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Can mountains of landfill turn into rivers of gold?

Words By: Linnett Good

Australia now has a well-established recycling industry that is rapidly gaining strength in the market. As with most industries, there is plenty of room for improvement, and also good potential for further growth. New technologies and legislative support along with landfill diversion targets established by governments have encouraged a growing sophistication in the way we process our waste.

Use of the term 'waste' can be contentious when referring to what can contain many recoverable and recyclable materials, organic matter for soil improvement or even a source of alternative fuels. Waste is better thought of—and better valued as—a resource that allows us to limit our use of 'virgin' resources, reduce greenhouse gas emissions and generate huge savings in energy and water use in the production of goods.

For the future, the next important thing for councils, households and businesses will be to stop the mixing of greenhouse-gas-producing food waste with regular garbage.

Recycling is also good business. The Australian Council of Recyclers (ACOR) represents 85 per cent of the national industry, including such companies as Alcoa Australia, Bluescope Steel and Visy Recycling. According to its CEO, Anne Prince, ACOR members are collectively worth $11.5 billion. They represent $6 billion in capital investment and process 11 million tonnes of material a year. Nine thousand people are directly employed in the industry, along with 27,700 other personnel. These investment and employment figures represent a number of direct and indirect benefits to the overall value of the industry, conservatively estimated at $55 billion a year.

ACOR's mission is to encourage governments, industry and the public to take actions that advance the optimal use of Australia's secondary materials, and to facilitate the removal of barriers that hinder effective recycling and reprocessing. Australians generated approximately 32.4 million tonnes of solid waste which, in 2002-2003, averaged to approximately 1,629 kilograms of waste per person. According to the Australian Bureau of Statistics, the overall recycling rate is estimated to be 46 per cent, which represents the amount that has been reprocessed into a usable production input and not just the amount collected for recycling. However, recycling rates vary from state to state, with South Australia and Victoria leading in waste diversion from landfill per capita. For the future, the next important thing for councils, households and businesses will be to stop the mixing of greenhouse-gas-producing food waste with regular garbage. Some councils already collect food and garden waste weekly, and the 'normal' garbage bin fortnightly: this could become much more common. Products resulting from reclaiming this material will include compost and energy.

Improvements in sorting facilities have increased the volume of material recovered for reprocessing. Traditionally, manual sorting has been used to separate different types of materials. Mechanical separation by a variety of physical processes, including shredders, screens, magnetic separators, and eddy current separators can be used. Separation by the item's specific gravity (relative density) is another method.

Near-infrared detection technology can also be used for sorting, and is particularly helpful in separating different types of plastic polymers, which cannot be reprocessed in combination. A near-infrared light beam is projected onto the material passing along a conveyor belt and is reflected to a detector that positively identifies the material. An air jet then blows the item off to the appropriate collection bin.

Currently, there is a move towards optical sorting, which has been available in Europe and the US for some time. It has only recently been deemed viable in Australia due to increasing labour costs and the need to sort materials at a speed and precision beyond human capability. Optical sorting has the capacity to separate out mixed paper, newsprint, cardboard, timber and plastics.

Table 1: Dividing the stream of solid state waste

Municipal

- Paper and Cardboard
- Plastic
- Glass
- Ferrous metal
- Aluminium
- Garden Organics
- Food
- Other Recyclables (eg tyres, oil, batteries, e-waste, non-ferrous metals, white goods)

Commercial & Industrial

- Ferrous metals
- Paper and cardboard
- Garden organics
- Other recyclables
- Timber
- Plastic

Building & Construction

- Aggregate, including concrete, brick, rubble
- Metal
- Paper
- Glass
- Bricks
- Timber

Waste collected goes to resource recovery centres, where it is sorted, and from there goes to various reprocessing facilities or to landfill, usually within the state of origin. Some recovered material, particularly plastic, is exported overseas for reprocessing or exported/imported interstate. Australia has a high level of recovered plastics sent to Asian reprocessing markets.

Closing the Loop for Polypropylene

Marcel Barnardo, Sales and Marketing Manager for Bindweld Plastics, is excited about their new product line of stationery, which uses 100 per cent recycled polypropylene from municipal kerbside collection. This material includes such items as ice cream containers, cordial bottles and some plant pots. These are melted down and made into pellets from which products such as ring binders and satchels can be manufactured in much the same way as using virgin material.

Barnardo says that there is no evidence that the polypropylene cannot be recycled over and over again, without loss of quality. The only issue is that colour can be compromised, and Bindweld plans to offer both 100 per cent recycled and 50/50 recycled/virgin material items to give a wider colour choice.

Unlike some other plastics, such as PVC, there are no toxins emitted when melting down polypropylene for re-use. Bindweld uses both post-industrial (off-cuts) and post-consumer (kerbside collected) materials, usually with around 20 to 30 per cent recycled material used in their products. The use of post-consumer items is particularly exciting, as it 'closes the loop' of production, and Bindweld is the first company to do so with polypropylene in a major way in Australia.

Reprocessing facilities include: smelters of aluminium and steel; crushing and auxiliary screening plants for concrete, brick, asphalt, and other construction refuse; paper/cardboard and de-inking pulp mills; composting facilities; glass product manufacturers; rubber product manufacturers; plastics converters/manufacturers; timber reprocessors; and alternative energy producers. Some material is sent to landfill as waste from the reprocessing or manufacturing processes.

