



# RECYCLING RESOURCES ECONOMIC OPPORTUNITY (RREO) GRANT FINAL REPORT

## Cover Sheet

**Organization Name:** Earth Enterprises, Inc. d/b/a Waste-Not Recycling

**Project Title:** Composite Materials Processing and Remanufacturing Line

**Project Coordinator:** Todd Loose, 970-669-9912, [tloose@waste-not.com](mailto:tloose@waste-not.com)

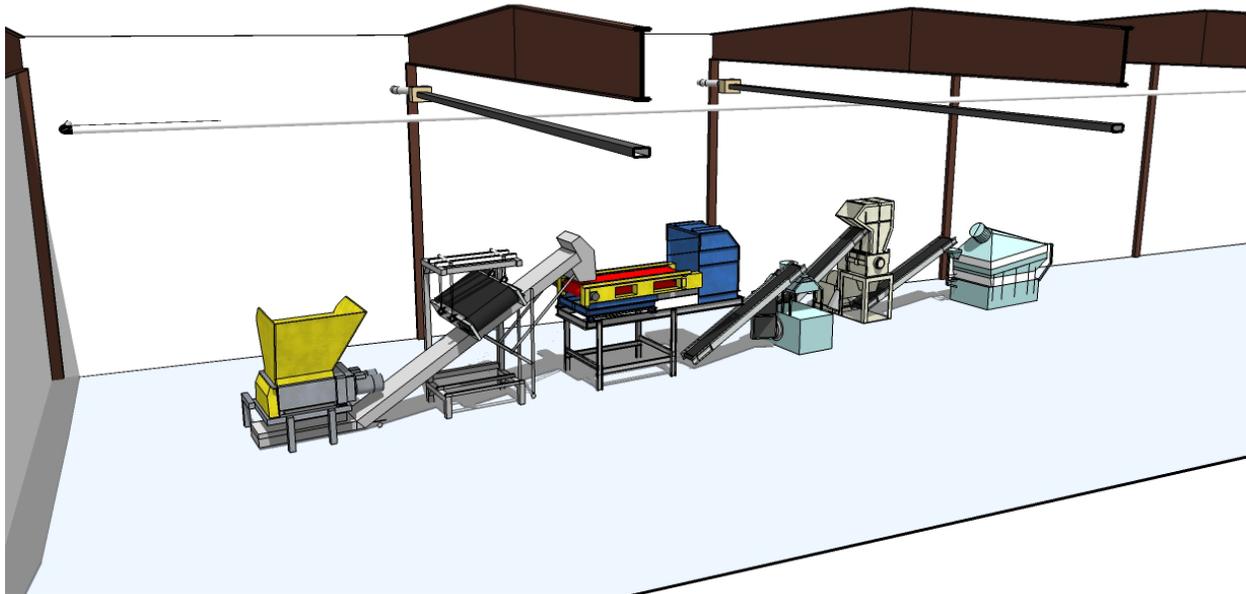
**Project Report Completed By:**

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## II. WORK PLAN

Deliverable	Completion Date	Comments
Purchase Equipment	3/1/2011	It was a challenge meeting required timelines and gathering test samples. Most suppliers worked extremely hard to help us meet our deadlines.
Equipment Delivered	6/24/2011	Equipment came in various stages. Overall the equipment was delivered in excellent condition.
Equipment Installed	6/29/2011	Coordination of 14 individual components associated with the process line was difficult but brought together efficiently in a short time frame.
Equipment testing	Various completion dates associated with each vendor.	Rain delays with foundation construction and cure time. Electrical components associated with Xcel service upgrades were on backorder.



### **III. PROJECT SUMMARY**

#### **1. Executive Summary:**

This ambitious project to expand processing capabilities has several elements including processing, collection, and remanufacturing under simultaneous development. The primary focus was to evaluate and test equipment components that could be coupled together to create an equipment line capable of processing composite materials into recyclable commodity streams. Our objective was to fully test these components with our target materials to ensure that the equipment line would be successful after completion. Waste-Not invested the time early in the project to travel to the suppliers and perform equipment testing with our targeted materials.

