

# Waste Reduction

A response from  
The Institute of Materials Minerals and Mining  
to  
Sub-Committee I of  
Lords Science and Technology Committee

## Summary

Our main observation is that there is a lack of 'standardised' information on eco-design. So it is difficult for engineers and designers to include considerations of sustainability and environmental impacts in the evaluation of new products and processes. There are developments to provide standards for the supply of this information and there are many efforts to educate engineers and designers in the most appropriate use of new materials to minimise the environmental impacts. It is important that the whole population is made aware of the importance of resource efficiency not only in relation to climate change but also in terms of materials availability/security of supply. The classification of waste needs to be more intelligently defined. Government policies and objectives should encourage innovation in new products and processes and the development of new skills to support a more rapid shift towards sustainability.

### 1. Better design and use of materials

Better design and a more knowledgeable use of materials and manufacturing processes can minimise the creation of waste.

The term waste is a general term which if applied to materials can create negative implications which do not assist re-use or recycling. It would be more appropriate to consider material that is not the primary output to be classified as by-products. These by-products should only be considered to be waste if they are not utilised further or are sent to a disposal facility.

The main factor that influences the use of materials is the availability of the relevant information. In general this information is related to the engineering performance or specification of the product and the associated costs. Common standards for information defining sustainability are not readily available. Some single factor ratings have been used to compare the performance of products and materials but more comprehensive methods for full comparison, taking material, energy and environmental impact into account need to be agreed as international standards.

Given the lack of information on sustainability indicators, product designers and project engineers have great difficulty in taking into account the life-cycle impacts of their design for new products and new process operations.

The development of new materials is frequently an opportunity for new and innovative designs. 'Materials World', the monthly magazine of The Institute

of Materials Minerals and Mining (IoM3), publishes many examples this synergy every month. There is also strong evidence of interaction between material scientists and designers. The September 2007 issue of the magazine 'Engineering' includes an article on the potential uses of new versions of Aluminium - Lithium alloys for reducing the weight of airframes. The new alloys were designed to meet the requirements of the design engineers and the high cost required that the products made from these alloys had to be manufactured close to the final product size in order to avoid machining: which would create waste. Another example was the European project to create light-weight steel automobile bodies. In this case, the auto-body, the steel and the process for forming the steel were all designed interactively to produce the optimum combination of strength, formability and body shape. These achievements have become possible because of the high levels of intellectual knowledge and capability of the material scientists and material engineers for whom IoM3 is the professional engineering institute.

It is important that design and material considerations are integrated. In addition to performance and cost considerations Eco-design should take the following factors into account: -

- Design for minimising resource use (commensurate with performance)
- Design for process/product efficiency
- Consider appropriate design life and 'end of life' fate
- Consider all Environmental Impacts
- Consider human and social factors
- Consider material compatibility factors (in use and recycling)
- Consider potential for dismantling, repair, re-manufacture
- Could recycled inputs be used?
- Are substitute materials available?

If we consider the case of light weighting with advanced high strength steels, these 'new' steels are indeed lighter but they can be difficult to dismantle and even repair. If the designer does not take this into account the products may be more difficult to recycle or repair and thus a change introduced with the aim of improving resource efficiency could have the opposite effect.

This example highlights the need to adopt a holistic approach to design, materials and recycling. These issues should not be separated and viewed in isolation. To move to a more sustainable approach all aspects of the life cycle of the product must be considered.

A number of designers have sustainability and environment factors within their remit but there is a need to spread the word further, possibly at Graphic Design courses at University. The IOM3 is encouraging designers to make more imaginative use of new materials - MADE is a new Magazine initiative from IOM3.

For packaging, DEFRA have an active committee endeavouring to provide Standards on how to create CO<sub>2</sub> mission rates for all products, including packaging. These must have a global consensus to be widely accepted

The main conclusion for this section is that there is a lack of information on sustainability in a suitable or standard form rather than gaps of knowledge and insufficient communication between all of the stake holders in the product life cycles. There has been a major global effort for the last twenty years within the ISO Technical Committee TC184/SC4 to develop International standards for the communication of engineering information in independent forms that can be processed in the software for engineering design and for process management. The latest application of this technology is a new standard, ISO 10303-235, that would represent sustainability data for computer processing and enable the data to be conserved for long term archiving. More extensive use of this technology would enable a market and a supply chain to be developed for the creation and supply of sustainability data for use in engineering design. Other standards in the same series provide resources for managing the information about the whole life-cycle of a product and could provide a new source of sustainability information.

