

Case Study: Mineral Wool/Steel Composite Panel Recycling

Recycling of Mineral Wool Composite Panels Into New Raw Materials



Eurobond have developed a method for recycling mineral wool composite panels. By segregating the panel into constituent materials (mineral wool and steel), these can be fully and independently recycled so that new complete panels can be made and waste diverted from landfill.

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Written by: BRE/Eurobond



Front cover photography: Composite panel being fed into a composite panel recycling machine (Eurobond)

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Executive summary

This case study describes the recycling of composite sandwich panels, comprising mineral wool and steel facings, following the refurbishment of a computer data centre for Goldman Sachs Investment Bank. 17000m² of wall and ceiling composite panels were installed on the data centre in East Grinstead, Sussex. The composite, derived from door way cut-outs, off-cuts and site-damaged panels, comprised of approximately 1,800m² which was re-processed into new raw materials (steel and mineral wool).

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1.0 Background

1.1 General information on the recycling project

- **Name:** Data Centre for Goldman Sachs Investment Bank.
- **Region:** East Grinstead, Sussex, England.
- **Type of recycling activity:** Mineral wool composite panels collected, shredded and separated for re-entering into the manufacturing process to make new products (steel and mineral wool).
- **Whether new build, refurbishment or demolition:** Refurbishment of data centre.
- **Type of material accepted:** The recycling process accepts mineral wool composite panels from site demolition or refurbishment waste, site waste from new build and waste from manufacturing processes.
- **Use/application(s) of the material(s):** Scrap steel and mineral wool raw materials are produced which are suitable for a range of products including, potentially, new composite panels.
- **Timescale:** During 2008.
- **Client for the trial:** Eurobond Laminates Limited.
- **Contractor:** Laing O'Rourke (main contractor); CPS (panel sub-contractor).
- **Strategic partners:** GD Environmental Services Ltd, Rockwool International and Corus.

1.2 Description of the recycling project

1,800 m² of Eurobond's Firemaster wall and ceiling composite panels (100mm and 150mm thickness), which are faced with Corus' steel 'Performa' product, were removed from Goldman Sachs' data centre in East Grinstead, Sussex. The recycle, derived from door way cut-outs, off-cuts and site-damaged panels were re-processed into new raw materials (steel and mineral wool).

Construction generates more than one third of waste materials going to landfill in the UK but only half of construction and demolition waste is reused or recycled within the sector¹. There is a growing realisation that the current model of development is unsustainable; habits must change and progress made if growth is to be sustainable. The Government recognises this and is committed to achieving sustainable development in the United Kingdom through its 'Sustainable Construction Strategy'. Government and industry have proposed halving the amount of construction, demolition and excavation waste sent to landfill by 2012².

One way to tackle waste of construction materials is to use them again at the end of their life. An example of this is the approach adopted with the mineral wool/steel composite structural panels manufactured by Eurobond. Eurobond advocates a 'cradle to cradle' approach to recycling where materials are recycled in a closed loop. Maintaining materials in closed loops maximizes material value, allowing materials to be used, recycled, and used again, often without any deterioration in material quality. For mineral wool composite panels, this is a "win-win" situation. There are no expensive disposal costs and there is also a reduction in the need for primary natural resources.

A composite panel can be considered as part of a "closed loop" recycling process as both steel and mineral wool can be used to make new product. After processing, 100% of the separated mineral wool and steel facings is re-entered into the manufacturing process to make virgin products. No material is required to go to landfill. All parts of the composite panels are recycled.

Eurobond's approach, in collaboration with its strategic partners GD Environmental (a waste management company), Rockwool (a mineral wool insulation manufacturer) and Corus (a manufacturer of coated steels), is to manage the recycling of the composite panels and ensure delivery of all recycled material to the relevant manufacturer for transformation into new product.

1.3 Cost benefits

The recovered steel has an increasing value and, in some projects, this could result in a recycling process approaching cost neutrality. Transport has a significant impact on the recycling costs and therefore cost benefits are calculated on a project-by-project basis. However, through the use of readily available machinery and careful project management, Eurobond is able to offer a cost-effective, closed-loop recycling capability for end-of life composite panels.

1.4 Environmental benefits

- Total recyclability.
- Steel and mineral wool returned and recycled into new product.
- Zero waste to landfill.

2.0 Specific Details of the Recycling Methodology

2.1 Overview

Managing the recycling of the composite panels and ensuring delivery of all recycled material to the relevant manufacturer for transformation into new product has several key 'system components':

- Segregation (with acceptable levels of contamination).
- Delivery to recycling site.
- Recycling.
- Reprocessing back into steel/mineral wool products.

