

Toronto's Expanded Polystyrene Densification and Marketing Pilot

A Continuous Improvement Fund supported Pilot Project # 1035

**Report submitted to CIF
March 2018**

Executive Summary

This report describes the operational processes, costs, and results of the Polystyrene Densification and Marketing Pilot. It also provides a summary of the existing and potential markets for Expanded Polystyrene (EPS) based on feedback from the pilot. The City of Toronto Solid Waste Management Services (City) conducted this pilot to investigate markets for the City's EPS captured through the Blue Bin program. Eco Development LLC (Eco) was under contract to broker EPS samples to potential re-processors and to provide information on available markets. The pilot was initiated in June 2017 and densification operations took place in October 2017. Eco provided their report at the beginning of January 2018.

Using a RUNI-SK200 densifier, the City was able to produce eight and a half skids, for a total weight of 1,750kgs of densified EPS blocks in a two week period. Eco was able to send samples out, and CPIA also took a sample for testing.

As a result of the pilot, it is believed that any Offer to Purchase for the recycling of EPS at this time, whether baled or densified, is likely to produce few or no bids and that the price offered would be costly to the City. Therefore, Eco's report on markets recommends introducing Waste to Energy for the management of this product, a direction that the City is not prepared to take. The City's course of action at this time is to continue to pay attention to market developments, as well as extended producer responsibility developments arising from the Waste Free Ontario Act and the transition of the Blue Bin program.

Based on the findings of the Densification and Marketing Pilot, along with information obtained through CPIA, the City plans to manage EPS in the short term through continuing to provide sample loads arranged through CPIA. For the long term, the City hopes to execute a sales agreement through the standard Offer to Purchase process, however, it is likely that, should a call document be issued at this time, no viable offers would be received.

The City appreciates the support of the Continuous Improvement Fund for reimbursing costs incurred for this project. Section 3 of this report details costs and revenues. The City is also grateful for a donation from the Canadian Plastics Industry Association.

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1. Project Description and Methodology

Project Rationale

Expanded Polystyrene (EPS) was introduced to the City of Toronto's Blue Bin program in December 2008, including protective packaging (polystyrene foam blocks), meat and produce trays, take-out food containers (foam plates, cups, clamshells), and foam egg cartons.

In March 2017, Solid Waste Management Services (SWMS) recommended the cancellation of the Offer to Purchase EPS because the one and only bid received for the purchase of baled EPS exceeded approved funding. Since April 30, 2017 the City has been without a Sales Contract for EPS, and the tonnage captured at the MRF has been managed through pilot activities.

The 2008 addition of EPS to the Blue Bin program has made EPS recycling more convenient for residents. However, the following characteristics of the product make its capture challenging:

- EPS breaks into pieces and may contaminate other products;
- EPS take-out food containers are often contaminated with organic waste;
- There are a variety of colours, including blue, pink and black used for food trays. In the past, some re-processors have stated that coloured trays contaminate loads. However, this is no longer as relevant, since finding any market that accepts white EPS is difficult in itself;
- Food trays are often overwrapped with plastic film and labels;
- Polyethylene (PE) and Polypropylene (PP) can look like block or food service EPS packaging;
- Food trays made of #7 plastic look similar to EPS trays;
- Baling material can be difficult, and bales are not always uniform in size and are more prone to falling apart than bales of other denser products; and
- Transportation costs for EPS are high unless the product is pre-processed through extrusion or densification because of the airspace in EPS.

As well as the above difficulties for the capture of EPS at a MRF, securing a market for baled EPS has also proven difficult. At the time of Toronto's decision to include EPS in the Blue Bin program (2008), the Mississauga reprocessing facility operated by the Canadian Polystyrene Recycling Association (CPRA), suspended operations. CPRA was an industry organization comprised of manufacturers and EPS packaging users, which lobbied the City to include EPS in the Blue Bin program, suggesting that the addition of Toronto's EPS would help their profit margin significantly enough to carry the business through a period of decline in revenues related to the weakening US currency. However, from the beginning, securing an EPS re-processor has been a recurrent challenge for City. Typically, Toronto has paid \$200 to \$400 per metric tonne for the material to be processed.

Project Responsibilities

In order to determine the availability of a market for EPS, and in order to understand the availability of a market if EPS was prepared in densified form, the City entered an agreement with a broker, Eco Development LLC (Eco), whose responsibility it was to:

- Rent a densifier from RUNI (including its transportation and start up);
- Oversee the densification process;
- Ship densified blocks to re-processors;
- Advise the City about the availability of EPS recycling options.

The City was responsible for:

- Providing an indoor space;
- Capturing at the MRF and transporting to the site bagged EPS;

- Connecting the electrical outlet for the machine;
- Acquiring an amendment to the facility's ECA;
- Staffing for the labour associated with the project, including the provision of PPE and training.

Throughout the pilot the City liaised with the Canadian Plastics Industry Association (CPIA) in order to receive advice about market options, technical information and considerations for the densification process.

