Memorandum by Professor Sue Grimes SITA and Royal Academy Professor of Waste Management, of the Centre for Environmental Control & Waste Management, Imperial College, London.

Evidence is provided under the headings.

1. Better design and use of materials
2. Government policy
3. Skills

1. Better design and the use of materials

The concept of 'design for the environment' is directed essentially at the end of life of products in order to maximise reuse and recycle of materials.

The problem faced by many industries is that there is often a conflict between fitness for purpose of their products and the ease of material recovery at end of life. There are undoubtedly barriers to the use of sustainable materials in production where there is a possibility that the technical performance of the product is diminished. Although emphasis is sometimes placed on changes in the materials specified at the design phase, there are in fact three ways of achieving sustainability throughout the life of a product:

(i) Direct replacement of materials that have an adverse environmental impact with materials that lead to greater sustainability. This would be the preferred option subject to manufacturing, fitness for purpose and end-of-life treatment issues. In this context a major problem arises from the use of composite materials by manufacturers - for example plastics that contain additives such as fire retardants and conducting materials to reduce electrostatic properties but which make the composite difficult or expensive to reuse or recycle. For this reason research on the use of more sustainable materials in design for the environment must take account of the need for efficient and economic end-of life disposal in addition to the product technical specifications.

(ii) Electronic smart tagging of product materials and components to permit automatic sorting of materials at end of life into fractions that maximise opportunities for reuse recycle and remanufacture. This method also has to involve the design stage of the product life cycle to ensure that the information contained in the tags permits the identification of components and materials after deconstruction to ensure that the data on the tag identify the specification of the material or component; the best practicable economic and environmental recovery options for reuse, recycle or remanufacture and information on the return of valuable secondary materials to appropriate commercial cycles.

(iii) In situations where it is not possible to alter design to accommodate new materials or tagging methodologies, because of technical requirements, new technologies to ensure that maximum recycle, reuse and recovery have to be developed to recover value at end of life. An example of this would be the development of leaching technologies to separate composite materials into fractions that can be reused and recycled, while minimising the amount of material going to landfill.

The hierarchy of these strategies is:

Replacement is preferable to tagging.

Tagging is preferable to separation technology.

Separation technology is preferable to end of life disposal.

There is no doubt that better design could minimise the creation of waste that is difficult to recycle. Design input alone, however, is unlikely to achieve sustainability without the involvement of experts from the fields of material science and waste treatment for optimum recovery. Sustainability throughout the life cycle of a product will best be achieved through greater interaction between practitioners in design for purpose, in the development of new materials and in the methods of maximising reuse, recycle and remanufacture and such collaboration must be encouraged.

2. Government policy

A major problem for the reuse and recycling industries lies in the legal definition of waste. In some situations, a perfectly acceptable reusable by-product of waste treatment will still be regarded as waste requiring any user to have a waste management licence. Although this definition has been modified in some circumstances recently, sustainability will never be achieved if the products from treatment of waste are not regarded as commercial products in their own right without carrying the label “waste” forward to their end use.

An opportunity exists for the government to promote the development of new methods to achieve sustainable products through the Environmental Trust bodies’ use of funds from the landfill tax credit scheme. The recent restrictions placed on the Environmental Trusts on the direct uses of the funds specifically exclude this type of support. There seems to be no logical reason why the Trusts should not be able to support research and development of research solutions that are promising but not currently close to market. The current concept of the need to develop partnerships between the Trusts and the industry sector could catalyse more work on linking manufacture to end of life recovery provided that there is sufficient interest from the waste producing manufacturing industries otherwise landfill tax benefits will be wasted.

3. Skills

There are many training programmes in universities, colleges and institutions such as the CIWM that include consideration that sustainable waste in broader industrial training courses. Although this is a good starting point there is a case for the urgent development of training programmes at the highest level to maximise knowledge input from all of the branches of science and technology to produce graduates with expertise on sustainable manufacture from design to end-of-life treatment. This training ideally should be at post-graduate level and include (i) Masters degrees to enable graduates in appropriate disciplines to extend their knowledge base into other disciplines and (ii) industrially-based Doctorate degrees (such as the Eng.D.) to encourage inter-disciplinary research to close knowledge gaps and develop novel methodologies and techniques for sustainability

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