# BOKASHI COMPOSTING: PROVEN AT THE HOUSEHOLD LEVEL, NOW ADAPTED FOR USE AT THE COMMERCIAL LEVEL

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## *Introduction*

A major problem facing communities throughout New Zealand is the treatment, disposal, and or recycling of solid wastes. Generally solid waste from a community consists of biodegradable organic materials. At the present time, a high percentage of this material is being diverted to landfill.

With landfills, filling at a faster rate than anticipated, there is an urgent need to divert much of this material away for other economic use. With the high costs associated with transporting this waste to landfill, alternative usage is being sought and promoted.

Putrescible waste in the main is a high quality resource and new technology is being produced to assist in the treatment of organic waste. One of these technologies is Effective Micro-Organisms (EM).

## *What is EM?*

The technology of EM was developed during the 1980's at the University of Ryukyus, Okinawa, Japan by Prof. Teruo Higa. Studies have shown that EM has a number of applications including agriculture, composting, bio-remediation, septic tanks and household use (Higa, 1994). This technology is well established globally with more than 120 countries around the world using this technology.

EM is a mixture of groups of organisms that has a reviving effect on the natural environment and has been described as a multi-culture of coexisting anaerobic and aerobic beneficial micro-organisms (Daly & Stewart, 1999).

**Main species involved in EM are;**

Lactic acid bacteria
Photosynthetic bacteria
Yeasts
Actinomycetes
Fermenting Fungi

The basis for using these species of micro-organisms is that they contain various organic acids due to the presence of lactic acid bacteria, which is a strong sterilizing compound and suppresses harmful micro-organisms and enhances the decomposition of organic matter. They also have the ability to suppress disease-inducing organisms (Higa, 1996).

When used in waste systems EM will improve the efficiency of biological systems, and in the process reduce smell, and compete against harmful pathogens in the waste. This technology was a key ingredient in the wool-scour sludge composting project at Ashburton in 2007, which did successfully remediate contaminated wool-scour sludge (Kroening *et. al.*, 2007).

Research has shown that the carbon content of wastes decreased during composting and there was an increase in nitrogen content. This indicates that the increased microbial activity in the process, results in an increased mineralization rate of organic nitrogen (Daly & Stewart, 1999).

***What is Bokashi?***

Bokashi is a Japanese word, translated means "fermented organic matter" and is made by treating plant-based by-products with EM and then dried for longer shelf life. In this form, the EM microbes, when introduced to an organic matter source such as food waste, go to work.

Bokashi can be successfully used to treat putrescible waste, which results in a higher decomposition of organic matter and virtually no odour during process. This produces high quality compost, which is contributing to sustainable development across a number of sectors.

***Results & Discussion***

Sold under the brand name Compost-Zing and manufactured by Bokashi NZ Ltd in South Canterbury, the product has now been in use for nine years. The Christchurch City Council first used it in 2000, for a 100 household trial over a 3-month period. The trials which tested household usage and acceptance were a success and formed the basis of some further trial work by another three NZ Councils. In a further kerbside collection trial testing two methods of food waste collection it was reported "EM Bokashi minimised odours and the materials collected composted well in an open air windrow system" (Anon, 2002). The manager in charge of the composting project reported a very rapid breakdown of the Bokashi food waste, requiring just 7 days compared to more than 14 days for untreated waste (Pontin, pers comm., 2002).

The Bokashi Compost-Zing system is now well known across many NZ communities and is increasingly being accepted as a viable alternative system of processing food waste to the home garden.

The success at the household level has raised awareness amongst some business communities and for the past 12 months trial work has been undertaken at a number of localities to test the effectiveness of a system for the treatment and recycling of larger amounts of food waste.

One of these was Mudbrick Vineyard and Restaurant on Waiheke Island.

Fig 1. Mudbrick Vineyard and Restaurant

Fig 2. Wheelie bins adapted for Bokashi use

Renowned for its award-winning wines and food dishes, its chefs have enjoyed international acclaim showcasing the very best New Zealand ingredients. Now, this innovative restaurant is also a five star example of successful large-scale kitchen waste recycling in the hospitality industry.

With assistance from the *Waiheke Waste Resource Trust* and *Bokashi NZ*, Mark Robinson, Mudbrick's resident gardener, has established a system for recycling up to 3 tonnes of kitchen waste per month utilising Bokashi's Compost-Zing. This is then put to good use in the restaurant's own vegetable garden and waste disposal system.

