THE BIOBOOST® FERTILISER STORY – SUCCESSFUL BIOSOLID BENEFICIAL REUSE

Graham Morris (New Plymouth District Council), David Taylor (New Plymouth District Council)

ABSTRACT

For the last 17 years New Plymouth District Council has been selling "Bioboost® Fertiliser", the thermally dried biosolid produced at the New Plymouth Wastewater Treatment Plant, to the public via its distributor Bioboost Ltd. NPDC has met its 100% biosolid beneficial reuse KPI target on a consistent basis.

This paper tells the Bioboost® story and explores the factors that have made Bioboost® successful, namely product quality, compliance with and understanding of the regulations and good marketing. But the story does not end there. Our thermal dryer is at the end of its useful life and requires replacement. We will discuss the options considered for this replacement and why we have chosen to replace it with another single line drum dryer and to continue the production of Bioboost®. Now that we have made that decision we are looking to the future, so the paper concludes with upcoming risks and challenges and a call to work collaboratively towards the promotion of the fantastic product that is biosolid fertilizer

KEYWORDS

Beneficial biosolid reuse, Bioboost® fertiliser, thermal drying, marketing biosolids

PRESENTER PROFILE

Graham Morris joined NPDC in 1996 as Trade Waste Officer. Oversaw sludge disposal sites and was instrumental in developing the Bioboost® brand and contracts with Bioboost Limited. A role as Team Leader Treatment for water, wastewater & solid waste followed. He is currently Process Engineer Operations for Council.

David Taylor has worked as a designer and project manager on a range of projects across the three waters as a consultant and in local government. He currently leads the network planning team at NPDC which is responsible for the infrastructure planning for the three waters, transport and solid waste networks.

1 INTRODUCTION

New Plymouth District Council has successfully sold almost all the biosolids produced by its wastewater treatment plant as an agricultural and domestic fertilizer Bioboost® since September 2002. This paper discusses the factors that have enabled NPDC to create a market for Bioboost® and what we consider to be the critical success factors for achieving beneficial reuse of biosolids. These are split into three key themes: quality, regulations and marketing.

1.1 WHAT IS BIOBOOST?

Bioboost® is a fertilizer formed from dried sludge produced in the bioreactors at the New Plymouth Wastewater treatment plant. It is a round, hard ball of 2-4mm in diameter with a Nitrogen:Potassium:Phosphorus (NPK) ratio of 6-2-0. It is a slow release fertilizer that breaks down over 12-16 weeks.

1.2 A BRIEF HISTORY

In 1984 the New Plymouth Wastewater Treatment Plant (NPWWTP) was commissioned. A Carousal plant, it was the first of its kind in New Zealand. Dewatering of solids was initially undertaken by centrifuge which yielded a sludge of 13-14% dry solids. Sludge disposal was to landfill by mixing with refuse. However, there wasn't sufficient refuse to achieve the required 5-1 ratio required and this resulted in a large slip at the landfill. In 1991 sludge began to be disposed to land at consented sites. The method involved trucking sludge at 13% DS to the disposal site and ploughing it in. Pathogens were dealt with by applying an 18 month quarantine period. However, heavy metals from industry became a problem as they limited the long term capacity of the disposal site.

To address the heavy metal issue a new Trade Waste Bylaw was introduced in 1997 and resulted in significant reductions in metal contaminants. Investigations into pathogen reduction technologies were made and in 2000 a thermal sludge dryer (TDF) was commissioned. The pelletised biosolid product continued to be applied to consented sites until the pathogen reduction of new process was proved to Ministry of Health satisfaction. Application was made to register the pelletised product as a fertiliser, under the Fertiliser Act, and this was successfully achieved in July 2000. Concerns regarding risk by Ministry of Agriculture and Fisheries were satisfactorily answered and the registration confirmed in September 2000. Application of fertiliser is a permitted activity under the Taranaki Regional plan. The Council was now in a position to begin the job of finding a market for the thermally dried biosolid. Marketing material and product management documentation was developed. Milestones were the

registration of the Bioboost® brand name in May 2001 and achieving Q-Base Quality Management System certification in September 2002.

