

# Submission to the Inquiry into the Management of Australia's Waste Streams

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Senate Environment, Communications and  
the Arts Committee

5/23/2008

This Submission establishes the importance of recycling glass and offers a new paradigm to the glass recycling industry by realising a world first technology, adding value to the waste stream, capturing the recycled glass embodied energy and providing 100% recycled products to contribute to green star ratings of buildings.

## Executive Summary

The economic and environmental benefits of recycling glass have been long established. The creation of new “glass” products from recycled glass both adds value to the waste stream and saves energy and resources.

Australians now understand the merits of glass recycling and the need to conserve resources. This understanding is gradually being demonstrated in use of recycled products and recycling collection streams.

The imperative to recycle glass is far from a community “norm”. Glass packaging used by people in public places represents more than 12% of items collected on Clean Up Australia Day.

Existing strategies like the SA recycling refund scheme result in recycling rates of up to 90% of drink bottles, cans and cartons, an average of 420 million containers annually. However, 8,000 tonnes of SA containers end in landfill annually.

Recycled glass availability is expected to double in the next two years as a result of the National Packaging Covenant which requires 65% of consumer packaging to be recycled by 2010. Australia consumes over 850,000 tonnes of glass a year but only 350,000 tonnes are recovered for recycling.

The viability of the recycled glass industry will be threatened by this huge increase in glass availability if there is no “high value add” product to create a new market and demand for recycled glass. This threat will occur despite the increased use of technology to improve recycled glass quality and increased recycled glass use in bottles and glass production and increased use in “low value add” products like road construction, sand blasting and landscaping.

The lead time for such new products including research and development is over two years.

“Phoenix Glass” is world first technology that utilises:

- Innovative kiln technology
- 100% recycled glass
- 40% of the energy required to make glass from raw materials
- Technology that is scalable to enable co-location at waste recovery centres to meet regional, state and national glass supply and product demand

"Phoenix Glass" retains the integrity and benefits of glass while having the appearance of marble or granite and is graffiti resistant. It can be used as building cladding, benchtops, and non slip pavers.

"Phoenix Glass" is not in production.

Policies and Strategies have traditionally been targeted at public perceptions, community expectations or company performance. The National Packaging Covenant for example endeavours to "force" companies to effect recycling for the greater community's economic, environmental and social benefit.

New environmental innovations such as "Phoenix Glass" have little, if any, Policy and Strategy identification or support and have been required to have their "business" merit determined against the merits of other start up businesses through AusIndustry. This lack of recognition and support is mirrored in a similar lack of funding to assist in the attaining of organisational integrity to ensure medium and long term viability.

Government Policies and Strategies that recognise such innovations and environmental opportunities have limited if any funding programs. These programs have been incapable of providing meaningful assistance or have excluded "businesses" despite the merits of the case, for example the 50% funding of the \$10million required for the finalisation of research and development of the technology and the construction of the first production facility for "Phoenix Glass" is markedly larger than most environmental programs.

The total waste cycle must be addressed in the collective of Policies and Strategies. The National Packaging covenant and the recycling refund schemes are economically, environmentally and socially responsible but require incentives and assistance to enable the "high vale add" products such as "Phoenix Glass" that can underpin the integrity of the waste stream.

## Introduction

The viability of the Australian glass recycling industry is arguably under the greatest threat since the inception of the “Marine Store” network in 1897 in South Australia. This threat is a result of success rather than failure.

Although there is still much to be achieved, Australians have rightly embraced recycling and recognised the economic, environmental and social benefits. Public policy and strategies have initiated new recycling directions or adopted existing opportunities.

Combined these have delivered thousands of tonnes of glass for reuse. Recycled glass is used in sheet glass and bottle production but there is a paucity of other value add products to reduce or eliminate the disposal of glass in landfill.

The popular perception is that a bottle placed in a household recycling bin is recycled.

This myth is the result, in part, of government policies and strategies not addressing the total waste and recycling stream. These policies and strategies must ensure the creation of innovative and high value add products resulting from the recycling process to ensure the waste industry viability.

## Glass Recycling

The merits of recycling glass are readily substantiated.

Contemporary research has proven:

- Recycling glass saves up to 74% of the energy it takes to make glass from raw materials – Grant T, James K, Dimova C, Sonnesfield K & Lundies S 1999 Stage 1 Report for the Life Cycle Assessment of Packaging Waste Management in Victoria
- Each tonne of cullet (crushed glass) saves 1.1 tonnes of raw material– ACI Glass Packaging Website
- Recycling a glass jar saves enough energy to light a bulb for 4 hours– ZeroWaste New Zealand Trust
- Recycling 1 tonne of glass saves about 34 litres of fuel oil – Ohio Department of Natural Resources – Division of Recycling and Litter Prevention

The reuse of glass enables both a capture of the embodied energy as well as the saving of significant resources.