1. Food waste from the restaurant is put into 20 litre buckets and collected daily by the gardener and taken to a purpose built area, and tipped into 240 litre wheelie bins (Fig 2).
2. As each layer of waste is added, around 250gms of Compost-Zing is sprinkled over the top. This process occurs each day and when the bin is full, it is sealed and allowed a further 7 days to complete the fermentation process, during which time the microbes pre-digest the food waste in preparation for the next stage.

3. The fermented waste is now mixed with spent potting media after the micro-greens have been harvested and then left to mature for 2-3 months. The maturing pile is covered to control moisture and protection from rainfall (Fig 4).

4. The mix is then used as high quality compost in Mudbrick's onsite vegetable garden, providing a nourishing food source for the restaurant's micro-greens, and conditioning the soil with enriching microbes. The fresh greens and herbs are then used in Mudbrick's award-winning dishes.

5. Finally, the nutrient packed juice, which results from the Bokashi fermenting process, is used in the restaurant's septic tank system, as a natural and environmentally friendly way of improving the efficiency of the system and reducing unpleasant smells (Fig 3).

Fig 3. Draining the "Bokashi juice"

Fig 4. Combining the food waste with media

By using the Bokashi Compost-Zing system to recycle it's kitchen waste, Mudbrick Vineyard and Restaurant is not only preventing tonnes of waste from entering the landfill, it is also saving money in the purchase and transportation of the traditional compost previously required to grow it's micro-greens.

Auckland City Council has added further support, by funding further trial work on Waiheke Island in conjunction with the Waiheke Waste Resource Trust with a Café to Community gardens trial at Café Get Stuffed and at Waiheke Island Resort, where up to one tonne /week of food waste in peak season will be recycled to a local fledgling horticultural enterprise, Rock and Pestle. This enterprise will use the resultant compost for use in a greenhouse and to grow micro greens for the local café and restaurant trade. Inspiration for this came about as a result of the success of the operation at Mudbrick Vineyard and Restaurant.

Fig 5. 120 Wheelie bins at Waiheke Resort  Fig 6. Micro-greens at Mudbrick

The Café, "Get Stuffed" is located in Ostend on Waiheke Island and has seating for 40 people. Dennis the proprietor reported sending around 7 bags of rubbish to landfill per week prior to the trials. He has since reported a huge reduction.

This trial was for a period of 26 weeks and resulted in the Café staff feeling good about not sending their food waste to landfill and was happy to participate reporting good odour control whilst buckets awaited collection.

Staff from the nearby community gardens collected their buckets of organic waste weekly and recorded statistics.

In this 26 week period, a total of 63 x 15 Litre buckets were collected, weighing in at 581.3 kilograms.

This contributed to significant saving in landfill fees for the restaurant as well as reducing operational costs, an important factor for this trial for other future businesses to follow suit.

The owner, Dennis, reported saving 1 rubbish bag per day resulting in a saving of $21.60 per week plus operational costs associated with time and energy use.
The benefits to the local community proved very beneficial in fostering good relationships between the business and local community with the community gardens producing great compost resulting in healthier vegetables, higher yields and a savings in not having to buy compost.

The Community Gardens have become a focal point to run the "Create Your Own Eden Compost Courses" from which a practical element can be demonstrated as they also have a large worm farm as well. This has resulted in an increase in the number of people becoming aware of community gardens, resulting in further support for them.

There will be four more community gardens starting on Waiheke, and it is hoped that other restaurants could be paired up with community gardens in their local proximity.
At present there are no municipal facilities on Waiheke to compost food waste, so this approach assists with a more sustainable resolution for diverting food waste from landfill for the waste minimization programme.

***Summary***

The trials carried out on Waiheke Island have shown that larger amounts of putrescible food waste can successfully be treated using the Bokashi method and there is scope to transfer this system across other areas. Whilst the trial work has focused on areas where there has been opportunity to recycle the treated waste back to the soil, within a close proximity to source, the system is not limited to just this technique.

A major advantage of the Bokashi system is that the collection times can be reduced and extended significantly, due to the Bokashi process which prevents putrification and associated odour emission. This could lead to significant savings in associated transport costs.

It is envisaged that trucks could uplift the waste on a regular basis and take it to a processing point where it can be added to green waste, further mature and then sold as a high quality compost material.

Further work is currently being undertaken in conjunction with a local council in an area where food waste constitutes a large part of the waste stream to test the feasibility of this.

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