Plasterboard case study

Plasterboard waste recovery from smaller building sites

This case study describes approaches taken to recover and recycle plasterboard waste from smaller building sites, and its use in the manufacture of cement.
WRAP

WRAP (Waste & Resources Action Programme) works in partnership to encourage and enable businesses and consumers to be more efficient in their use of materials and recycle more things more often. This helps to minimise landfill, reduce carbon emissions and improve our environment.

Established as a not-for-profit company in 2000, WRAP is backed by Government funding from Defra and the devolved administrations in Scotland, Wales and Northern Ireland.

**WRAP and plasterboard**

Through its Construction Programme, WRAP is helping the construction industry cut costs and increase efficiency through the better use of materials.

WRAP receives funding from Defra through the Business Resource Efficiency and Waste (BREW) programme to divert plasterboard waste from landfill by working to overcome the barriers to plasterboard recycling. Additional funding is also received from the devolved administrations in Scotland, Wales and Northern Ireland.

WRAP is developing a number of initiatives which are supporting the segregation, collection and recycling of waste plasterboard, and the development of end-market uses for the resulting recycled gypsum.

More information on WRAP’s work can be found on www.wrap.org.uk
Summary

Most methods for recovering waste plasterboard from construction sites rely on it being segregated on site into a dedicated collection container, such as a skip, bin or bags. This can be difficult for smaller building sites where space for these containers may be limited, and the quantities of plasterboard waste are small thus reducing the cost-effectiveness of recovery.

However, many small and medium size building companies recognise the various benefits of good site waste management and resource efficiency, and want to be able to recover their plasterboard waste for recycling.

One such company is A. Hatcher & Sons Ltd, a building contractor and property developer in West Lincolnshire. They have recently completed a three week project to refurbish Westgate Court, located in Sleaford, to house 30 new flats.

Through previous projects they have a good working relationship with MID UK Recycling Ltd, that provide recycling services to a wide range of sectors in the East Midlands. Mid UK Recycling Ltd operate a materials recycling facility (MRF) in Caythorpe, West Lincolnshire, and accept a wide range of waste types, including plasterboard, either as mixed waste loads or pre-segregated on site. Mixed waste loads are sorted at the MRF, and the different materials recycled or recovered.

For waste plasterboard MID UK Recycling Ltd operate a bespoke plant at the MRF which processes the waste to produce recycled gypsum. They supply this product for use in cement manufacture.

MID UK Recycling Ltd and A. Hatcher & Sons Ltd worked together to identify the most appropriate waste
management solutions for the Westgate Court refurbishment project. Due to space constraints only a single skip could be placed on site for the mixed collection of all construction and demolition waste. MID UK Recycling Ltd provided the skip and collection service through their sister company Mountain Skip Hire & Recycling Ltd. The waste was then sorted at their MRF and the materials recycled.

12 tonnes of plasterboard were recovered and recycled from this project, which without this solution would otherwise have been disposed of to landfill.

This case study demonstrates that recovery of plasterboard waste is feasible from smaller building sites, and that the loop can be closed by recycling construction waste back into construction materials.
Background

Plasterboard is made of a gypsum plaster core with a paper facing. It is a widely used construction material for applications such as forming partitions, lining walls and ceilings. Over 2.5 million tonnes of plasterboard are manufactured and used in the UK each year, and this is increasing.

From its use, plasterboard waste arises during installation through wasteful design, off-cuts, damaged boards, and over-ordering. Wastage of 10%-35% often occurs on sites, leading to around 300,000 tonnes of plasterboard waste being produced each year from this source. It also arises from its removal, such as from removing partitions, refurbishing wall and ceiling linings, repairing damaged linings, and from complete soft-strip before demolition of a building. It is estimated that in total more than one million tonnes of plasterboard waste is produced in the UK each year.

Although plasterboard waste from all these sources can be recycled, the vast majority is still disposed to landfill. It is increasingly necessary to find alternatives to this, due to factors such as:
- rises in landfill tax increasing the cost of disposal to landfill year on year;
- available space in landfill sites decreasing;
- the Landfill Regulations now requiring that quantities of gypsum-based materials being disposed of to landfill must be deposited in a specially engineered “high-sulphate monocell” in a non-hazardous landfill site, leading to increased disposal costs.