## Existing Strategies

Existing strategies for the recycled glass stream have realised significant collection of material.

South Australia, the only State offering a recycling refund scheme, recycles up to 90% of drink bottles, cans, plastic bottles, fruit juice and milk containers annually. Despite the SA residents returning 420 million containers each year 8,000 tonnes go to landfill (The Australian May 22 2008).

The National Packaging Covenant provides for a recycling of 65% of all consumer packaging by 2010.

Australia consumes over 850,000 tonnes of glass a year but only 350,000 tonnes is recovered for recycling ([www.abc.net.au](http://www.abc.net.au) Recycling Reality). This means that the amount of glass offered for recycling will double over the next two years.

Despite the recycling refund scheme and initiatives such as the National Packaging Covenant glass packaging used by people in public places represents more than 12% of items collected on Clean Up Australia Day ([www.abc.net.au](http://www.abc.net.au) Recycling Reality)

Glass is increasingly being used in roadworks, sandblasting and landscaping. These uses, whilst overcoming the stockpile, represent an absolute loss of the embodied energy in the glass.

Additionally this method of disposal, in many instances, represents a cost to the waste stream rather than a return.

## New Strategies

Existing policies and strategies do not address the total waste stream.

The viability of the industry is dependent upon not only public awareness and participation at the recycling bin but also the creation of high value add products and public demand at the end of the waste stream.

The Garnaut Climate Change Review February 2008 states that

*Australia would be the big loser...possibly the biggest loser amongst developed countries – from unmitigated climate change..the world of business as usual would be deeply problematic for Australia*

Similarly the world of business as usual for the recycled glass industry will be deeply problematic if the existing direction is maintained.

A new paradigm is required for recycled glass to:

- Add value across the glass waste stream
- Eliminate stockpiles of recycled glass
- Minimise glass loss to landfill, and
- Mitigate higher energy and transport costs

Such a paradigm will only come from the fostering of innovation. These innovations will range from improved recycled glass sorting to enable greater use in bottle making to new glass products.

One such innovation is Phoenix Glass. Forever Glass Pty Ltd has developed a unique engineering process to produce architectural surfaces for the building industry from recovered waste glass. The process follows five basic steps:



Step 1 - Procurement of recycled glass



Step 2 – Sorting and grading of glass



Step 3 – Kiln heated



Step 4 – Grinding and polishing



Step 5 – Quality assurance

The manufacturing process utilises unique, kiln-based technology to successfully fuse waste glass into a single homogeneous glass slab, which when polished and cut, is suitable for a plethora of uses. These uses include floor and wall tiling, bench tops, table tops, washbasins, exterior and interior architectural panelling and window panelling. The product can also be used in chemically active areas such as laboratory fume hoods and benches.

After recovered bottles and glass have been sorted, washed and shattered the glass is processed through a specially designed kiln that transforms the glass into solid glass slabs. The size and thickness of the glass slabs can be varied to meet specific client needs.

Phoenix Glass is non-porous, does not retain odours, withstands staining, graffiti resistant and when utilised outside does not weather. The product retains all the integrity and benefits of glass, while having the appearance of marble or granite.

## Phoenix Glass

The Phoenix glass product range is the end result of the Forever Glass manufacturing process. A product that is made from 100% recycled glass, is produced using green technology and carries innate environmentally friendly attributes is unique in the building industry. Phoenix Glass is well positioned to be the product of its time.

### Key Attributes

Phoenix Glass products are the first building material in Australia to be produced from 100% recycled glass. This break-through is of significant importance to the increasing environmental problem of used glass and landfill issues and fills a need in the market for the environmentally aware consumer.

Phoenix Glass products have the strength and durability of stone and the translucent beauty of polished marble, while retaining all the integrity and benefits of glass. Depending on colour choice (white, off-white, blue, green, brown) the product displays marvelous depth and has the added benefit of being stain and graffiti free.

The exceptional features of the product extend to its flexibility. It is nonporous, an outstanding characteristic not shared by engineered stone, does not retain odours and does not weather. The practical applications for the product within the building industry are endless.

Phoenix Glass is well positioned to be the next innovative product for Architects and Interior Designers. It is well positioned in quality, environmental credentials and price. The product

and environmental benefits can readily create a point of difference with products in the existing market.

