THE WINSTON CHURCHILL MEMORIAL TRUST
CHURCHILL FELLOWSHIP 2007

Report by - Natalie Jenkins – 2007 Churchill Fellow

To investigate design and technical aspects of recycled glass in art.

Signed Natalie Jenkins Dated 25 September 2008

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Introduction

This report details the findings of my Winston Churchill Memorial Trust fellowship to the United Kingdom and the United States of America, where I investigated design and technical aspects of recycled glass in an artistic context.

This project considered:

A. The viability of small scale art and or warm glass studios using recycled / waste glass as a base material.
B. Expanding the use for recycled glass into art glass and other end products (glass tile)
C. Developing an easily followed set of protocols for safe collection, processing, sorting glass for the community and the arts industry.

As a glass artist from the Northern Territory I am keenly aware of the challenges that isolation poses. Travelling on this fellowship has given me the opportunity to meet manufacturers' of equipment and glass cullet, other artists, attend glass conferences, visit museums and galleries.

Whilst this project concerned itself with recycled glass and it use as an end product, it was advantageous to also visit producers of non recycled glass and artists that don't use recycled product. The techniques used have applications across the spectrum of kiln formed glass arts in all studios I noted variations in method, innovation and ideas. The improvements discovered will benefit myself and other artists and will be discussed in my teachings and presentations. My experience has impassioned me to further develop and maintain awareness in the need and use of recycled glass as an art material.

To take advantage of opportunity offered to me by the Winston Churchill Memorial Trust I also undertook the following additional activities/site visits;

Glass Art Society annual conference,
Bullseye and Uburios glass factory tour Portland,
CMOG travelling furnace and studio.
Tacoma Museum of Glass education unit & Studio (TMOG).
Seattle Art Museum (SAM) and Seattle Library (reference collection) Seattle.
M'eda Creations San Francisco.
Boise Public art instillation walk.
Gallery of Artisans (artist cooperative) Victoria, Canada.
Tate Modern, London.
Broadfield house,
Commercial galleries

I would like to acknowledge and thank the Winston Churchill Memorial Trust for resourcing this research trip. My thanks also go to the many individuals and organisations that extended their warm hospitality and willingness to share information and experiences.

Executive Summary

Natalie Jenkins, Artist, 0406 825 998
To investigate design and technical aspects of recycled glass

Highlights

The Winston Churchill Memorial Trust Fellowship began on 16 June finishing 9 September 2008. The highlights of this trip were the following people and businesses that were generous with their knowledge and time.

Andela Industries, John Andela and Melissa Reid New York State, USA.
Bedrock Industries Chris Munford, Seattle Washington, USA.
Trivitro, Jan McKeever, Seattle Washington,USA.

This fellowship also highlighted the importance exploring the external and historical influences of design and innovation on the way glass and associated technologies have developed.

Major Lessons and conclusions

This Fellowship has produced the following lessons and conclusions:

1. It has given me a very much clearer context to work within and a point of reference of where glass art form the NT sits globally and the potential for recycled product both in domestic and commercial applications in Australia.
2. Highlighted the advantages and disadvantages of the relative isolation of the NT. The beneficial factors of creating a distinct artistic pathway and the disadvantage of not have a local reference point for recycled products and the advantages of access to cooperative networks within industry..
3. A starting point for discussions on promoting recycling with tangible outcomes ie art wear and commercial products.
4. A source of encouragement and confidence in the viability of small scale production of a range of reproducible recycled objects.
5. Confirmed that the systems and structures can be developed within the recycling industry that will aid and increase the social value of recycled materials. The corporate structures and models I experienced in the UK and the USA with careful management are workable and applicable in Australia and would be of great benefit to the arts.
6. The fellowship made me focus on question the viability of introducing an artistic practice based on recycling in remote or rural areas that have a low potential yield for recycled glass locally and would require material to be shipped in for pulverizing. The carbon footprint of such an enterprise needs to be further explored.

