Aiming for Sustainable Product Development

Furniture and Building Products

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This brochure aims to provide summary information and guidelines that can assist companies manufacturing furniture and building products industries in their transition to higher levels of environmental performance and Sustainable Product Development (SPD). Australia is being influenced by a range of building products and commercial office furnishings that have been developed with a greater environmental emphasis. One of the key issues for commercial office furniture is the short product life-cycle, and the high rate of product turnover, particularly with workstations, seating, partitions and carpets. The rate of product churn results in large quantities of discard product unnecessarily going to landfill. Overseas manufacturers are re-conditioning, reusing and recycling these products and materials. This will increase the pressure on Australian manufacturers to review their products and meet the growing demand for improved environmental performance.

Drivers for change

Manufacturers of Commercial Furniture:

- Recognition of the environmental and health hazards associated with the application of solvents and emissions of chemicals, such as formaldehyde, nitrogen dioxide, chlorofluorocarbons and volatile organic compounds (VOC's).
- Growing public awareness of the adverse environmental impacts associated with current disposal practices, high waste disposal costs and the use of valued resources (ie: old growth forest).
- Australian products intended for export must comply with increasingly stringent environmental regulations, particularly on issues such as product take-back and recyclability. In future, companies will not get access to overseas markets unless they produce low-pollutant, low waste products. Recent reports suggest that some Australian exporters are currently being denied business because they had no idea, when asked, what pollutants their products emitted (The Air We [cough, cough] Breathe, The Age).
- International competition from 'green imports' has placed pressure on domestic manufacturers to meet or exceed world best practice environmental and quality standards.
- As the market for goods and services globalises and manufactured goods struggle to be competitive, product differentiation and adding value via the environment, can provide a competitive edge.

In the United States, manufacturers have responded to pressures aimed at encouraging the diversion of commercial carpet away from landfill by significantly...
increasing recycling and alternative-use schemes. Similar schemes have also been established for the diversion of office partitions, workstations and seating.

In North America, specialist companies are receiving over 400 inquiries per month about environmentally improved products, ranging from coatings and adhesives, through to furnishings and fixtures ('Living Well', Interior Magazine). While in Europe, German manufacturer, Wilkhahn (details in case study - over page) has addressed the issue of ecodesign by looking critically at benefits of design for recycling, disassembly and reductions in material consumption.

Manufacturers of Building Products:

- In response to local environmental concern, major Australian companies, including BHP, Amcor, Boral CSR, Pioneer and James Hardie, are looking at the life-cycle impacts of their products to evaluate the avenues for process and product improvement.

- Industry associations often assist their members to keep up to date with best practice environmental initiatives. The 'Smart Building Program' for instance, run by the Master Builders Association educates builders about cleaner work practices; encouraging environmental awareness and responsibility.

- A growing awareness of the high costs and adverse environmental impact of building product disposal has prompted industry and government to try to reduce the amount of building waste going to landfill. In almost every major Victorian landfill, the disposal of non-municipal solid waste (tonnes), including commercial, industrial, construction and demolition waste, is more than double the amount of municipal waste. Since 1992, Victoria has spent an average of $24 million per annum of Gross State Product on the disposal of non-municipal solid waste. (The Landfill Levy and Solid Waste in Victoria, EPA Information bulletin).

- Tendering requirements for special events, such as the Sydney 2000 Olympics, often require that specific environmental criteria are satisfied. The environmental criteria may for instance, insist that raw materials have undergone a life-cycle assessment, or been supplied from renewable sources.

- Reports of a growing incidence of chemical allergies and intolerance, such as the 'sick building syndrome' are claimed to be responsible for most lost working time in the Western world than any other cause. A range of 'bewildering' ailments such as fatigue, dizziness and nausea, have been associated with 'sick building syndrome'. (The Air We [cough, cough] Breathe, The Age, Melbourne, 23 September 1997.).

- Material source reduction has the potential to save money and resources in the manufacture of either furniture or building products.

Life cycle environmental impacts

Unlike other manufactured goods, such as appliances which impact on the environment through the energy/water used during operation; commercial furniture and building materials can result in environmental problems throughout their life cycle. With the impacts spread more evenly (at manufacture, distribution, construction and disposal), the redesign strategies must address each phase. Off-gassing and its impact on indoor air quality is of growing concern and has been the latest area for consideration when designing a product or material. Listed below are some of the environmental and health concerns associated with building materials and commercial furniture.

Commercial Office Furniture

Manufacturing impacts

- Dust and chemical emissions to air and water during manufacture contributes to smog, pollution of waterways and to human health problems.

- Energy used during manufacturing leads to the creation of greenhouse gases (global warming), particularly with high energy users such as steel and aluminium.

- Over-specifying and over-designing results in wastage. The use of a material in a product that does not serve a functional purpose adds to wastage of resources; to transport related impacts (ie. use of more fuel due to additional weight or mass) and may make disassembly and recycling more complex and expensive.

- Non-renewable resources are often used even though alternative materials (recycled or repaired) are available and economical.

Use Impacts

- Peoples' health may be adversely affected by the indoor air pollution caused during the off-gassing of some furniture.
**Disposal Impacts**

- Under utilisation of resources occurs when products and materials are disposed of, rather than being refurbished, reused or recycled, while energy used to transport discarded furniture and materials to landfill contributes to greenhouse gases and outdoor air pollution.
- Disposal of synthetic materials and chemicals often contributes directly to hazardous or toxic waste, i.e. heavy metals which can leach from landfill.
- The use of landfill space with discarded bulky furniture increases the need for new landfill, over and above what would otherwise be needed for municipal waste disposal.

