What is recycling?

Recycling is the collection and separation of materials that have reached the end of their useful life, and their subsequent reprocessing to create useable products. The term covers a wide range of processes such as the crushing and screening of construction and demolition wastes, remelting and refining of metals and the recovery and return to use after cleaning and re-assembly of articles such as mechanical or electrical components. Recycling is a key element of the government’s hierarchy of waste management options that also includes the minimisation of waste and simple reuse of products.

Why is recycling important?

Recycling and reuse helps to protect the environment and ensures sustainable use of resources through:

- Energy conservation
- Waste minimisation
- Resource conservation

For example, in the case of metals, the energy needed to remelt scrap metal is a fraction of that required to extract the metal from its ore. For construction minerals, the benefits are obvious when the use of recycled demolition waste (broken concrete etc.) reduces the need to provide crushed rock or gravel from quarries that may be in environmentally sensitive areas. A further environmental benefit lies in the fact that if more material is recycled rather than disposed of, there is less pressure for space in landfill sites. Resource conservation is also an important benefit of recycling even though there is no prospect of most parts of the world running out of them in the foreseeable future.
Recycling of construction minerals

Non-metallic minerals used in construction are rarely recycled as minerals. Construction minerals are normally recovered and recycled in the form of manufactured materials such as concrete, brick, plasterboard and ceramic articles. The continual demand for construction minerals, such as sand and gravel and crushed rock, for commercial buildings, roads and houses, and the consequent expansion of quarries to supply them, has been a powerful incentive to try to replace these minerals by recycled materials. These are derived from both construction waste, for example damaged bricks, and demolition waste, such as broken concrete, brickwork and masonry. An important contribution to supply is also made by secondary materials; these are materials that are waste products from industrial processes such as blast-furnace slag, which is used as aggregate and a cement additive.

In the UK, an Aggregates Levy has been imposed on the producers of primary aggregates with the object of encouraging the increased use of recycled materials. In addition, taxation of material discarded to landfill sites also encourages a reduction in waste and increased recycling. Equally, mineral waste produced, for example, from china clay and slate working, is increasingly being used as aggregate.

Recycling of industrial minerals

In the cases of many minerals used in industrial and manufacturing processes their valuable physical properties are either destroyed in use (for example plasticity of ceramic clays is lost during firing), or the minerals are dispersed and not readily recoverable in their original form. They may however be recovered and used in their manufactured form for other purposes, for example ceramic materials such as refractory bricks can be re-used as construction fill. Glass is a unique case among manufactured products based on industrial minerals in that, like metals, it may simply be melted and reformed with savings in energy and raw material. It may also be used in broken form (‘cullet’) as a road-surfacing aggregate. Minerals that are valued for their chemical properties alone are generally either difficult or impossible to recycle; examples are the salt used to treat roads and the potassium and phosphorus minerals that are the basis of agricultural fertilisers.
Economic considerations

The cost of recovering materials from discarded products and demolition is the major factor that limits the amount recovered. The chief costs are the energy and labour costs of collection, separation and identification, each of which has an environmental impact. The recovery of, for example, certain minor metals from complex manufactured articles such as a computer may involve careful dismantling of the article concerned and the costs of doing so may well exceed those of the production cost of virgin materials. Thus while it may be environmentally desirable not to dispose of the materials in a landfill site or incinerator there may be a powerful economic case for doing so. The balance may be altered by designing products specifically for recycling, or by economic instruments from government such as the Landfill Tax and Aggregates Levy.

The future

Recycling will undoubtedly increase in importance as energy use is restrained by pollution concerns and as waste disposal becomes more problematic. There will, no doubt, be much greater emphasis in the future on designing products for recycling. However, it will be necessary to identify suitable sites for processing and storage of recycled materials if their contribution is to be maximised.