



**CDPHE RREO FUND FY09 GRANT FINAL REPORT:  
THE PURCHASE OF A DENSIFIER FOR #6 BLOCK FOAM RECYCLING**

**July 30, 2009**

Dear PPAB Assistance Committee,

Eco-Cycle's Center for Hard-to-Recycle Materials is honored and gratified to have been selected as one of the first awardees of the Recycling Resources Economic Opportunity Grant Fund. We have completed our project – as proposed – to install a specialized piece of equipment to process expanded polystyrene foam packaging (commonly called Styrofoam), expand our capacity to accept the material, and provide a model that other Colorado communities can duplicate to build green jobs and keep non-renewable resources out of our landfills.

The following is our final report for the granted project. Please contact me if you have any questions or require further information.

Thank you,

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## I. ORGANIZATION INFORMATION

1. **Agency Name:** Ecocycle
2. **Project Title:** Purchase of a densifier for EPS block foam recycling
3. **Name of Project Manager:** Dan Matsch
4. **Project Manager e-mail address and phone number:** [dan@ecocycle.org](mailto:dan@ecocycle.org), 303-444-6634 ext.116
5. **Name of person(s) completing this report:** Dan Matsch
6. **E-mail address and phone number of person(s) completing this report:** same

## II. WORK PLAN

<b>Deliverable</b>	<b>Completion Date</b>	<b>Comments</b> (if deliverable <u>was not completed</u> , please explain why or progress made)
Finalize equipment purchase	8/1/08	
Install new equipment	11/15/08	
Test new equipment	1/23/08	
Full operation of equipment	2/1/09	
Outreach campaign, Step 1	4/22/09	
Outreach campaign, Step 2	4/1/09	

## III. GRANT PROJECT INFORMATION

### 1. Executive Summary

This RREO grant allowed Eco-Cycle's Center for Hard-to-Recycle Materials (CHaRM) to purchase a specialized piece of equipment, the addition of which creates a sustainable economic model for the first post-consumer expanded polystyrene foam (EPS, commonly known as Styrofoam) collection program in the state, and perhaps in the country. Our intent for the CHaRM facility is to create a model facility that can be duplicated by other communities

which targets the roughly 15% to 20% of the waste stream that is not compostable and currently not recyclable for the general public, consisting of countless types of packaging and durable goods, primarily.

At least one new material is added each year as markets develop, using a variety of tools to generate income to arrive at a “cost plus 10%” budget format for each material. We added block foam to the CHaRM roster in 2005, initially shipping it loose to an intermediate processor in Denver. The popularity of the program eventually began to exceed the capacity of the Denver processor, so we needed a “foam densifier” to allow us to reach shipping weights that could justify bypassing the intermediate processor and shipping directly to end-markets, which also allows us to earn income from the sale of densified foam, thereby meeting our budget needs while also giving us capacity for handling a larger volume of foam.

The grant itself was straightforward funding for the purchase and installation of the foam densifier, followed by some in-kind work by Eco-Cycle staff to gradually build the volume of foam we receive as we familiarize ourselves with the operation of the machine. We are on schedule to ship our first 40,000 pound load of foam to market in August, 2009. Most of the growth in the volume of foam we handle will occur after the grant reporting period ends, but we have added one significant commercial customer and have opened our doors to several others with smaller volumes.

## **2. Project Description & Overview of Work Completed**

This project adds an important piece of infrastructure necessary to make the CHaRM a complete working model that demonstrates a new philosophy of solid waste management that is capable of achieving landfill diversion rates in excess of 70%, and possibly as high as 90% as new markets develop for new materials. In this model, the CHaRM is one of six pieces of a “Zero Waste Resource Recovery Park” that also includes a Materials Recovery Facility (MRF) to process “traditional” recyclables, a construction-and-demolition materials MRF, a compost facility, a re-use center, and a trash transfer station for whatever is left. The CHaRM is the most difficult piece of this vision to fund because hard-to-recycle materials, as the name implies, need considerable help in developing new markets. Our hope is to make the state of Colorado the home of the very first resource recovery park of this kind in the country.

