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Transforming Trash



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By Jeannine Rossa

When my husband and I married, we received two beautiful glass bowls among our wedding gifts. One was green and the other, a deep, amethyst purple. Both were big and solid, yet held the light, with a unique dimpled surface. We were surprised to learn that they were made from recycled glass by a company called Fire and Light in Arcata, California. I held a bowl in my hands. Was it really made from my friends' discarded mayonnaise jars and wine bottles?

Ever since I was a child in the 1970's, I have been curious and intrigued by recycling, as well as a committed recycler. I knew - or thought I knew - that most glass was trucked off to plants where it was melted down for reuse. But these glass bowls had me interested. If Arcatans were using their glass to make value-added products (and thereby saving the gas and effort to truck glass to distant destinations, as well as adding jobs to the local economy), then what did our other regional communities do with their recycled glass? I decided to find out.

In researching this article, I talked to California recyclers in Arcata, Fortuna, Crescent City, and Redding; and Oregon recyclers in Grants Pass, Eagle Point, Medford, and Ashland. I found that our region's sanitation and recycling companies are an innovative bunch, and that artists throughout our region are also part of the solution by committing to using recycled glass to make gorgeous recycled glass products. I also found out that I knew very



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little about glass recycling. So first, some glass facts.

Recycled Glass Facts

In California and Oregon, most of the recycled glass is used to make new glass containers (bottles and jars) and fiberglass insulation. The California Integrated Waste Management Board estimates that 88% of the recycled glass in California is used by the container industry and approximately 12% by fiberglass manufacturers. However, there are other uses: recycled glass beads are mixed in paint to create the reflective lines and signage on highways and streets. Recycled glass can be crushed (to specifications) and substituted for rock aggregate in road beds, utility ditches, and drainage areas (like septic fields). Glass can also substitute for sand in sandblasting or the manufacture of “gritty” products like sandpaper. Glass powders can be added to paint, stucco, and plastic. And of course, recycled glass can be used for a variety of art forms.

A primary manufacturing advantage is that recycled glass melts at a lower temperature than virgin glass; therefore, manufacturers save energy. For local sanitation companies, recycling glass keeps it out of landfills. Glass is bulky and does not decompose, so it just takes up space – an important commodity in our region, especially when one considers that due to landfill closures, Humboldt County communities truck their refuse to the Dry Creek Landfill in Jackson County, Oregon.

All of the recycling centers in our region sort glass by type

and most of them sort by color. The centers are picky about glass sorting because all glass is not created equal. Different types of glass, for example, bottles and jars, Pyrex cookware, drinking glasses, light bulbs, or windows, all have slightly different chemical compositions. These differences affect the properties of the melted glass, as well as melting temperatures. Therefore, the different types of glass cannot be mixed together during the smelting process. Mark Loughmiller, Executive Director of the Arcata and Eureka Recycling Centers, explains that when manufacturing a new product with recycled glass, even small amounts of the wrong type of glass can create weak spots in the product, lower the temperature of a smelter or cause dangerous flare-ups, resulting in expensive furnace repairs. For these reasons, glass purchasers specify what kind of glass they will buy from recyclers. The bottle manufacturers use only container glass. Fiberglass producers prefer plate (window) glass, according to the California Integrated Waste Management Board; however they usually use container glass because the availability of plate glass fluctuates widely.

Container glass must be sorted by color because container manufacturers often only buy particular colors of glass. For example, the only bottle manufacturer in Oregon, Owens-Illinois in Portland, uses clear and brown glass, but little green. Conversely, California manufacturers like the Gallo Glass Company in Union City use a lot of green to make bottles for the wine industry. It is easiest to melt glass containers of one color together to make new containers of the same color: green glass for wine bottles, brown glass for beer, clear glass for mayonnaise, salad dressing, or canning jars. Fiberglass manufacturers do not require that glass be sorted by color, but they do have other stringent requirements. To ensure production of consistent fibers, they require that recycled glass be crushed to certain "grain" size specifications and cleaned before it is acceptable.

Once container glass is sorted by color, "contaminants" must be removed. (Bottle labels are easily burned off in the glass smelting process, so these are not a problem.) Besides the complications of glass type, objects like lids, ceramics, and stones can cause enormous problems for manufacturers. Stones become embedded in bottles. Metal objects can damage a furnace. According to the California Integrated

Waste Management Board, even pulverized ceramics and stone will not melt in the smaller furnaces of fiberglass plants. Recent technology development, spearheaded by the Gallo Glass Company, allows glass container manufacturers to use recycled glass contaminated by ceramics and stones. However, this technology has limits on the amount of contamination it can tolerate, and requires more energy to process cullet (already sorted and smashed glass) than conventional beneficiation facilities.