Implementation of gained knowledge

The knowledge gained will be shared via an exhibition entitled *déjà vu* of recycled glass objects inspired from my experiences and an exhibition floor talk (5 - 10 November 2008), Territory Craft and Darwin Entertainment Centre). Artist in Schools activities incorporating recycled glass into a public artwork. Talking anyone willing to listen and in everyday practice.

United States:
16 June – 11 August 2008

Public Institutions

Visiting public institutions was integral to this project so as to reference myself to modern craft and design and the historical contexts and influences that have impacted on the moment in time in which we operate. The institutions visited all either had extensive specialised glass collections (CMOG, TMOG, V&A) that provided a historical context on the development of glass from the early roman era to art glass from the 20th century or smaller collections situated within a larger gallery (SAM, MAD) that were reflective of design trends or in the case of SAM show cased the work of indigenous glass artists like Preston Singletary.

Andela Industries, Richmond Springs New York State,

Business model:	Private
Product:	recycled glass chip, abrasive and filtration medium. Crushing for secondary companies ie Bedrock industries.
Source glass:	Post Consumer and Post Industrial glass.

Andela Products started out as a tool & machine shop founded by James and Jeffrey Andela in 1981 serving the local community and area businesses in the industrial and agricultural sectors.

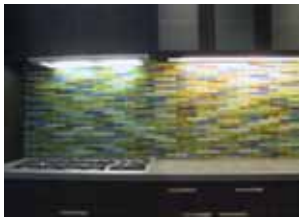
Andela Products currently produces a range of rugged, versatile machines to serve needs of the glass crushing industry. The Andela Pulverizer GPM (hand feed) is a new system and extremely exciting product that would eb eminately suitable for the remote communities in the NT. The GPM comes in units ranging from 1 to 20 tons per hour, and reduces all types of glass to 3/8th of an inch or less.

Trivitro, Seattle Washington,

Business model:	Private
Product:	recycled glass chip, abrasive and filtration medium. Crushing for secondary companies ie Bedrock industries..
Source glass:	Post Consumer and Post Industrial glass.

Since 1996, TriVitro® has been developing innovative, environmentally responsible recycled glass products. Our natural and color coated recycled glass chips are being used around the nation in terrazzo flooring and exposed aggregate surfaces; our finely crushed glass has been providing cleaner, longer lasting, and more cost effective water filtration for pools, spas, theme parks and aquatic habitats, as well as environmental and industrial filtration; even sand blasting can be done much more safely and effectively by replacing sand with our NIOSH-recommended crushed glass for surface preparation, rust and paint removal, and abrasive cleaning.

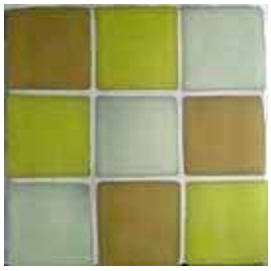
Bedrock Industries, Seattle Washington,



Business model:	Not for profit (self funded)
Product:	Recycled glass tile and garden accessories. The colour range is determined by the source colour of the bottle no pigmentation is used in the product.
Source glass:	Post Consumer and Post Industrial glass, crushed onsite or by Trivitro

Bedrock operates several community-based programs including a bottle drive, student tours of our plant and a special bottle drive for the parents and students of a local elementary school. As an incentive for the community to recycle bottles bedrock pays $0.10 per cleaned and de-labeled bottle delivered to their site. The effect is twofold first the community has a financial incentive to recycle and the company doesn't have to clean and de-label the bottles this saves time and reduces the OHS risk from left over waste.

