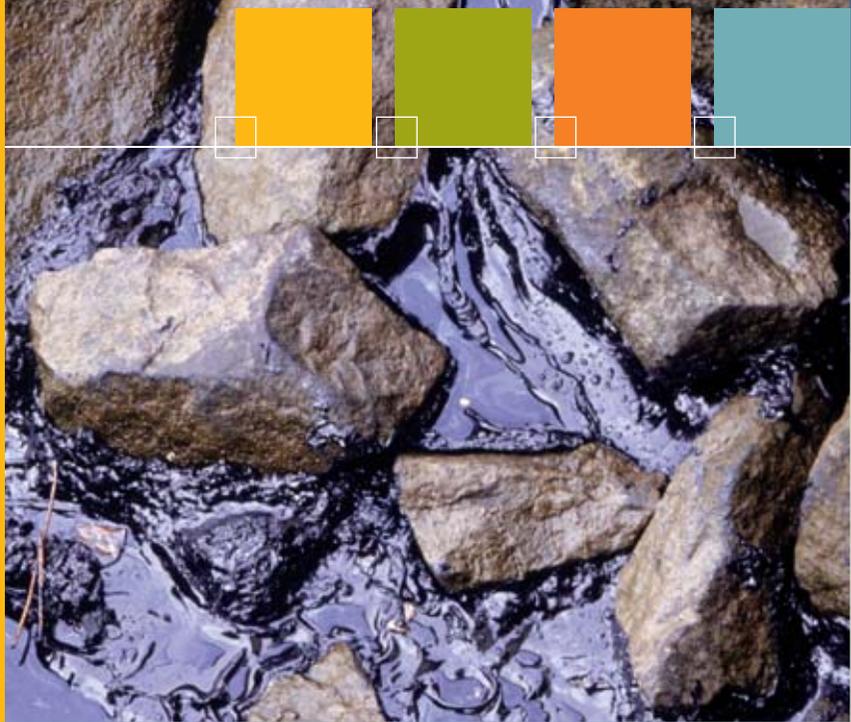


BOOST YOUR BUSINESS WITH BIOTECH



Hazardous Waste Management

BENEFITS FROM BIOTECHNOLOGY

Biotechnology can offer significant benefits to your business through the adoption of improved materials and processes



What is biotechnology?

Biotechnology involves the development of techniques and technologies based on knowledge of living organisms. Industrial uses of biotechnology come from 'adapting the biological organisms, processes, products and systems found in nature for the purpose of producing goods and services'.¹

¹ OECD 2001, The Application of Biotechnology to Industrial Sustainability - A Primer

What are the benefits of using biotechnology in your business?

Biotechnology has the potential to deliver possible cost savings by offering:

- waste reductions;
- creation of value from waste;
- reduced degradation; and
- energy and water savings.

What are the major applications of biotechnology in waste management?

Biotechnology has a range of applications in waste management including:

- reduced waste outputs through changes in production techniques or input materials;
- rehabilitation of soil and water at spills and contaminated sites;
- removal of organic pollutants from domestic and industrial effluents; and
- production of biofuels and electricity from organic waste.

Biotech products for soil and water remediation

Waste Stream	Contaminant	Product	Company
Soil	Oils, greases	<i>Enretech-1</i>	Enretech
	Oils, greases, petrol, diesel, phenols	<i>GCT</i>	Perth Petroleum
	Hydrocarbons (broad)	<i>FABCOM®</i>	Spartel
	Heavy metals	<i>FABCOM® (with METALOK™)</i>	Spartel
	Hydrocarbons, Oils, Toxic chemicals	<i>Micatrol</i>	Ozmotech
Water	Pesticides	<i>Landguard™</i>	Orica
	Oil	<i>Biomarine</i>	Genesearch
	Greases	<i>Ecobac</i>	Genesearch
	Oils/greases; Petroleum; Phenols	<i>GCT</i>	Perth Petroleum
Direct Spills	Oil/Fuel	<i>Enretech-1</i>	Enretech

Microbes and hazardous waste

Microbes are living organisms and are found everywhere in the environment. Microbes can include bacteria, fungi, algae and many other types of living things. Single microbes are too small to be seen with

the naked eye, but can play an important part in cleaning up hazardous chemicals, such as pesticides, oil, and heavy metals. Some microbes can use these materials as a food source. By spreading specific microbes at a site contaminated with dangerous waste products,

the waste can be broken down into harmless substances. This process is known as bioremediation. Other approaches stimulate the growth or activity of microbes native to the site to breakdown the contaminant more quickly.



Successful site rehabilitation

Penrice Soda Products (SA) commissioned the cleanup of a fuel oil spill from the 1970s that had become trapped in the soil below the groundwater level. Bioremediation designed by Golder Associates (US) used recycled material composed of limestone by-products from the Penrice soda ash production process as the construction base for the bioremediation piles. The contaminated soil was dug up and put into the piles where microbes and organic additives were added to make ideal conditions for the microbes to eat the oil. The soil only required a few months treatment and was then reused as surface soil.

City of Salisbury (SA) has more than 30 constructed wetlands along the urban stormwater drainage system. These wetlands feature plants that enhance the physical and biological removal of hazardous pollutants from the stormwater. A number of these wetlands, including major schemes based at Parafield Airport and Edinburgh Airbase, can harvest the cleansed stormwater for eventual re-supply to local industry, schools and community reserves.

General Bioremediation

Companies like **Sustainable Infrastructure Australia (AU)** and **Flinders Bioremediation (SA)** can clean up contaminated sites using microbes. Sustainable Infrastructure has successfully treated industrial sites, such as chemical plants

and depots, urban service stations and refineries. Flinders Bioremediation has managed the cleanup of several projects in South Australia, including an old railway refuelling yard and a wood treatment plant. The land was later redeveloped for residential housing.