For all of these reasons, recycled glass purchasers have very strict contamination standards. Denise Wolgamott, Recycling Coordinator for Rogue Disposal in Medford, OR, remembers when Rogue Disposal trucked its container glass to Portland. "If the buyer found even a small amount of contamination, the entire load would be rejected. Everyone in the Oregon glass recycling industry had problems."

Local Industrial Uses for Recycled Glass

So given all this information, where does our recycled glass go? What do our regional recycling facilities do with it?

Ashland Sanitary and Recycling of Ashland, OR, uses all the glass from its curbside recycling and drop-off centers as "rock" for access roads on its closed Valley View transfer station. The glass is pulverized and turned into fine sand that is then mixed into the road base. Risa Buck, Waste Reduction Educator for Ashland Sanitary, says that, "Using recycled glass eliminates the need to mine more rock from local

quarries, and the expense of trucking the glass 300 miles to a purchaser." This innovative use for local glass is why Ashland has what is called a "two stream" recycling process: the glass always needs to be separated from the rest of the recyclable materials, rather than tossed into a bin with everything else.

Rogue Disposal of Medford, OR, also crushes all its glass - including all the glass collected by Southern Oregon Sanitation from the outlying areas of Oregon's Jackson and Josephine Counties - into aggregate for its own use. The pebble-sized glass "cullet" is used to cushion drainage and methane-collection pipes at the Dry Creek landfill. At the landfill, Rogue Disposal is building self-contained, 12-acre "cells" with four feet of geosynthetic clay liners and other materials protecting the soil and ground water below. As one cell is filled with trash, Rogue Disposal crews are busy constructing the next cell. Each cell costs \$410,000 to construct; using crushed glass for aggregate helps offset those costs. Rogue Disposal is allowed to count the glass tonnage as "recycled" because it is being used for a purpose that would otherwise require a new material, in this case, rock mined from a nearby quarry.

Other communities, such as Arcata, Eureka, and Fortuna, CA, would like to use more glass as aggregate (rock) replacement, but so far, there is no organized program. Local contractors sometimes request glass cullet for use in cement production, for example, or in road beds. However, says Loughmiller, the primary impediment to organizing an aggregate

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Regional Recycling Information:

Arcata and Eureka Community Recycling Centers: www.arcatarecycling.org

Ashland Sanitary and Recycling: www.ashlandsanitary.com

Humboldt County Waste Reduction and Recycling Guide: www.humboldtrecycling.org

Jackson County Recycling Directory: www.roguesmart.org/directory

Jackson County Recycling Partnership: <http://jcrecycle.org>

City of Redding Municipal Utilities, Solid Waste Division:
www.ci.redding.ca.us/solwaste/swmain2.cfm

Rogue Disposal and Recycling: www.roguedisposal.com

Southern Oregon Sanitation: www.sos.com

State Recycling Information:

Oregon: <http://www.deq.state.or.us/lq/sw/recovery/glass.htm>

California: <http://www.consrv.ca.gov/DOR/index.htm>

gate program in Humboldt County is that there is no local facility to process the glass. Glass used for construction (e.g. as a cement additive) or road aggregate is usually cleaned and then smashed to a specific, small “grain size.” “It would defeat the purpose,” says Loughmiller, “to ship the glass to a processor in the Bay Area and then ship it back north [to be used].” The Arcata Community Recycling Center is building a new facility, and Loughmiller is hopeful that it will have the capability to process recycled glass into construction and road-grade aggregate.

Several years ago, the City of Redding, CA, tried its hand at turning glass into a product needed by Knauf Insulation, a global fiberglass insulation manufacturer with a plant in Shasta Lake, CA. Larry Miralles, Redding’s Municipal Utilities Manager in Solid Waste, remembers that the City worked to develop a way to “beneficiate” the glass: to sort, clean, and crush it to a specific size. However, the economics did not play out.

Shipping Glass to Manufacturers

All of the California recyclers interviewed for this article ship glass to a company called Strategic Materials. Strategic Materials, Inc. is the largest purchaser of scrap glass in North America, as well as the largest glass processor, selling approximately 1.3 million tons of glass cullet each year from its 31 facilities nationwide.

