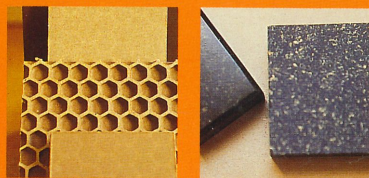


# hi-tech waste



**Anne-Marie Willis looks at a range of high quality, high performance recycled materials now becoming available in the USA and Australia. These go well beyond a 'rough and ready' recycled aesthetic and have the potential for a range of design applications.**

That brand of modernism which equated technology with progress, and marvelled at science and industry's smooth delivery of evermore efficient, convenient products and lifestyles, has, as we know, been shaken up on many fronts. Not least of these is the prospect of impending ecological collapse wrought by the cumulative negative effects of accelerating industrial production and high consuming lifestyles. Yet given the thoroughness of the weaving of science's ways of thinking into the relational fabric of our mental, material, institutional and cultural lifeworlds, the prospects of abandonment or reversal are simply not available. We may live among the ruins of science's thinking, and the material consequences live on—but we can scavenge and find unexpected things to use. In fact, reconfiguration/remaking within the closed (yet vast and diverse) system of our own making are the only possibilities.

Similarly, the innocence we may have once had about the manufactured materiality of everyday life has been shattered. Every act of purchase is potentially charged and coded with lethal connotations. The dividing line which once fenced off the wonder world of goods from the means of their making, delivery and after effects are now down and out. It has been shattered by a growing storehouse of available mental images—landfill sites leaching toxic wastes, chainsaws and bulldozers mowing down forests, landscapes scarred with mining sites, oil-sodden penguins, murky brown-stained coastal waters, iridescent blue-green rivers, and the contradictory experience of sunsets, now more spectacular than ever, due to the effects of photochemical smog.

The vague sense of helplessness that can accompany such everyday acts as discarding non-recyclable 'waste' or of being compelled to purchase items with built-in obsolescence, can be partially remedied by a different way of thinking about materials and objects, and the knowledge that such ways are beginning, if very slowly, to make their mark.

Recyclability is a case in point. The kerbside collection of cans, PET bottles, newspapers and cardboard, needs to be seen not as 'the answer', not as atonement for the sins of purchasing, but as a crude interim measure that deals with materials and products that were ill-conceived in the first place. Transmutability, re-useability, disassemble-ity (straining for the right word here is an index of the

very problem) need to become inherent principles of materials science and design practice. No longer can the luxurious short-sightedness of 'final product' thinking be afforded.

Until recently, recycled materials and products have been associated with a 'make-do' aesthetic, which has been a deterrent for many would-be purchasers. The 'inferior' look of recycled materials is now being overcome, as they are manufactured to higher standards, which includes greater consistency and better performance. Recent developments in the USA are evidence of this. Yemm & Hart is a Missouri-based company which markets recycled materials—plastics, rubber and cellulose from paper and textiles. They can make repeatable colours available because of contractual arrangements with plastics recyclers to source separate coloured bottles prior to grinding. Washing to remove contaminants also produces a better end product. What's happening here is that containers designed to be discarded are not being treated as waste, but as a valued raw material and are treated accordingly. This goes against the grain of many of the connotations of plastic and the behaviours it has encouraged. Historically it has been a cheap, durable, low-value material which requires little care. Yemm & Hart also has an attractive range of floor coverings (black with flecks of different colours) which are made from recycled tyres.

There are a variety of ways of producing high quality recycled materials. The move in the opposite direction of source separation is exemplified by Gridcore, a construction panel material made from variably sourced cellulose waste. Raw materials include office paper, cardboard, crop residue, textiles, sawdust and even plastics. A slurry is made up, poured into a rubber mould which looks like a waffle iron. Water is then vacuum extracted, followed by heat and pressure. The result is a flat board with a honeycomb grid on one side; two of these are glued together grid to grid and the result is a light, strong panel. Curved panels can also be made. Gridcore can be used for the same kinds of applications as particle board, plywood or plasterboard. It has already been used as a substitute for a non-sustainable material, luan plywood, sourced from rainforests, which is the traditional set-building material used by Hollywood. Gridcore is being tested by the Alliance of Motion

Picture and TV Producers and has been used for the sets of a David Lynch (of *Twin Peaks* fame) TV series, *Hotel Room*.