Polystyrene plastic is readily recyclable and has well-established markets. Unfortunately, the lightness and strength that make EPS a desirable packaging material also make transportation of loose or baled EPS to plastics recyclers prohibitively expensive. We proposed to use grant funding to purchase an EPS densifier, a specialized piece of equipment that is capable of compacting EPS to the point that standard shipping weights can be achieved to make shipping economical. The densifier nearly triples our capacity, but more importantly it replaces a rather tenuous market with a sustainable one and provides a model that other businesses and communities can use to handle this ubiquitous material that often ends up as litter due to its light weight and its tendency to get caught by the wind.

Without the densifier, we were limited to a zero cost/zero income arrangement with an intermediate processor in Denver who operates a densifier. Their capacity for handling EPS material from Eco-Cycle was limited to one trailer-load of loose EPS (1500 lbs) per week, and our volumes received ran from 90-100% of capacity year-round. The densifier we purchased with this grant is capable of processing 100+ lbs/hour, so over a 40 hour work week our capacity with this project will be 4000 lbs/week.

There is no data currently available for the amount of EPS found in the local waste stream. A Wisconsin statewide waste characterization study conducted in 2003 found EPS to make up 0.5% of the waste stream by weight. It takes 40-45 cubic yards of compacted material to make one ton, however, so by volume EPS takes up as much as 8% of the waste stream compared to an average volume of compacted municipal solid waste (400 lbs/cubic yard).

Volume limitations with our initial EPS arrangement did not allow us to accept EPS from any of our commercial customers; we only accepted material from residents. Since installing the densifier, we have been conservative in reaching out to our commercial customers while we familiarize ourselves with the new equipment and develop associated handling procedures and learn our actual operating costs. Therefore, our volumes received have not yet grown significantly by the end of the grant reporting period. We have made some modifications to meet our specific needs, but we anticipate that we will be able to achieve the design capacity of the machine over time.

### **3. Summary of Findings & Results**

The equipment purchased consists of a “prebreaker” that grinds incoming EPS into golf-ball sized pieces, then shoots them through a duct into a giant fabric hopper suspended above the densifier itself. The densifier consists of a hydraulic ram that advances the material at the bottom of the hopper through a restricted trough and out in a continuous extrusion of 9”x13” processed material with a final density of 15-20 pounds per square foot. This is sufficient density to achieve the target of 40,000 pounds of material in a semi trailer destined for the plastics recycler.

We have provided tours to two organizations that learned of our densifier acquisition either through the State or from our website, one a recycler in Arkansas and the other a business in Fort Collins that is considering partnering with the city of Fort Collins to do a similar project there. We have also received several telephone inquiries about the machine from around the state and elsewhere.

Three of our commercial customers regularly schedule pickups of their EPS material and several others deliver directly to the CHaRM themselves.

### **4. Summary of Unanticipated Outcomes or Roadblocks**

We did not experience significant unanticipated outcomes or roadblocks. We did find that the orientation of the equipment necessitated by the limited space available at our current temporary facility was not ideal, causing some of the functions of the equipment to be compromised. The manufacturer has been extremely helpful in working through solutions with us, but the result has been that we have slowed our outreach program to area businesses while we concentrate on maximizing the function of the machinery.

We are also very focused on refining the EPS drop-off procedure to minimize our handling requirements as well as limit the potential for contamination of the feedstock with non-EPS material. The prices end-markets pay for densified EPS dipped considerably during the economic downturn, and while the prices have recently recovered somewhat, the experience highlighted the importance of minimizing our overhead costs for this relatively low-value material.

## 5. Communication of Project

We have already offered to make a presentation on our EPS recycling program at the next conference of the state recycling association, the Colorado Association For Recyclers. Upon request, we will share our full operating costs with interested recyclers. Our comprehensive website is regularly used as a resource by other recyclers in the state and beyond. We will continue to selectively reach out to existing and potential customers who generate significant EPS waste. Regular tours of the CHaRM facility by school children and interested groups include a visit to the densifier. And last but certainly not least, we have 47,000 customers per year getting a firsthand look at the machinery in action as they deposit their EPS through the collection window.