Major players already in the fertiliser supply market were approached and an expression of interest tender for Bioboost® distribution and marketing was developed and advertised. A number of parties showed interest and trials of product were undertaken while talks continued and a number of "heads of agreement" entered into. Out of this process a local champion for Bioboost® emerged, David Tong, who through his Taranaki based horticultural & sports turf supply company D T Horticulture Ltd. had excellent industry contacts and understanding of the market which was backed up with technical expertise. Due to this relationship a contract with New Zealand Peat Ltd. was initially entered into in 2002. Two years later, in February 2004, the contract was transferred to a new Taranaki business, Bioboost Ltd., made up of a local fertiliser trucking and spreading firm with David undertaking marketing and technical support. This has been a very successful relationship for NPDC and has meant that all dried biosolids, except out of specification product, has been sold as Bioboost® since April 2002.

Throughout this period NPDC and Bioboost Ltd. have; continued to address changing regulatory requirements, worked to improve product quality and developed the Bioboost® brand and market. For example, Council has recently reduced the energy requirements for the production of Bioboost® 30% by installing new screw press dewatering equipment that mechanically reduces sludge water content by 30-40%.

2 PRODUCT QUALITY

The first step in any sludge management project should be to determine where your final product will go. If the answer to this question is reuse, then the quality of the final product should become a key consideration in the technology selection. In order to understand what "product quality" means requires a good understanding of what your final market wants.

In our experience there are four key quality characteristics of Bioboost®: its physical characteristics of size, shape and hardness, its nutrient value, the concentration of contaminants such as heavy metals and ensuring the destruction of pathogens.

2.1 PHYSICAL CHARACTERISTICS

One of the keys to Bioboost's® success has been the nature of the granule produced by the drum drying process. These particles are round, 2-4mm in diameter and hard. The size and shape means that they can be distributed by standard agricultural machinery. It also makes the product look and feel similar to other domestic fertilizers thus making it more accepted in the domestic market. The hardness means that the particle does not break down during transport and handling producing dust.

In our experience dust is one of the most significant challenges to the acceptance of biosolid fertilizers. Agricultural customers dislike dust clouds created by the spreading equipment for personal reasons and due to the potential for complaints from neighbours. Domestic customers dislike the feel and experience of getting a face full of dust when opening the bag and getting it on their clothes when spreading by hand.

During the early years the product had a much higher dust content that led to a number of complaints from our customers. We were able to remedy this through process optimisation and keeping a close watch on key parameters including the final percentage dry solids, and efficiency of the dust management system.

The hardness of the granule is a natural by-product of the drum drying process where the nucleus of the granule is created from recycled product coated with wet product, creating a hard core. The granules are then dried using a waterfall type effect which causes abrasion between the particles knocking off any loose pieces.

The relative importance of these physical characteristics is evident from experience in the USA where almost all the operators selling biosolids as a fertilizer (eg Milorganite, NEFCO, Synagro and Oceangro) are using drum dryers due to the excellent characteristics of the final product. The importance of a low dust product is emphasised by a number of these operators dosing the final product with an oil to further reduce the generation of dust.

Finally physical characteristics can also be an opportunity to target different markets. Milorganite produces a "green grade product" with a smaller particle size for greens and tees at golf courses. This has not been pursued by NPDC at this time as our relatively small scale makes the costs prohibitive, however it would be worth considering for a larger manufacturer, especially if implemented or allowed for in the initial design.

2.2 NUTRIENT VALUE

Plants grow best in healthy soil. Common agrichemical fertilizers are often targeted to provide high concentrations of N-P-K, nitrogen, phosphorus and potassium and little of anything else. However a healthy soil requires large quantities of carbon and a host of other micro nutrients. Biosolids like Bioboost® have a more complete spectrum of nutrients and carbon that builds soil, rather than just focusing on growing plants in the short term. Figure 1 shows a breakdown of the components that make up Bioboost®. This equates to a NPK ratio of 6-2-0 which is relatively low when compared against inorganic fertiliser but good compared to competing organic products. As a result it's the presence of the micro nutrients and carbon that is often the key selling point.

Understanding these characteristics and building on them is part of creating a high quality product. One example of this is Milorganite. As part of their wastewater treatment process they use ferric chloride for coagulation. The resulting iron in the product then forms a key selling point as iron is a key micronutrient for growing grass.

