

## EcoBoard

RePlaS: Reducing the amount of plastic sent to landfill, to reduce the carbon footprint of temporary works

Please specify if you have already participated in the European business Awards for the Environment: **NO**

**Name of proposal:** EcoBoard: Development of and alternative board for use in temporary works using new technology for recycling plastic, reducing both the amount of plastic sent to landfill and the carbon footprint of temporary works.

**SMEs or Major Corporation:** this initiative was a joint entry between Bovis Lend Lease, ERT and St David's Partnership

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Specify that you have included any annex to the entry:

- Annexes have been included to this entry.

Please list the appendices:

- Provisional carbon footprint comparison. These figures are the subject of a ongoing research project, to validate the results.

## Summary (one page maximum)

Over three million tonnes of plastic waste is produced in the UK every year with only a small proportion of this being recycled. Bovis Lend Lease was first in identifying potential uses in the construction industry for a material made from co-mingled polymer waste using a new process; **Powder Impression Moulding (PIM)**. Developed using mechanical and chemical engineering knowledge, PIM enables 500% more polymer waste to be recycled than any other polymer moulding process. The first new product, *EcoBoard*, consists of approximately 80% co-mingled plastic waste and can replace plywood in temporary and, potentially, in permanent construction work..

One single production plant, with a capacity to make 300,000 *EcoBoard* boards from 6,000 tonnes of co-mingled polymer waste per annum, representing less than 6% of the plywood used in construction and about 0.2% of the waste plastic sent to landfill each year.

In addition to reducing costs and improving the carbon footprint of construction work, it will lead to new sustainable products which can be used in permanent works, further reducing the volume of plastic sent to landfill. The development of this exciting and innovative new product demonstrates Bovis Lend Lease's commitment to leaving a positive legacy from the construction projects with which we are involved, and having a positive effect on our environment and the communities with which we interact through inward economic investment and upskilling of the local workforce.

## Entry

### 1. Please provide the following:

- a. **a summary of the circumstances leading to the development of the new product or service;**

Every year, millions of sheets of plywood are used in temporary works on construction sites for site hoarding, concrete formwork and protection. The fact that external plywood uses adhesives and has been painted limits the options for disposal, so most of it is shredded and finds its way to landfill. Rigorous systems ensure that plywood used is FSC certified.

The aim of this project was to find an alternative material which is not only cost effective and sustainable, but is also safe and provides a durable, high quality public face to projects.

Bovis Lend Lease had learnt of a new process for recycling mixed waste plastic stock called Powder Impression Moulding (PIM) developed by ERT. ERT was keen to identify potential uses for the process in the construction industry and we worked together on finding potential applications for the material. Bovis Lend Lease recognised that initial applications could be in temporary works and enlisted the support of St David's Partnership, the developer of a new retail development in Cardiff, to trial the new board which is produced in the pilot plant set up by ERT in Caerphilly, only 12 miles from Cardiff, using local employees.

- b. **details of the specific innovative elements that distinguish this product or service from its predecessors or others already on the market; and**

The recycled plastic content of the board is about 80%, consisting of a unsegregated mixed plastic waste which can also include problematic waste such as Waste Electrical and Electronic Equipment (WEEE), which is normally difficult to reuse or recycle.

EcoBoard will enable manufacturers of Electrical and Electronic Equipment to meet the WEEE requirements to increase the recycling of their products at the end of life. The PIM process uses mixed recyclates and avoids the need for labour intensive segregation of plastics. The carbon footprint of the board is similar to that of plywood when transportation reuse and disposal is taken into account.

The new board is easier to work than plywood, with no risk of splinters to site operatives or the public, who could come into contact with the board on the outside of the site. It can be left untreated over several seasons and will not deteriorate. The boards can be manufactured pre-coloured, to save the labour cost of painting. At the end of its life, it can be reused or recycled several times, the rebate scheme providing a financial incentive to do so.

- c. **evidence that the product or service performs at least as well as a comparable alternative and meets relevant safety standards.**

The board has similar strength properties to plywood but has better fixing characteristics. It does not need to be painted to protect any areas of exposed core. It is lighter than plywood and narrower so it can be handled by one person reducing the labour costs to fix the board. The introduction of EcoBoard on the St David's 2 site has been so successful that there are plans to roll it out across other Bovis Lend Lease projects.