Sandhill Industries, Boisie Idaho,

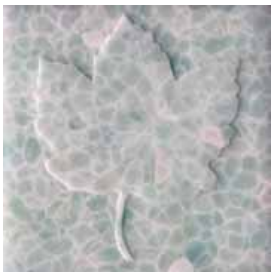


Business model: For Profit
Product: Recycled glass tile. The colour range is determined by pigmentation.
Source glass: Post Industrial glass, source external organisation

Founded in 1998 in Fairbanks, Alaska, Sandhill was awarded a grant from the Alaska Science and Technology Foundation to develop an innovative glass-fusing technology which utilizes 100% recycled glass. The outcome of a two year research project resulted in the tile line that Sandhill produces today. The volume of recyclable glass produced in Alaska was non-sustainable for a commercial facility. The sustain production levels Sandhill had to import glass. Transportation of raw material in turn raised costs and the carbon footprint of the company. This and the distance from markets lead meant that in May 2002, Sandhill relocated its manufacturing facility to Boise, Idaho. Sandhill Industries received EPA Evergreen award for environmental excellence and leadership.

United Kingdom:

Eluna (Freeform Arts Trust)



Business model: Limited Liability Partnership, financed by The Adventure Capital Fund and Free Form Arts Trust.
Product: Glass pavers & tiles. Glass bench tops
Source glass: Cullet

In 2000 a team of artists working for the Freeform Trust decided to find ways to use recycled materials in public arts projects as a contribution to sustainability in the built environment. Eluna/ Freeform Trust encourages participation in recycling by offering a community workshop programme. Enabling children and or adults to participate in designing and producing recycled glass for installation in site specific public locations. Eluna/ Freeform, having originally produced their own culet now operate on out sourced glass. Outsourcing has allowed the organisation to focus on production of artwork.

The International Festival of Glass, Ruskin Glass Centre Stourbridge.

The IFG afforded me the opportunity to

- Tour the TV screen recovery unit at the Ruskin centre which uses a patented process to separate the glass from lead in TV Tubes, preventing the toxic lead from going into the landfill as well as recycled the glass back into cullet.
- Meet with other artists using recycled glass as a medium.
- Meet the centre's director, conference organizers and high profile artists
- Participate in a number of small workshops and discussions.

- Paricipate in the Puffy Glass (Experimental kiln) Workshop

  The original workshop offered by the IFG and Ruskin Glass was altered shortly before commencement (3 days prior) as the tutor had her visa application denied. The original premis of the workshop was to use recycled glass mixed with household ingredients to produce a sculptural doh like substance that was then kiln fired. The kiln firing would burn out the organic material leaving behind a Pate de Vere like glass structure. Due to the late change in the tutor the programme was altered to incorporate puffy glass and a number of other casting techniques as decided by the group. The disadvantage of this was that puffy glass was restricted to our interpretation of the notes provided and there was not opportunity to answer direct questions.

To take advantage of opportunity offered to me by the Winston Churchill Memorial Trust I also undertook the following additional activities/site visits;

Glass Art Society annual conference, Portland.

Lecture	Catherine Newell	Working with frit and paint
	Steve Klein	Kiln-formed
	Panel discussion	Original Thought in Design
	Helen Stokes	Honeycomb Casting

Bullseye glass factory Portland.

	Exhibition	E-merge Bullseye Factory
	Richard Whiteley	Designing a safe functional studio
	Factory Tour	

CMOG travelling furnace and studio.

TMOG education unit, gallery & Studios.

	Lino Tagliapietra in retrospect	
	Education studio visit	
Lecture	Super Hero's	Children's glass design
	Jiri Harcuba	Engraving and cold working glass

Seattle Art Museum and Seattle Library (reference collection) Seattle.

M'eda Creations San Franscisco.

Boise Public art instillation's.

Gallery of Artisans (artist cooperative) Victoria, Canada.

Tate Modern, London.

Commercial galleries

Although there is no scientific or historical consensus, glass is thought to have been first "discovered" probably in Syria or Egypt, about 1200 BC, where it was used for decorative purposes. The first clear glass dates from around 800 BC, with glass blowing being developed about 300 BC. Glass manufacture first appeared in the UK in Roman times where it was heavily taxed, and subsequently went into a period of decline, to re-emerge 2000 years later as Venetian monopoly in 1200 AD. The first automated bottle making plant opened in 1903 in the USA.