**Building Products**

**Manufacturing Impacts**

- The creation of greenhouse gas from the energy used during their manufacture and processing of materials.
- The potential contamination of land, air and waterways with toxic chemicals, coatings and cleaning agents.
- Dependence on non-renewable materials.
- Workers using hazardous and toxic materials and processes (i.e. heavy metals in cleaning and surface coatings) may be exposed to elevated levels of risk.

**Packaging & Distribution Impacts**

- The inefficient use of materials and the generation of solid waste associated with the packaging of the primary building product e.g. paint tins, plastic films and strapping.
- Emissions to air associated with inefficient or polluting modes of transport,

**Use Impacts**

- Adverse health effects of indoor air pollution, caused by the off-gassing of some building materials and products.

**Disposal Impacts**

- Wastage of resources associated with the disposal of large volumes of building materials that could otherwise be re-used or recycled.
- Use of landfill space and the contribution to greenhouse and air pollution with the fuel used to transport building materials and products to landfill.

**Design Strategies**

Environmental impacts of a product and its packaging can be reduced through a variety of design strategies.

**Key Strategies for Furniture Products**

- minimise the use of different materials, simplifying the internal process maximises the opportunities for recycling waste from production and re-using the components at end of life.
- optimise the number of components and assemblies; maximise material specifications and minimise waste.
- integrate several functions in one component or assembly, or design one component to serve more than one purpose, thereby reducing material use and making savings in tooling and energy.
- specify low-impact materials and processes, for instance, avoid processes that use toxic materials, such as electroplating.

New product design should include the evaluation of end-of-life scenarios to minimise or eliminate waste at the end of the product's life. The key strategies include:

- Design for durability. This can be achieved by identifying and eliminating potential weak points in the design; particularly for operational components and parts.
- Design for easy care and maintenance.
- Design for re-use and re-manufacture. Office furniture should be designed for re-use and refit; damaged and worn components or trims should be replaceable. The objective is to extend the first life of the product as long as possible.
- Modular design can also reduce premature obsolescence and unnecessary disposal.
- Design for disassembly. Ensure that the overall design can be disassembled for re-use. This strategy facilitates easier repair and maintenance. Replacing a single component is preferable to a whole assembly or product.
- Design for recycling. This means that the materials used to manufacture a product could have a secondary use, either as the same product or as a different product. Consider using single materials, and materials that are compatible with recycling. Consider using single materials for assemblies and sub-assemblies where possible. Evaluate construction methods and try to avoid adhesives and incompatible materials.
- Design for safe disposal. Ensure that all materials that have a toxic content, i.e., products and components that use adhesives and surface coatings, are correctly labelled. Impacts will vary according to the individual product design, its functional life-span, and its ultimate disposal path. However, when evaluated critically, it becomes obvious that the manufacture and disposal of office furniture
contributes to an extensive range of impacts that affect environmental quality.

**Key Strategies for Building Products**

Building products are similar in that many of the impacts occur during the manufacturing phase of the product's life, however, the 'use' phase of the product's life also contributes to considerable health problems. For example, off-gassing of emissions occurs from several product groups, including adhesives, treated timber products, electroplated metals and painted coatings and finishes. The other key issues include the end-of-life disposal of the products. This is particularly pertinent with the disposal of paints and finishes and coated products that could lead to leaching and site contamination.

Design for resource conservation:
- use the minimum amount of material required for the function;
- use materials which are renewable
- avoid materials which deplete limited natural resources;
- use recycled and recyclable material, and
- use waste by-products.

Design for use of low impact materials:
- avoid materials made from toxic or hazardous substances;
- use materials that are easily reused and/or recycled, and
- avoid ozone-depleting substances.

The initiatives highlighted above reflect the importance of design strategies in addressing environmental impacts during the manufacture use and/or disposal of furnishing and building products. Volatile organic chemicals (VOC’s), emissions to air and off-gassing also present a concern to human health.

Increasingly there is considerable discussion about product-service strategies and how the total volume of manufactured products might be reduced through dematerialisation and maximising materials efficiency. It’s therefore important to carefully understand the functional aspects of conventional products and explore the potential for designing new, sustainable services as opposed to simply redesigning existing products.

**Relevant publications**

- *Re-cycling Post-Industrial Composite Wood Waste Material within the Commercial Furniture Industry*, a report by Schiavello Commercial Interiors, EcoRecycle Victoria,
- Other relevant reports related to the furniture industry can be downloaded from the EcoRecycle Victoria web site (see URL below).

**Web sites**

MetaMorf Design
http://www.metamorfdesign.com

Wharington International
http://www.wharington.com.au

Rivet Furniture
http://rivetfurn.com.au
Environmental Building News
http://www.buildinggreen.com/

Green Building Information Council
http://www.greenbuilding.ca/

Oikos: Green Building Source
http://www.oikos.com/

EcoSpecifier: A Guide to Eco Materials —
http://ecospecifier.rmit.edu.au

onSITE: Minimising Construction Waste —
http://onsite.rmit.edu.au

LCA Tools in Building & Construction —
http://buildlca.rmit.edu.au

EcoRecycle Victoria
http://www.ecorecycle.vic.gov.au

Centre for Design at RMIT University
http://www.cfd.rmit.edu.au

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