Phoenix Glass snapshot:

- 100% Australian owned
- 100% Recycled Glass
- Attractive
- Impermeable and non-porous
- Sanitary and odourless
- Translucent
- Hard
- Scratch resistant
- Colourfast
- Graffiti resistant

Phoenix Glass is green:

- Does not pollute
- No wastage
- Energy saving
- Reduces waste to landfill
- Reduces consumption of raw materials
- Chemically inert
- Adds value to the entire glass waste stream



## Technique

Recovered glass is cleaned, sorted for colour and then size. This glass cullet is then kiln fused, with the heating and cooling profile dependent on the thickness of glass to be produced and the chemical composition of the recovered glass. The output of the kilns is a 3000mm x 1400mm sheet of glass of the desired thickness (15mm, 20mm, 25mm, 38mm). While the colour of the end product is dependent on the colour of the glass used, it is also affected by a process known as vitrification. This results in a glass sheet in which the individual pieces of glass can still be distinguished and gives the final product a unique opaque quality. The glass sheets can then be used to create a number of products.

## Glass Pavers



- The standard glass pavers (400mm x 400mm) are 25mm thick and are designed to be used on a solid or cement base.
- The surface of the pavers is non-slip, non-porous, stain and weather free.
- Specialist opaque pavers suitable for under lighting and pavers incorporating a company logo can be made on request.
- Colour choices include white, off-white, blue, green and brown.

## Glass Wall Panels



- Both interior and exterior glass wall panels are available in three finishes; textured, hammered or polished.
- Panels are available in standard sizes of 200mm x 400mm and 100mm x 200mm or to customer specifications up to 3000mm x 1400mm.
- Panels can be fixed to existing walls using stainless steel fixing systems or using construction adhesives.
- Polished panels are especially suitable for public buildings as graffiti is easily removed using high pressure water.

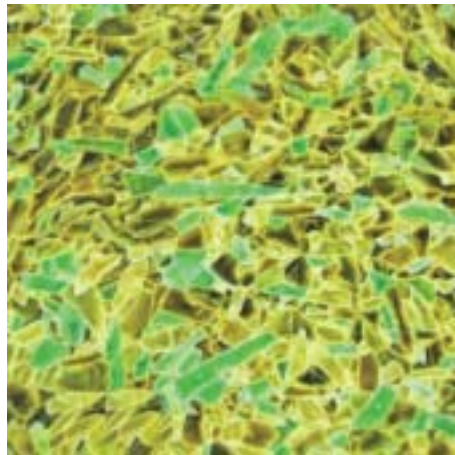
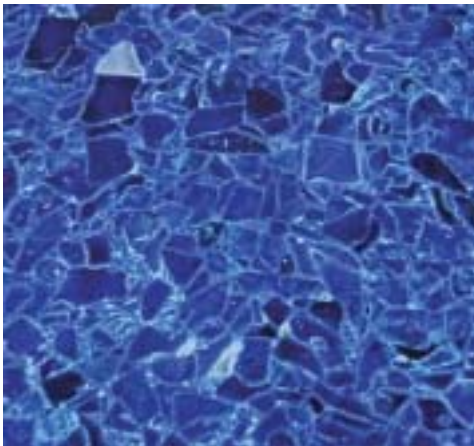
## Bench Tops



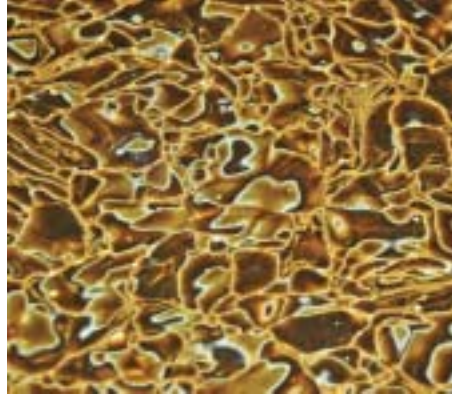
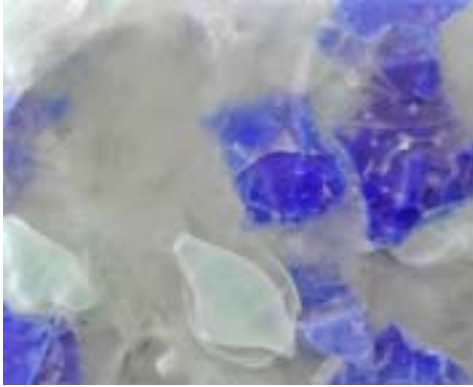
- High-quality bench tops suitable for kitchens, bathrooms and outdoor furniture are available.
- Bench tops are polished to a high lustre and are available in widths up to 1400mm and a thickness of 22mm. These can be cut in any shape and edged with the customer specified profile.
- Colour choices include white, off-white, blue, green and brown.

