



CIF Project #810.3: Durham Region MRF Baler Final Report



1.0 Introduction and Background

Durham Region is the largest geographical jurisdiction in the Greater Toronto Area stretching from Lake Simcoe in the north to Lake Ontario in the south, and from as far west as Pickering to Newtonville in the east. The Region encompasses an area of approximately 2,532 square kilometers and is home to approximately 673,500 residents.

Durham Region has operated a Blue Box program for over 25 years, currently servicing approximately 232,000 residential households. In May 2005, the Region issued an RFP to design/build and operate a new Material Recovery Facility (MRF) which was officially opened in December 2007. The Region re-issued an RFP for the operations and maintenance of the MRF in August 2012 and the current contractor, Miller Waste Systems Inc., began operations in November 2012. The Region maintains a highly successful Blue Box recycling program that is currently processing approximately 50,000 tonnes of two-stream curbside collected residential recyclables per year with a residue rate of less than 5%.

Originally when the MRF commenced operations in 2007, it was designed to process a suite of materials that did not include PET #1 Thermoform and mixed #3-#7 plastics or many of the new lighter weight and single serve “convenience” packaging materials that are seen in the Ontario curbside mix today. In 2013, the Region added PET #1 Thermoform and #3-#7 plastics to the blue box stream which created operational challenges. It is well documented that these new materials have an impact on existing processing systems and can add increased costs to a MRF operation.

The following table demonstrates the container tonnage percentage change over the 2012 to 2016 processing period:

Table #1

Container % Change 2012-2016						
	Aluminum	Steel	PET	HDPE	Mixed Plastics	Polycoat
2012	690.51	1668.06	2135.58	809.84	454.91	449.41
2013	670.24	1699.28	2500.83	657.23	1458.73	503.18
2014	577.25	1665.41	2674.85	605.58	1562.45	459.51
2015	610.45	1610.92	2971.85	697.11	719.33	466.93
2016	676.13	1560.11	2758.81	669.31	1100.69	389.37
Total Container % Change 2012 - 2016	-2.08%	-6.47%	29.18%	-17.35%	141.96%	-13.36%

As a result, the Region purchased a single ram baler designed to handle the increased plastics volumes and to enable an increase to the throughput of the MRF. This also greatly benefited bale densities and reduced end market trucking.

2.0 Project Description and Objectives

In late 2012 to early 2013 the original MRF baler, the Harris Gorilla 200T-6-12/9 model, required continuous maintenance and exceeded its operating effectiveness including limited processing capacity of the inbound container material due to the slower bale cycling times. Eventually, the Harris baler was replaced with a temporary unit which was an American Baler, 8043 model.

Durham Region released a Request for Proposal No. 621-2015 requesting the supply, installation and commissioning of a new baler. This also included the supporting infeed conveyor modifications, electrical controls integration, electrical hook up and permits, pre-start-up health and safety report, start up training, and performance testing of the baler. Durham received one compliant bid submission and awarded the contract to Industries Machinex Inc. for a heavy duty single ram MLP-235 TP model baler. Please refer to Machinex baler specification brochure in Attachment #1.

The total price of the purchase and installation of the baler was \$805,070.98 excluding taxes. The following payment schedule was included within the RFP:

- 30% or \$241,521.29 payment upon contract award
- 30% or \$241,521.29 payment upon proof of baler manufacturing complete
- 25% or \$201,267.75 payment for baler start up and training
- 15% or \$120,760.65 final payment upon successful performance and testing

To offset the capital cost of this project, the Region applied and received CIF funding of up to \$165,360.

An additional cost associated to the project that was not covered by the installation was for the removal and reinstallation of sprinkler pipes and heads along the infeed conveyor line. This cost the Region \$4,546.04.

Delivery timeframe was 11 weeks from point of order and installation timeframe was approximately 3 days. The American baler was removed on the Friday and the new baler was also moved into the MRF on Friday for installation. By Sunday the new baler was operational. Staff training involved two full days of operator training including programming, safety, operations, and preventative maintenance.

Durham anticipated that by replacing the existing baler with Machinex's baler, it would achieve the following performance objectives and associated outcomes:

- Increased bale densities;
- Increased floor storage space;
- Better payload for commodity buyers as loads are maximized (decreased trucking);

- Increased throughput of material (faster cycle time);
- Decrease in non-productive baling time and bale wire savings (less broken bales due to 10 wire banding and doubled at 1st, 3rd & 5th position);
- Remote troubleshooting and control by modem with Machinex; and
- Easier to clean and access baler components for maintenance (many access doors and unit is off the ground).