2.2 Segregation

Amendments to The Landfill (England & Wales) Regulations 2002 implemented Council Directive 99/31/EC on the landfilling of waste impose more strict controls on waste being sent to landfill. Traditional co-disposal methods can no longer be used. From 30 October 2007, all waste has had to be pre-treated (physically, chemically or thermally), before acceptance to landfill. Physical treatments include segregation and volume reduction. At this stage it is practicable to separate steel faced composite panels.

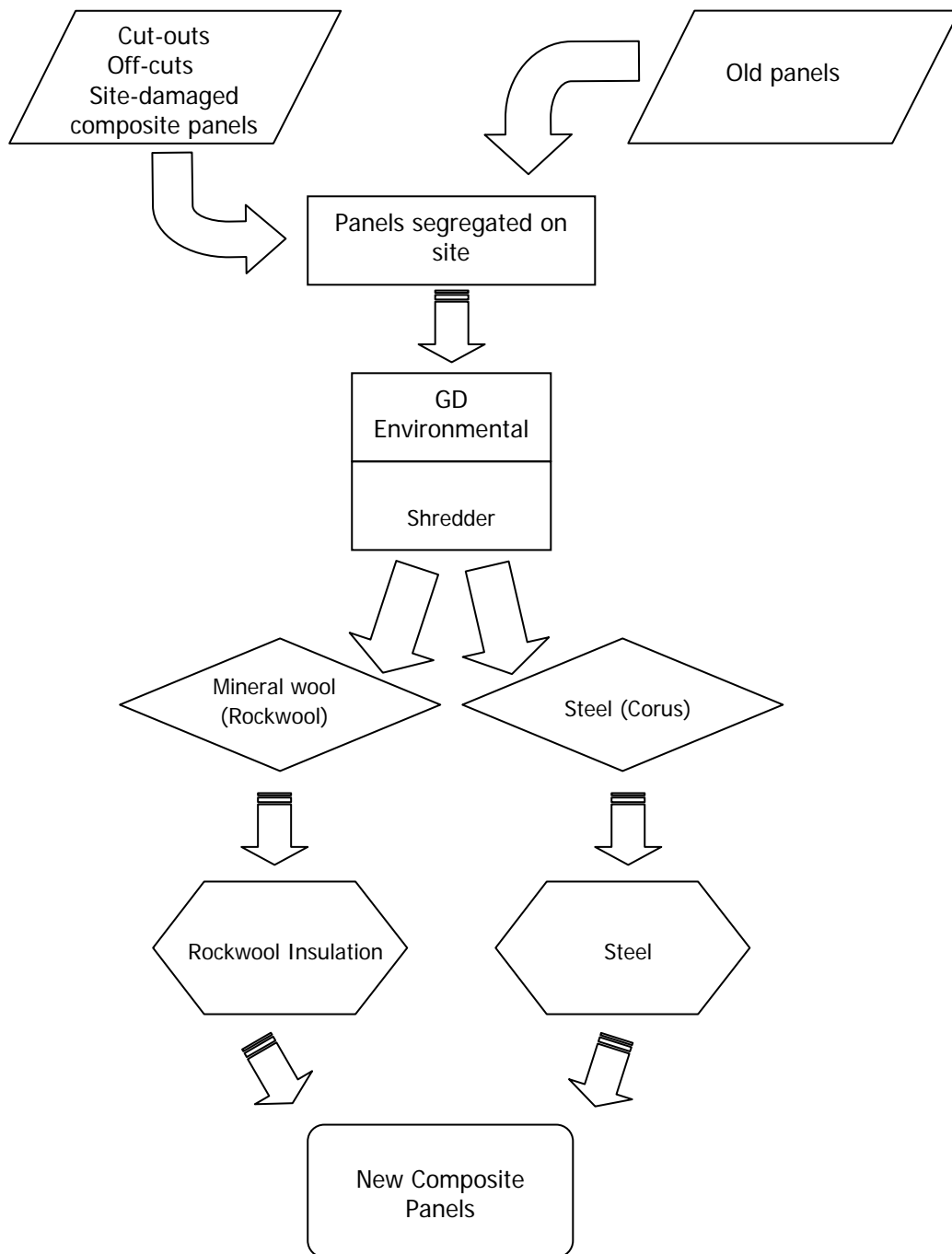
From 6 April 2008, construction projects in England over £300,000 in value were required to have a Site Waste Management Plan (SWMP). The SWMP must include a forecast of wastage as well as a record of types of waste and their destinations (recycling, landfill etc). Projects over £500,000 must estimate the cost savings from waste management.