## **2. Business framework**

The current policies, regulatory and legal frameworks seem to confuse and do not support the development of better and more sustainable product and processes. There is evidence that the main emphasis in the UK is on avoiding risk, which is inimicable to innovation. For example, the legislation that provides enhanced capital allowances for installing specified types of environmental devices seems to be too restrictive as new types of products do not qualify because they are not defined in the lists that are part of the legislation.

The European Commission has recently conducted a consultation exercise to support the development of action plans for Sustainable Production and Consumption and Sustainable Industrial Policy. The aim is to develop a more integrated approach to legislation and policies that impact on sustainability.

The business conception is that the adoption of sustainability involves a cost, because this is easily identified and measurable. However there is insufficient understanding of the benefits, because the methodology for estimating these is not well developed and there is not an obvious way of itemising these benefits in the company accounts. There is a situation similar to the pressure several years ago to adopt better quality control and quality assurance in British industries. The adoption of formal quality procedures was seen first as a cost and a burden on business but these procedures are now regarded as essential to be able continue in business.

Some businesses are examining their environmental performance even if this is from the point of view of identifying potential liabilities or negative consumer reactions. They need to be encouraged to work with the environmental authorities to develop ways of improving their performance. There are a number of business support agencies that can help them to do this (Carbon Trust, Envirowise, NISP and the KTNs). Within the packaging world there are other agencies helping environmental performance e.g. WRAP, INCPEN,

EUROPEN. Cost reduction techniques can significantly save on waste as well as adding to the bottom line in packaging. Other European Member States do many things better with regards to waste and the environment.

Global businesses are addressing the increase in consumer interest in environmental issues and some have shown that taking the lead in advances in Eco-design (e.g. hybrid cars) can secure part of the market.

There are initiatives that are in place to encourage sustainability that come from the European Commission where sustainability has been incorporated under the umbrella of Innovation. The INNOVA group of projects and networks have inextricably linked sustainability and innovation together in order to support the amended Lisbon Agenda.

### **3. Government Policy**

Government policy should aim to ensure that the necessary skills to incorporate sustainability into new design and processes are available and continue to be developed. The UK Government should support the initiatives of the European Commission to unite the collection of EU policies that were developed during a period of learning and the evaluation of alternative strategies.

There is an aspiration to make public procurement more sustainable but for this to happen some guidelines must be developed and disseminated to the supply chain. Procurement practice is still based mainly on initial price because of the lack of relevant information to make alternative decisions

Policy should encourage collaboration between stakeholders involved in different stages of product life cycle; for example, raw material suppliers, manufacturers, dismantlers, recyclers, legislators, etc. to ensure that there is a more integrated approach to sustainability.

Is it possible to consider tax incentives for businesses that can show that they have made a real improvement in the sustainability of their operations?

### **4. Skills**

The IoM<sup>3</sup> is responsible to the Engineering Council for the accreditation of university degrees as part of the progress to Chartered Engineer (CEng) status. Most University courses already include sustainability and environmental issues in their courses and there is the opportunity to emphasise this requirement in future assessments of the suitability of courses. These changes have been introduced by the engineering profession as an extension of their social responsibility to ensure the safety of the products and processes for which they are responsible.

The IoM<sup>3</sup> sponsors a range of material based design courses and competitions for schools and design students. These are lacking on the

packaging side although there are diploma courses available from The Packaging Society leading to a degree course. There are innumerable courses, seminars and workshops on sustainability, e.g. The Green Summit at RSA London 29/30 Oct. Employers need to encourage participation and to allow staff to go. Maybe a Government allowance on such activities could help.

However the extension of the engineering responsibility to include sustainability and environmental factors will require a broadening of the knowledge of engineers to include areas of science for which they have not been traditionally trained and to include social and political factors which will be in constant flux.