Material change for a better environment

Case study

Reverse logistics for vinyl flooring

A demonstration of the benefits of applying reverse logistics on construction sites from Recofloor

Polyflor deliver vinyl flooring to the construction site and bankhaul wasted materials (typically offcuts) for recycling

Key facts

- It is estimated that 80% of vehicles delivering to a construction site leave empty. Utilising these vehicles can reduce your environmental impact.
- There is a significant carbon saving to be made from using recycled content in vinyl flooring (in the order of 0.2kg CO_2 per m^2)
- The number of visits to the site (including both delivery of materials and waste management) has reduced by 30%.

Introduction

Reverse logistics is the use of those vehicles delivering materials to a location to backhaul materials. In the context of this case study, it is the use of vehicles delivering new construction materials to a site to return the unused materials and off-cuts back to the manufacturer for recycling and reuse.

There are a number of benefits to implementing an effective reverse logistics operation. These can be summarised as:

- effective waste management – targeting and backhauling specific waste streams often diverts this material from landfill, and ensures that it can be swiftly recycled into new product;
- costs – backhauling opportunities can often save in waste management costs or be cost neutral;
- carbon impact – backhauling materials in vehicles that would previously have returned empty often results in lower emissions than those from waste collection vehicles; and
- health and safety / site efficiency – using reverse logistics can reduce the number of separate vehicle visits to site.

In order to assess the potential benefits of reverse logistics to a range of construction sites, WRAP (Waste & Resources Action Programme) has developed a spreadsheet model that allows the user to input details about their site, and determine the costs and benefits of implementing reverse logistics.

This case study looks at the example of one reverse logistics operation by Recofloor, a partnership between vinyl flooring manufacturers Polyflor and Altro, formed to collect waste vinyl flooring for recycling back into new product. The case study explains the specifics that have made the reverse logistics a success for one construction site, and the costs and benefits of this operation.

Project Details

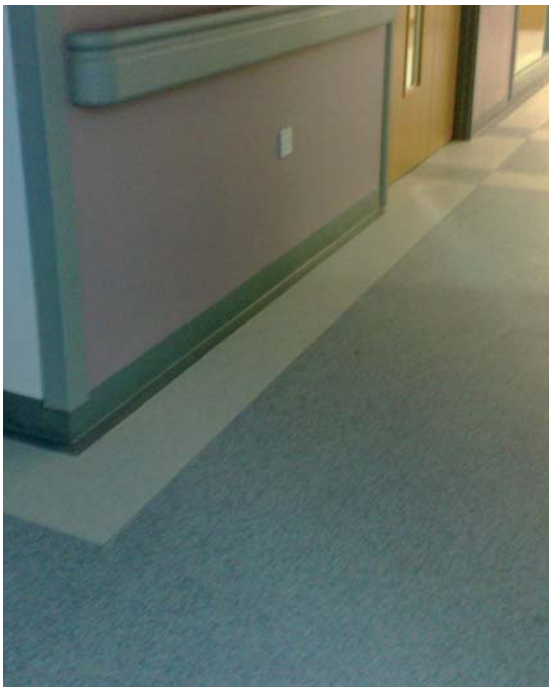
The site in question is Newcastle Royal Victoria Infirmary. Main contractor Laing O'Rourke was responsible for the construction of two separate buildings as part of a £170M hospital extension project. The project commenced in 2005 with final works completed in 2010.

Waste management on site is a key issue for Laing O'Rourke, and as such they have appointed a dedicated waste management and logistics contractor, Munnellys. This appointment is key in assisting them to achieve their target of 90% recycling for material that leaves site, and contributing to their commitment to help the construction sector achieve halving waste to landfill by 2012 (the key industry target for construction, demolition and excavation waste covered by WRAP's Halving Waste to Landfill Commitment).

The flooring selected for the hospital is a combination of standard vinyl and safety vinyl flooring, both fitted by a sub-contractor (FPL Flooring) working for Laing O'Rourke. Upon specification and ordering of the flooring, Recofloor worked with Laing O'Rourke and FPL flooring to set up the waste take-back scheme, and this has been operating throughout the floor fitting stage. The main role of FPL flooring in the scheme is to ensure that the waste off-cuts are effectively segregated and presented for take-back as they arise.

Managing the collection of vinyl flooring waste on site is simplified by the introduction of dedicated wheeled bins. These bins have a 'post box' style slot for acceptance of flooring off-cuts only and can be easily moved to the fitting area. The sub-contractor is responsible for filling the bins, and ensuring that they are presented for collection when a delivery is due. Delivery vehicles exchange a full bin for an empty one.

The sub-contractor operates teams of two fitters and one labourer, and has found no issue in using the new bins for collection of waste - the system is said to be just as easy to operate as their standard method of working (where waste still needs to be transported from where it arises to a site waste compound), and is something that they will pursue on other projects.