Equipment testing was extremely valuable in determining the final line configuration and identifying challenges in the process line. Shredders, separators, granulators and other components have configurations that must be determined based on test materials to ensure success and optimize capacity. The shredder for example can be ordered with cutting blades that range in size from 9 millimeters to 200 millimeters or larger. Determining the cutter size correlates the liberation of materials with material sizing, fines and contaminant generation, etc. We learned a tremendous amount of information from this testing and were able to avoid several pitfalls associated with our early assumptions.

We faced a number of challenges during the process. There was an ongoing battle through the course of the project timeline to manage suppliers to commit to short deadlines on both testing and equipment delivery. One of our suppliers ultimately would not make this commitment and was eliminated from the project. Of course this created additional effort as we worked to replace this supplier and acquire the needed equipment in time. Our greatest accomplishment during the project was the ability to bring the suppliers together in time and acquire the equipment following testing.

We are excited and amazed at the potential to divert large quantities of material from the landfill. The volume of materials accumulating in the Denver warehouse is 250ton. Just by liberating the metals from this project it will reduce carbon emissions, and we haven't even begun to expand to other items. We have recently been contacted by an office supply company to process 2500 paper towel dispensers and learned about a large volume of toys that are periodically landfilled. As we expand our product destruction/separation services the environmental impact will be increased tremendously.

Waste-Not has hired four new employees since being awarded the grant. Not only were the employees hired to assist with the preparation and set up of the process line, but honestly the excitement and energy related to receiving the funding from the grant empowered the company as a whole to expand. We have hired multiple sub-contractors that have put in hundreds of hours to prepare and install the line. The impact of being a grant recipient will have an economic

impact much beyond the actual dollars awarded. We expect to hire additional staff in the near future to operate the machinery.

Our next project phase will include shipping larger quantities of processed materials to be tested in our manufacturing process to create landscape signage along with shipping product produced from the line to be recycled as a commodity and incorporated into the manufacturing of snow sports products. We will continue development of the collection model required to bring snow sports equipment from a multi-state region to our warehouse for processing.

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

Our objective was to install an equipment line to process 1,000,000 pounds of snow sport equipment in the first twelve months of full operation. With the installation of the equipment line complete we are now actively working with Snow Sports Industries of America (SIA) to develop a collection network to supply materials. A pilot program was recently completed in which approximately 500,000 pounds of materials were collected. These materials are currently being stored in Denver waiting processing. We currently have one of four recent trailer loads of ski equipment in our warehouse waiting to be run through the process.

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

We are receiving widespread support from the snow sports industry. SIA has been able to communicate our project objectives to many of their local members who are actively asking questions about how to best support and utilize the recycling service. We feel that this communication will provide additional recycling opportunities as we enter these discussions. We have early indications from several of their members that they are also interested in incorporating processed and manufactured materials into their properties and products as we continue to refine these products.

We have learned that processing skis separately from boots and other equipment will provide us with more consistent materials for resale and manufacturing and increase our throughput volumes. Testing has provided valuable data in determining what particle size is best at various stages in our line as follows;

- Primary Shredding – 19mm cutting blades coupled with 30mm screens are producing a primary shred product that appears to liberate most metals from the skis and boots.
  - Reducing the screen size reduced line throughput significantly and produced excessive fines.
  - Increasing the screen and cutter size was not fully liberating metals from the materials.
- Granulation – ½ inch screens coupled with a high shear blade configuration is producing the largest plastic particle that can be effectively separated from “fluff” or light weight fractions.

- Liner removal – removing liners from the boots in the collection process reduces the light fraction generated during separation and produces a cleaner plastic stream.

Members of the community continue to bring ideas of other materials they would like us to try to process and are thankful for the opportunity to recycle more items.