Capture at the MRF

EPS is recovered from the City's Single Stream Recyclable Materials (SSRM) at the Arrow Road Material Recovery Facility (MRF) owned and operated by Canada Fibers Limited (CFL). It is manually recovered at multiple points on the lines. Larger pieces (and the majority of the pieces picked) are captured on the pre-sort and Old Corrugated Cardboard (OCC) lines. Smaller pieces are handpicked along the PET line. Positioning sorters along the PET line serves a dual function of capturing small EPS pieces as well as providing quality control for the PET. Similarly, for the purpose of quality control of other products, including aseptic & polycoat, mixed rigid plastic and HDPE, hand sorters are positioned at end points on the lines and will remove EPS along with other contamination. It is estimated that less than 5% of the EPS captured at CFL is captured on the aseptic & polycoat, mixed rigid plastic and HDPE lines.

Sorters place picked pieces in plastic bags that sit along walkways until a CFL utility staff empty them into a bunker. Some bags are thrown down to a centralized area for storage until there is sufficient quantity to bale. Once there is sufficient quantity, the bunker is emptied onto a conveyor belt, and some bags are manually emptied directly onto the belt as the material moves through to the baler.

Bagged EPS was used for the pilot project. Bags of EPS were placed on a transport trailer, rather than being baled, and taken from the MRF to Dufferin Waste Management Facility, to the maintenance building at 75 Vanley Cres. The bags of EPS used in the pilot were generated at the MRF along the path described above (i.e. majority handpicked from the pre-sort and OCC lines).

The City and CFL have an agreed upon cost per tonne for each of the products captured at the MRF. It is estimated that the total cost to capture the approximate amount of EPS gathered for pilot is \$495.00. This amount excludes the cost of the rental trailers used to store and transport the material to the pilot address. Also, it includes excess EPS that was brought to the site but not actually used during the pilot. Table 2, below, provides a complete list of project costs.

Transportation to Densification Site

In preparation for the pilot, bags of EPS were manually packed into two 53 foot rental trailers and driven from the MRF to the Dufferin Waste Management Facility Maintenance Building (75 Vanley Cres) by staff from the City's Haulage section. This building was a suitable option for the short term pilot, but would not be appropriate for long term, full scale densification because it is in use for other purposes.

Environment Compliance Approval:

The MOECC required an ECA amendment for densification operations to take place at the Dufferin facility. The City submitted an application, met with MOECC staff to present the scope of the project, and provided a notification to neighbouring properties before the project took place. The cost of the ECA is included in Table 2. Appendix D includes correspondence with the MOECC.

RUNI SK200 Model Machine

RUNI Recycling Machinery Inc. is an international equipment manufacturer that started as an agricultural equipment manufacturer in Denmark. RUNI offers a variety of densification systems, including conveyor-belt-fed silo systems that can be used for larger scale polystyrene densification. At the recommendation of Eco, the City rented a RUNI SK200 machine. This model is one of the smallest available from RUNI and is typically used for space saving purposes in warehouses or for the densification of polystyrene blocks, such as fish boxes.

The SK200 was the appropriate size for the amount of sample material piloted. If a large continuous operation was set up, measures to mitigate against noise and dust would need to be considered in further detail.

Appendix A: *Compacting EPS (airpop) Technical data specification for SK200* is attached to this report.



RUNI SK200

The RUNI SK200 densifier consists of a hopper, into which EPS pieces are manually loaded, and a chamber in which the material is crushed and then pushed by a screw press. The screw press pushes small EPS pieces into a narrow chamber (estimated as 15 cm x 15 cm). There is no heat applied by the machine, but the material does heat due to the action and pressure of the screw press. At the top of the chamber is a hydraulically activated pressure plate. The densified block emerges along a stabilization channel, at which point it swells slightly and cools. Once the block has reached the desired length (typically the length of a pallet) it is manually pulled from the channel and lifted onto a skid. On a larger machine, a cutting device would be required in order to separate the blocks.

The RUNI SK200 machine is equipped with an automatic setting for both the screw press speed and the jaw pressure (pressure plate). The automatic setting relies on:

- a. Internal sensors that adjust the speed of the screw press (e.g. if the rate of input slows) and
- b. A control wheel that sits on the block output and adjusts the pressure in the chamber.

The automatic setting was used throughout the pilot and zero shut down time resulted from operational problems with the machine. The machine was shut off and restarted daily and for lunches and other breaks.

As RUNI is a European company, a motor equipped for Canadian electrical standards was required and was shipped separately. City staff installed a power supply electrical connection for the project. In automatic mode the RUNI SK200 machine electrical consumption is 2.5-3 kW according to the technical specifications.

RUNI recommends that the machine's bearings are greased every 100 hours. Staff were prepared to apply grease in the event that the display panel indicated a need for it. However, the pilot was completed without greasing being required.

Secondary Sortation

Bagged EPS was unloaded from the two trailers and the bags were emptied onto a table where three staff were stationed. Before coming to work on the densification project, the staff assigned to sort the pieces and feed the hopper had not previously been assigned similar work and they had no specific education related to the identification of different types of plastics. The staff were shown EPS as well as expanded polypropylene (PP), expanded polyethylene (PE) and food trays made of mixed plastic (#7). Once the staff emptied the plastic bags, the empty bags were set aside to be weighed. Staff then hand sorted the material, placing what they identified as only EPS into the top of the hopper. Staff hand loaded EPS into the SK200, and any other residual materials were manually set aside.

