

Glass Recycling

- Background
- Sources
- Processing
- Quality
- Applications
- Outcomes
- Phoenix Market

Western Glass Recycling

❑ Strategic Materials

- ❑ Processor of Approx 90% of Western Glass
- ❑ Plants in Commerce, Vernon, Madera, San Leandro, Hayward, Sacramento and Mexicali, BC
- ❑ Las Vegas Plant 1st Q 2011, Phoenix Under Review
- ❑ Depot in Portland
- ❑ 950k Tons/Year of Recycled Glass Output
- ❑ Primary Supplier to Western Container and Fiberglass Furnaces - OI, SG, Gallo, Fevisa, Anchor, OC, JM, Knauf, CertainTeed

Western Glass Recycling

Why Does Glass Recycle So Well?

Sustainable

- Endless Closed Loop

- No Degradation in Quantity or Quality

- True Cradle to Cradle Process

Air Quality Improvements

- CO₂, NO_x, SO₂, PM₁₀

Industry Benefits

- Energy Savings (lower melt point)

- Production Improvement

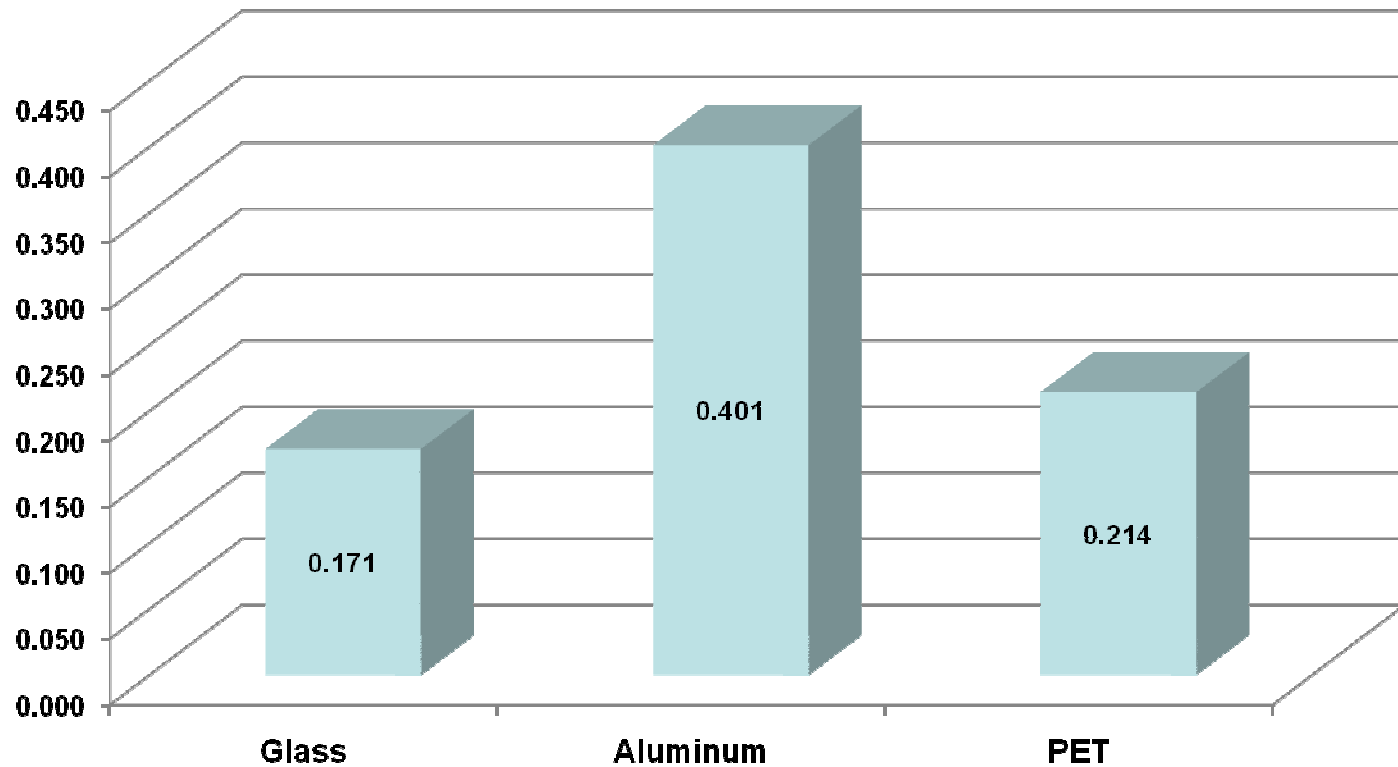
- Maintenance Savings

Western Glass Recycling

- ❑ Carbon Footprint – Complete Analysis
 - ❑ RM Extraction and Processing
 - ❑ RM Transport
 - ❑ Production Process
 - ❑ FG Transportation
 - ❑ End Of Life Management
 - ❑ Cradle to Cradle - Full Life Cycle