Jordan Kekny, owner of Julindra Recycling in Crescent City, explains that “because of the deposit law, the state [of California] pays me a processing fee for handling glass. Otherwise, the costs of transport would eat up all my profits.” California’s Beverage Container Recycling and Litter Reduction Act of 1986 (Assembly Bill #2020) and the “Bottle Bill Amendment” of 2000 (Senate Bill #332) set redemption values for certain types of beverage containers. In addition, the State pays a portion of the California Redemption Value (CRV) to recycling drop-off centers and certified recycling processors every time a load of container glass (including non-beverage glass) is collected from consumers and shipped to a processor like Strategic Materials. An extra bonus is added

for color-sorted glass. For almost 20 years, California law has also required manufacturers to use at least 35 percent post-consumer cullet for glass food, drink, and beverage containers manufactured in California, and at least 30 percent for fiberglass building insulation. The end result is a network of recyclers, small processors, and large “finishing” processors supporting California’s container and fiberglass industries.



PHOTO: PAUL HOSTEN

Fire and Light glass artisan Jesse Cobb quickly pulls away a ladle of molten glass after pouring the correct amount in a graphite mold. He will then use a press to make the bowl shape, and skillfully finish the bowl’s surface with a blowtorch. All of the work is done by eye.

The only problem with California’s system is that when recycled glass is used locally, the recycling center or processor must forego the CRV rebate. This does not encourage local use of recycled glass. However, the California recyclers interviewed for this article were all adamant in their support for local use of recycled products, especially glass. Kris Mobley of Eel River Disposal tries to support contractors who need glass for cement or other construction uses. “We don’t get paid the [CRV] deposit if we take it and put it into aggregate,” he says. “But we still think that it’s a great idea.” Keeping glass local can also be financially smart. Despite the CRV rebates, Loughmiller has found that it costs the Arcata and Eureka Community Recycling

Centers \$40 per ton to ship glass worth only \$30 per ton. Therefore, keeping glass local saves them \$10 per ton – the proverbial money in the bank. Loughmiller estimates that the Arcata Recycling Center sells approximately 15–20% of its clear container glass to the local recycled glasswares company, Fire and Light.

Entrepreneurial/Art Uses

Besides the innovative and hard-working recyclers, I found three different small companies in Northern California and Southern Oregon making beautiful products out of recycled glass: Fire and Light in Arcata, CA; Bonfire Glass Tile in Bend, OR; and Aurora Glass in Eugene, OR. All three companies are part of our regional solution to waste management.

Fire and Light was formed in 1995 as a partnership between the Arcata Community Recycling Center and a group of local investors who wanted to improve recycling economics, create jobs, and keep things local. About 30 people brainstormed over living room potlucks. After local glass artist George Bucquet brought in some small molded glass bowls he had made, the group had its “Eureka” moment, bought George’s molds, and Fire and Light was born. Eventually, the company was purchased by locals John and Natali McClurg who improved and expanded all aspects of the business. It took years to develop the formulas for the amount and type of recycled glass content, colors, melting and annealing temperatures, furnace construction, mold materials, and the material of the presses to create the signature textured surface. John McClurg exclaims, “There were so many furnaces of bad glass!” But the McClurgs persevered and Fire and Light has become very successful. They ship dinnerware (bowls, glasses, plates) and giftware (vases, candlesticks, art pieces) to galleries and stores all over the country. If you want to get in the door of one of their famous “seconds sales,” you have to get in line the day *before*. Spouses have apparently been pressed into service as “line sitters” for this event.

So how does Fire and Light use recycled glass? It buys approximately 8–10 tons per month of clear container glass collected at the Arcata Recycling Center. Products use 90% recycled glass, and are made with nine different colors. (Two colors can’t be made with recycled glass). In order to eliminate glass contamination, Fire and Light

sorts each bin of recycled glass by hand, manually removing caps and rings. Glass is run through a crusher, color is added, and the cullet heated. Then the colored glass stock is melted at 2400 degrees Fahrenheit. Six hundred pounds of glass are melted per night, per furnace. Different furnaces are used for different colors, all of which require slightly different temperatures. Once the glass is molten, ladlefuls are scooped out, poured into a graphite mold, pressed, partially cooled, and then skillfully touched up with a blowtorch to eliminate any slight visual imperfections. Then, the pieces are placed in “annealing” ovens which slowly cool the glass from 900°F to 85°F overnight. McClurg is proud of his glass artisans. “It takes skill to press and shape the glass. Each piece is made by hand, without timers or automation.”