In terms of meeting relevant safety standards, EcoBoard is actually safer than traditional timber for site hoarding, as it does not present the risk of splinters, as well as it being easier to handle, as it is lighter and more narrow than traditional timber hoarding solutions.

2. **Please provide clear, detailed and quantified evidence of the environmental benefits of the product or service, over and above a comparable alternative, measured over the complete cycle. These should be stated in terms of:**

- a. **energy and material inputs**

Current capacity can make 300,000 boards from 6,000 tonnes of co-mingled polymer waste per annum representing < 6% of the plywood used in construction and about 0.2% of the waste plastic sent to landfill each year.

The provisional, unvalidated carbon footprint of the board, included in the annex, shows that it is similar to that of plywood when considering the overall transportation and end of life disposal costs, assuming the initial energy costs in manufacture of the original plastic are discounted. We have included within the annex a table showing the relative carbon emissions associated with each type of material.

- b. **waste generation**

Not only does the board use waste material which would otherwise have been sent to landfill or incineration, it is also anticipated that the board can be reused and will not deteriorate, as plywood can during long contract periods.

At the end of the use on a project, the board is returned to the manufacturer for recycling and a refund of approximately 10% will be given. This provides an incentive to the contractor to recycle rather than simply send the *EcoBoards* for disposal, reducing landfill.

Aside from reducing costs and our carbon footprint, it will lead to new sustainable products which can be used in permanent works, further reducing the volume of plastic sent to landfill.

**c. emissions to air, water and land**

The recycling plant will reduce the carbon miles involved in transporting the material to the point of use as it will be manufactured in the country in use and, as utilisation increases, it is anticipated that production plants will be built in each region of the country.

As stated above, it will reduce the material normally sent to landfill

**3. Please provide evidence of the expected contribution to be made by the new product or service to the organisations overall financial performance**

We hope EcoBoard will demonstrate to all our stakeholders, including clients and the communities in which we work, that Bovis Lend Lease is committed to sustainability and works hard with its partners to develop innovative solutions to environmental problems. The material will also reduce the cost of temporary works by reducing the labour required to fix the material and will also reduce labour costs associated with painting traditional timber hoarding, as *EcoBoard* is supplied ready-coloured.

**4. What commitment exists, within your organisation, to the further development and/or marketing of the new product or service?**

Through promoting *EcoBoard* to all of our employees, we have already a list of projects interested in using the material. We are currently finalising plans to get *EcoBoard* to these projects.

We have also encouraged our supply chain to use the material for concrete formwork and in partitioning systems and it has been very well received by subcontractors.

Bovis Lend Lease is a member of a research consortium with Brunel University, ERT and PERA to prove the properties of the material for use in permanent works, to develop a demountable hoarding system made from the material, and establish if the waste packaging materials being removed from our projects can be diverted to the production of the board.

**5. What consumer needs are met by the product or service?**

Both our clients and our own projects will be able to reduce the carbon footprint of construction work, particularly for temporary works. We are also able to reduce the risk of injury to the personnel involved in erecting the hoarding, because the panels are lighter and because they are made from recycled plastic, there is no risk of wood splinters and no saw dust produced when cut.

Consumer needs (in this case the construction industry in general and their clients) can be assured that the materials they are using on site go a long way towards reducing the carbon footprint of the construction process.

6. **What wider social benefits can be expected to arise from the production and consumption of the product or service (e.g. improved quality of life; security of employment; local economic development; consumer safety)?**

A number of stakeholders have benefited from this innovative product, including:

- **St David's 2 team through identifying a new product which will:**
  - reduce the carbon footprint of the construction works, tying into Bovis Lend Lease's sustainability plan; and
  - reducing costs associated with construction.
- **People local to the manufacturing plant who benefit from:**
  - employment and the associated economic investment in the area; and
  - the opportunity to develop new skills.
- **Members of the public walking by the hoarding who:**
  - are less likely to pick up splinters from the hoarding; and
  - will be informed by hoarding displays about the efforts to minimise the environmental impact of the development, including an insight into how the board has been produced;
- **contractors working with the board who:**
  - have found it easier to use; and
  - reduced their risk of injury through working with it, in comparison to traditional hoarding methods.
- **people living near landfill sites will benefit from:**
  - reduced volumes of waste material going to landfill, through the use of mixed plastic waste stream.