## 6. Future Impact of Project

For all CHaRM materials, we try to set up a model that can be duplicated elsewhere. Each material is evaluated with a separate full cost accounting budget, and each material must meet our "cost plus 10%" standard on its own. Eco-Cycle is a pacesetter for recycling in Colorado, which requires an unusually large overhead of research, development, and outreach programs, so if anything, our models are conservative for duplication in most areas.

Eco-Cycle actively works with other organizations to encourage manufacturers to use more environmentally-friendly forms of packaging than EPS, but that is a long process and meanwhile EPS makes up as much as 8% of the total solid waste stream by volume. Through this grant funding we hope to have answered some of the basic questions other recyclers might have when considering a similar program so that together we can have an impact on the amount of EPS being landfilled and potentially develop more markets for densified material.

## 7. Financial Summary

<b>Capital Expenditures</b>	<b>Grant Funds</b>	<b>Eco-Cycle Funds</b>
Model 30X Continuous Ribbon Densifier	\$28,025.00	
Dust Minimization	n/c included	
Synthetic Bag with supports & Duct	\$2,500.00	
Model FS-2W PreBreaker	\$16,075.00	
Shipping	\$2,500.00	
Installation	\$900.00	\$712.12
<b>Totals</b>	<b>\$50,000.00</b>	<b>\$712.12</b>

### **Eco-Cycle In-kind detail:**

Equipment installation supervision (25 hrs)	\$875.00
Equipment testing (20 hrs)	\$700.00
Outreach (60 hrs)	\$2100.00
15% G & A	\$551.25
<b>Total In-kind contribution</b>	<b>\$4226.25</b>

## 8. Final Conclusion

Eco-Cycle is proud and gratified to have been selected for funding through the initial grant cycle of the RREO fund. With 33 years of experience developing markets for recyclable materials in Colorado, we can unequivocally say that such a fund is vital for our state to achieve further waste reduction and resource recovery beyond the current level. We are very hopeful that the fund can be renewed successfully and made a permanent tool for building recycling infrastructure within the state.

## Appendix

## **Community Leaders Contact Information**

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# State Helps Eco-Cycle Recycle Foam with a Reduced Carbon Footprint

by Dan Matsch

It's always been Eco-Cycle's goal to make sure our recycling efforts are as sustainable as possible on a number of fronts. In the case of #6 white block foam (commonly called Styrofoam®), we have a particular challenge since the material is super lightweight but takes up a lot of space, making it difficult to maximize the weight of each load we transport for processing.

Thanks to a grant from the State of Colorado, we have a new piece of machinery at the Eco-Cycle/City of Boulder Center for Hard-to-Recycle Materials (CHaRM)—a densifier—that compresses the bulky foam into less than one-tenth of its original volume, significantly reducing the financial costs and carbon footprint of transporting the material.

Before getting the densifier, the average amount of loose material we could load onto a trailer was only about 1,500 pounds. That's a good load weight for a pickup truck but not for a semi. Now we can ship full 40,000-pound truckloads to recycling markets.

The densifier works by squeezing the block

foam so hard that even the little beads are compressed. A large hydraulic ram squishes the material through a constricted chamber. What comes out looks like a white railroad tie—and weighs about as much too. We break these extrusions off when they are about four feet long and then stack them on a pallet for shipping.

The best part of having this new equipment is that for the first time we have a revenue source for this material. Our grant from the state allows us to gather real data on the costs and profits of densifying foam to share with recyclers all over Colorado, which can help them justify getting a densifier for their communities.

According to Marjorie Griek, Executive Director of the Colorado Association for Recycling, "This Eco-Cycle project will help other Colorado communities develop a sustainable model for diverting Styrofoam® from the landfill and put it to good use."

The funds for the Colorado grant came from a new state law that puts a small surcharge on trash received at landfills. That money is then set aside in a fund for innovative recycling efforts.



