

# **Business data for recycling**

## **Business planning guidance for aggregates recycling companies**

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**CIRIA** *sharing knowledge ■ building best practice*

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# Summary

This business planning guidance is intended to help companies start up an aggregates recycling facility or improve an existing recycling operation. The information will also be relevant to construction contractors intending to recycle materials on their construction sites. The guide includes background information on the growing market for recycled aggregate products, indicative data on the costs of running a recycling operation (including a CD-ROM forecasting tool) and supporting information covering waste management licensing, environmental management, health and safety and quality management.

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# Executive summary

This business planning guidance is designed to help companies start up an aggregates recycling facility or improve an existing recycling operation. The information provided will also be of use to construction contractors interested in recycling materials on their construction sites.

## **Market opportunities and materials**

The growing market opportunities from recycling are discussed, including the drivers behind the uptake of recycled aggregate products, which include improved availability of competitive processing equipment. The book provides a list of common waste materials that can be processed into products and identifies the aggregate products that can be produced from these materials.

## **Planning, waste management licensing and environmental impacts**

The summary of planning requirements included here will help organisations anticipate some of the conditions that may accompany the granting of consent by the planning authority – and the amount of time that this takes.

Certain activities are subject to regulation under the current WML regime. Low-risk activities that do not require a waste management licence are distinguished from high-risk activities, which may need additional authorisations and permits in respect of emissions and effluent discharges.

There is information to help operators anticipate and avoid some of the potential environmental liabilities that may occur. The book also discusses disturbance to natural habitats and the role of environmental management systems.

## **Health and safety and quality management**

The book considers the daily hazards and risks associated with manual handling, slips and falls, vehicles and machinery. It highlights some of the problems that may arise from employees' exposure to hazardous substances present in the materials to be recycled and through dust inhalation.

The benefits of using quality systems to produce products that conform to accepted industry standards are made clear. These include provision of a clear audit trail for demonstrating compliance with waste legislation.

## **Costs and price**

The book looks at a range of costs associated with running a recycling operation and pays particular attention various potential capital costs. Detailed discussion of the components that influence product price includes a "decision tree". The book also indicates two useful sources of potential funding to support recycling businesses.

## **Enterprise forecasting CD-ROM**

Also included with this book is a CD-ROM (attached to the inside back cover) that can be used to model some financial aspects of recycling.

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Please note that all prices and costings were correct at the time of writing, but are subject to change. Readers are recommended to ascertain current figures from reliable sources. Similarly, the web addresses given in the References and elsewhere were checked before this book went to press, but may be liable to change or deletion after publication.

# Definitions and abbreviations

<b>Air knife</b>	Air-driven system for separating smaller particles from a product stream
<b>Crusher</b>	Mechanical plant or equipment for breaking irregular over-sized blocks of hard materials into a more regular aggregate with a predictable distribution of particle sizes. Some crushers have integral screens
<b>Excavator</b>	Wheeled or track-driven plant used to supply feedstock to process plant
<b>Flotation system</b>	Water-based system for separating lighter materials such as wood and plastic from aggregate product streams
<b>Granulator</b>	A piece of mechanical plant for shredding oversize asphalt-based waste into a more regular material
<b>Loader</b>	Wheeled plant used for moving and loading aggregates
<b>Picking station</b>	Conveyor belt system that allows the manual separation of materials
<b>Screen</b>	Standalone mechanical system for sorting, separating and sizing mixed materials
<b>Weighbridge</b>	Mechanical device for determining vehicle load weight
BAA	British Aggregates Association
CDEW	construction, demolition and excavation waste
CIRIA	Construction Industry Research and Information Association
CIWM	Chartered Institution of Wastes Management
Defra	Department for Environment, Food and Rural Affairs
DETR	Department of Environment, Transport and the Regions
DoE	Department of the Environment
DOENI	Department of the Environment (Northern Ireland)
EA	Environment Agency [environmental regulator for England and Wales]
EC	European Commission
EHS	Environment and Heritage Service [Northern Ireland]
EPA	Environmental Protection Act 1990
EWG	European Waste Catalogue (EC, 2002)
HA	Highways Agency
HSE	Health and Safety Executive
IPPC	Integrated Pollution Prevention and Control [system]
Mt/y	million tonnes per year
ODPM	Office of the Deputy Prime Minister
PCB	polychlorinated biphenyl
PPC	Pollution Prevention and Control [Regulations 2000 and 2003]
SEPA	Scottish Environmental Protection Agency [environmental regulator for Scotland]
SHW	<i>Specification for highway works</i> (HA, 1998)
SMEs	small and medium-sized enterprises
TSO	The Stationery Office
WML	waste management licence/Waste Management Licensing [Regulations]
WRAP	Waste and Resources Action Programme

# 1 Introduction

## 1.1 CONTEXT

Market and legislative conditions are likely to stimulate higher levels of demand for recycled aggregates. This business planning guidance is intended to help a company set up an aggregates recycling business or to improve the commercial prospects for a facility that it already operates.