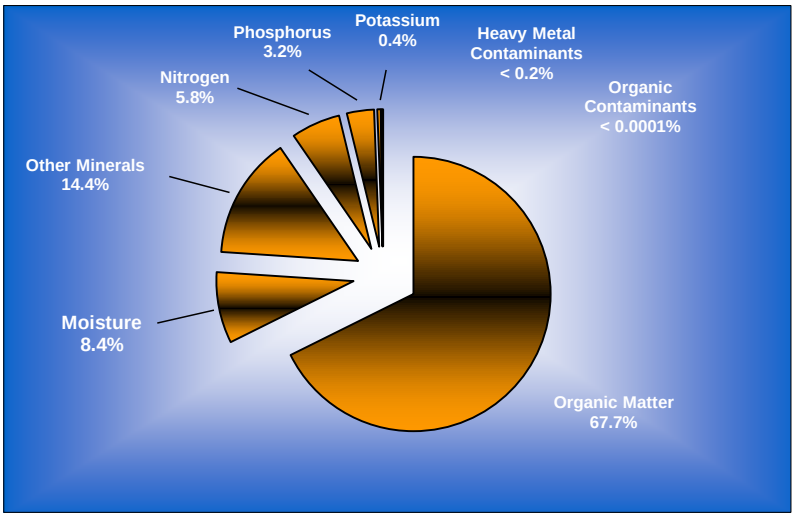

Figure 1: Nutrient content of Bioboost®

2.2 DEALING WITH CONTAMINANTS

Controlling contaminant levels in biosolids is essential if beneficial reuse is to be achieved. Under the current regulation the main focus is on heavy metals, however this is expected to evolve as the industry develops. In New Plymouths case high levels of zinc, copper and nickel, originating from local metal processing industries were limiting land application. To address this a new Trade Waste Bylaw, based on the Interim NZ Standard Model Trade Waste Bylaw (1995), was introduced in 1997. This bylaw allowed charging for strength (BOD and SS), volume and contaminants and enabled the setting of concentration and mass limits. It also introduced the concept of trade waste management plans. As a result very significant reductions in heavy metal concentrations have been achieved. Figure 2 illustrates the reduction in zinc, copper and nickel levels since 1996.

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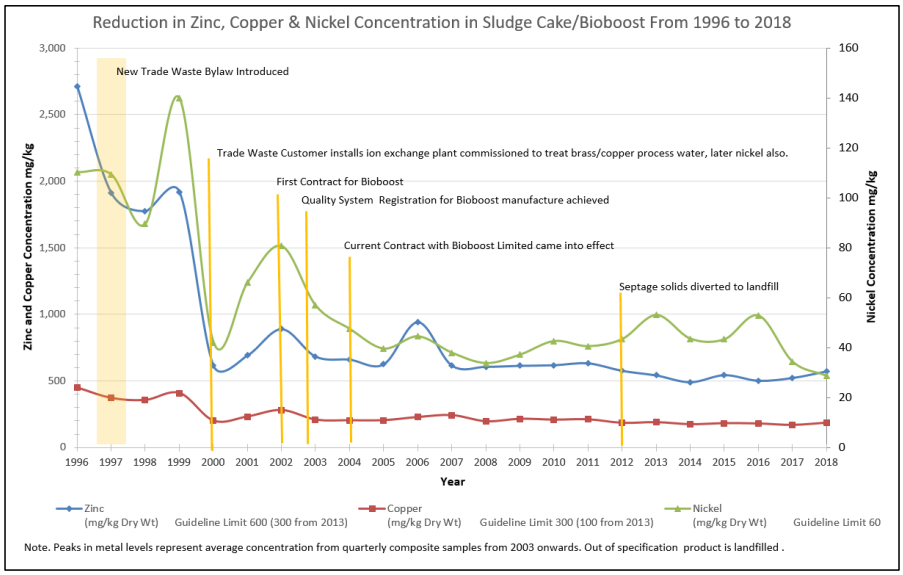

Figure 2: Metal reduction in sludge/biosolids produced at NPWWTP since 1996

Table 1 below shows different Biosolid Guideline values for these metals. Of note is the proposed new guideline values in the "Draft Guidelines for Beneficial Use of Organic Materials on Productive Land (December 2017)" which proposes less stringent limits on the basis that biosolids be used at agronomic nutrient levels with a maximum of 200 kg N/ha/yr. Bioboost® recommended application rates are based on agronomic nutrient needs in terms of nitrogen and 200 kg N/ha/yr maximum.