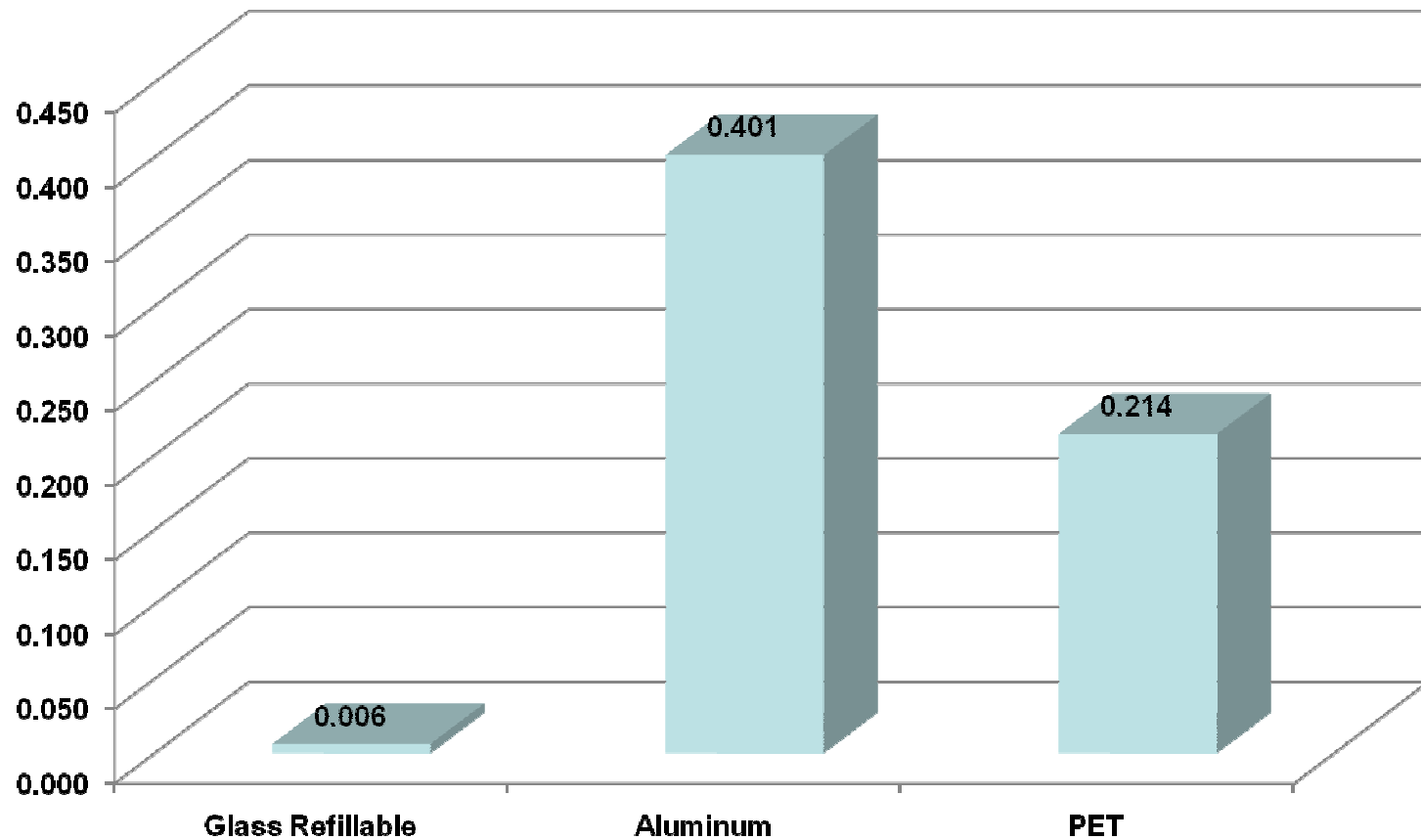
Western Glass Recycling

kg CO₂/Container



Western Glass Recycling

kg CO₂/Container



Western Glass Recycling

Sources

Buy Back Centers/CZs

- Color Separated, Clean Glass

MRFs

- 3 Mix - Dual and Single Stream
- Color Separated Pulled Off Line

Window Manufacturers

- Factory Defects, Breakage

Western Glass Recycling

❑ Quality

❑ Metrics

❑ Ceramic Contamination

- ❑ 40 PPM by Weight

❑ Organic Contamination (paper)

- ❑ .1%

❑ Color Purity

- ❑ 95% Flint, 80% Amber, 75% Green

❑ Other

- ❑ Heat Treated Glass, Metals, Rocks

CERAMICS



Western Glass Recycling

Quality

Buy Back Center/Collection Program

Bottle Bill States

Excellent Quality

High Demand

Minimal Losses

Suitable for Container Furnaces and Other Applications.

Buy Back Glass



Window Glass



Western Glass Recycling

❑ MRF Curbside Glass

❑ Source Separated Curbside

- ❑ Minimal Contamination (Ceramics)

- ❑ Suitable for Container and Fiberglass

- ❑ Moderate Cleaning and Processing Required

- ❑ Fine Particles ($< 1/4''$) are Salvaged

❑ Dual Stream (No Paper)