Some recycled materials have properties that defy our traditional understanding of materials: we think of wood as something which can easily be sawed and finished, and of granite as extremely hard and able to be polished to a highly glazed finish. This is challenged by 'Environ'; made from recycled newsprint, soybean resin and colour additives—it looks like granite but works like wood. It is being used for interior applications such as counters and bench tops.

While Environ, Gridcore and Yemm & Hart's recycled plastics are not yet available in Australia, there are no technical reasons why they could not be manufactured here. The small size of the market is one barrier, but with Australian manufacturers increasingly thinking of their market place beyond national boundaries into the whole Asian region, this will change. The promoters of Gridcore emphasise that it can be made from a wide range of locally available waste materials, that it could be a solution to the needs of low-cost housing, and that its production can be adapted to low-tech processes, such as hand presses and sun-drying.

Plastics recycling is reasonably well developed in Australia—processes are now being used to recycle PET softdrink bottles into more soft drink bottles. This kind of value-adding is an advance on the previous scenario, whereby, because of contamination, PET recycling cascaded down a chain of ever-decreasing value, for example, soft drink bottles ending up as flower pots. Turning to a different material, a Melbourne based company, Encore Rubber Technologies, utilises exhausted tyres as the basis for its rubber floor tiles, suited particularly for outdoor uses such as playgrounds. Regupol, based in Sydney, offers a range of locally produced and imported recycled rubber flooring very similar to Yemm & Hart's.

However, these new recycled composite materials, both local and international, are still very rare. Rather than being thought of as 'solutions' they need to be seen as markers of the necessity to conserve the artificial. Made from 'waste' they alert us to the fact that waste is a cultural category. Just as a weed is a plant growing in the wrong place, waste can be thought of as raw material that's been put in the wrong place. The waste lies in the wasting of a potential resource.

**Anne-Marie Willis is Assistant Director of the EcoDesign Foundation and one of the participants in 'Waste Not Waste', an EDF exhibition that explored the use of culture to transform perceptions of waste. It is available for hire. Enquiries 02-555 9412.**

**Top left: Gridcore systems made from recycled card, paper and agricultural fibre. Top right: Environ composite board made from recycled newsprint, soya bean resin and colour additives.**

# wear it, write on it



**Warren McLaren looks at the new fibres processed from tree pulp, PET soft drink bottles, sugar cane, hemp and cork—and speculates upon the kinds of futures implied by their arrival. These are not the ravings of some wildly imaginative fiction writer but commercially designed products available today. They are the alternative fibres, the uncommon threads.**

Many creative minds have been applying themselves to the dilemma of humankind and our relationship with ourselves and our environment. Some of those minds have an interest in developing new (or revising old) products and processes in the field of sustainable textiles-fibres and fabrics. A brief look at just some of the developments in textiles will indicate how much we have forgotten and how much potential there is for future creativity.

Only in this last century has our paper been predominantly made from the wood pulp of trees. For nearly two thousand years prior paper was often crafted from fabric wastes like cotton and from agricultural crops such as hemp and flax. High quality paper continues to use cotton as a component.

Regardless of the raw material used, paper could be considered a thin textile that we print messages on. There is really little difference between a T-shirt boasting a printed slogan and a book, except that the book uses finer type and carries more words. Both are based on





a dense marriage of fibres and have a story to tell. It is this similarity which has led to some innovative adaptations of the two. Materials traditionally used for paper are now being utilised for clothing production and new variations are turning up in paper making.

In 1853 mechanical pulp was invented. Since then the pulping process has improved to the point where we can now

quickly extract the cellulose from woodchips that is used to create pulp for today's paper. With recent interest in recycled papers, developments in this field are proceeding at a frantic pace. We can now source paper made from sugar cane, kenaf, hemp, flax, straw, blue/green algae, even recycled milk cartons. Many of these materials were used in ancient times for paper production but the methods had fallen into disuse. Gallant attempts are being made to re-establish this long lost lore as an alternative to destroying the world's old growth forests.