Document	Grade a, max. conc. Zinc mg/kg DS	Grade a, max. conc. Copper mg/kg DS	Grade a, max. conc. Nickel mg/kg DS
Guidelines for the Safe Application of Biosolids to Land in NZ, August 2003 Until 31/12/12	600	300	60
Guidelines for the Safe Application of Biosolids to Land in NZ, August 2003 From 31/12/12	300	100	60
Draft – Beneficial Use of Organic Materials on Productive Land (December 2017)	1500	1250	135
Historic range for Bioboost® over last 5 years	490-635	170-215	25-55

Table 1: Comparison of different metal limits applied or proposed in NZ.

The combination of both the concentration and mass limits put robust parameters around industrial discharges and Council worked with industry to develop management plans to achieve the limits within agreed timeframes. In addition the cost to Council of receiving copper, zinc, and nickel into our treatment plant was calculated and a dollar per kg value assigned for each metal (Total Cost assigned to metal *y* / Total mass metal *y* into treatment plant).

The inclusion of a charge for the three most problematic metals on a $ per kg bases provided a financial incentive for businesses to apply cleaner production techniques and justify expenditure in time and on equipment to reduce metal discharge. Council staff worked closely with businesses on their management plans to set goals and timeframes within each industries capability to achieve incremental improvements in trade waste quality. Often the gains did not involve large expenditure but just applying better process techniques such as ensuring the use of drip trays or air drying between electroplating chemical and rinse baths. However, in one case an ion exchange plant and filter press was installed to remove significant quantities of copper, zinc and nickel. Septage received at the treatment plant was identified in 2011 as containing very high levels of zinc and copper in the solids and in 2012 a local business set up a septage dewatering facility. This resulted in a drop in zinc concentration in our biosolids of 50-100 mg/kg. Copper & zinc now received at the NPWWTP are largely from diffuse domestic sources.

To manage agricultural chemical residues concentration and mass limits have also been applied to plants discharging these contaminants. This has resulted in industry installing carbon filters to remove contaminants before discharge to sewer.

2.3 ELIMINATING PATHOGENS

Application of sludge to land on a bulk scale was not considered a sustainable method of disposal by NPDC nor the Taranaki Regional Council. While reducing metal contaminants increased the quantity that could be applied, the land would eventually reach its limit. Taranaki has rich soils and there is very little low grade land that would benefit from bulk sludge application within practical transport distance from our WWTP. In addition to availability of suitable land pathogens in wastewater sludge meant application sites had to be quarantined for 18 months. To address the pathogen issue NPDC began to investigate possible technologies. Successful examples in New Zealand in the latter 1990's included the auto thermophilic digestion (ATAD) of sludge in Nelson and its application to forest on Rabbit Island. The other was the Living Earth Joint Venture biosolid compost operation in Wellington. Both ATAD and composting were investigated in depth by NPDC.

Fortunately for New Plymouth an alternate technology, thermal drying, emerged and proved to be cost competitive with ATAD and composting. It also had some significant advantages; it would reduce the mass of product produced to 1100 tonnes/year of a dry pelletised product compared to 8,500 t/year of a wet ATAD

sludge and compost of 8,500 t/year, the dried product could be easily and economically transported, it stored well so could be stock piled for release when demand rose, the small round pellets produced are similar to many premium fertilisers so have almost as much appeal as compost, it is very easy to apply and it has good nutrient value. All up drum dried biosolid pellets has proved a most desirable and versatile product type. Thermal drying has proved a robust process in terms of pathogen sterilisation and the dried product is stable in terms of vector attraction. It is important that product is stored in a dry condition until use. This has not proved a problem in 17 years of manufacture and distribution.

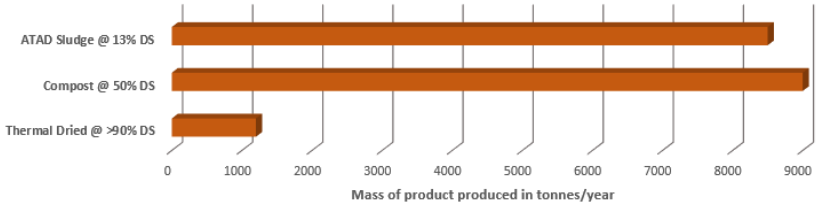

Figure 3:Comparisons mass of product produced by different pathogen reduction technologies (based on 1,100 tonnes of dry sludge per year).

New Plymouths WWTP IANZ accredited laboratory undertakes weekly, monthly, quarterly and yearly analysis on different aspects of the process from raw sludge to the thermally dried biosolid in order to ensure the quality of Bioboost® distributed meets specification.