## Sample photos

A selection of the product range:



The submission to the Senate Environment, Communications and the Arts Committee Inquiry into the Management of Australia's Waste Streams has been prepared using information provided by the Directors and Staff of the Forever Glass "Group" of Companies and research undertaken for the preparation of their Strategic Plan.



*Samples of Phoenix Glass. Different coloured glass is produced by using different coloured recovered glass.*

### **Australian Standard Compliance**

Forever Glass has commissioned Dr Leon Jacobs of Jacob & Associates Pty Ltd to complete independent analysis of Phoenix Glass. Jacob & Associates are consulting engineers specialising in the design, analysis, evaluation and testing of glass, glazing systems and related products. The company has offices in Sydney, Brisbane, and Johannesburg, South Africa.

Australia Standard testing that is currently being carried out:

| <b>Australian Standards</b>           | <b>Tested to</b>         |
|---------------------------------------|--------------------------|
| Impact resistance:                    | Currently being tested*  |
| Scratch and wear resistance           | AS 3558.2 – 1989         |
| Tensile strength:                     | Currently being tested*  |
| Chemical/Stain Resistance             | AS 3558.2 – 1989         |
| Heat resistance:                      | Currently being tested*  |
| Moisture resistance                   | AS 3558.2 – 1989         |
| Slip resistance (wet, shiny surface): | AS/NZS 4586:1999 Class Y |

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UV resistance

AS 3558.0 - 1989

\*Jacob & Associates Pty Ltd 313 Canterbury Rd, Canterbury, NSW 2193

As with granite and marble the product is heavy, its weight specifications are as follows:

| Sheet Thickness | Weight Kg/m <sup>2</sup> |
|-----------------|--------------------------|
| 10mm            | 26.0                     |
| 15mm            | 39.0                     |
| 25mm            | 65.0                     |
| 30mm            | 78.0                     |

#### Reactgens against Phoenix Glass

|                   |  |
|-------------------|--|
| Water             | Water will attack glass at elevated temperatures and pressures   |
| Acids             | Container glass is severely attacked by hydrofluoric acid and slightly attacked by hot phosphoric acid. The attack by other inorganic and all organic acids are negligible           |
| Bases             | Strongly attacked by strong bases such as caustic soda. The hotter the solution, the greater the degree of attack. Weak bases will have less effect, but will still attack the glass |
| Organic Chemicals | In general these will have no effect unless they contain fluorine. Some gaseous fluorocarbons may attack glass if water vapour is present  |
| Solvents          | No effect  |
| Biological Stains | Under normal usage, no effect  |

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## **Unfortunately, Phoenix Glass is not in production**

A new strategy must be developed to ensure end of waste stream high value product are nurtured.

## **Economic Benefit and Policy Priorities**

Double the amount of glass will enter the waste glass stream by 2010 solely as a consequence of the National Packaging Covenant.

This quantum increase is conservative and excludes other initiatives within the existing public policy and strategy framework such as the ACT NoWaste Policy.

An increase of this proportion in the recycled glass industry has the potential to destroy its viability.

No innovations or initiatives have been "sponsored " to ensure the ability of the industry to avoid the transfer of glass to landfill.

Phoenix Glass, by way of example, could be a consumer of recycled glass. The concept designs provide for efficiency, staging and scalability. The smallest production facility contains three kilns capable of using over 5000 tonnes of recycled glass annually. This scales to a 30 kiln facility which has the capacity to consume 54,000 tonnes of recycled glass annually.

Forever Glass has entered discussions with the Australian National University for the research and testing of the next generation products, discussed sites for a production facility with the ACT Government, explored opportunities with potential alliance partners in the recycling industry, completed market research and financial modeling.

Four years of research and development have resulted in products of sufficient integrity to substantiate financial modeling. This modeling demonstrates that "Phoenix Glass" production is viable in both the medium and longer term if "start up" assistance is provided.

Forever Glass requires 50% of the total \$10 million necessary to construct the first production facility and the necessary design/research components.

No Government Program or strategy exists to assist in enabling this innovation or other innovations that provide part or whole solutions to immediate issues confronting the waste industry in Australia.

Policy priorities must address the integrity of the whole waste stream not only those that are perceived as the public responsibility. Innovations provide the opportunity to give timely and appropriate solution. These solutions are not being addressed under the existing policy and strategy frameworks.

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## Conclusion

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Existing strategies like the SA recycling refund scheme result in recycling rates of up to 90% of drink bottles, cans and cartons, an average of 420 million containers annually. However, 8,000 tonnes of SA containers end in landfill annually.

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