- ❑ Some Organic/Ceramic Contamination

- ❑ Suitable for Container and Fiberglass

- ❑ Moderate Cleaning and Processing Required

- ❑ Fine Particles ($< 1/4''$) are Salvaged

Dual Stream Mix



Western Glass Recycling

❑ MRF Curbside Glass (Phoenix)

❑ Single Stream

❑ Mixed Colors

❑ Good to Very Poor Quality

❑ Heavy Organic/Ceramic Contamination

❑ Extensive Cleaning and Processing Required

❑ Fine Particles (< 1/4") are Lost

❑ Heavy Processing Losses Due to Rejects

❑ Long Expensive Trip to Landfill in Some Cases

Single Stream Mix



Western Glass Recycling

- ❑ MRF Curbside Glass (Phoenix)
 - ❑ Single Stream Best Practices
 - ❑ Educate Customers
 - ❑ No Ceramics
 - ❑ No Pyrex
 - ❑ Avoid Over Compaction/Handling
 - ❑ Remove From Line Quickly
 - ❑ Retain Size Where Possible
 - ❑ Vacuum Paper at Drop Points
 - ❑ Screen off Fines

Western Glass Recycling

❑ Applications

❑ Container Furnaces

- ❑ Container Glass Only, Color Separated

- ❑ Most Run at 20-60% Cullet, Max 80%

- ❑ Benefits include Lower Energy Usage, Improved Air Quality, Increased Furnace Life, and Increased Production.