2.4 QUALITY CONTROL

We need a product that; meets specifications and regulatory requirements and is of a consistent quality so that our customers can have confidence in it. We also need to ensure that they have the right information to apply it and get the best out of it. To achieve this a quality system, the Telarc Q-Base Code 2001 was adopted and registration gained in September 2002. Figure 4, Quality Management Flow Chart for Bioboost®, gives an overview of our quality process.

The scope of the NPDC Biosolids Quality System covers:

(a) Verification of final product temperature so as to ensure only product which leaves the thermal dryer at greater than 80˚C is supplied for sale,

(b) Verification that product when loaded out from final product hoppers, to distributors trucks, has a dry solids content of greater than 90%,

(c) How non-conforming product is to be managed,

(d) The biological, chemical & physical testing requirements for the product,

(e) The management of the load out of product to the customer and the documentation necessary,

(f) The overall management of the quality system,

(g) The control of documents and records,

(h) Customer needs,

(i) Purchasing,

(j) Training and work instructions,

(k) Inspection and control of substandard work,

(l) Audits of the Biosolids Quality System and Distributor.

To this end the application of the quality system as it applies to our process and systems is focused on:

(a) Verification of critical final product temperature and calibration of temperature probe,

(b) Identification & disposal of non-conforming biosolids,

(c) Supply & distribution of Bioboost® fertiliser,

(d) Testing of final biosolids product & management of biosolids Quality System.

A Biosolids Forum Group meets quarterly, to review the overall direction of the biosolids process and has been a key to continuing to ensure we maintain an ethic of continuous improvement and a quality product is supplied to our distributor and customers. The focus of the meeting is:

- To maintain an overview of NPDC biosolids production, compliance, management and review on a quarterly basis,
- To oversee the management of the "Bioboost® Agreement" with Bioboost Ltd. for the distribution and marketing of our biosolids fertiliser "Bioboost® 6-2-0" and ensure NPDC meets its obligations under it,
- To ensure good communications are maintained with the distributor (Bioboost Ltd) and customer feedback is appropriately addressed,
- To be aware of new legislative/regulatory issues that may affect the sale of biosolids fertiliser and ensure the appropriate party (either NPDC or our distributor) is addressing them,
- To ensure resource consents or certificates of compliance are obtained and maintained to allow the sale of Bioboost® in as many regions as possible,
- To ensure issues affecting biosolids production, quality and supply are appropriately addressed,
- To develop a manufacturing ethic and cultivate a customer focused attitude.

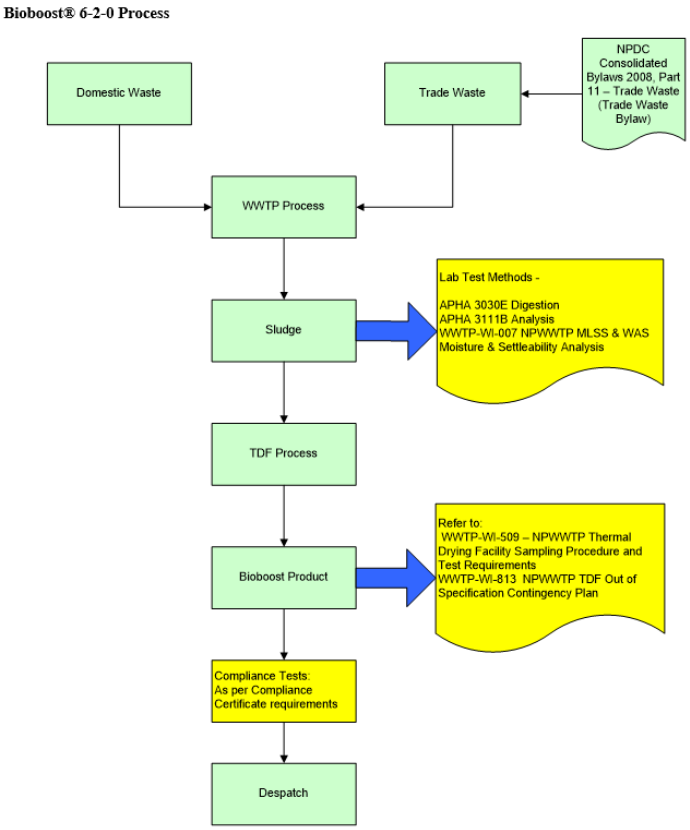

Figure 4: Quality Management Flow Chart for Bioboost®

3 MEETING REGULATORY REQUIREMENTS

The sale and application of Bioboost® is regulated by the following:

- Agricultural Compounds and Veterinary Medicines Act 1997,
- Hazardous Substances and New Organisms Act 1996,
- Resource Management Act 1991,
- Various Regional Plans,
- Guidelines for Safe Application of Biosolids to Land in New Zealand 2003,
- Draft Guidelines for Beneficial Use of Organic Materials on Productive Land.