3.0 Monitoring Results

The Region retained the consulting services of Bob Marshall from Marshall Industrial Inc. to assist with the baler RFP specifications, monitor the installation and performance testing. The following Table #2 demonstrates the required throughput rates of tonnes per hour and bale density of pounds per cubic foot values met and/or exceeded the performance evaluation criteria. The actual throughput rates and bale density values are the average results of the testing:

Table #2: Throughput and Bale Density Required and Actual Comparison

Material	Throughput Rate Required (tonnes/hr)	Throughput Rate Actual (tonnes/hr)	Bale Density Required (lbs/cubic foot)	Bale Density Actual (lbs/cubic foot)
Residential Mixed Paper	50	53	38	39
OCC	25	30	34	38
Aluminum Cans	15	20	25	26
Steel Cans	25	46	45	55
Mixed Plastics	18	19	25	29
PETE	20	21	28	34
HDPE	20	21	28	33
Polycoat	35	35	35	41

In addition to the test values, please refer to Attachment #2 for Marshall Industrial Inc. confirmation letter to the Region regarding the baler performance and testing evaluation results.

The improvements of bale weights resulted in increased MRF floor storage space and better payload for commodity buyers as loads are maximized, which decreased trucking significantly. The MRF went from under loading buyer's commodity trailers to having to watch to ensure the trailers were not overloaded due to the capability of the newly installed baler. Table #3 depicts the efficiency this baler has brought to the MRF operation:

Table #3: Container Bale Production, Average Load Weight (Tonnes) and Number of Loads Comparison 2015-2016

	PETE			
	Bales Shipped	Tonnes	# of Loads	Avg Load Weight
2015 Total	8,607	2,971.85	190	15.90
2016 Total	4,246	2,758.81	127	22.20
% Change	-50.7%	-7.2%	-33.2%	39.6%

	HDPE			
	Bales Shipped	Tonnes	# of Loads	Avg Load Weight
2015 Total	1,795	697.11	43	16.24
2016 Total	1,082	669.31	35	19.10
% Change	-39.7%	-4.0%	-18.6%	17.6%

	Polycoat			
	Bales Shipped	Tonnes	# of Loads	Avg Load Weight
2015 Total	494	466.93	23	20.37
2016 Total	363	389.37	20	20.99
% Change	-26.5%	-16.6%	-13.0%	3.0%

	Mixed Plastic			
	Bales Shipped	Tonnes	# of Loads	Avg Load Weight
2015 Total	1,889	719.33	44	16.19
2016 Total	1,681	1,100.69	54	19.93
% Change	-11.0%	53.0%	22.7%	23.1%

	Aluminum			
	Bales Shipped	Tonnes	# of Loads	Avg Load Weight
2015 Total	1,216	610.45	37	16.67
2016 Total	982	676.13	35	19.32
% Change	-19.2%	10.8%	-5.4%	15.9%

	Steel			
	Bales Shipped	Tonnes	# of Loads	Avg Load Weight
2015 Total	1,614	1,610.92	61	26.68
2016 Total	1,109	1,560.11	58	27.17
% Change	-31.3%	-3.2%	-4.9%	1.8%

Attachment #1: Machinex Baler Brochure

SINGLE RAM BALERS

MLP | 125 | 155 | 155TP | 195TP | 235TP

M
MACHINEX

Experience Results



Machinex high density, single ram extrusion balers, with patented Pre-Press & Shear technology, feature many innovations for optimal results, ease of use, and maintenance-friendly access. Each Machinex baler is CAD-engineered and precision built to offer advanced structural performance and to meet, or exceed, safety and operating standards.

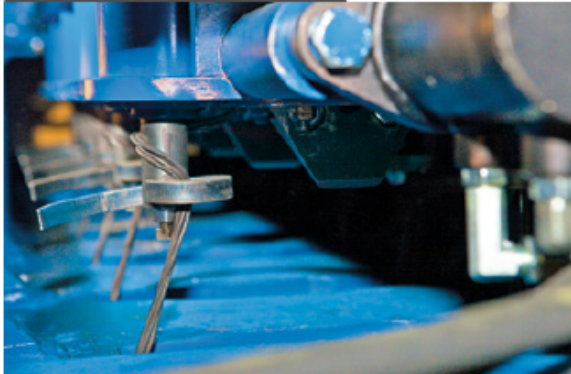


PATENTED PRE-PRESS & SHEAR TECHNOLOGY

The Machinex Pre-Press & Shear baler features patented, double action technology for stable, homogenous bales. With peaks of 60 tons precompaction, extra-large cardboard cutting capability, and up to 235 tons of ram face compaction, this baler provides densities of up to 50 lbs/sq. ft. and a capacity of up to 85 tons per hour.