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

Our original assumptions had not identified stainless steel and titanium in significant quantities in the snow sports equipment. During testing we found that these materials had the potential to cause processing difficulties that may damage equipment during operation. Once we quantified this risk we identified an additional piece of equipment to remove these materials. Waste-Not purchased and installed this additional equipment to ensure the success of the project and reduce the risk of equipment damage.

During the testing phase we also recognized that the plastic analyzer originally specified in our grant proposal had a number of limitations that would be detrimental to our project. Hand held spectrometers operate at a slightly different optical range and will not analyze dark materials. Many of the plastics associated with sporting equipment are dark or black in color and would not provide accurate results on this unit. We were able to work with the manufacturer to acquire a more robust version of this equipment with the capability to analyze dark materials.

#### **5. Communication of Project Findings**

Waste-Not and SIA are currently working with industry members to develop a collection model for the local snow sport community. Both manufacturers and resorts are involved in this model. Manufacturers have indicated a willingness to apply fees on the retail sale that would help fund the collection of materials for recycling. We are planning to use local retailers, recycle centers, and industry locations to collect materials and communicate the program to members and individuals. SIA has communicated the ability to recycle equipment to their members. Initially Siquis LTD, Baltimore, MD will utilize SIA's existing marketing structure to promote the program to members. Following the launch of this program SIA and Waste-Not will work locally to expand the marketing campaign through vendors and local resources.

We will also look to include snow sports equipment at several selected internal collection events in the coming months. We are anticipating a late fall open house in which we would invite members of the snow sports industry along with local governments and media to view the process line in action.

#### **6. Future Impact of the Project**

We are excited about the potential of this project. Waste-Not and SIA intend to extend our partnership outside of the Colorado regional area once we have optimized the equipment line and worked through any unforeseen challenges. The Snow Sports Industry is committed to

introducing a recycling program to its members. As part of this introduction there is heavy interest in using materials generated from the processing line back into new manufacturing of sporting equipment. One ski manufacturer is already discussing how to refine the materials for use as a non-structural component in their future ski lines. Ultimately this project will help the Snow Sport Industry introduce a new story of sustainability and commitment to recycling. As the need for additional processing grows, our lessons learned can be transferred to other facilities.

## 7. Financial Summary

We anticipate spending additional funds as we continue to implement and run the processing line. Below is our current summary of expenditures.

**Grant Budget Table**

Description	Grant Funds Spent	Matching/In Kind Amount (if any)	Total Amount
Personnel Salaries	\$0.00	\$56,200	\$56,200
Fringe Benefits	\$0.00		
Tuition/Fees	\$0.00		
Travel Costs	\$0.00	\$8,650	\$8,650
Materials/Supplies/Equipment(under \$5000)	\$0.00	\$8,000	\$8,000
Equipment Purchases (over \$5000)	\$420,353	\$45,228	\$465,581
Contractors/Subcontractors	\$0.00	\$13,458	\$13,458
Consultants	\$0.00		
Training/Education	\$0.00		
Marketing/Advertising	\$0.00	\$0	\$0
Other Direct Costs	\$0.00	\$6,000	\$6,000
Indirect Costs	\$0.00	\$104,600	\$104,600
Total Project Cost:	\$420,353	\$242,136	\$662,489

## **8. Conclusion**

We believe that establishing an equipment line capable of processing composite materials will open the door to recycling products and materials not historically considered recyclable. We have found that the commitment of the snow sports industry to follow through on their desire to recycle their waste equipment displays and exemplary and reproducible behavior. We are thrilled to be creating a “producer responsibility” program that is not mandated. We hope that this can be reproduced in other industries.

## **9. Community Leader Contact Information**

- a. Susie Gordon – Senior Environmental Planner – City of Fort Collins – 970-221-6265 – Sgordon@fcgov.com
- b. Kevin Berg – Operations Manager – Summit Recycling Project – 970-686-5703 - recycle@colorado.net
- c. David Ingimie – President – Snow Sports Industries of America - 703-506-4225 - Dingemie@snowsports.org



Equipment arrives and gets installed.