In the mornings, prior to commencing work, a Supervisor used a long narrow piece of lumber (2 by 2 board) with a nail on the end to reach into the hopper and pull out plastic film that had wound around the screw press. While staff were careful to put only EPS in the hopper, this was a necessary task because plastic film (e.g. plastic wrap on food trays), tape and labels were inadvertently missed during this secondary hand sort.

As mentioned, the machine was set on the Automatic setting and there were no operational shut downs due to the equipment or the material. However, the machine was turned off for two breaks and one lunch each day.

2. Densification Process Outcome

Sample Production

The samples produced were generally uniform in dimensions and appearance. The blocks measured 20 cm by 20 cm by approximately 90 cm, and on average weighed 7.78 kg each. The total weight of the finished skids was 1750 kg.

The finished blocks were placed on 9 skids with between 25 and 27 blocks per skid (except for skid #9 which had 13 blocks). The skids' weights are as follows:

Table 1: Densified Blocks Produced

Skid #	Net Skid Weight (kg)
1	210
2	210
3	215
4	195
5	175
6	205
7	240
8	185
9	115
Total	1750

A layer of cardboard was placed on the base of each skid, which reduced slippage and increased the skid's stability. Except for skid #9, the skids were each stacked 5 layers high, with five or sometimes six blocks across each row. The blocks were placed in alternating direction (criss-cross) in each row to increase the stability of the skid. When the skid reached five layers high, it was shrink wrapped.

After the skid had been wrapped, staff used a forklift to lift the skid and to drive it over the weigh scale at Dufferin Transfer Station. The tare weight of the forklift was subtracted for the net skid.

Had the City used a manual setting and increased the pressure in the chamber of the RUNI SK200 machine, a denser block could have been created. However, as stated above, the results were produced with the machine continuously set to automatic. The automatic setting meant that block quality (density) was consistent and that there were no operational issues, such as overheating in the compression chamber or breaks in the material produced.

RUNI's data sheet for the SK200 machine indicates that the daily capacity of the machine is 500 kg. During our pilot, the machine was in operation for an approximate total of 45 hours (7.5 days times an average of 6 running hours per day). It took about 5 hours of run time to produce each skid. That means that about 40 kg of EPS was densified each hour. At this production rate, sorting the material, feeding the machine, removing and stacking the densified blocks, and other tasks such as emptying residue and tidying emptied plastic bags, was completed with very little pressure on staff.

The total weight of the emptied plastic bags was 66.3 kg. Estimating that the weight of an empty bag is on average 50 grams, we estimate that 1300 bags of EPS were densified.

Sample Quality

The sample blocks appear mostly off-white, with grey in areas and small patches of pink and blue. Cracks in the samples indicate that contamination is present in the material. While dirt, such as dust or grime could cause some irregularities, it is more likely that a crack would appear because of the presence of non-EPS expanded foam, such as expanded foam PP, PE, or #7 plastic.



The coloured patches indicate the presence of coloured food trays, which were included in order to see whether or not re-processors could handle the small quantity of coloured trays received in our stream.

Re-processors tested the material for fire retardants and found that they were problematic. Fire retardants are present in EPS insulating foam, which is also usually blue. Blue and pink sheets that resembled foam insulation were sorted out during densification as residue, but it is possible a small amount was missed and that it became mixed into the densified sample blocks.

Throughout the densification of the material and the production of the 1750 kg of densified EPS, there was a total of approximately 130 kg of residue captured. The residue included:

- PP: block packaging protection for electronics;
- PE: foam wrap (used as packaging protection) and foam pipe used as plumbing insulation;
- #7 plastics: meat/produce trays, and take-out food containers;
- Plastic film: meat/ produce trap wrap, labels and stickers, envelope sleeves, and tape.

Densified material loaded on skid. Appendix B includes additional pictures taken during the pilot including additional images of the completed blocks.

3. Project Costs

The table below provides approximate costs incurred by the SMWS Division for the Polystyrene Densification and Marketing Pilot.

Table 2: Project Costs

Item	Item Description (steps involved)	Staff Costs	Material Costs	Eco Costs
Project Planning Meetings	<ul style="list-style-type: none"> Internal planning meetings Meetings with Vendor* Arrangements for use of space 	\$2400		\$2900
Procurement of Vendor	<ul style="list-style-type: none"> Solicitor for legal agreement Review of Vendor's insurance Purchasing staff's time for release of Purchase Order 	\$600		
Collection of EPS	<ul style="list-style-type: none"> Per tonne processing cost times volume gathered, based on contract with CFL Time to coordinate its capture 	\$140	\$495	
Trailer rental	<ul style="list-style-type: none"> Storage at MRF Transportation to 75 Vanley Cres (driver hours) 2 trailers were rented for 3 months 	\$250	\$1500	
Obtaining ECA	<ul style="list-style-type: none"> Application preparation and submission Application fee Meeting to present to MOECC Preparation and distribution of notice to neighbours 	\$620	\$300	
Electrician	<ul style="list-style-type: none"> Power connection on site 	\$160		
Staffing	<ul style="list-style-type: none"> HR consultant to find staff to operate densified Creation of job description 	\$310		
Training of Sorters and on-site Supervisor	<ul style="list-style-type: none"> Supervisor's hours to prepare and deliver training, including H&S Hours for all staff at the session 	\$1410		
PPE and supplies	<ul style="list-style-type: none"> Gloves Masks Skids Shrink wrap 	\$50	\$125	
Operations	<ul style="list-style-type: none"> Labour for feeding hopper 	\$6200		
Supervision	<ul style="list-style-type: none"> Documentation of data Operation of machine controls Oversight 	\$3700		
Forklift Operator	<ul style="list-style-type: none"> Labour for obtaining weights, moving completed skids 	\$450		
Equipment Rental	<ul style="list-style-type: none"> RUNI SK200 rental Freight to and from 75 Vanley Cres.* 			\$8850