Vinyl flooring at Newcastle Royal Victoria Infirmary

Upon receipt of the off-cuts the manufacturer will check for contamination, and then can incorporate the vinyl directly back into the manufacturing process. The vinyl off-cuts directly replace the need for raw materials within new flooring, making it a valuable feedstock.

Modelling costs and benefits

WRAP's Reverse Logistics model requires the user to enter details of the materials purchased, the delivery logistics and the wastage rates. It then compares the impact of business as usual with a reverse logistics scenario and presents these as simple graphics.

Polyflor have so far delivered in excess of 60,000 m^2 of flooring to the site in Newcastle. The breakdown of the different flooring types was entered into the model, along with updated information regarding the costs and dimensions of the materials.

Two different types of vehicles are used to deliver material from the manufacturing site in Manchester to the construction site. Rigid body delivery vehicles with a payload of either 8.2 tonnes or 15.3 tonnes are employed depending on the size of the load being sent at any particular time. These vehicles typically return to Manchester empty, meaning that there is ample capacity for back-hauling waste flooring as it arises.

The distance between all sites is entered into the model, including in this case the distance from manufacturer to site, and waste management contractor to site. If a builder's merchant is being used as an intermediary, then this can be factored into the assessment, with additional vehicles defined as required.

The final information needed is a definition of current waste management practices – i.e. what would happen to the waste flooring if it was not back-hauled? For vinyl flooring, between 5% and 10% is typically wasted as off-cuts, depending on the shape of the area that the flooring is being laid on, and this material would be taken away by a waste contractor and landfilled locally.

What are the results?

The results show that the Recofloor scheme has diverted 19 tonnes of waste flooring (equivalent to around 6,000m^2) from landfill on the Royal Victoria Infirmary site (based on assumptions of a 10% typical wastage rate). Following collection, it is recycled at the Manchester production site directly into new flooring. The number of site visits (including both delivery of materials and waste management) has reduced from 31 to 22 meaning there is less pressure on the site to manage deliveries and less nuisance for the site's neighbours. This is of particular importance to Laing O'Rourke, who are managing their construction whilst the hospital remains in full operation. There is the potential for the main contractor to save in the region of £700 in waste management charges. The contractor is currently on a fixed price contract for waste management, but this was agreed before the take-back scheme was developed.

Despite the distance in transporting the material being significant and greater than the distance to a local landfill site, the reduction in the number of site visits meant that distance travelled was reduced by 1,190 km per year. There was also a net carbon reduction from 0.74 tonnes CO_2 to 0.66 tonnes CO_2.

What other cost and benefits are there?

The benefit of recycling vinyl flooring has been the focus of a recent WRAP research project. A life cycle assessment study (MDD007 Demonstration of end uses for recovered PVC flooring, 2009, WRAP) compared the environmental impact of making vinyl flooring including some recycled content versus making it from virgin raw materials. This study concluded that there is a significant carbon saving to be made from using recycled content in flooring (in the order of 0.2kg CO_2 per m^2). Using such flooring on the Newcastle Hospital site for example could result in further saving of 12 tonnes of CO_2.

Quote

"Back hauling of material has been an efficient and effective way of collecting waste off cuts from the flooring laid at Newcastle Hospital. We are very pleased to have made such a positive impact on site logistics as well as having achieved a significant net carbon reduction and diverted material from landfill."

Jane Gardner
Recofloor Project Manager

Vinyl flooring off-cuts at Newcastle Royal Victoria Infirmary

Application to other materials

Where manufacturers can recycle the off-cuts of their materials back into new product, take back schemes are becoming increasingly popular. Schemes are already operating for plasterboard and insulation where the wasted materials can be easily recycled back into new products. Polyflor is also now looking at expanding their take-back service to taking back associated packaging materials (e.g roll-cores) as well.

Summary

With access to the right data, the model takes approximately 30 minutes to complete for a first pass assessment of a few material take-back opportunities. If fewer data are available, then the user can select from pre-defined information regarding a wide range of material types.

WRAP's Reverse Logistics model is free to download (www.wrap.org.uk/constructionlogistics) and can be used to assess backhauling opportunities for a specified operation and a wide range of construction materials.

The model can be used at a number of different times during a project lifespan:

At project scoping	To determine the potential benefits to the project that reverse logistics could bring.
When tendering for material suppliers	To assess the best combination of material supply and waste management. The outputs from the model can be used to guide discussions between suppliers and contractors.
During the project	To assess progress against plan
Retrospectively	To determine what benefits could have been realised on a previous project.

WRAP Construction Programme:
http://www.wrap.org.uk/construction

Case Study:
http://www.wrap.org.uk/constructionlogistics

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