Whilst a strong working knowledge of these regulations is required, they are not prohibitive of beneficial re-use. We have been able to navigate a route to

compliance and thus help reduce the uncertainty and risk for the Council and assist with providing consumer confidence.

3.1 PROVING THE PROCESS

In 2000 when the thermal dryer (TDF) was commissioned "The Guidelines for the safe application of Biosolids to land in New Zealand 2003" (the 2003 biosolid guidelines) were in the early stage of development and were of little help as far as what would be required to prove the TDF was producing a pathogen free product. It was essential to have sign of from the Ministry of Health that we were producing a safe product. The pathogen testing requirements for the Living Earth Consent were therefore adopted as the required standard for proving the NP TDF process. The USA EPA Part 503 rule criteria for further reducing pathogens was also adopted as the process benchmark for pathogen and vector reduction criteria. This rule was incorporated into 2003 biosolid guidelines and is proposed in new Guidelines for Beneficial Use of Organic Materials on Productive Land (draft new guidelines). After 3 months of trial running and testing we were able to prove the new thermal drying process was able to meet the requirements. Key process parameters are that the temperature of product leaving the drum had to be greater than 80^0C for it to be diverted to final product hoppers and that product in load out hoppers had to be greater than 90% dry solids. To ensure this is the case a certified temperature probe is installed at the exit of the drum and this controls diversion valves to recycle/or storage. The plants IANZ accredited laboratory monitors this and tests all loadouts to distributor for moisture content.

3.2 FERTILISER REGULATIONS

In 2001 the Fertiliser Act, under which we had registered Bioboost® as a fertiliser, was replaced by the Agricultural Compounds and Veterinary Medicines Act 1997 (ACUM Act). Suddenly the ticket we thought we had to be able to distribute Bioboost® seemed to be disappearing. However, this was not the case. The ACVM Act does not in general require fertilisers to be registered PROVIDED they meet the prescribed standard. Fertiliser requirements are described in Schedule 5 of the regulations and relate to:

1. Labelling requirements such as: trade name; name of manufacturer; nutrient content; precautions to be taken to prevent or manage **risks** when being used; directions for use.
2. They must be fit for the purpose specified in the directions for use.
3. They are fit for their purpose only if they are used as recommended and do not; produce residues in primary produce that fail to comply with applicable food residue standards; cause pain and distress in animals due to toxic reactions or physical damage; contain micro-organisms at pathogenic levels or any plant or animal pest that is likely to promote disease or pest transmission; have a selenium content that would result in application of selenium at a rate exceeding 10grams per hectare.

The risks in 1 above specifically relate to those outlined in section 19 of the ACVM Act. Briefly they are:

a. risks to public health,
b. risks to trade and market access for primary produce,
c. risks to agricultural security,
d. risks to the welfare of animals,
e. risk to domestic food residue standards.

To address these risks the biosolid manufacturer must manage their product through; applying Trade Waste Bylaws, installing appropriate processing technologies, giving biosolid users correct information and applying quality control in key areas.

3.3 HAZARDOUS SUBSTANCES & NEW ORGANISMS ACT 1996

To understand whether Bioboost needed to be registered under the Hazardous Substances and New Organisms Act was our responsibility as a manufacturer. To fulfil this we looked at the pathogen transmission risk, contaminant levels and flammability. Producing an A Grade product means that pathogens have been dealt with and tests show contaminant levels are all below any trigger levels in HASNO regulations. Tests were undertaken to ascertain the flammability of Bioboost® in accordance with a standard test. It proved to be impossible to set on fire and consequently has not been classified as a Dangerous Good under NZS 5433:2012 Transport of Dangerous Goods on Land. Bioboost® is not classified as a Hazardous Substance according to NZ HSNO legislation.