Vendor Fees	<ul style="list-style-type: none"> 3 day on-site commitment, including Eco and RUNI* 			\$5750
Freight for Samples	<ul style="list-style-type: none"> FOB 75 Vanley Cres to reprocessing facilities* 			\$7000
Vendor Travel	<ul style="list-style-type: none"> Includes flight, hotel, meals* 			\$6050
Clean Up	<ul style="list-style-type: none"> Trailer clean out Packing rental machine Removal of residue and empty bags 	\$100		
Administration	<ul style="list-style-type: none"> Vendor invoices Review of Vendor's report 	\$340		
Total		\$16,730	\$2,420	\$30,550
Grand Total		\$49,700		

*Eco was paid in US currency. The amounts paid to this Vendor have been converted from USD to CAD and rounded to the nearest \$50 on this chart. Vendor invoices with exact costs are included as appendix C.

Staff Costs were calculated as the approximate number of hours spent on the task times the wage of the staff involved.

The City received \$7500 from CPIA towards this project. On October 18, 2017 David Thomson representing CPIA was provided with access to the facility where densification was underway and was provided with one sample densified block. Appendix E is a copy of a letter exchange with CPIA regarding our receipt of their funds.

This City appreciates the support of the Continuous Improvement Fund, specifically for the approved funding of CIF Project #1035. CIF funding covers \$30,000 for project expenses, plus \$5000 for staffing costs.

4. Project Results

Where Samples were sent

The City's Vendor for the pilot arranged for the pickup of densified samples to be sent to potential re-processors. Because the City has not had a sales contract in place for the removal of baled EPS from the MRF since April 2017, and in order to not stockpile material, additional truckloads of baled EPS were removed, as shown below, under separate agreements. The chart below shows all outbound EPS loads and samples from May 2017 to January 2018.

Table 3: Outbound EPS

Date	Quantity	Densified / Bales	Handled by
June 28, 2017	5.37 MT	Bales	CPIA
October 18, 2017	Single block ~10 kg	Densified	CPIA
November 2, 2017	2 skids – 395 kg	Densified	Eco
November 3, 2017	2 skids – 405 kg	Densified	Eco
November 10, 2017	2 skids – 445 kg	Densified	Eco
November 21, 2017	Single block ~10 kg	Densified	Eco
November 21, 2017	Single block ~10 kg	Densified	Eco
November 28, 2017	6.91 MT	Bales	Another broker
December 7, 2017	7.1 MT	Bales	CPIA
December 12, 2017	6.61 MT	Bales	Eco
January 25, 2018	6.83 MT	Bales	CPIA

As shown above, CPIA has handled relief loads that have been processed at PRI in Indianapolis, Indiana. Toronto is awaiting specific feedback on the quality of bales sent and any reprocessing considerations from PRI/Dart. PRI's processes include optical sortation, flake washing, sink/float screening, and extrusion in order to convert EPS into pellets, which can then be used in new products such as desktop paper trays, spools for cash register receipt paper, or scotch tape holders.

For additional relief, an agreement with another broker for the removal of baled EPS on a trial basis was established, however, as of March 27, 2018, the broker has been unable to find a re-processor willing to accept the load. It is currently being held in storage.

Available markets and costs

Eco's final report includes six sections representing options for EPS markets. Eco identified outcomes for each as follows: two were identified as "positive"; two as "negative"; and two as "not yet available".

The report did not provide a viable recycling option for baled EPS nor densified EPS. Instead, Eco put forth what they term a "Program Proposal" that would consist of a "Dual Option." Their program proposal recommends, at the determination of a broker, EPS be provided to an "intermittently" reliable re-processor for recycling into pellets, and/or a fuel manufacturer. Their proposal includes the Waste to Energy component in order to mitigate against the risk of price fluctuation in the recycling market.

Eco's Program Proposal quotes a cost of approximately \$370.00 CAD per metric tonne for the removal and processing of EPS bales FOB Arrow Rd., Toronto, Ontario. The report also indicates that this cost estimate could be offset by potential rebate funds to the City from time to time in relation to the market value. It is also notable that the proportion of the material that would be used for waste to energy versus used to make "General Purpose Polystyrene" pellets was not disclosed and would not be determined by the City.

Potential Markets

The "Program Proposal" recommended by Eco is not being considered because the City is seeking a recycling option rather than one that incorporates Waste to Energy.

Potential markets that could become available are listed below, as well as considerations related to their reliability.