FEATURES

AUTO-TYING



- ▶ Auto-tie, double wire feeders (5 to 10 ties) provide optimal strength and enhance productivity
- ▶ Auto-adjusting wire twisters progressively move the wires closer to the twister axle for smoother operation and simplified mechanics
- ▶ Closed-casing twister drive chains reduce downtime
- ▶ Wire twisters are bearing mounted to enhance up-time
- ▶ Hydraulic motor-driven twisters
- ▶ Heavy-duty drive chain provides greater life expectancy
- ▶ Smart needle head design: Bolted needle head pulls wires tight to enhance the durability and performance of the needle assembly

HORIZONTAL TIE



- ▶ Tie module opens-up to release any unwanted material, resulting in a cleaner, and more effective, tie cycle
- ▶ Machinex unique horizontal off-side tie reduces negative impact of pulling wires
- ▶ Double tie come standard with the horizontal tie option
- ▶ Wires on the side of the baler eliminate double bale handling
- ▶ Easily accessible from floor level (Easy maintenance access)

HYDRAULIC DEVICES PREFILL VALVE



- ▶ High-tech hydraulic system with prefill valve generates twice the speed of a regular hydraulic system with regen, using the same HP and results in an increase of productivity and cost savings
- ▶ Top-mounted, self-contained power unit is designed for convenient maintenance and servicing
- ▶ Variable displacement hydraulic pumps maintain maximum ram speed through all pressure ranges
- ▶ All hydraulic-actuated motions (pre-press flap, main ram, needles, twisters, cutters, and extruding channel) are controlled by proportional valves for individually adjustable speeds, accelerations, and decelerations

ENERGY EFFICIENT POWER UNIT Smart Twin Power



The totally enclosed, fan-cooled (TEFC) motors work efficiently in dusty conditions and poor ventilation. Machinex Balers are powered by one or two premium efficiency motors for extra energy savings.

SMART HOPPER JAM BREAKER (optional)



The jam breaker helps keep material moving freely through the feeding hopper. The device uses infrared photocells to ensure automatic clearance of the feeding hopper and eliminate fastidious release operations.

V KNIFE TWIN SHEAR BLADES (optional)



Heavy-duty "V knife" twin shear blades, with multiple serrated hackles, cut through extra-large commercial cardboard to eliminate pre-flap and main ram jams. They are made of steel, hardened to 60 RC, to guarantee long-lasting performance. The progressive knife design eliminates hydraulic jerk while enabling very large commercial cardboard to be cut for higher volume processing and reduced energy consumption.

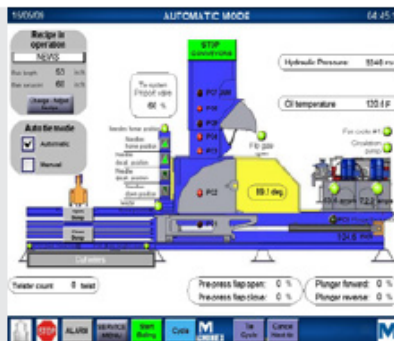
RAM STRUCTURAL DESIGN

The main ram is mounted on large, hardened steel wheels rolling on a floor made of bolted, abrasion-resistant steel plates to reduce wear, replacement costs, and intervention time.



SMART CONTROLS

- ▶ 15" touchscreen on main panel
- ▶ User-friendly Omron PLC programmable controller, featuring automatic and manual controls, diagnostics, and bale control panel interface for complete baler management
- ▶ Remote troubleshooting and control by modem
- ▶ UL approved