The lack of flammability was surprising given reported issues with thermally dried biosolids reported overseas. However, not all sludge's to be dried are equal. The New Plymouth product is produced from an aerobic activated sludge meaning anions such as sulphur are fully oxidised and there is no primary sludge content. This contrasts with a digested sludge where sulphur may be in an un-oxidised form or products contain high energy primary sludge. The hard beads of the drum dried biosolid also contributes to its stability.

As the manufacturer of a biosolid based natural organic fertiliser we believed it essential we developed a Safety Data Sheet (SDS). The SDS plays an important role in ensuring clear instructions are available regarding such things as product identification, appropriate storage and handling, environmental /ecological information, disposal information, etc. NPDC regularly keeps its SDS up to date and in line with SDS standards.

3.4 RESOURCE MANAGEMENT ACT 1991

The application of a biosolid derived fertilizer is governed under the Resource Management Act 1991 by the relevant Regional Plan. Each Regional Plan has different requirements, with some requiring a consent, some having it as a permitted activity and others specifically excluding it. For example in Taranaki fertilizer application is a permitted activity and the plan is silent on biosolids. In addition NPDC have a Certificate of Compliance from TRC that Bioboost® application complies with its Fresh Water Plan for clarity. Outside Taranaki, NPDC holds a Resource Consent for region wide application in the Waikato.

At first the regulations appear overwhelming, but they need not be a roadblock. Lessons we learned along the Bioboost® journey were that **educating** regulators about the product, the benefit of using biosolids and how they are produced is an important step in getting the bureaucrats on side and obtaining the help needed to navigate and meet regulations. Having robust guidelines around biosolid beneficial use will greatly help navigate the regulatory environment. Guidelines tend to be adopted by Regional Councils as if they are standards. Having all regions adopt a standard set of environmental criteria across the country would greatly enable more biosolids to be beneficially reused. It is for this reason NPDC strongly supports the adoption of the proposed "Draft Guidelines on Beneficial Use of Organic Materials on Productive Land (December 2017)".

4 CREATING A SUCCESSFUL BRAND AND MARKET

It is no use creating a fantastic product that meets all the rules if no one wants to buy it.

The total fertilizer market in New Zealand is worth approximately $2.5 billion. Of this organic fertilizers, such as Bioboost®, blood and bone, animal manure and seaweed, currently represent around 2.5% or $60M. Currently about 40% of our revenue is from the retail market in 25kg and 8kg bags, retailing for $25-$40 for a 25kg bag. The remaining 60% of revenue is from the agricultural market in 500kg or 800kg sling packs or in bulk. This retails for between $150 and $500 a tonne. By weight, 54 % of the product is sold into the pasture market with the balance being relatively evenly distributed between home garden, turf, nurseries, broad acres cropping and forestry as shown in Figure 5.

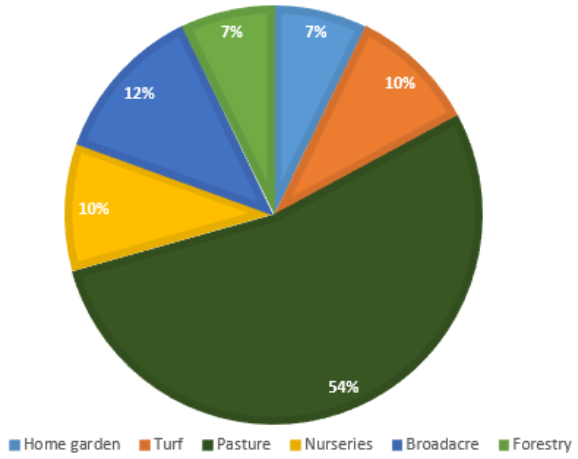

Figure 5: Final product use by weight

Under the current arrangement NPDC own the rights to the Bioboost® brand but the product is marketed and distributed by a third party, Bioboost Limited. Bioboost Limited sells around 25% of the product direct to the consumer. The

remaining 75% is on sold through various retailers including Farmlands, PGG, Mitre 10, RD1 and Palmers.

The bulk of this market development was done in the early 2000's by David Tong mostly by unsolicited approach, stands at field days and the like and word of mouth. David's passion for the product has been key in Bioboost's® success as his passion has inspired others.