One alternative is to collect and recycle waste plasterboard that is produced. The companies which worked together on the Westgate Court used this principle to reduce the amount of plasterboard waste being sent to landfill.
Company overviews

**MID UK Recycling Ltd**

MID UK Recycling Ltd are committed to the environment and the responsible reuse and recovery of renewable and non-renewable resources. The business was set up in 1998 as a skip hire company, but soon recognised that recycling and composting presented greater opportunities. They have since developed into a well established waste management company in the East Midlands, providing recycling solutions to both the private and public sectors.

**Materials recycling facility**

The hub of the operation is a materials recycling facility (MRF) located in Caythorpe, West Lincolnshire. The MRF can process 120,000 tonnes of mixed waste per annum, and currently accepts plasterboard, glass, aggregates, scrap metals, plastics, paper, card, green waste, timber and agricultural waste. The MRF recovers or recycles on average over 80% of the material it accepts. The facility is also used by numerous local councils for the recycling of co-mingled materials collected from kerbside schemes.

**Plasterboard recycling facility**

Plasterboard is just one of the many construction and demolition (C&D) waste streams that MID UK Recycling Ltd process for recovery. Approximately 90% of plasterboard waste processed comes from the C&D sector, with the remaining 10% arising from damaged and out of date boards from builders’ merchants and distributors.
Mountain Skip Hire & Recycling Ltd

Mountain Skip Hire and Recycling Ltd is a sister company of MID UK Recycling Ltd and provide skip hire and collection services through a fleet of over 50 vehicles. They provide collection services for small projects, such as a one off conservatory or extension, as well as large scale demolition and new build projects. They accept both segregated and mixed waste streams, depending on the clients’ requirements.

A. Hatcher & Sons Ltd

A. Hatcher & Sons Ltd is a small building contractor and property developer based in Sleaford in West Lincolnshire, located approximately 10 miles from the MID UK Recycling Ltd MRF. They mainly work with commercial clients, concentrating on local projects, but also take on work nationally for their larger clients. This has recently included the building of a new church, refurbishment of a shop arcade, conversion of a snooker hall into flats, and the building of two new bungalows for people with disabilities. They are committed to recycling and try to find alternatives to landfill disposal of their C&D waste wherever possible.

The partnership

Since MID UK Recycling Ltd first started business ten years ago, they have built a strong relationship with A. Hatcher & Sons Ltd. They established a system for the collection of mixed C&D waste to be transported to the MRF and segregated for recycling. The system proved to be successful and they now work together regularly using similar waste management and recycling solutions for small and large refurbishment and new build projects.
The approach

**Westgate Court**

Westgate Court, Sleaford, is a block of 30 flats originally constructed in the 1970s. A. Hatcher & Sons Ltd undertook a project to refurbish these flats, which included the removal and reconstruction of internal and external walls, and the excavation and re-laying of footpaths leading to the property. This was a three week project that commenced in February 2007.

**Planning stage**

Before the works commenced an initial assessment was carried out to estimate the types and quantities of waste arisings, and determine the available space for siting a mixed waste container.

**Waste arisings**

The refurbishment project was expected to generate various waste streams including plasterboard, timber, bricks, rubble, soils, metals and other light waste materials.

Plasterboard waste would be arising from:
- stripping out partitions, ceilings and wall linings, and could potentially be contaminated with paint, wallpaper, nails or screws; and
- off-cuts from installing new partitions and linings, and would be clean and uncontaminated.

The total waste arisings for this conversion project was estimated to be in the region of 70 - 80 tonnes.
Containers

This particular site presented space constraint issues. It was only feasible to have one skip on site at a time for the collection of mixed C&D waste. A range of skips, enclosed containers and roll on/offs were considered, but a standard 8 cubic yard skip was seen to be most suitable. Collecting mixed waste in this manner was beneficial to A. Hatcher & Sons Ltd as there were relatively small volumes of waste being generated and they were still able to recycle without being restricted by the lack of space on site. MID UK Recycling Ltd had no issues with segregating loads once they arrived at the MRF as the infrastructure was in place to carry this process out efficiently.

Collection of mixed waste on site

Loading the skip

A skip dumper was used on site to clear all types of C&D waste from inside the building to deposit into the skip. Skip dumpers are motorised eliminating the use of wheelbarrows, and have a hydraulically operated high lifting mechanism which allows the waste to be tipped directly into the skip without any manual handling.
The skip on the Westgate Court site, filled with mixed C&D waste

Contamination

MID UK Recycling Ltd could accept any C&D materials mixed with the plasterboard in the skip load. They did however specify, as with all their waste management solutions, that hazardous materials such as asbestos, wet paint, and batteries were not placed into the same container as the mixed load. This type of contamination would result in additional charges.