Table 4: Potential Markets

Potential Re-processor (location)	Process	End Product/ End Market
Green Mantra Brantford ON	Uses a catalyst that breaks polymers and isolates specific monomer so that pellets can be created.	After styrene monomer is isolated, it can be used as an additive for print ink, and would replace virgin stock. Alternatively, it could become an additive for asphalt roofing or road paving applications, pending permits and agreements.
Considerations: Green Mantra will begin a pilot program for EPS in 2018. The pilot will determine, among other things, whether or not the company is compliant with emissions standards that arise from fire retardants present in some EPS. Initially, Green Mantra indicated that samples from the City of Toronto were unusable because of the fire retardant they contained, but have since indicated that they are interested in engaging further, as their facility develops solutions for EPS.		
Berga Recycling Montreal QC	Creates General Purpose Polystyrene pellets then provides to partner in Europe.	Can be used in building materials.
Considerations: Berga receives polystyrene from post-industrial and post-commercial providers, but has not yet worked with a municipality supplying post-consumer material. Berga demonstrated initial interest in the sample block, however, they did not proceed with processing it due to concerns over contamination leading to equipment damage (filter blockage).		
Pyrowave Montreal QC	After pre-processing EPS in order to remove contamination and air-space, PS is put into a reactor where molecules are cut.	A styrene monomer is produced and can be reprocessed into virgin-like polystyrene.
Considerations: Extensive pre-processing is required before the reaction can be conducted and there is no existing facility that would accept MRF generated post-consumer EPS.		
Polystyvert Montreal QC	Provides "reusable" essential oil to warehouses or other sites where EPS is collected. The oil dissolves EPS, and is shipped back in liquid form to Montreal where a styrene monomer can be isolated. The oil can be cleaned of contaminants and used over again.	A styrene monomer is produced and can be reprocessed into virgin-like polystyrene.
Considerations: While this method can add value to users by reducing the amount of warehouse space that EPS occupies, the cost of transportation is high, as the liquid needs to be delivered and removed from the site and returned to the Montreal. It has not been used for MRF generated post-consumer EPS.		

5. Next Steps

Waste Free Ontario Act and the future of EPS in the Blue Bin Program

The Waste Free Ontario Act and the introduction of Extended Producer Responsibility are major considerations in the development of agreements related to recycling in Ontario. As per the December 2017 Blue Bin Program Plan, Stewardship Ontario supports research and development efforts towards the inclusion of EPS in the Blue Bin program. The City is therefore in a "wait and see" position: Will extended producer responsibility incentivize the industry to ensure that adequate reprocessing capacity develops, or will the packaging and food service industry turn to alternatives such as PP and PE?

In the short term

As mentioned previously, CPIA arranged for the recycling of three truckloads of baled EPS destined for processing at Plastic Recycling Inc. (PRI) in Indianapolis. Toronto expects further feedback from PRI shortly and this option is expected to be appropriate for the coming months. Whether or not it will be an acceptable long term solution depend upon their capacity and ability to accept Toronto's material (which will depend upon the supply available elsewhere, including New York City), as well as the cost.

Until more detail is known about how and when the Blue Bin program will be transitioned under the Waste Free Ontario Act, and what that means for EPS recycling, the City will continue to provide samples loads, to processors that are able to accept them.

Appendices

A	RUNI Data Sheet
B	Pictures
C	Vendor Invoices
D	ECA amendment
E	Letter of Agreement with CPIA