In addition the business model for *EcoBoard* covers a refund of approximately 10% of the cost of boards which are returned to the PIM plant for recycling. This is an incentive to recycle the board and will discourage fly-tipping, benefiting contractors, public and local authorities who have to deal with this waste nuisance.

7. **What potential is there for the innovative aspects of this product or service to be replicated elsewhere?**

Further research is being undertaken, under a research and development project supported by the DTi (now the Department for Business, Enterprise and Regulatory Reform) involving Brunel University, ERT, PERA and others to establish the effect of the range of plastics and the properties of the board, and to develop hoarding panels with integrated moulded rails and posts. It is also hoped that materials for use in permanent construction works can be developed

Following further testing and development in 2007, full scale commercial production is planned in 2008.

The research project should enable full certification of the board to be obtained for use in permanent works.



## Basic Carbon Footprint Data (Revised Sep 07)

Hoarding Panel

2.4m x 1.0m x 0.019m

Panel only, does not include formwork, cement or transport

Table 1. Carbon footprint per hoarding panel.

Material Reference	Material type		Per hoarding section - 2.4m (height) x 1m (width) x 19mm (thickness)						Basic Life Cycle CO2 emissions		Notes	
	Description	Embodied Energy		Density	MJ/m2	MJ (embodied energy)	kg (weight)	Unpainted kg CO2	Painted kg CO2	per hoarding panel		
		MJ/kg	MJ/m3							Reuse Factor		per life cycle kg CO2
				t/m3		per hoarding	per hoarding (density/volume = mass)	per hoarding (unpainted)	per hoarding (painted)	No of times product can be reused before recycling	kg CO2/reuse frequency	
	(Reference A)							(Reference B)	(Reference B)			
1	Aluminium (Virgin Extruded)	230	621,000	2.70								
3	Concrete (30MPa)	1	3,120	2.40								
4	Cement	5	9,360	1.95								
5	Fibre Cement Board	37	52,540	1.42								
5	Fibreglass Insulation	27	810	0.03								
6	Polystyrene Insulation	88	1,760	0.02								
7	HDPE	103	95,790	0.93	1820	4368	21	204	207	3	69	
8	LDPE	103	91,670	0.89								
9	Mixed PE (Virgin)	103	94,760	0.92	1800	4321	21	204				
10	Mixed Plastic (100% recycled PIM density 450kg/m3)	16	7,020	0.45	133	320	21	21	24	3	8 Ref c	
11	Mixed Plastic (80% recycled, 20% Virgin PIM density 450kg/m3)	28	12,546	0.45	238	572	21	38	41	3	14 Ref c	
12	PP	99	89,280	0.90								
13	PVC	77	102,676	1.33								
14	Timber (kiln dried, planed)	9	4,758	0.55								
15	MDF	12	8,120	0.70	154	370	32	37	40		Ref d	
16	Plywood	15	7,500	0.50	143	342	23	35	38	1	38 Ref e	
17	Paint	80	104,000	1.30	10	25		3			Ref f	

Table 2. Derivation of embodied energy for Reference 10 (Mixed plastic).

	MJ/kg
PIM Process	12
Material Preparation	4
<b>Total</b>	<b>16</b>

Table 4. Notes

Ref a	University of Bath "ICE" database 2006/07
Ref b	DEFRA 2005 (UK) Reporting guidelines for Company Reporting on Greenhouse Gas Emissions)
Ref c	<b>Assumes PIM is manufactured using 80% Gas and 20% Electricity</b>
Ref d	Assumes MDF is manufactured using 60% Electricity and 40% Gas
Ref e	Assumes Ply is manufactured using 60% Electricity and 40% Gas
Ref f	<b>Assumes paint is 0.1mm thick on 1 side only</b>