The construction industry now has greater confidence in recycled products, so the recycling of aggregates into higher-value materials for construction applications is likely to prove especially profitable. The introduction of European Aggregate Standards is playing an important role in reducing discrimination against recycled aggregates and the market is likely to be further supported by changes to UK legislation such as the latest amendments to the Waste Management Licensing Regulations 1994.

The greater availability of competitive process plant will also encourage profitable recycling, while UK public procurement policy and government targets for the use of recycled aggregate, now supporting more sustainable practices, will increasingly drive market development.

Within this context, the guide examines all the key aspects of business planning, from products and processing options through to costs, pricing and legislative issues. The book contains detailed financial planning information and is supported by an enterprise modelling spreadsheet tool, available on CD-ROM, to enable the reader to use the data to develop business scenarios.

## 1.2 CONTENT

This guidance is intended for commercial organisations interested in recycling construction, demolition and excavation waste (CDEW). It provides sufficient costing and resource information to enable companies to decide, with confidence, whether, when and how to proceed with a detailed business plan for investing in CDEW recycling in the UK.

Through the development of a spreadsheet-based enterprise forecasting tool and a set of associated guidelines, practitioners can analyse a range of feedstock, process plant and recycled product scenarios to identify how to maximise product value in line with regional market conditions and demands.

The model is intended both to provide an initial feasibility appraisal and to allow users to identify the relative sensitivity of the business case to changes in key product or process variables. It is aimed both at organisations already engaged in recycling activities that wish to explore new opportunities and at new-start operators. The information is also relevant to construction contractors interested in recycling materials on their sites.

The guidance is divided into the following chapters.

- 2 Products and services – defines the scope of the model in terms of feedstock materials, process options and recycled aggregate products.
- 3 Staff, equipment and transport – provides data describing key operational costs.
- 4 Operations and systems – highlights legislative, environmental and health and safety requirements for establishing and operating recycling facilities.
- 5 Markets, legal issues and competition – characterises regional demand patterns, price information, legislative risk and funding opportunities.
- 6 Enterprise forecasting tool – outlines the structure and key variables adopted in the enterprise forecasting tool.

Each chapter begins with a series of checklist questions highlighting the main points that ought to be considered.



## 2

# Products and services

This chapter looks at the arisings of CDEW that are considered in this business planning guidance. It also reviews the range of potential aggregate products that can be processed from these arisings and the plant required to process them.

Have you considered:

- ❖ the range of materials that are suitable for recycling?
- ❖ the products that can be produced?
- ❖ the types of processing equipment needed for recycling?

### 2.1

## CONSTRUCTION AND DEMOLITION WASTE ARISING

For the purpose of this guidance, CDEW is defined as:

*Inert, non-hazardous and uncontaminated waste materials which arise from the construction or demolition of buildings and/or civil engineering infrastructure, including hard construction and demolition waste, and excavation waste, whether segregated or mixed.*

One of the most important European rulings on waste is the 1975 Waste Framework Directive (75/442/EEC, as amended by 91/156/EEC), which contains the definition of waste. This definition is used to establish whether or not a substance is waste.

“Inert waste” and the implications of the definition of waste are discussed in *The quality protocol for the production of aggregates from inert waste* (WRAP, 2004a). This is recommended reading for those engaged in the recycling of aggregate material. It refers to the Waste Framework Directive definition of waste as “any substance or object that the holder discards, intends to discard or is required to discard”.

The Quality Protocol sets out a uniform control process that enables producers to demonstrate that their product has been fully recovered and is no longer a waste. The protocol is also available on the website of WRAP’s sustainable aggregate information service, AggRegain, as is a dedicated version for Scotland (WRAP, 2004b).

Construction, demolition and excavation waste comprises the following arisings (provided there is no suspicion of contamination):

- concrete
- masonry
- bricks
- tiles and ceramics
- stone
- asphalt
- terracotta
- mixed flows of the above materials
- unbound granular materials – aggregates that do not have an added binder, for example trench arisings and excavation wastes

## 2.2

## PRODUCTS

Inert, non-hazardous and uncontaminated CDEW may be reprocessed into products that fall within the following product groups:

- aggregates for concrete
- aggregates for asphalt
- aggregates for *Specification for highway works* (SHW) sub-base types 1, 2 and 3
- aggregates for SHW capping layer
- aggregates for SHW fill
- other graded aggregates
- aggregates for general fill
- fines generated from recycling.

Appendix 1 gives a tabular summary of the CDEW arisings that can be processed into the products listed above along with their specific grading and technical requirements. Data presented in Appendix 1 are derived from information available on the AggRegain website. These generic product groups form the basis of the analysis of process options presented below.

## 2.3

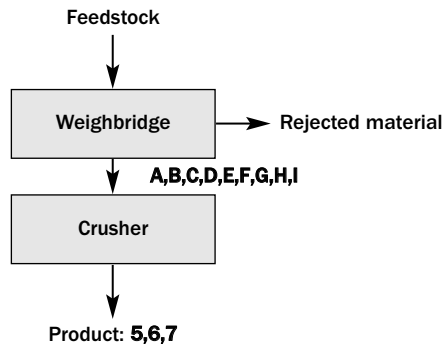
## PROCESS OPTIONS

Plant required to convert the CDEW arisings into each of the generic product groups are presented in flow chart form in Figures 2.1a to 2.1c. The individual operational functions of plant are outlined in the definitions and abbreviations given on page 6. Sophisticated plant is needed to produce some product groups, but sites using such plant will also produce lower-grade products such as fills and capping. Table 2.1 lists the codes used in Figures 2.1a to 2.1c defining waste inputs and product outputs.

