

# VERTECH<sup>®</sup>

WHY WASTE ANYTHING

## Road Bridge made from Rubbish?

### Vertech delivers Europe's First Road Bridge made from Recycled Plastic



Vertech raw materials



Prefabricated bridge panels in the factory



The completed 30 metre bridge

Vertech Limited and Dawyck Estates Ltd are delighted to announce the construction of the UK's first HGV road bridge made from recycled plastic.

This landmark bridge built over the river Tweed, at Easter Dawyck in Peeblesshire, is the first recycled thermoplastic road bridge to be built outside the United States. It has been designed to carry heavy goods vehicles of up to 44 tonnes. Its individual spans, at over 9m, are the longest ever constructed from recycled plastic. Being manufactured from plastic it will not rot or rust, it does not require painting, treating or regular maintenance. It has made very effective use of over 50 tonnes of waste plastic, e.g. from kerbside collection of household bottles and plastic waste from end of life vehicle recycling, which might otherwise have been sent to landfill. The bridge is also 100% recyclable.

This remarkable project, conceived by Vertech Ltd and supported by the Welsh Assembly Government, has been made possible through a highly effective collaboration with its forward looking

partners from Dawyck Estates, specialist bridge designer Cass Hayward LLP, Cardiff University's School of Engineering, Rutgers University's AMIPP Department, Polywood Inc and Axion International Inc. The Bridge was constructed ahead of time by an outstanding team from Glendinning Groundworks Ltd, a local Peeblesshire contractor, and 10 Field Squadron (Air Support), Royal Engineers. The latter as part of a valuable training exercise on private land. The bridge crossing was closed for just 2 weeks, with the new deck construction taking a mere 4 days to complete despite challenging weather conditions.



The Installation Team

**Vertech Ltd is also applying this unique technology to the manufacture of revolutionary recycled and recyclable sheet materials as a replacement for plywood, MDF, laminates and other virgin material composites.** Vertech products will convert UK waste to highly engineered and truly closed loop solutions for the European construction industry. They will never need to go to landfill.



Final Span being craned into place

**William Mainwaring, co-founder and CEO of Vertech Limited** said, “We should neither be sending so much of the UK’s waste plastic to landfill nor should we be shipping it to China. With this unique technology we can now recycle it ourselves to produce increasingly sought after high quality and sustainable construction materials for the European market.”

**William Mainwaring** added, “The UK has a significant bridging requirement, particularly in rural areas, to meet modern transport needs. Whole life costs, particularly with respect to maintenance, are increasingly important and hence we are very excited to be able to introduce this unique new structural material into the UK market. Its environmental credentials combined with its durability and minimum maintenance requirements are a distinct advantage over conventional alternatives as well as offering cost effective solutions.”



**Robert Balfour** taking his first trip across the plastic bridge

**Robert Balfour, Managing Director Dawyck Estates Ltd** said, “With so much pressure on rural businesses, this technology innovation will dramatically reduce the annual maintenance burden previously faced.” He added, “Hopefully this will encourage a greater desire to recycle plastics of all sorts. We have a plentiful, sustainable and recyclable raw material in the UK, let us use it”.

**James Parsons, Partner at specialist bridge design consultant Cass Hayward LLP**, comments: “It is exciting to be part of the pioneering work to introduce this material into the UK and Europe. Reconstructing old poor condition or low capacity bridge decks is an increasingly common event. This particular project has taught us much about how the material behaves. Whilst the new bridge deck for this project was developed using mould shapes and sizes already in existence, we are already considering how the technology can be developed for future bridges and including other bridge elements, e.g. the support cills that traditionally are formed in reinforced concrete, that are necessary in projects of this nature.”

**Professor Robert Lark Deputy Director Cardiff University School of Engineering** said that this had been “A unique opportunity to contribute to the development and assessment of a truly sustainable construction material for the nation’s transport infrastructure. This initiative has the potential to deliver durable, low maintenance alternatives to traditional structures manufactured from recycled waste, the benefits of which, particularly to rural communities, should be far reaching both economically, socially and environmentally.”

**Professor Tom Nosker, R&D 100 Award winner and Professor at Rutgers University,** said, “I have appreciated the opportunity to work on this ground breaking project very much, and appreciate the trust and confidence that has been extended by all involved to attempt this feat, which is probably considered by most as crazy. This bridge is the most beautiful I have worked on, and it went up in less than 4 days, which has to be some kind of a record for a 90 foot road bridge.”

### **Background and Notes for Editors**

Vertech Ltd, a recently established Welsh start up Company, has secured the exclusive rights to a unique technology developed by Rutgers University, America’s oldest University, which enables the conversion of plastic waste into highly engineered construction products. These rights extend to Vertech’s use of the technology for bridging in the UK and for the production of sheet materials and profiles across Europe.

This record prototype bridging project included the design and construction of an innovative prototype 30m x 4m, 3 span road bridge made from a unique patented recycled plastic composite. The design was modelled using performance and material data supplied by the technology owners, Rutgers University, in the USA; a virtual structural model was developed, using industry standard structural modelling software, to enable a detailed comparison between the performance properties of the recycled thermoplastic composites and the conventional alternatives. This generated the design data to enable the effective use in conventional bridge design methodology for a live project. The full design was completed by Cass Hayward LLP, a leading and progressive Welsh practice of consulting engineers specialising in Bridge design, with support from the School of Engineering at Cardiff University and Rutgers University in the US.

Bridge components were manufactured and assembled by Axion International Inc; US license holders for the technology. The bridge was installed in a remarkably short time in challenging weather conditions by Glendinning Groundworks Ltd, a local Peebleshire contractor, and 10 Field Squadron (Air Support) Royal Engineers as part of a valuable training opportunity on private land in preparation for future operational deployments.