Today glass is widely used as a packaging material in bottles and jars, as a structural component in buildings and automobile windows, in other domestic applications (e.g. cookware, light bulbs) and for specialised technical applications in science and engineering

There are different types of glass used in today's society with the function determining the type required and each differs according to its required function. These include:

- soda-lime glass (bottles and jars, and automotive applications), 90%of all glass made
- lead alkali glass (crystal glassware and television screens)
- borosilicate glass (glass fibre, ovenware, glass wool insulation)
- small volume technical glasses (scientific and optical)

Typically soda glass made up of 61% sand (SiO_2), 18% soda (Na_2CO_3),13% limestone ($CaCO_3$) or lime (CaO), and 8% other components, i.e. alumina (Al_2O_3) magnesia (MgO) and refining agents

Glass constitutes just one fraction of societies complex waste stream, for example in 1999 of the 435 million tones of rubbish produced in the UK only 1.5 million tones was glass (75% Post Consumer and 25% Post Industrial). There are distinct economic and environmental advantages to glass recycling including:

- glass can be recycled indefinitely without deterioration
- conservation of and reduced demand for natural raw materials
- reduced the water consumption of the manufacturing process by up to 50%
- energy savings; for every tonne of recycled glass used the equivalent of 130 liters of oil are saved, as cullet melts at a lower temperature than the raw materials.
- reduced pollution, over the whole life cycle, by up to 20%
- valuable void space in landfills is saved by diverting glass

Glass has been promoted as recyclable since the 1970's and still has problems associated with the recycling process in general, factors include contamination of the glass by: mixing of incompatible glass types (such as bottles, window panes, light bulbs and ovenware); mixing of different colours of glass; and the presence of non-glass inclusions (especially stones and ceramic pieces).

These problems are being addressed by the glass recycling industry in attempts to improve the quality (and hence value of the recovered material) and to reduce the rejection rate of contaminated loads. *Andela* (USA) has addressed many of these issues in its larger *Andela* pulveriser (model GP-05) by using magnetic separators, air and other mechanical devices to remove the plastics, metal and other contaminates from the waste stream. This is extremely efficient but is non transportable and reliant on 3 phase power. The smaller *Andela* pulveriser (model GPM) is an ideal community based machine it's hand feed so the product can be pre sorted, it uses single phase power and has been designed to be transportable. In the context of this fellowship this machine would be suitable to move around suburban Darwin and regional centre's allowing the public to bring clean glass waste to be crushed.

Finally the production of culet suitable for the art glass industry needs to incorporate sourcing and preparing cullet that is from the same batch or that with the addition of chemicals that make mixed batches of glass compatible

Conclusions

The viability of small scale art and or warm glass studios using recycled / waste glass as a base material would be restricted by the availability of source material and in the case of warm glass the accessibility of a kiln. All businesses involved in the production of either raw cullet and / or end product (tile) cite the availability of raw materials as a constraint to growth.

To further recycling in a professional glass practice the following issues and need to be resolved;

- The cost associated will collection and crushing of glass.
- Incentives for the public to send clean de-labeled glass waste to a specialised glass recovery centre
- Accessibility to suitable raw product
- Efficient crushing machinery that is transportable and accessible
- Establishment of a range of recycling enterprises established

The organisations visited take pride in being both environmentally and economically sustainable and see this as a lynch pin for the long term viability of the industry especially in remote and regional locations.

Recommendations

1. To assess the sustainability of discrete recycling operations in individual communities verses providing a conduit for recycled materials to a central or larger centre's with each state.
2. To assess the potential for Nataional mobile recycling units and encouraging recycling by monetary compensation i.e 5 – 10c a bottle.
3. To encourage the use of recycled products in general community applications.
4. A truly sustainable business model needs to be developed, initially resourced and integrated into programs that work across business, local government, and education.