Soil Bioremediation

Enretech Australasia (NSW) produce a microbe-based product that can degrade oil contaminated soil or direct oil spills. Microbes are added to an absorbent produced from recycled natural cellulose fibres that contains additional nutrients to grow and maintain the microbes and allow them to degrade the oil into harmless components. The process has resulted in up to 80% reduction in hydrocarbon levels in 30 days and is effective to a depth of approximately half a metre. Below this depth, soil needs to be dug up to be treated. The products are safe and simple to use and require no special training.

Spartel Pty Ltd. (WA) has made the FABCOM system which includes a flexible cover system that can be put over soil piles to speed bioremediation by native microbes. The system is suitable for soil contaminated

with hydrocarbons from tar-derived wastes from different kinds of industries. The system prevents the escape of odours and vapours and weather effects are also reduced. The bioremediation process can progress faster as the conditions are more constant, allowing the microbes to work more efficiently. The system can also be used with the non-biotech absorbent **METALOK™** product to reduce heavy metal contaminants such as cadmium, chromium, copper, lead, nickel and zinc.

Perth Petroleum Services

(WA) produce a bioremediation liquid effective at degrading phenols, fuels and lubricants in contaminated soil and water. A liquid filled with various microbes is mixed

with water and sprayed onto the affected site allowing the microbes to break down the contaminants. The bacteria can also be established in oil/water separators, separation pits and waste lagoons.

Ozmotech (VIC) distribute *Micatrol*, a product that stimulates microbes already present in contaminated soil. It helps to restore the natural balance in the soil allowing the microbes to function better and more effectively break down contaminants in the soil. The product uses native microbes to break down a range of contaminants, including toxic chemicals, hydrocarbons and oil residues. The soil is typically tilled to a shallow depth to improve the conditions for the microbes.



Photo Courtesy of Flinders Bioremediation



Water Bioremediation

Orica *Landguard™* is an Australian-developed product that has captured an international market for the cleanup of pesticides. *Landguard™* uses enzymes to break down specific pesticides by up to 99.99% within just 10 minutes - a process that would normally take several months to occur.

Genesearch (QLD) produce two powdered bacterial products for the biodegradation of specific wastes. *Ecobac* digests grease and food waste and has been tested in grease traps, sewage pump wells, sullage trenches, grease-contaminated sewage works and abattoir waste-treatment ponds. *Biomarine* eliminates the oil from boat bilges, replacing

chemical degreasers which are often pumped into the boat harbour or ocean causing undesirable environmental results. The *Biomarine* bacteria produce a harmless sludge which can be safely pumped into the ocean or harbour as the bacteria are unable to become permanently established in the marine ecosystem.

Ozmotech (VIC) also distributes *Bio-Energizer*, designed for use in treating wastewater lagoons. The product provides nutrients and stimulants to enhance the natural microbial activity in wastewater and soil. The product uses naturally-occurring microbes to decompose a variety of contaminants. The efficiency of waste lagoons is improved, reducing the amount of sludge formed and decreasing odours. *Bio-Energizer* can also be used in wastewater treatment plants, treating the wastes more efficiently.

Waste Reduction

Novozymes (Denmark) produce a wide array of stimulants and augmenters targeted at the degradation of key waste components of many industries, including textiles and paper, as well as specific wastes such as industrial fats, phenols and ketones. Several products from the *ABR BLEND* range are able to bioremediate soils contaminated with fuels and oils.

Danisco (Denmark) has produced a number of enzymes that replace chemical processes in industries including textiles, waste treatment, paper and raw material processing. Enzymes are natural catalysts that speed up chemical reactions. Use of biological systems like enzymes or microbes can reduce the amounts of waste chemicals produced and can result in cheaper, more efficient processes with improved product quality. An example of such technology is a microbe that can produce an intermediate component of a high-performance polyester fabric known as 3GT™.



Treating Industrial Effluents

Aquatec-Maxcon (QLD) Ltd Pty is the licensee for the **BIOPAQ®** system (developed in the Netherlands) which treats a range of industrial wastewater streams. A range of industries have utilised this technology, both nationally and internationally, including the paper, mining, food, and beer and beverage industries. The process treats organically polluted industrial wastewater using little energy, and produces a reusable biogas, contributing to energy cost savings for the plant. Treated effluent can be directly discharged to sewer or further treated for re-use, allowing for a substantial reduction in trade waste fees.



Biospot (NSW) has produced a waste treatment system that relies on microbes immobilised on polyethylene rings with a high surface area. These microbes digest ammonia in wastewater to safe levels. The system is completely enclosed to prevent odour escape, and does not require chemical dosing. The technology can also be adapted to treat heavy metals and organic hydrocarbons from leachate.

Enretech (NSW) *Trap Clean* can be added to grease traps, drains, septic systems, manure pits, industrial wastewater and food processing systems. The microbe mix digests each of the wastes in these systems, meaning that the traps need to be cleaned out less frequently, and prevents drain blockages.

AUSTRALIAN CAPABILITIES

Australia has a strong base for further innovation

Australia has significant capabilities in hazardous waste management, a high skill base in biotechnology research, and a high level of Government commitment to increasing innovation in Australian industry. These capabilities give Australian companies opportunities to leverage off Australia's strengths and adopt biotechnologies in the hazardous waste management sector.

Government Assistance for Innovation in Hazardous Waste Management

The Australian Government provides a range of programs to assist industry to foster innovation and international competitiveness. These competitive grant programs are open to a number of industries, including hazardous waste management.

To find out more about the Government's industry assistance programs, visit the AusIndustry website **www.ausindustry.gov.au**, or call the AusIndustry Hotline on 13 28 46.

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