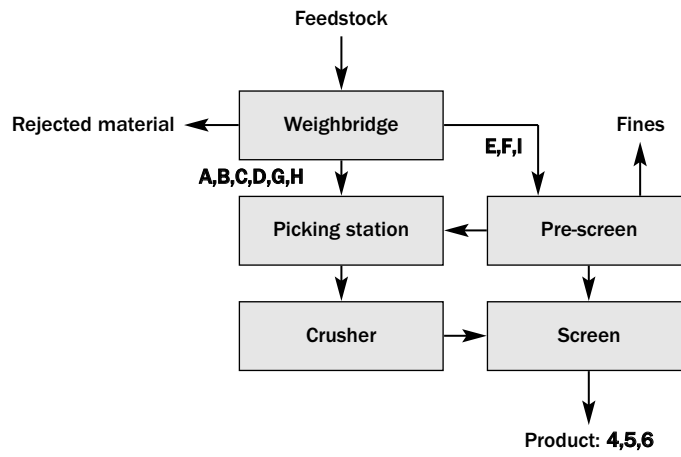
Process options shown in Figures 2.1a to 2.1c form the basis of the economic analysis in Chapter 3 and are the central elements of the forecasting tool described in Chapter 6.

**Table 2.1** *Legends for waste inputs and product outputs used in Figures 2.1a to 2.1c*

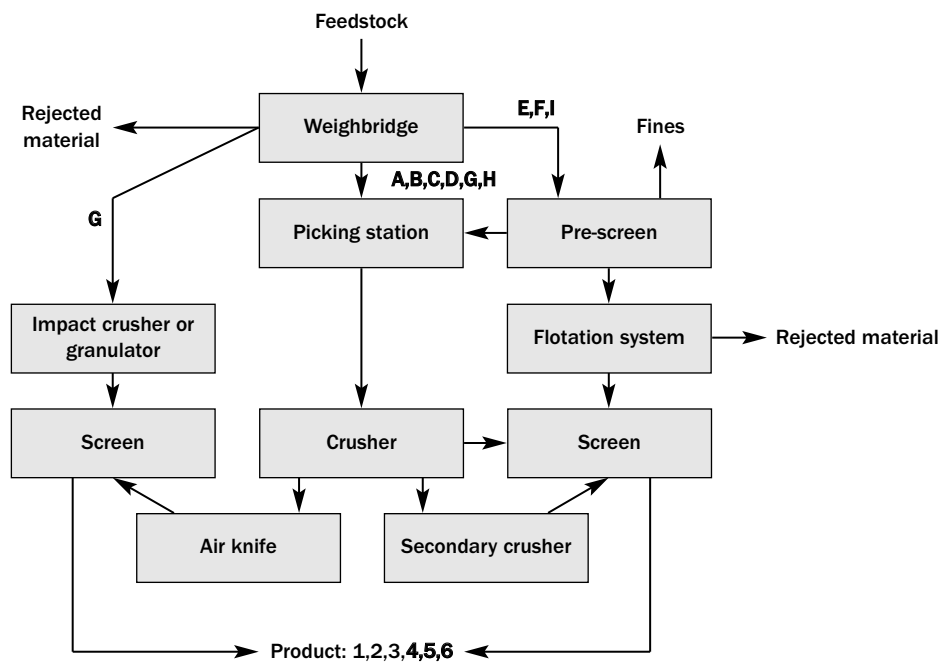
Waste arisings	Code
Concrete	A
Masonry	B
Bricks	C
Tiles and ceramics	D
Unbound granular materials	E
Stone	F
Asphalt	G
Terracotta	H
Mixed flows of the above materials	I
Product	Code
Aggregates for concrete	1
Aggregates for asphalt	2
Other graded aggregates	3
Aggregates for SHW sub-base types 1, 2 and 3	4
Aggregates for SHW capping layer	5
Aggregates for SHW fill	6
Aggregates for general fill	7



**Figure 2.1a** Option  $\alpha$  – process plant requirements for lower-value aggregate products



**Figure 2.1b** Option  $\beta$  – process plant requirements for lower-value and mid-value aggregate products



**Figure 2.1c** Option  $\gamma$  – process plant requirements for producing the full range of aggregate products

It is important to recognise that any given route through the process options does not necessarily produce a distinct product. Each route may produce constituent parts of a product that subsequently are blended. The specifications for many aggregate products allow a range of constituent materials to be used, which means that it is not possible to assign the products identified in Figures 2.1b and 2.1c to particular items of process plant or to individual processing routes. Operators are advised to consult the AggRegain website to obtain specifications for particular products.