A new use for tree pulp has also been discovered. It can produce a textile fibre and yarn known as Tencel. This cellulose based material is the first new textile to be allocated its own classification (Lyocell) since the likes of nylon and polyester. About ten years of research and development by the textile giant Courtaulds has gone into producing this new fibre. It is ideal for many textile applications and has been seen quite widely since its release in denim look jeans. The fabric has many of the same properties of other cellulose derived materials such as rayon and ramie, but it is much stronger with a softness that must be felt to be believed. With a strength approaching that of polyester Tencel has breathe-ability and absorbency greater than cotton. With such qualities, this cloth is commanding a premium price. Courtaulds have set up a plant in America to produce the Tencel fibre from sustainably harvested tree farms. The species of tree used is said to grow rapidly like a weed. The solvent process used in the plant to extract the cellulose pulp is recycled in a closed loop system to reduce effluent emissions. In Australia, Dachet were one of the first clothing manufacturers to embrace Tencel. By all accounts customers love the tactile and flowing qualities of the material in jeans and skirts.

Most of us have heard the story of how jeans were invented. It began when Levi Strauss went to the gold fields of the US gold rush intending to make his fortune by sewing tents for the miners. Instead he hit upon the idea of making tough work pants from the tent canvas. Given that the word Canvas is derived from Cannabis, there is some supposition that these original jeans were made, in fact, from hemp.

Hemp is one of the names given to the plant Cannabis sativa L, also known as Marijuana. This plant, related to the hops plant from which beer is derived, has historically been a very important source



of fibre. The tough outer sheath (bark or bast) of hemp, when removed from the 'woody core', has been put to a plethora of uses over the past few thousand years. So important has hemp been that in 1535, in Britain, it was a fineable offence not to

grow hemp on your land—a notion that continued in the late 1700s when Americans could be jailed for not growing it. Hemp has been used to make paper, ropes, sails, clothing, furnishings, etc for hundreds if not thousands of years.

As we examine the impact we are having on the planet, we are learning that the obvious is not always the best. For instance, many green-minded people promoted cotton as the most environmentally sound fibre in preference to petroleum based synthetics. Careful research and lifecycle analysis studies have since found this line to be flawed. Cotton, for example, is a water greedy crop that requires extensive irrigation which severely depletes our river systems. Although only about 3% of the world's agricultural crop, cotton uses about 25% of the world's chemical pesticides, herbicides and fertilisers. The effects of these impacts are now becoming evident in our own inland waterways such as the Darling River system. The Australian Cotton Foundation has allocated \$14 million in research funds to find ways of reducing problems with our cotton crop.

Hemp grows very rapidly. So fast that it has been likened to a weed (from which it derives one of its many slang names.) As the plant grows swiftly its large flower heads block out the sun reducing the chances of other weeds sprouting up beneath. It is also largely pest-resistant and makes a useful rotational plant with food crops. It can reach a height of five meters in a single growing season. Because of this phenomenal growth rate it is estimated that one acre of harvested hemp will provide four times as much paper pulp as one acre of trees. Used as a textile it is reputed to be more than three times stronger than cotton providing more durable clothes and furnishings.

Unfortunately, the industrial applications of hemp were suppressed when the plant was caught up in the prohibition of Marijuana in the 1930s. While the debate over recreational and medicinal use of the hemp plant continues, seed varieties are being developed in Europe that contain next to no narcotic element (known as THC). Plants from these seeds have been grown in Tasmania for an experimental paper project. A similar experimental program has recently been announced in South Australia. The people pioneering the local developments in hemp have been overwhelmed by enthusiastic enquiries from green groups to

farmers. But they are quick to point out that introducing hemp to Australia is not going to be an overnight event. Much work needs to be undertaken simply to find the seed varieties which will suit Australian soils which are much poorer than European soils. Then there remains the task of converting a crop into a commercially viable fibre. Currently, the major hemp producers are Eastern European Countries and China, who are using ancient machinery and working conditions considered unacceptable by western standards. It is to be remembered that canola oil is only receiving recognition as alternative fuel after 25 years of research. Encouraging the Federal and other State governments to keep an open mind on hemp, (like Tasmania and South Australia), can only help to speed up the process.