Through this exciting project Vertech Ltd seeks not only to prove the technology for the manufacture of structural bridging components as replacements for steel, treated timber or reinforced concrete to meet the specific requirements of UK road bridging up to 44Tonne load class (European standard 11.5T individual axle loads) but also to demonstrate the significant engineering properties of the composite materials for use in the European construction industry as a replacement for less environmentally sound timber based products such as plywood, laminates, metal and virgin polymer sheet materials. Vertech Ltd plans to establish a manufacturing facility in North Wales in 2012 to manufacture its recycled thermoplastic composite products for the European market.

The collaboration with Cardiff School of Engineering was initiated through the Knowledge Transfer Centre (KTC) at the School. The KTC is a project supported by the Academic Expertise for Business Programme, and is financed by the Welsh Government and European Regional Development Fund.

The success of this bridge project can be put down to an open minded but determined collaboration between Vertech Limited, Dawyck Estates Ltd, Cass Hayward LLP, Cardiff University, Rutgers University, Glendinning Groundworks Ltd, the Royal Engineers, Polywood Inc and Axion International Inc. It has shown what can be achieved when organisations with different agendas are prepared to work together to achieve a common goal.

Thermoplastic composites have been used in a range of low impact, low stress and low cost applications ranging from garden and playground furniture to decking, picnic benches and fencing. However, while as strong as equivalent sized pieces of wood, these thermoplastic composite products have an elastic modulus (stiffness) at least 10 times less than even the most common wood species used in construction. Subsequent research has shown that certain immiscible blends of

thermoplastics can address this weakness and enable the manufacture of structural components theoretically capable of replacing treated timber, steel and reinforced concrete.

In the US Structural recycled thermoplastic composites already represent an alternative to chemically treated timber. These structural composites presently enjoy commercial success as replacements for creosoted railroad ties and other rectangular cross-sectioned materials. The market has otherwise been limited for structural recycled plastics, because they have hitherto been significantly more expensive than treated wooden beams on an installed cost basis, despite the use of recycled waste plastics.

It has now been discovered that certain immiscible polymer blends can be formed into structural shapes that are more cost-efficient. The structural shapes can be moulded as single integrally-formed articles and include modular forms such as I-Beams, T-Beams, C-Beams. The reduced cross-sectional area of such shapes represents a significant cost savings in terms of material usage without sacrificing mechanical properties. This innovation has been patented by Rutgers University.

A range of structurally demanding applications have been attempted, and have all met with some level of success. Applications have included joists, railroad ties and marine piles. The development of the US ASTM test methods to evaluate and compare the properties of plastic composites has paved the way to engineer structures with these materials on a commercial basis in the USA.

#### **About the Companies Involved:**

##### **Vertech Limited**

Vertech Ltd is a dynamic company established in Wales to exclusively exploit Rutgers University's revolutionary polymer blending and processing technology to manufacture and distribute genuinely closed loop and very high performance composite sheet materials and thin walled profiles across Europe. These highly engineered products, offered under the "Vertech" brand, will be UK manufactured from UK sourced recycled material, completely recyclable, often reusable and will offer significant carbon savings. Working with Polywood Inc and Axion International Inc, Vertech Ltd will also combine Rutgers' technology with its extensive market knowledge to exploit the significant bridging market in the UK.

[www.vertechcomposites.co.uk](http://www.vertechcomposites.co.uk)

##### **Dawyck Estate Ltd**

Dawyck Estates Ltd operates an agricultural and forestry business near Peebles in the Scottish Borders and is responsible for the management and maintenance of a number of roads and bridges in the Tweed Valley.

##### **Cass Hayward LLP**

Cass Hayward is an Engineering Consultancy with a widely acknowledged capability in bridges, engaged to produce designs and to complement teams of construction experts. The Firm was formed in 1983 and founded on the Principals' extensive experience in design, fabrication and construction of steel and composite bridges. More than 400 bridges, comprising over 800 spans have been constructed to Cass Hayward designs.

[www.casshayward.com](http://www.casshayward.com)

## **Glendinning Groundworks Ltd**

Glendinning Groundworks Limited is a civil engineering and agricultural contractor, based in the Scottish Borders, specialising in the design, pre-construction advice, construction, commissioning and maintenance works for water and wastewater infrastructure projects. The Company was established in 1990, although has been trading as Glendinning Bros since 1964, as a civil engineering and agricultural contractor. The company to this day remains a family business with the emphasis on quality workmanship as the principal contractor on civil engineering projects. The company has been working in the industry for over 40 years.

<http://www.glendinninggroundworks.co.uk/>

## **Axion International Inc and Polywood Inc**

Axion International and Polywood Inc are leading structural solution providers of cost-effective alternative infrastructure and building products. The Company's "green" proprietary technologies allow for the development and manufacture of innovative structural products made from 100% recycled consumer and industrial plastics. Axion and Polywood's up-cycled products are an economic and sustainable alternative to traditional building materials such as wood, steel or concrete. Developed in collaboration with scientists at Rutgers University, Axion and Polywood's patented technologies allow for products that are extremely strong, durable, flexible in design, and low maintenance.

[www.axionintl.com](http://www.axionintl.com)

[www.polywood.com](http://www.polywood.com)

## **Cardiff University**

Cardiff University School of Engineering has one of the largest and most diverse engineering research and development laboratories in Wales, and is seeking to help industry develop new and improved products and services. The Knowledge Transfer Centre within the School is dedicated to enabling industry access to world-class facilities and leading expertise through knowledge transfer, collaborative work and services.

<http://www.engin.cf.ac.uk/ktc>

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