties of the baler operator frees up this staff person to complete value added activities and results in an indirect savings for the Region	A reduction from 80-85% of the baler operator's time spent operating the baler to 30% has been achieved. New activities focus on baler maintenance which increases the asset's useful life and decreases downtime
Baling wire	A reduction in the amount of baling wire required per bale is an indirect savings	The CRA report estimated an annual savings of approximately $30,000 as a result of the new baler. This savings is understood to have been realized through a lower contracted monthly fixed operating fee