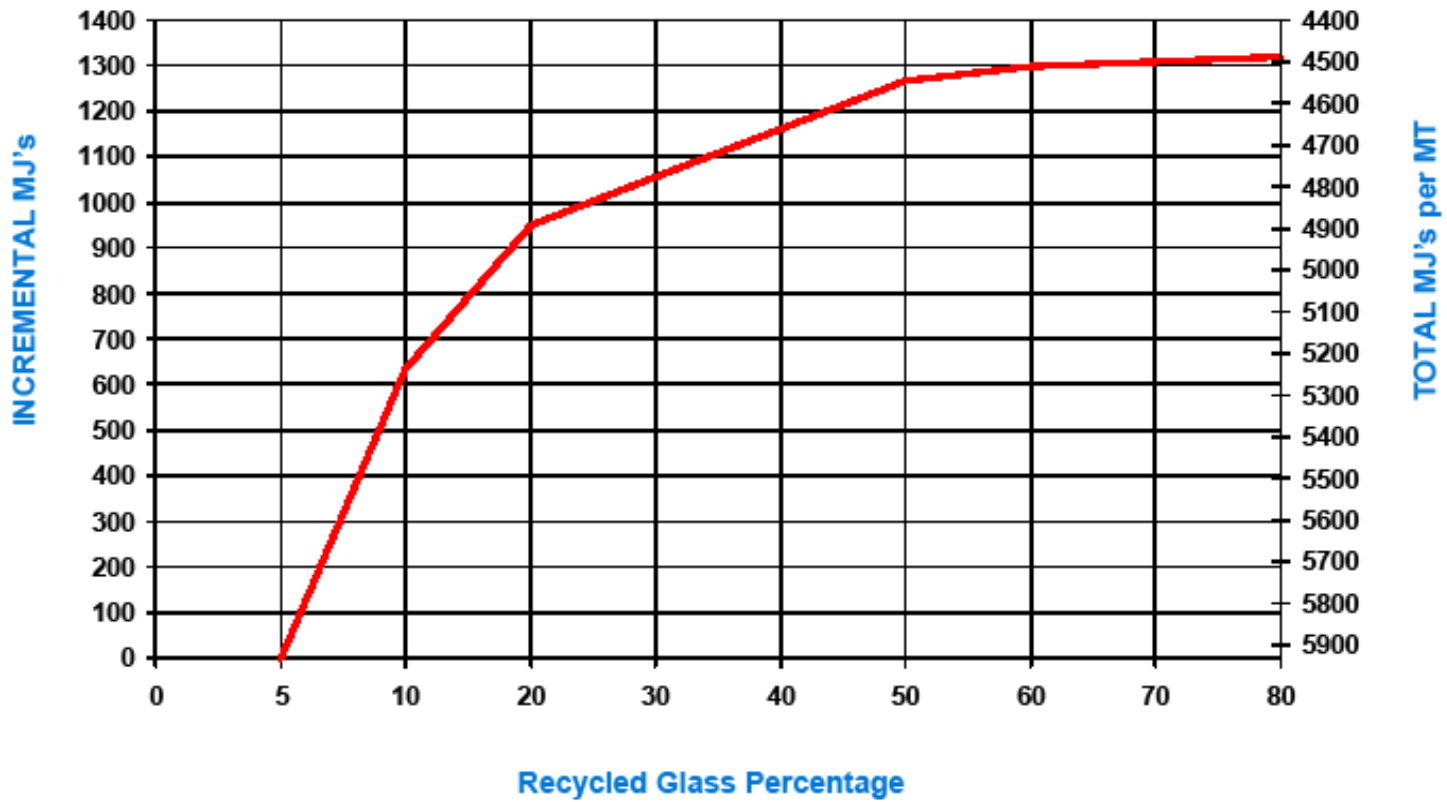
- ❑ Negatives are Contamination and Color Variability.

Processed Amber



Energy Savings

Estimated Impact Of Recycled Glass On Energy Consumption



Western Glass Recycling

❑ Applications

❑ Fiberglass Furnaces

- ❑ Require Fine Grind Product
- ❑ Most Run at 30-60% Cullet
- ❑ Primarily 3 Mix and Window Glass
- ❑ Benefits include Lower Energy Usage, Air Quality, Increased Furnace Life, and Increased Production.
- ❑ Negatives are Contamination, Color Variability, and Increased Production Costs with Electric Furnaces.

Western Glass Recycling

Applications

Limiting Factors

- Freight Costs, Inbound and Outbound

- Depressed Housing Markets

- Container Furnace Consolidation

Sustaining Factors

- Economic Benefits

- Reduction of Carbon Footprint

- Green Marketing

Fine Grind Glass



Western Glass Recycling

Outcomes

- Color Separated – Best Material, Max Application Flexibility.

- Dual Stream - Best Curbside Material, High Application Flexibility.

- Single Stream - Contaminated, can be cleaned if customers are educated and best practices are followed

 - Get Glass Out Early

 - Minimize Handling

 - Air Systems to Remove Fiber

Western Glass Recycling

Arizona Glass

- Primarily Curbside 3 Mix
 - Moderate Quality
 - Potential for Improvement

Other Glass

- Collection Programs
- Color Sorted Glass at MRFs
- Window Glass

Western Glass Recycling

□ Arizona Glass

□ Markets

- Container Furnaces – Fevisa, OI
- Fiberglass Furnaces – OC (Eloy), JM
- Green Construction - Pavers, Tiles....

□ Processing Requirements

- Approx \$4 Million in Capital
- Cleaning Systems, Ceramic Detection, Color Sorting
- Fine Grind Systems
- Rail Served