A. Hatcher & Sons Ltd ensured that their waste met the criteria and no extra charges were applied to this refurbishment project.

Skip collections

A. Hatcher & Sons Ltd and Mountain Skip Hire and Recycling Ltd agreed that collections from sites were to be charged at a flat price per skip, rather than by weight. This enabled A. Hatcher & Sons Ltd to anticipate and manage their waste disposal costs with greater certainty.
A. Hatcher & Sons Ltd generally pre-arrange with Mountain Skip Hire and Recycling Ltd to carry out daily collections, or provide an estimated date or time when the containers will be full and require replacement. At Westgate Court, daily collections were selected as it prevented the containers from overfilling, although on days when they managed to reduce the waste produced a collection was not made if it was not necessary.

In total, 9 skip collections were made from the site throughout the project. All of the skips were transported directly to the MRF, only approximately 10 miles away.
At the MRF

Waste segregation

Like most C&D waste delivered to the MRF, the waste was co-mingled for segregation and recycling. MID UK Recycling Ltd have procedures to ensure all waste is processed immediately it is received at the MRF to avoid stockpiling.

Firstly the waste is tipped onto the processing area where a number of mechanical grabs extract the larger items and place them in separate bays. The remaining smaller items of waste are then passed along a picking line where the materials are sorted by hand.

The materials are then processed separately, either at their designated facility on site, or are delivered directly to their end markets.
Waste analysis

At the completion of the Westgate Court refurbishment a total of 61.5 tonnes of mixed C&D waste had been delivered to the MRF. A waste analysis was carried out to identify the waste streams that were contained within each of the mixed loads. The overall breakdown of materials was:

- 50% inert materials;
- 20% plasterboard;
- 15% timber;
5% metal; and
- 10% other materials.

The plasterboard that was recovered for recycling was equivalent to 12.3 tonnes. The inert materials, timber, and metals recovered were all recycled or composted. The remaining 10% could not be recycled and were therefore sent to landfill.

**Plasterboard recycling**

The plasterboard recycling facility has an operating capacity of 35,000 tonnes per year. Its high capacity and unique processing technology enables MID UK Recycling Ltd to recover and recycle nearly 100% of all waste plasterboard they receive into a recycled gypsum product which can be used in a range of alternative applications.

Most plasterboard waste is processed dry, but the facility is capable of processing plasterboard with a moisture content of up to 30%. The facility uses a series of trommels, screens, shredders, magnets and gravity separators to separate contaminants, the paper layers, and the gypsum product.

The recycled gypsum product is in the form of granules, 90% of which are sold to a local cement manufacturer as a replacement for gypsum from conventional sources. The remaining 10% is sold into a range of other markets. The cost of this product is lower than gypsum from conventional sources.
The recycled gypsum product

The paper is extracted in pieces approximately 50mm square. It is blended with paper types from other sorting processes at the MRF allowing it to be 100% recycled back into the paper manufacturing industry.
Benefits

- This approach has provided A Hatcher Ltd with a recycling solution for low volumes of plasterboard waste generated along with other C&D waste materials on small and medium sized construction projects where there is limited space for more than one skip.

- 90% of the C&D waste material accepted by MID UK Recycling Ltd from the Westgate Court refurbishment was recovered, recycled or composted.

- 100% of the plasterboard waste was recovered and recycled into recycled gypsum and paper. This enabled 12.3 tonnes of plasterboard waste to avoid landfill disposal. The recycled gypsum was used in the manufacture of cement, and the facing paper was recycled into new paper. This has demonstrated that the recycling loop can be closed by recycling construction waste back into construction materials.
Contact details

**MID UK Recycling Ltd**

Chris Mountain  
Managing Director  
The MRF  
Station Road  
Caythorpe  
Lincs  
NG32 3EW  

Tel: 01400 275 718

Email: chrism@midukrecycling.co.uk  
Web: www.plasterboardrecycling.co.uk

**Mountain Skip Hire and Recycling**

Nick Mountain  
Commercial Director  
Summit House  
Quarrington  
Sleaford  
Lincolnshire  
NG34 8RT  

Tel: 0800 026 36 99

Email: sales@greenmountains.co.uk  
Web: www.greenmountains.co.uk
A. Hatcher & Sons Ltd

David Hatcher
Director
Navigation House
Carre Street
Sleaford
Lincolnshire
NG34 7TW

Tel: 01529 303012

Email: ahatcherandsons@aol.co.uk
This case study was developed for WRAP by Enviros and CIRIA

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