In the meantime hemp fabric can be imported duty free into Australia; if designers are willing to pay the higher price the limited supply dictates. It is available as 100% hemp or blended with cotton or silk. In its natural state hemp is a subtle pale honey or pale olive colour but may also be dyed or bleached. Several Australian firms are already making apparel from such imported cloth, while others are still selling made-up imported products such as clothing, shoes, bags and daypacks. Hemp holds a lot of promise as a fibre of the future with inherent benefits for our planet.

At the opposite end of the spectrum another revolutionary development has been occurring. The introduction of apparel made from recycled post-consumer PET drink bottles. Those rocket bottom lemonade bottles are collected, bailed, shredded, remelted, extruded into fibre then spun into a new polyester yarn. From this, knitted, woven and non-woven fabrics are being created. PET is actually a high grade polyester and as such it has been used in its recycled form for outdoor sports clothing. The fleece fabric created from the bottles feels as soft as a cashmere blanket. Made into a jumper it protects the wearer from the cold and keeps about 25 soft drink bottles from going to the rubbish tip (where they would otherwise sit for at least 400 years before breaking down into plastic dust). For every 3,700 two litre bottles

recycled, one barrel of oil and 1/2 ton of toxic air emissions are saved.

Jumpers, bike shorts, socks, rucksacks and even thermal underwear are being created from this fibre. The reprocessed PET has since been developed into futon filling, webbing, cord and textured woven fabric suitable for luggage and upholstery applications.

In a complementary move, the trim waste from making the waterproof outers of disposable nappies have been recycled. Like PET, polypropylene in this case, is melted down and

extruded to produce a durable fibre. This has been woven to create, among other things, the tough water resistant upper for a footwear line, which also incorporates recycled car tyres, wool blankets, wet suit waste and coffee filters.

While the potential in recycling can give some plastics almost immortal qualities, there is often a degree of degradation, each time a plastic is recycled. Where possible, one should bear in mind that reducing our consumption of materials or reusing them is even more effective than recycling.

If you do find yourself in need of a warm recycled PET jumper you might stick your hand in your Tencel jeans for your wallet or dig in your hemp briefcase for your purse. It may be that your wallet or purse are made of cork. Thin strips of cork bonded to fabric, cork



which has a unique one-of-a-kind pattern, cork which is sustainably harvested bark from Southern European cork trees, cork which is durable and may be washed. Cork that provides an option to the problems inherent in chromium based leather tanning and the associated environmental issues of cattle farming.

No one fibre is going to be the saviour of humankind's need for sustainable textiles. Each have their dark sides, some more so than others. A willingness to work with the old and the new green fibres will however bring us closer to a time when society can accept these materials as common threads.

**Warren McLaren** is a member of the EcoDesign Foundation and is an educator and designer working in the areas of textile products and graphic design. The EcoDesign Foundation is a membership-based non-profit organisation. For further information contact: PO Box 369, Rozelle NSW 2039. Phone 555 9412 Fax 555 9564. Photographs of hemp crops, stalks and fibre provided by *Practical Hydroponics & Greenhouses* magazine, a bi-monthly horticultural magazine for the hydroponics industry.

Opposite top left: Patsy and Frits Harmsen who formed the Tasmanian Hemp Company in 1993. They began growing trial plots of hemp as a fibre crop in 1991 and the project has recently seen its fourth harvest. Opposite top right: Hemp stalks, fibre and 100% linen cloth manufactured in China. Left: Detail of Lyn Inall's quilt, *Hemp for Victory* (1995), made from Chinese 11oz hemp cloth offcuts from the Cannabis Clothing Company's range. The quilt takes its title from a documentary film, *Hemp for Victory*, made by the US Department of Agriculture in 1941 to encourage farmers to grow hemp fibre for civilian and military purposes for the duration of the war. When World War Two ended the US government cancelled all hemp farming permits. Bottom left: Lyn Inall's *Various Shades of Natural—a Hemp Cloth Quilt* is made from offcuts from the Cannabis Clothing Company's range and hemp open-weave cloth imported from China. Above: Hemp fashions in linen and canvas from the Sydney-based Cannabis Clothing Company.