MODELS	MLP-125	MLP-155	MLP-155 TP	MLP-195 TP	MLP-235 TP
Platen Force	127 tons	155 tons	155 tons	195 tons	237 tons
Platen Pressure	216 PSI	173 PSI	173 PSI	215 PSI	270 PSI
Hydraulic Motor(s)	1 x 125 HP	1 x 100 HP	2 x 75 HP	2 x 75 HP	2 x 75 HP
Knotter Motor	Hydraulic	Hydraulic	Hydraulic	Hydraulic	Hydraulic
Main Cylinder Bore	9"	10"	10"	10"	11"
Pre-Press Bore	2 x 5"	2 x 5"	2 x 5"	2 x 5"	2 x 5"
Overall Dimensions	41'-5 1/2"	41'-5 1/2"	41'-5 1/2"	41'-5 1/2"	41'-5 1/2"
Clear Top Opening	72" l x 39" w	72" l x 39" w	72" l x 39" w	72" l x 39" w	72" l x 39" w
Chamber Dimensions	42" x 28"	42" x 42"	42" x 42"	42" x 42"	42" x 42"
Auto-Tie System	5 to 10 wires	5 to 10 wires	5 to 10 wires	5 to 10 wires	5 to 10 wires
Bale Size (expanded)	43" x 29" x variable	43" x 43" x variable	43" x 43" x variable	43" x 43" x variable	43" x 43" x variable
Machine Weight	44.6 tons - 98,000 lbs	53.5 tons - 102,000 lbs	54 tons - 108,000 lbs	55 tons - 110,000 lbs	55.5 tons - 111,000 lbs

HYDRAULICS

Maximum Pressure	5,000 PSI	5,000 PSI	5,000 PSI	5,000 PSI	5,000 PSI
Cooling System	Air/Oil	Air/Oil	Air/Oil	Air/Oil	Air/Oil
Pre-Press Flap Pressure	60 tons	60 tons	60 tons	75 tons	75 tons
Oil Tank	800 gallons	800 gallons	800 gallons	800 gallons	800 gallons
Oil Heater	2 x 3000 W	2 x 3000 W	2 x 3000 W	2 x 3000 W	2 x 3000 W

PERFORMANCE

Cycle Time (Material & Pre-Flap)	18 sec.	20.5 sec.	17 sec.	18.5 sec.	20.5 sec.
Cycle Time (Material without Pre-Flap)	13 sec.	15 sec.	11 sec.	12.5 sec.	14.5 sec.
Capacity per Cycle & Pre-Flap	131 cu. ft.	165 cu. ft.	165 cu. ft.	165 cu. ft.	165 cu. ft.
Capacity per Cycle without Pre-Flap	68 cu. ft.	102 cu. ft.	102 cu. ft.	102 cu. ft.	102 cu. ft.
Displacement per Hour with the Pre-Flap	26,200 cu. ft.	28,976 cu. ft.	39,941 cu. ft.	32,110 cu. ft.	28,975 cu. ft.
Displacement per Hour without Pre-Flap	18,831 cu. ft.	24,480 cu. ft.	33,382 cu. ft.	29,380 cu. ft.	25,324 cu. ft.
Tie Cycle Time	15 sec.	15 sec.	15 sec.	15 sec.	15 sec.

*Each specification is subject to modifications. (2015-10V)

MACHINEX ALSO OFFERS A RANGE OF BALERS WITH SHEAR ONLY



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www.machinextechnologies.com

Attachment #2: Marshall Industrial Inc. Performance Evaluation Confirmation Letter to the Region



Marshall Industrial Inc.

March 30, 2016

Attn: Frank Lombardo & Steven Jedinak
Regional Municipality of Durham,
Works Department, Waste Management
4590 Garrard Road,
Whitby Ontario

Re: Baler Performance Test, Contract # 621-2015

Dear Frank & Steven,

As a part of the fulfillment of the contract with Industries Machinex for the supply, installation and commissioning for the new horizontal baler that was installed last fall, the baler was performance tested on March the 23rd, 2016. The nature of this test was to assure that the baler is capable of baling the Regions recyclables at a suitable rate of speed and bale density as set out in RFP # 621-2015.

The testing performed on March the 23rd, 2016 was successful and proved that the baler is capable of meeting the performance criteria specified. This baler has more than ample productive capacity to exceed baling rate required by the MRF's operations. More importantly, the bale densities of all materials baled exceeded the requirements of the RFP which will allow the region to realize better revenues for the various commodities baled, especially plastics. This improved bale density also increases the MRF's bale storage capacity.

If you have any questions, please contact me at your convenience,

Sincerely,
Marshall Industrial Inc.

Bob Marshall

Marshall Industrial Inc. 6-170 Fuller Road, Ajax Ontario, L1S 7G8,
P: 905-239-2102 F: 905-239-4610 E: bobmarshall@rogers.com

Attachment #3: Project Photos













