

INNOVATIVE METHOD FOR PROCESSING MIXED COLOR RECYCLED GLASS TO CLEAN, USABLE PRODUCTS

SWANA Florida Sunshine Chapter - 2022 Summer Conference

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RECYCLING PROCESS

- Commingled Products- Lower Reject/Contamination Rate
 - Glass
 - Plastics
 - Metals
 - Paper Products
- Single Stream – Higher Reject/Contamination Rate
 - Glass, Plastics, Metals, Paper Products and ‘Other’ Materials (Non-Recyclable) Mixed



Sorted, Mixed Recycled Glass (Note lids, labels and contents)

Glass Products (Partial List)

- Blasting Abrasives
- Partial Substitute for Cement in Concrete
- Concrete Fine/Coarse Aggregate (In Some Mixes)
- Quartz/Glass Countertops, Terrazzo (May Be Color Sorted)
- Landscaping/Fish Tank Pebbles (May Be Color Sorted)
- Beach Construction/Reconstruction (May Be Color Sorted)

Potential Markets

- Blasting Abrasives
 - Commercial Surface Cleaning Operations
 - No Free Silica Dust
 - Harder Than Many Other Abrasives (Longer Lasting)
 - More Abrasive Than Other Materials
 - Labels/Residue Must be Removed (Can be Sterilized)
 - Must be Dry and Free Flowing



Potential Markets (Cont'd)

- Partial Substitute for Cement in Concrete
 - Removal of Labels/Residue Required
 - Multi Color Usually Acceptable
 - Crushed/Processed to a Fine Cement-Like Powder
 - Can be PreMixed With Cement as a 'Highly Reactive' Pozzolan
 - Must be Free Flowing
 - Must Meet ASTM Standard C1866 and C1866M
 - Can Replace 10 - 40% of Cement in Many Concrete Mixes



Potential Markets (Cont'd)

- Concrete Fine/Coarse Aggregate in Some Mixes
 - Removal of Labels/Residue Required
 - Multi Color May be Acceptable
 - Crushed/Processed to Suitable Size(s)
 - Must be Free Flowing
 - May be Limited to Non-Structural Applications
 - Primarily Used for 'Secondary' Applications (Architectural Features, Walkways, Patios, Etc.)



Potential Markets (Cont'd)

- Quartz/Glass Countertops, Terrazzo
 - Removal of Labels/Residue Required
 - Color PreSorting May be Required
 - Crushed/Processed to Suitable Size(s)
 - Must be Free Flowing
 - Sterilization May be Required



Potential Markets (Cont'd)

- Landscaping/Fish Tank Pebbles
 - Removal of Labels/Residue Required
 - Color PreSorting May be Required
 - Crushed/Processed to Suitable Size(s)
 - Must be Free Flowing
 - Sterilization Probably Required (Fish Tank Pebbles)
 - May Require Tumbling to Ease Sharpness (Similar to 'Beach Glass')



Potential Markets (Cont'd)

- Beach Construction/Reconstruction
 - No Free Silica Dust
 - Harder Than Sand – Lower Degradation
 - Multi Color or Color Separated
 - No Sharper Than Most Sand
 - Removal of Labels/Residue
 - Must be Free Flowing
 - May be Produced in The Jurisdiction (Make Your Own)



Fine 'Glass Sand'

Glass Processing Methods

- Manual/Automated Sorting From Mixed Recyclables
 - Manual/Automated Color Sorting
- Crushing/Granulation/Rough Sizing
- Removal of Labels/Residue
- Sterilization
- Tumbling
- Production of Final Products (Meet Specifications)



Sorted, Mixed Recycled Glass



Primary Glass Crusher Product



Crushed, Tumbled, Cleaned Glass Product



Fine 'Glass Sand'

Manual/Automated Sorting

- Remove Glass from Mixed Recyclables
 - Manual Sorting
 - Hand Picking from Recyclables Stream (Can be a Danger to Workers)
 - Color Sorting Difficult
 - Automated Sorting
 - Mechanized Glass Identification and Removal from Recyclables Stream (Not Usually Dangerous to Workers)
 - Color Sorting Possible

Crushing/Granulation/Rough Sizing

- Preliminary Product Sizing
- Magnetic Removal of Metals
- Air Blast Removal of 'Fluff'
- Removal of Oversize Material
- Fairly Uniform Product Size
- Wet, Odorous Product



Primary Glass Crusher System



Primary Crushed Product Trommel



Primary Trommel Rejects

Removal of Labels/Residue

- Wet Method
 - Dunk Tank
 - Produces a Wet Sludge and Waste Water
 - Not Totally Effective
 - Not Considered Here
- High Temperature Processing
 - Process in a High Temperature Oven (Not Incineration)
 - Removes Labels and Residue
 - Screen Product from Residue
 - 100% Dry Process
 - Can be Fueled by Landfill Gas or Other Heat Source
 - Can Produce a Sterilized Product

Production of Final Materials

How Do We:

- Produce a Usable Product
- Fairly Uniform Product Size
- Clean Product
- Dry, Odorless Product
- Foot/Child/Pet/ Fish Safe
- Sterilized Product
- Produce Specialized, Specific Products
- ????????????

High Temperature Processing

- Removes Contaminants
- Can Process Most Any Type of Glass (Containers, Float, Laminated, other)
- Dry, Odorless Product
- Free Flowing Product
- Foot/Child/Pet/ Fish Safe
- Sterilized Product

Thermal Processing System

- High temperature Oven (800F – 900F)
- Landfill Gas Firing Possible (Or Other Heat Source)
- Remove Organics (Paper, Plastics, Adhesive, Contents)
- Screen Residue From Product
- Clean/Sterilized Product
- Free Flowing Product
- Vacuum Handling of Dry Product to Storage
- Suitable for Subsequent Processing
 - Secondary Crushing
 - Secondary Sizing
 - Packaging for Sale



Uses for Thermally Processed Glass

- Blasting Abrasives
- Partial Substitute for Cement in Concrete
- Concrete Aggregate (In Some Mixes)
- Composite Glass Countertops/Terrazzo (May be Color Sorted)
- Landscaping/Fish Tank Pebbles (May be Color Sorted)
- Beach Construction/Reconstruction (May be Color Sorted)

Summary

- Limitless Uses/Products – Thermally Processed Glass
 - Clean Products (No Residue)
 - Free Flowing Material
 - Sterilized Products Possible if Needed
 - Uniform Size Gradation
 - Color Sorted Products
 - Most Any Type of Glass Can Be Processed
 - High Value Uses Possible

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