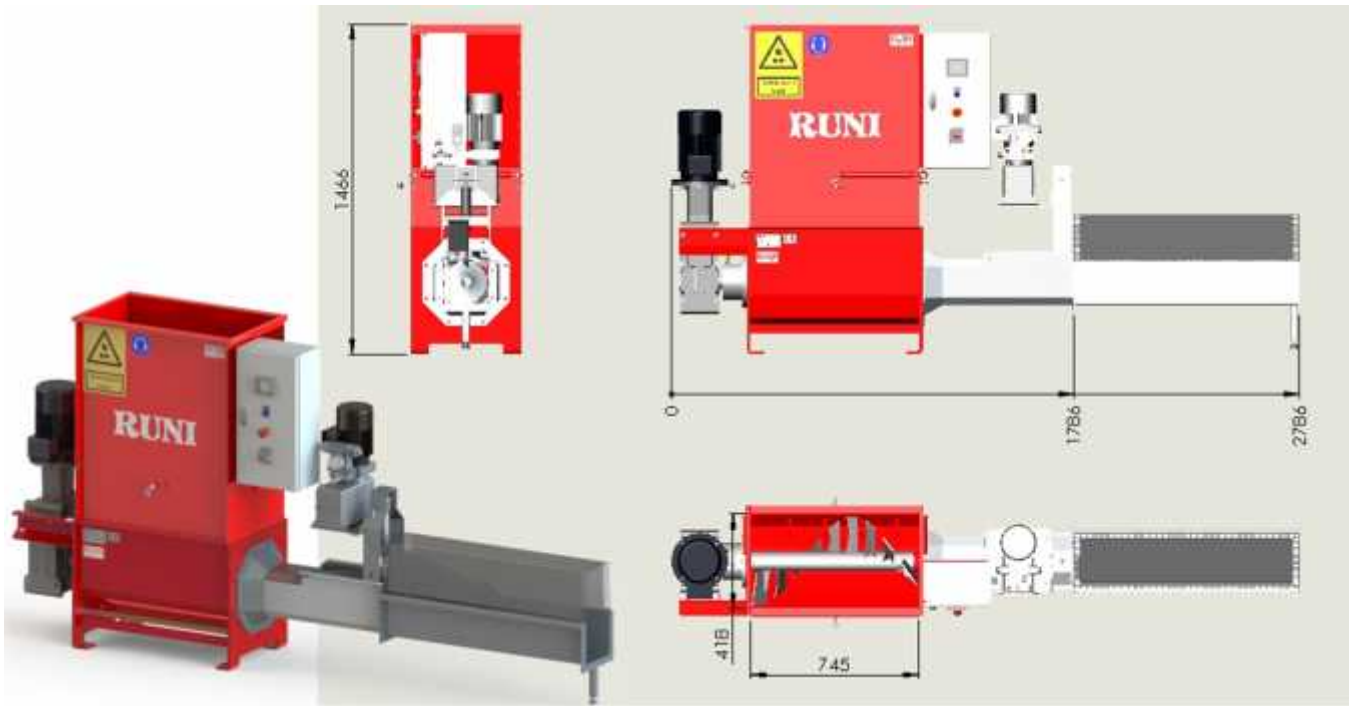


Compacting EPS (airpop)

Technical data specification for SK200

Dimensional drawing

Subject to technical modifications



Technical data	Europe	USA
Material	EPS	EPS
Achieved density *)	350 kg/m ³	22 lbs/ft ³
Capacity per hour	45 kg	100 lbs
Daily capacity	500 kg	660 lbs
Block measurement	200 x 200 mm	8 x 8 inch
Feed-opening dimension, inlet	750 x 420 mm	30 x 16 inch
Weight	450 kg	990 lbs
Noise level (distance 1 m)	Standard: 77-100 dB With soundproofing: 68-85 dB	Standard: 77-100 dB With soundproofing: 68-85 dB
Machine dimensions (LxWxH)	2786 x 418 x 1466 mm	110 x 16 x 58 inch
Motor power	Main motor: 4,0 kW Hydraulic pump: 0,55 kW	Main motor: 6,5 hp (5 kW) Hydraulic pump: 0,9 hp (0,66 kW)
Power supply	3 x 400V, 50Hz, 32A	2 x 230V, 60Hz, 40A 3 x 480V, 60Hz, 32A
Marking	CE-approved	CE-approved, UL

*) Depending on the type and EPS density.



Compacting of EPS (airpop)

Description

RUNI SK200 screw compactor is the second smallest machine for compacting EPS and is recommended for expected annual volumes of 10 - 30 tons. The screw compactor can compact the EPS (also known as airpop) at the ratio of up to 50:1. Without compaction 50 trucks were needed to take the loose EPS to landfill. After compaction just one truck is enough to transport the densified blocks. The density of the compacted EPS blocks is approx. 350 kg/m³. The compacted blocks can be stacked on a pallet and sold for recycling and typically 20 tons can be loaded on a truck or in a container. TURN WASTE TO VALUE!



50  1
Compaction ratio



Function

When the EPS is fed into the screw compactor it will be pre-crushed. The screw and the automatic hydraulic jaws will compact the material into solid and uniform blocks. The SK200 is very user friendly and the integrated sensors ensures easy operation with automatic start and stop function and adjustable speed for EPS with variable density. For EPS dust and precrushed EPS scrap it is also possible to place the compactor below a silo. For retail shops with smaller confines we recommend having the machine equipped with sound proofing material in hopper and lid.



Benefits

- Generate income from compacted EPS.
- Reduce cost for warehouse, transport and disposal.
- Safe and easy operation with automatic start and stop.

Option

-) Wheels for SK200 – set of 5 wheels
-) Lid for hopper
-) Soundproofing in hopper and lid – reduces noise with 10-15 dB

Bagged material unloaded from trailer



Equipment Set-up

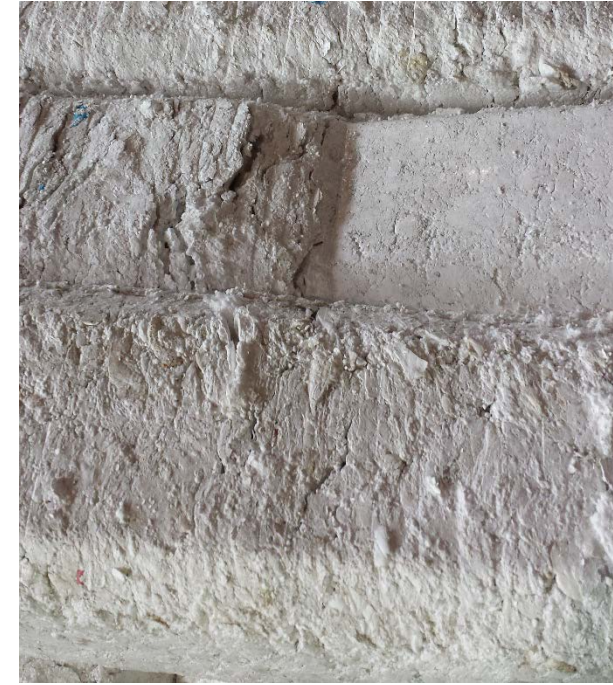


Bags unloaded on table and hopper hand fed



Blocks came out through stabilization channel and were lifted onto skids

Densified material samples



Notes:

- Some colour is visible in the samples, which could be from pink or blue produce trays, or insulation. Insulation is problematic for reprocessors because it contains fire retardant chemicals.
- Cracking occurs when contaminants are present and could be formed from the presence of PP, PE or #7 plastics.
- Indentation (above) occurred from a break in loading the hopper and indicates that the material moved through compression chamber more slowly and became hotter while there. This was rare and not significant to processing. However, overall material could have been made denser.