Thanks to a grant from the State of Colorado, Eco-Cycle has a new densifier that compresses bulky #6 white block foam to less than one-tenth its original volume, significantly reducing the financial costs and carbon footprint of transporting the material.



**Figure 1 – Densifier installation showing hopper, densifier cylinder, and catch tray for finished densified material.**



**Figure 2 – Densified EPS ready for market**

# Grant Metrics

**Date project fully operational:**

January-09

(Based on deliverables- month that impact of grant would have changed volumes/job creation/participants)

**Diversion Rates:**

(Choose one material per box. Only list those collected over the grant cycle. Must be listed as "tons". See tab labeled "Conversion Tables" if needed.)

Material Diverted #1

Tons Diverted

July-08	
August-08	
September-08	
October-08	
November-08	
December-08	
January-09	3
February-09	2.5
March-09	3
April-09	2.5
May-09	2.5
June-09	3
<b>Total</b>	<b>16.5</b>

Other div. material:

Material Diverted #2

Tons Diverted

July-08	
August-08	
September-08	
October-08	
November-08	
December-08	
January-09	
February-09	
March-09	
April-09	
May-09	
June-09	
<b>Total</b>	<b>0</b>

Other div. material:

Material Diverted #3

Tons Diverted

July-08	
August-08	
September-08	
October-08	
November-08	
December-08	
January-09	
February-09	
March-09	
April-09	
May-09	
June-09	
<b>Total</b>	<b>0</b>

Other div. material:

Material Diverted #4

Tons Diverted

July-08	
August-08	
September-08	
October-08	
November-08	
December-08	
January-09	
February-09	
March-09	
April-09	
May-09	
June-09	
<b>Total</b>	<b>0</b>

Other div. material:

Material Diverted #5

Tons Diverted

July-08	
August-08	
September-08	
October-08	
November-08	
December-08	
January-09	
February-09	
March-09	
April-09	
May-09	
June-09	
<b>Total</b>	<b>0</b>

Other div. material:

Material Diverted #6

Tons Diverted

July-08	
August-08	
September-08	
October-08	
November-08	
December-08	
January-09	
February-09	
March-09	
April-09	
May-09	
June-09	
<b>Total</b>	<b>0</b>

Other div. material:

Material Diverted #7

Tons Diverted

July-08	
August-08	
September-08	
October-08	
November-08	
December-08	
January-09	
February-09	
March-09	
April-09	
May-09	
June-09	
<b>Total</b>	<b>0</b>

Other div. material:

Material Diverted #8

Tons Diverted

July-08	
August-08	
September-08	
October-08	
November-08	
December-08	
January-09	
February-09	
March-09	
April-09	
May-09	
June-09	
<b>Total</b>	<b>0</b>

Other div. material:

**End use of diverted materials:**

(Describe where materials are going [e.g., MRF, new products, reuse])

Our first 20-ton load of densified styrofoam will be sent to market in August. We have not finalized the specific market, but it will go to a plastics recycler who will grind the material and form it into recycled polystyrene pellets which can then be used as recycled content in any new product made from polystyrene. Examples of products made from polystyrene include CD and DVD jewel cases, plastic storage bins, and a variety of office supply products such as standard "in" and "out" boxes, file dividers, etc.

**Number of Permanent Jobs Created:**

(Include full-time & part time paid positions. 1 FTE = 2080 Hours Worked)

0

**Type of Permanent Job(s) Created:**

(Provide titles of jobs created)

As volumes dictate, we may add 0.5 FTE when necessary

**Average Salaries of Jobs Created:**

(Average of all jobs created)

**Average Monthly Customers for FY 08:**

(July 1, 2007 - June 30, 2008)

915

**Average Monthly Customers for FY 09:**

(Estimate or customer lists)

	Ave. Monthly Amount
July-08	1131
August-08	919
September-08	956
October-08	995
November-08	966
December-08	832
January-09	1170
February-09	1802
March-09	1155
April-09	1080
May-09	1058
June-09	1035
<b>Ave. / FY 09</b>	<b>1091.583333</b>