Technology Brief

RECYCLING OF CRUSHED GLASS INTO COATING PRODUCTS

Key Words	
Materials:	Glass
Technologies:	Coatings
Applications:	Elastomeric Roof Coating
Market Goals:	Replace currently used materials for cost and health factors.
Abstract:	Use of finely ground recycled glass in an elastomeric roof coating.

Glass is a hard, relatively inert material that can be processed into finely graded products for many applications. In particular, finely graded glass may have value in various applications known as *industrial fillers*. This Technology Brief describes a project to test the use of finely ground glass as a filler for elastomeric roof coatings. The issues and results of this project should apply to a variety of industrial filler applications.

Industrial mineral fillers range in size from coarse grit to very fine powders. In products such as paint and elastomeric coatings, finely sized fillers provide volume and increase viscosity. These applications typically require a mesh size finer than 150 for coatings, and finer than 325 mesh for smooth surface paints.

Motivation

Some of the common materials currently used as industrial mineral fillers, such as flint, talc, and various dry clays, contain naturally occurring crystalline silica in varying amounts. It has been recognized that crystalline silica-containing dust can cause serious lung disorders such as silicosis. Thus, concerns for worker health have prompted increased interest in identifying substitute materials.

While glass is produced from silica sand, the manufacturing process converts the crystalline structure to an amorphous state. Tests have shown that recycled container glass contains less than 1% crystalline silica, which may make glass an excellent substitute from the perspective of worker safety.

Industrial mineral fillers are less sensitive to variations in glass chemistry than recycling into new containers. Therefore, glass sources for many of these types of uses can be post-consumer container glass, post-industrial plate glass, or a mixture of the two.

Challenges

Paint and coating applications are especially sensitive to organic contamination. For example, one unwashed jar of mayonnaise could provide enough residue to bacterially contaminate many gallons of paint. This contamination might not be evident until sometime after the paint's application and could cause product failure. Adding fungicides and preservatives to the coating formulations could counter this problem. This study did not investigate washing options.

If a source is available, it may make sense to use post-industrial glass for applications where the glass powders will be in intimate contact with potential food for bacteria because post-industrial glass tends to be much cleaner than post-industrial glass.

The need for color consistency also varies between applications. The color of finely graded post-consumer glass runs from light gray (for color-sorted clear containers) to dark gray (for mixed-color containers). In many applications this may not be an issue, but some

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uses may require crushed post-industrial glass, which usually appears to be very white.

Processing

The opportunities for obtaining glass fines vary by locality. Some industrial operations generate glass fines as byproducts of other processes. It may be possible to obtain these fines and apply additional value-added processing in the form of air classification for size separation. Size reduction to produce powders directly from scrap glass with proper consistency requires multiple steps. One strategy is to first use impact crushers to reduce the size and for coarse screening and contaminant separation. Then, ball mills or vibratory mills can perform secondary size reduction, followed by drying and size separation through vibratory screens or air classifiers.

Elastomeric Roof Coating

This project developed formulations using glass as a filler in elastomeric roof coatings. Elastomeric roof coatings, as the name implies, are blends of polymers and fillers that are spread on roofs to minimize the effects of weathering. The coatings, when dry, form a tough, durable, sealed surface that expands and contracts with the building structure. The coatings are usually white for heat reflection.

Two formulations using glass were developed and compared with two standard commercial products under weathering conditions on a roof through several seasons. Then one formulation was chosen for application to an existing building.

The glass source was mixed color, post-consumer glass from local collection systems, although the study concluded that clear glass, especially post-industrial, would be best to maximize reflectivity. A basic laboratory recipe was developed and used to evaluate the different sources of glass, particle type and fineness, and the effect of glass color. The formulation contained the following ingredients: binder; co-solvent; dispersing agents; thickener; pigments, fire retardant, recycled glass, de-foamer; preservative, and anti-fungal agent.

The issues treated in this project included color, gradation, mixability, bacterial growth, product consistency, and general applicability. The findings of the test showed that finely ground recycled glass can be used in the manufacture of waterborne coatings. Glass can be substituted directly on a volume or weight basis, depending on fineness and particle size distribution. The commercial availability of clean recycled glass in sizes ranging from 150 to 200 mesh would allow the use of this material in high-thickness coatings such as roof coatings or elastomeric wall coatings. The availability of ground glass in the 325-mesh particle size would open up the very large market of interior flat latex paint.

Formulation and Test Results

- Use clear glass with a particle size less than 150 mesh;
- Use 1.25 pounds per gallon glass;
- Use 1.0 pounds per gallon of a non-chalking grade of rutile titanium dioxide for hiding and high reflectance;
- Use 0.5% of pigment of anionic dispersing agents;
- Use 150% the normal level of preservative to prevent bacterial growth in the liquid product;
- Use standard level of fungal agent.

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For More Information

For a copy of the report, *Recycling of Crushed Glass Into Coating Products (No. GL-96-1)*, use the CWC Publication Order Form or for more information this report contact CWC at (206) 443-7746, info@cwc.org, or visit the CWC Internet Website at www.cwc.org.

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