Complete skids (7 of 8.5)



123 E. Main Street
Mason, OH 45040 US
513-336-0777
www.eco-ems.com/



INVOICE

BILL TO

Toronto Purchasing and
Materials
18th Floor, West Tower
100 Queen St. W, Toronto, ON
M5H 2N2

SHIP TO

Kathy Raddon, Project Lead,
SWMS, 35 Vanley Cres.
Building 250, Toronto, ON,
M3J 2B7

INVOICE # KL00845**DATE** 11/17/2017**DUE DATE** 01/16/2018**TERMS** Net 60

P.O. NUMBER

6045362

DATE	ACTIVITY	QTY	RATE	AMOUNT
11/17/2017	Start-Up Costs (in USD)	1	2,300.00	2,300.00
11/17/2017	Eco & Runi 3 Day Commitment	1	4,600.00	4,600.00
11/17/2017	Travel Expenses	1	4,830.00	4,830.00
11/17/2017	Freight	1	3,277.00	3,277.00
11/17/2017	Equipment Rental	1	3,565.00	3,565.00

Thank you for choosing Eco Development!

BALANCE DUE**\$18,572.00**

123 E. Main Street
Mason, OH 45040 US
513-336-0777
www.eco-ems.com/



INVOICE

BILL TO

Toronto Purchasing and
Materials
18th Floor, West Tower
100 Queen St. W, Toronto, ON
M5H 2N2

SHIP TO

Kathy Raddon, Project Lead,
SWMS, 35 Vanley Cres.
Building 250, Toronto, ON,
M3J 2B7

INVOICE # 2035**DATE** 01/25/2018**DUE DATE** 03/26/2018**TERMS** Net 60

P.O. NUMBER

6045362

DATE	ACTIVITY	QTY	RATE	AMOUNT
01/25/2018	Sample Shipment Cost	1	5,750.00	5,750.00

Thank you for choosing Eco Development!**BALANCE DUE****\$5,750.00**

Jim McKay
General Manager
Solid Waste Management Services

Solid Waste Management
Services
Dufferin Transfer Station
35 Vanley Crescent
Building 250, 2nd Floor
Toronto, ON M3J 2B7

Tel: 416-392-2447
Fax: 416-392-3722
Derek.Angove@toronto.ca
www.toronto.ca

September 1, 2017

VIA EMAIL

eca.submission@ontario.ca

Environmental Approvals Access and Service Integration Branch
Ministry of the Environment and Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, ON M4V 1P5

Dear Sir or Madam:

Re: APPLICATION FOR AMENDMENT TO THE EXISTING ENVIRONMENTAL COMPLIANCE APPROVAL NUMBER A280709 FOR DUFFERIN WASTE MANAGEMENT FACILITY, 35 AND 75 VANLEY CRESCENT

As indicated in the attached application and as discussed at our meeting with the Ministry of the Environment and Climate Change on August 23, 2017. The City would like to apply for an amendment to Environmental Compliance Approval A280709 for a Waste Disposal Site (transfer and processing) dated April 15, 2016.

The amendment is requested to allow the City to conduct an approximately 2 (two) week pilot to densify Expanded Polystyrene (EPS) at the Maintenance/SSRM Overflow Building, 75 Vanley Crescent, Dufferin Waste Management Facility (DWMF). The City would like to start the project in mid-October 2017.

The City has engaged Eco Development LLC to assist in the pilot. The proposed work includes:

- Rental of Runi SK-200 EPS densifier;
- Producing sample blocks of post-consumer EPS; and
- Presenting samples to market contacts to determine if the samples are acceptable for re-processing.

The pilot will be conducted between the hours of 7 am to 4 pm and it is estimated that 3 to 5 Metric Tonnes of EPS will be densified. Eco Development LLC will take back the trial equipment after densifying the EPS, and will take the sample densified EPS blocks to re-processors.

The goal of this pilot is to secure markets for EPS so that the City can continue to accept EPS in the Blue Bin Program.

The following documents are attached:

- completed Environmental Compliance Approval Application Form;
- processing and review fee;
- Runi SK200 Datasheet;
- zoning diagram; and
- DWMF Design & Operations Plan.

We trust that this submission contains all the information necessary for the Ministry to process the application as requested. A printed copy of these documents will follow.

Should you have any questions or comments related to this application, please contact Nina Koskenoja, P.Eng, Engineer, Transfer Operations at (416) 338-5889.