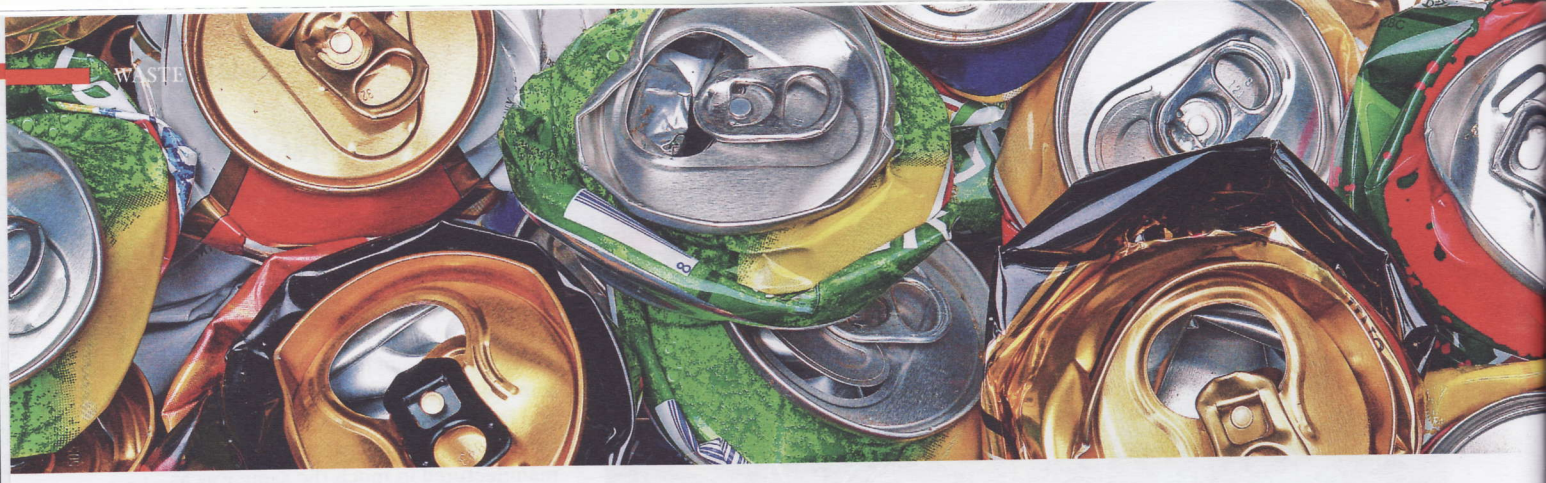
Landfill technology has also progressed from the simple hole-in-the-ground systems. Now a landfill site must be lined, or have a natural geological barrier to prevent the contamination of groundwater. After waste is put into the site, it is compacted and covered with several layers, including a final one of topsoil to allow vegetation to stabilise the cover.

As the material breaks down, methane and carbon dioxide is produced. At present, up to half of the methane may be harvested for electricity generation. Research and development is underway for a 'bioreactor' landfill, where decomposition is accelerated in order to capture more methane for energy production.

When recovering materials for recycling, the more material recovered, the greater the costs for recovery begin to increase disproportionately. In other words, it is easier and cheaper to separate out the first 30 per cent of the material than the second 30 per cent, and so on. The final 10 to 20 per cent may be extremely difficult to recover. This diminishing economic return may mean that the 'zero waste' policies adopted by some states could prove difficult, if not impossible to realise.

Other issues for the industry include the urgent need for easy-to-use recovery and recycling systems to be set up to prevent those items that contain toxic or hazardous substances from entering the general recycling or waste stream. Objects such as gas bottles, fluorescent lights, including CFLs, energy-saving light globes, batteries, and smoke detectors cause real problems in the recycling stream and can be dangerous if sent to landfill.

While governments continue to debate policy alternatives, and while there remains no over-arching, integrated strategy with an achievable implementation plan to improve resource recovery, the Australian market is held back from reaching its full potential. A number of industry organisations have advocated the use of market based instruments (MBIs) as part of environmental market reform.



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Some MBIs have been implemented to discourage waste disposal, but have not been balanced with incentives to recycle. ACOR advocates more sophisticated regulation along with negotiated agreements and well-designed MBIs as the most effective framework to meet the range of stakeholder objectives in the sector.

'The resource recovery sector is sustainable, but society isn't,' says ACOR's Anne Prince. 'We live in a take, make, waste culture'. In a consumer oriented society, growth in volume of waste is directly linked to growth in economic prosperity. This has to change, if we are to avoid using landfill as our main waste disposal tool, and encourage resource recovery.

Current figures show that recycling per capita is on the rise, but so too is waste production, leaving landfill figures relatively static.

A recent study, commissioned and jointly funded by the Commonwealth Government and ACOR, quantifies the net social, environmental and economic benefits of the recycling industry to Australia. Due to be released soon this year, it is the first study of its type in Australia that quantifies savings in water, energy and emissions: for example, last year the recycling industry alone saved the equivalent of 54,000 Olympic-sized swimming pools worth of water and took the equivalent of 1.8 million cars off the road.

This kind of study will assist government and industry to not only better understand where and how recycling is benefiting Australia, but will also guide policy and strategies for growth and improved sustainability. The resource recovery industry is looking forward to continued expansion and the opening up of further domestic and international opportunities. The challenge will be to take advantage of—and build on— the changing attitudes towards waste in order to create a healthy business environment for recyclers. GP