Not surprisingly, Fire and Light is committed to recycling in all aspects of its business. McClurg is always thinking about how he can recycle more. The factory floor is made of recycled steel; several presses came from a closing Brooklyn glass factory; and Fire and Light shreds and presses about 1000 pounds of cardboard a month from local businesses to make packing material. In addition, Humboldt State’s Engineering Department is working with McClurg to design a heat waste recycling system to decrease the energy needed to heat the furnaces.

A much newer, regional, recycled glass business is Bonfire Glass Tile in Bend, OR. Owners and glass artists Mare Schelz and Jamie “Twig” Branch started the business in 2005 from a studio next to their home. They make almost 100 different styles of glass tile using clay molds of their own design. The tiles are usually used as accent pieces in splashboards, showers, and countertops. A resident of Southern Oregon for over two decades, Schelz has a Bachelor’s of Fine Arts from Southern Oregon University in glass design.

To create tiles, Branch cuts thin sheets of non-recycled colored glass and fits them into clay molds. He then sprinkles recycled cullet over the colored glass and bakes the piece in a kiln at 1500 degrees Fahrenheit. The resulting tile is made of 90% recycled glass, durable, and beautiful. “A lot of glass

tiles are painted,” says Schelz, “but ours is fused, so the color is not going to come off.”

The cullet that Schelz and Branch use is clear, scrap window glass from a Portland factory. Window glass has no recycling market in Oregon, so all of this glass would otherwise go to a landfill. Schelz explains that they can only use



Wine bottles await transformation into green cullet.

PHOTO: ABIGAIL HEPBURN

... even small amounts of the wrong type of glass can create weak spots in the product, lower the temperature of a smelter or cause dangerous flare-ups, resulting in expensive furnace repairs.

plate glass to achieve the proper fusion of clear and colored glass.

Even though their business is only two years old, Bonfire Glass Tile has already been recognized for its environmentally friendly practices on the tile industry’s Web site, www.aboutglasstile.com. Schelz and Branch use Pacific Power’s “Blue Sky” renewable energy program for electricity; their home production studio is constructed with recycled materials; they use low kiln settings; and they use reusable clay molds instead of energy-intensive graphite or wasteful plaster molds.

Aurora Glass in Eugene, OR also uses window glass to create their products. In 1997, the charity St. Vincent de Paul started Aurora Glass to provide skilled job training and stable employment opportunities for low-income people. The foundry is also part of St. Vincent de Paul’s “strategic recycling initiative for a healthier community.” Aurora Glass makes architectural accents, gifts, ornaments, and jewelry in seven colors out of molded or blown recycled glass.

Thom Halvorson, an Aurora Glass Artist who has been with the group since the early years, explains that Aurora uses window pane glass because its properties tend to vary less than container glass. Windows have to meet certain specifications for safety, visibility, thickness, etc. Halvorson is also proud that Aurora Glass provides a recycling outlet for window glass in the Eugene area. Without Aurora all the window glass would end up in the landfill. Most of the glass used by Aurora is provided by contractors: leftover from house remodels or construction. Aurora also takes glass from individual citizens, for example, when someone has to replace a broken window. Aurora uses 1-2 tons of glass per month.

The process that Aurora uses is similar to both Fire and Light and Bonfire Tile. Window pane glass is already very fluid, but Aurora changes the consistency of the window glass, making it even more liquid. Then, a minute amount of coloring is added to the batch. The glass is melted at 2300 degrees Fahrenheit, 500 pounds at a time. The furnaces run “24/7.” They run a color a week. Aurora glass artisans make every piece by hand using molds and stamps as well as blowing the glass. Aurora welcomes tours as well as donations of window glass. However, they have limited storage space, so if you have a pickup load, call ahead to make sure they can take it.

Regional Pride

Without an economically viable recycled glass market, the Oregon communities are turning to innovative and environmentally sound ways to recycle glass. In California, where the State facilitates the recycled glass market, local recyclers are still trying to “close the loop” and employ their neighbors. Once again, I find that our regional entrepreneurial spirit is alive and well. I also found out what went into my “Fire and Light” bowls: mayonnaise jars! Happy recycling, everyone. ■

Jeannine Rossa has recycled all over the State of Jefferson since 1974. She lives in Jackson County, Oregon with her husband, daughter, dog, cats, chickens and a three-story “recycling tower” in the barn.