Yours truly,



Derek Angove, P. Eng.
Director, Processing & Resource Management
Solid Waste Management Services

Copy to: Kevin Webster, Manager, Toronto District, MOECC
Dan Panko, Supervisor, Toronto District, MOECC
Matthew Wheeler, Senior Environmental Officer, MOECC
Grace Maione, Manager, Transfer Operations, P&RM, SWMS
Annette Synowiec, Manager, Business Operations, P&RM, SWMS
Gord Ste-Croix, General Supervisor, Dufferin Waste Management Facility, SWMS
Nina Koskenoja, P.Eng., Engineer, Transfer Operations, SWMS
Garvin Williams, Manager, Environmental Health & Safety Compliance, SWMS



AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A280709

Notice No. 3

Issue Date: October 6, 2017

City of Toronto
35 Vanley Cres (Building 250), No. 2
Toronto, Ontario
M3J 2B7

Site Location: Dufferin Waste Management Facility
35 & 75 Vanley Cres
Toronto City,

You are hereby notified that I have amended Approval No. A280709 issued on April 15, 2016 for waste disposal site (transfer) , as follows:

I. Notwithstanding the existing Conditions of this Approval, the following Conditions are

added and are in effect only for the duration of the Pilot Project to densify Expanded Polystyrene (EPS) at the Maintenance/Single Stream Recyclable Materials (SSRM) Overflow Building, as described in the Environmental Compliance Approval Application dated September 26, 2017 and signed Derek Angove, Director, Processing & Resource Management, Dufferin Waste Management Facility, City of Toronto:

15. This pilot project shall be effective until **October 31, 2017** following which the project shall cease to be operational.

16. The City of Toronto shall conduct a pilot project, for the duration specified in Condition 15, to process Expanded Polystyrene materials at the Maintenance/SSRM Overflow Building at 75 Vanley Crescent.

17. The pilot project shall be conducted between the hours of 7am to 4pm.

II. The following Condition is added to Schedule "A":

12. Environmental Compliance Approval Application to conduct a pilot to densify Expanded Polystyrene materials, dated September 26, 2017 and signed by Derek Angove, Director, Processing & Resource Management, Dufferin Waste Management Facility, City of Toronto.

III. The reason for this amendment to the Approval is as follows:

To permit the City to process EPS waste during a pilot project to identify suitable markets for this material.

This Notice shall constitute part of the approval issued under Approval No.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

- a. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
- b. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes
of Part II.1 of the Environmental
Protection Act
Ministry of the Environment and Climate
Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 6th day of October, 2017

Dale Gable, P.Eng.
Director
appointed for the purposes of Part II.1 of
the *Environmental Protection Act*

CJ/

c: District Manager, MOECC Toronto - District

Nina Koskenoja P. Eng., City of Toronto



Jim McKay
General Manager
Solid Waste Management Services

Solid Waste Management
Services
Dufferin Transfer Station
35 Vanley Crescent
Building 250, 2nd Floor
Toronto, ON M3J 2B7

Derek Angove, P. Eng.
Director, Processing &
Resource Management

Tel: 416-392-2447
Fax: 416-392-3722
Derek.Angove@toronto.ca
www.toronto.ca

July 13, 2017

Canadian Plastics Industry Association
5955 Airport Road, Suite 125
Mississauga, ON
L4V 1R9

Attention: Joe Hruska

Dear Ms. Hochu and Mr. Hruska,

Re: Letter of Agreement between the City of Toronto and Canadian Plastics Industry Association for the Polystyrene Densification and Marketing Pilot

This letter outlines our agreement with the Canadian Plastics Industry Association (CPIA) for involvement in the City of Toronto's Polystyrene Densification and Marketing Pilot. A description of the project is attached to this letter.

The project will receive funding from the Continuous Improvement Fund (CIF) and CPIA. CPIA will contribute \$7500, in one disbursement, by way of a cheque made out to City of Toronto Treasurer, no later than November 1, 2017.

The City of Toronto (City) will provide the following to CPIA:

- Access to observe the EPS densification process at a City Transfer Station;
- A densified block resulting from the pilot, which will be at a minimum approximately 200 mm by 200 mm by 300mm.

The release of information related to the pilot will be at the discretion of the City. CPIA will not be given:

- Names or contact information of the third party contracted for the pilot, or the name(s) of the potential market(s) receiving the samples.

If this pilot is successful, the City will determine whether or not it is financially and operationally advisable to engage further with EPS brokers and/or recyclers, all in accordance with the City's established procurement policies and processes.



If CFIA is in agreement with this letter, please indicate by signing in the space allocated below.

Yours truly,

Derek Angove, P. Eng.
Director, Processing & Resource Management
Solid Waste Management Services

Agreed by Canadian Plastics Industry Association

Name:

Title:

V. P. Sustainability

Name:

Title:

CAROL HOCH
PRESIDENT & CEO

Attachments: Polystyrene Densification and Marketing Pilot
DA/kr

Copy to:

Jim McKay, General Manager, Solid Waste Management Services (SWMS)
John Baldry, Manager, Processing Operations, Processing & Resource Management (P&RM), SWMS
Nadine Kerr, Acting Manager, Processing Operations, P&RM, SWMS
Charlotte Ueta, Acting Manager, Waste Management Planning, PP&S, SWMS
Annette Synowiec, Acting Manager, Business Operations, P&RM, SWMS
Adam Gerrard, Supervisor, Operational Support, SWMS