

Chapter 15

Reverse Logistics for Sustainable Waste Management Processes

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ABSTRACT

This chapter highlights some of the innovative approaches that have been taken by businesses involved in reverse logistics for the removal of waste from urban areas. The chapter reviews some of these approaches and suggests which could be used more widely, recognising the specific limitations which may restrict their applicability. These innovative approaches include: the use of delivery vehicles to take-back waste/recyclate to out-of-town facilities such as a freight consolidation or recycling centre; combining commercial and household waste collections; deploying public transport vehicles to carry specialist recyclate; using multi-modal transport; 'smart' bin technology and pipelines for the removal of waste from buildings.

INTRODUCTION

This chapter is concerned with how waste management processes may be improved through the use of innovative ideas in reverse logistics. The main focus here is on the physical transportation of waste, rather than on the management and com-

puter systems that may also be required to support these activities. The chapter begins by describing some of the basic concepts and typical methods found in waste management practice, highlighting the main practical, organisational, financial and legal issues. The chapter then describes a number of different innovative methods that have been introduced in recent years and assesses their advantages and disadvantages. The objective of

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the chapter is to provide a critical review of these innovative methods and to examine their scope for more widespread application.

BACKGROUND

Landfilling waste is generally considered to be unsustainable due to concerns about leachate contaminating ground water, the length of time needed to stabilize materials and the potential for methane to contribute to the global greenhouse effect (Das *et al.*, 2002). Recognising this, and driven by a series of European directives, the UK government produced a 'Waste Strategy for England 2007' (Defra, 2007), which promoted more sustainable waste management processes through reduction, re-use and recycling of waste, recovery of energy and reduced landfilling of waste.

Reverse logistics refers to the "planning, implementation and control of the movement of goods, raw materials and related items from the point of consumption to the point of origin, for the purpose of recapturing value or proper disposal." (Rogers and Tibben-Lembke, 1999). Typically, the starting points for waste (or return goods) are commercial premises in urban areas (e.g. High Street shops). The end points for waste depend upon the recycling or waste treatment options being used. Waste treatment options include incineration, pyrolysis, gasification, composting, anaerobic digestion and landfilling (Williams, 2005). Materials that are most commonly recycled include cardboard, paper, metals, plastics, textiles, wood and glass, with cardboard and paper typically comprising around two-thirds of the commercial waste from High Street retailers (Maynard and Cherrett, 2010). There are often intermediate points in the reverse supply chain for the consolidation of wastes which could be at regional distribution centres (RDCs), transfer stations, or other locations, before onward transportation to final disposal. The reverse lo-

gistics channels for return goods are likely to be different from those for waste, adding complexity to the combined problem.

The alternative disposition routes used for waste and for return goods tend to add to the overall transport burden associated with waste logistics, so innovative methods to reduce this are welcome. Improvements in terms of reduced transport costs or improved recycling performance may come from improved co-ordination of reverse logistics processes and greater co-operation between the parties involved (e.g. retailers). A lack of co-ordination, sub-optimal use of vehicles and low levels of waste/ recycle backloading (use of delivery vehicles to collect waste), can result in unnecessary handling and associated increases in vehicle traffic (Shakantu *et al.*, 2002).

EXISTING PRACTICE

In the UK, commercial waste is collected either by a national or local contractor, by the local authority, where they offer such a service, or in-house, using the business' own vehicles; in some cases, commercial waste may be taken, often illegally, to household waste recycling centres (Maynard and Cherrett, 2010). The frequency of collection depends on the size of the business, with the largest typically receiving daily collections and the smallest often requiring one collection each week; an average of 2.4 collections per week was estimated in a study of 83 businesses in the city of Winchester, UK (Maynard and Cherrett, 2010). The typical collection arrangements for commercial recyclable waste and residual waste from a survey of businesses on Winchester High Street are shown (Figure 1).

For returned goods, the main reverse logistics methods seen in practice (Mukhopadhyay *et al.*, 2006) are:

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