2.3 Delivery to the recycling site

Once the accumulated volume of waste mineral wool composite panel has been identified and segregated, the material can be delivered to GD Environmental Services in Newport, South Wales. The strategic partners (Eurobond, GD Environmental, Rockwool and Corus) are all located in a similar geographical area within South Wales.

Depending on the volume of mineral wool composite panel generated via demolition, delivery can be staged over several days. Delivery can use a variety of haulage options although, in the case of the data centre refurbishment, was via two articulated lorries. The cost per tonne of recycling is considerably lower than the cost of disposal of waste to landfill. Figure 1 shows the recovery and recycling processes in a schematic form.

Figure 1: Flow chart illustrating the segregation and recycling process



2.4 Recycling

The recycling location of Newport, South Wales, was deliberately chosen as the recycled mineral wool and steel need to be transported only a few miles (25 miles or less) to the respective manufacturers for new material production (both of which are based in South Wales).

The recycling unit itself is a Doppstadt DW-2560K. Although the unit itself is mobile, it is predominantly used in a fixed, elevated position to ensure ease of capture of the recycled material.

Figure 2: A recycling unit for composite panels (Eurobond)



Figure 3: Composite panel being fed into a composite panel recycling machine (Eurobond)



Composite panels of all sizes can be fed into the shredding machine shown in Figure 3. All mineral wool composite panel waste can be handled using this system, which allows for a more flexible range of geometry of the panels as they do not need to be cut down in size. The shredder separates the steel from the mineral wool and deposits it into individual containers for compression prior to delivery to Rockwool or Corus. This process ensures that the minimum amount of transport is required, leading to an environmental and financial benefit. Mineral wool and steel are separated via a magnetic belt. The current capacity of the facility for recycling is approximately 2,000,000m² of panels per year.

Figure 4: Separation of mineral wool from steel fraction (Eurobond)



3.0 End Use

3.1 Reprocessing back into steel/mineral wool product

Both Rockwool and Corus have their own acceptance criteria for recycled materials. Eurobond has worked closely with both parties during recycling trials and has established that the material quality post-processing is not only acceptable but, in the case of the steel, prime quality for re-entering into the manufacturing process.

The shredded steel from the facing of the panels will be returned to the Corus site at Port Talbot, where it will be consumed in the steel making process. As a result of the high quality of the steel, the temperature in the blastfurnace at Corus' Port Talbot plant can be lower than normal. This is due to the introduction of already processed steel, which results in lower energy input and CO₂ production.

Rockwool have their own stringent screening process at their manufacturing base in Pencoed, South Wales. The recovered wool resulting from Eurobond trials is of sufficient quality to be re-entered into the manufacturing process without further processing.

3.2 Reprocessing panels back into mineral wool and steel

GD Environmental transports recycled material back to the Corus and Rockwool facilities. There is no need to landfill of any element of the mineral wool composite panel, unlike plastic foam composites which can see a portion of the panel (the plastic foam core) being landfilled after processing.

The recycling of Eurobond product leaves virtually no mineral wool on the steel. There is a small amount present upon the adhesive lines but this is well within the tolerances that are acceptable to Corus.

Rockwool has set targets to continuously improve its environmental impacts and has been able to substantially improve the recycling of waste on site at its Pencoed manufacturing plant. This has resulted in a decline in the volume and costs associated with waste disposal over a six-year period. Improved recycling has also resulted in product being generated from waste, increasing production efficiency and diverting waste from landfill.

To further expand its capacity to recycle waste stone wool, Rockwool is due to open a new recycling facility in the autumn of 2008 at a cost of more than £7 million. This new facility is capable of satisfying the growing demands of Rockwool's customers for recycling over the foreseeable future and also demonstrates Rockwool's commitment to recycling on a larger scale.

4.0 Conclusions

- Composite sandwich panels, comprising mineral wool and steel facings have been successfully re-processed following the refurbishment of a computer data centre for Goldman Sachs Investment Bank.
- The composite, derived from door way cut-outs, off-cuts and site-damaged panels, comprised approximately 1,800m² which was re-processed into new raw materials (steel and mineral wool).
- The current capacity of the facility for recycling is approximately 2,000,000m² of panels per year.
- The quality of the recovered steel and mineral wool recovered is sufficiently high for re-introduction into the relevant production processes. There is no need to landfill any element of the composite panel.

5.0 References

- 1 Setting a requirement for recycled content in building projects – WRAP
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