Project Overview

RMIT University in partnership with Alex Fraser Group - Australia’s leading producer of sustainable materials for the civil construction industry, and Mark Douglass Designs - a master glassmaker, artist and designer who produce a range of lighting and interior products, embarked on a research project to examine two issues related to increasing the use of recycled glass fines:

1. Innovative and alternative processing approaches to produce higher quality glass fines
2. Identifying ‘fit for purpose’ applications for glass fines for various industries and applications

The project involved two stages, the first stage looked at the characterisation of glass fines. This involved looking at what makes up the glass fines provided by Alex Fraser. The second stage involved identifying cost-effective processing options to enhance the quality of glass fines. The research team undertook a literature review on cleaning technologies, processes and known applications related to glass waste, as well as a series of tests to identify the type of materials present in the glass fines.

The second stage involved a practical design element with Mark Douglass Designs and eighteen RMIT undergraduate Industrial Design and Engineering students. The design students created strategies to rapidly develop, design and evaluate the suitability of repurposed glass fines in various applications.

What are glass fines and why are they a problem?

Glass fines are the small glass particles (typically between 3-8 mm in size) leftover due to breakage via comingled recycling collections. Glass fines are considered unsuitable for re-use in glass manufacturing. This is largely due to the size of the particles being too small for colour sorting and/or are contaminated with other materials such as ceramic, stoneware, Pyrex and plastic. Because of these challenges and the low economic value of glass fines, the majority of volume is either stockpiled, or landfilled.

Cementitious glass sample

Samples of fused glass fines

Samples of glass fines used as a decorative surface through marving processes

Snapshot

<table>
<thead>
<tr>
<th>Organisation</th>
<th>RMIT University</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry partner:</td>
<td>Alex Fraser Group, Mark Douglass Designs</td>
</tr>
<tr>
<td>Project</td>
<td>Understanding and repurposing recycled glass fines</td>
</tr>
</tbody>
</table>
| Objectives | – Understand glass fine contaminants and improve cleaning processes  
– Investigate and design innovative glass fine applications for use in various industries |

Outcomes

It was discovered that glass fines can be heated at high temperatures to remove organic contaminants and as a result, this process results in better quality glass fine stocks for recovered use. RMIT students researched and identified a diverse range of applications for glass fines to be repurposed in construction, environmental and consumer products, providing relevant industries opportunities to further explore.
Research Results

The first stage of the research project found that large-scale thermal based cleaning of glass fines could be conducted at 550 degree Celsius for 15 minutes inside a conventional furnace to remove organic contaminants. To reach this conclusion the research team performed a variety of experiments to determine the organic matter present in the glass fines provided by Alex Fraser. This included exploring various thermal treatment environments (including air or nitrogen) as well as heating up to 50 degree Celsius.

The second component of the research project identified and explored a diverse range of glass fines applications these included:

High-value consumer products:
- Decorative objects such as lighting
- Tiles, bricks, porcelain, stoneware and glazes
- The project also explored the use of artisanal uses of glass fines for marving (glass blowing technique used to create products), fusing and lamination.

Construction materials and products:
- Glass fines in thermal insulation for prefabricated panels
- Concrete aggregate
- Cement replacement
- Cementitious glass
- Lightweight bricks
- Building products made from glass foam

Environmental applications:
- Water filtration
- Glass fines as an alternative to granitic sand and gravels for landscaping
- Glass structures to support sea-bed erosion and artificial reef structures
- Using glass fines as a feed stock for mycelium bio composites

Opportunities

As the market for repurposed glass fines are relatively undeveloped, the research approach aimed to provide tangible insights for businesses and investors on the various uses of glass fines as a low cost but high value material. The results of possible applications in construction, environmental and consumer products are exploratory and propositional. The ideas RMIT reported are designed to demonstrate opportunities for further research and development to convert these concepts into commercially viable applications.

Further information

For more information contact Resource Recovery Strategies and Programs on 03 8626 8700 or visit www.sustainability.vic.gov.au/research-development-grants

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