4.1 LESSONS NPDC LEARNT IN DEVELOPING THE BIOBOOST® BRAND AND MARKET.

4.1.1 BE PASSIONATE ABOUT YOUR PRODUCT.

Here's why Bioboost® is such a great fertiliser:

- it's got a respectable NPK ratio at 6-2-0 (actually 6-2-0.4),
- adds organic matter, organic matter at 68% DS,
- it's got excellent mix of micro nutrients,
- acts as a slow release fertiliser,
- Is weed and pathogen free,
- it's very easy to use accurately , spreads very well,
- looks and handles similar to many high cost inorganic fertilisers the public is familiar with,
- can be stored for long periods, just need to keep dry,
- can be applied to lawns, grass areas any time of year and does not burn the grass. Activates when it rains,
- can be easily blended with other fertiliser products to make up special blends.

4.1.2 TELL YOUR STORY OF BENEFICIAL REUSE.

We have a great story to tell about beneficial reuse and resource recovery. In a world with limited resources being able to recycle nutrients, NPK, and organic matter to enrich our soils offsets production of oil based fertilisers such as ammonia urea and the need for mining of phosphates. It's a great thing to be happening in your community.

Develop promotional material for your biosolid product. There are lots of people who, after being educated, will want to use a good biosolid product. Great product, right price. Concentrate on connecting with these positive people.

4.1.3 CHANGE THE LANGUAGE USED AROUND BIOSOLIDS.

Talk about product, market, long term market, developing a robust market. Finding long term secure markets that maximise beneficial reuse. Don't talk about "Disposal Options" but "Market Options". Ban the words disposal and waste.

Biosolids are fit for beneficial reuse, they have value. Wastewater sludge is not a biosolid. Differentiate between the two. Recognise biosolids as a valued resource

and not a waste material (e.g. Macro & micro nutrient richness, organic matter, etc.).

4.1.4 NEVER EVER GIVE YOUR BIOSOLID PRODUCT AWAY.

Especially don't pay someone to take it off your hands. A good or service someone does not pay for they won't value. Put a value on it. For example, commensurate with nutrient value compared to other fertilisers on market. Bioboost® retails at $25 for 25kg bag ($1,000 per tonne).

Price your biosolid in line with the product it is competing in the market against. If a biosolid compost it should have a premium price as a compost due to its added nutrient content. If a fertiliser then match NPK value and possibly higher due to high organic material content. Having a price that is in line with a market value for nutrient content drives the right behaviours into users as far as application rates.

4.1.5 BE HONEST ABOUT YOUR BIOSOLID PRODUCT.

Be honest about what it's made from and that it does have some contaminants. Explain how sewage is transformed into micro-organisms, how pathogens are dealt with to make it safe. What contaminants are present and how these relate to guideline values and other fertiliser products and even organic products such as compost.

4.1.6 FIND A CHAMPION TO MARKET YOUR PRODUCT.

Early on in the Bioboost® story it was decided to seek successful business people that had the right skills to market and distribute Bioboost® rather than try and do this in house. They needed to have the right contacts in agriculture, horticulture, sports turf, forestry etc. To have sufficient capacity to take and store product such that production and the seasonal variation in demand can be balanced. There needs to be a bulk market that takes most of the product while the small package, high value market is being established.

Undertake field trials of your product in order to be able to demonstrate the benefits of biosolid use. Have satisfied commercial/ public users of your product supply testimonials of its great benefit.

Supply good instructions about how to use the product and on usage rates. This should be part of the instructions on the bag. Include these instructions on a product website.

4.2 THE OVERSEAS EXPERIENCE

Milorganite® and Oceangro® in the US have followed a similar approach to Bioboost®, abet they have kept the marketing and distribution in house and have committed more funds. Milorganite® spend $3M/yr. or a third of their revenue on packaging, sales, distribution and marketing. Oceangro® similarly spend a significant portion of their revenue on marketing with two employees

dedicated to marketing and distribution. Oceangro® also own fertilizer spreaders which they lend to farmers as part of their service. As a result these producers cannot meet the demand for their product. Conversely NEFCO and Synagro, both of which are private companies operating sludge drying plants focus on moving product at the best margins possible.

Regardless, all suppliers had some common principals in their approach to marketing their biosolids:

- Marketing and sales team had a passion for the product
- Marketing and sales team had a good understanding of agronomic principals and the niche biosolids fill in the fertilizer market
- Marketing and sales team understood the need to educate their customers around how the product was produced and its inherent limitations as well as benefits.
- Treating the product as a valuable commodity and not a product to get rid of.
- Carefully managing any oversupply so as not to collapse the market
- Taking a long term approach to marketing and sales.

5 NEXT STEPS FOR BIOBOOST®

5.1 UPGRADE OF THE THERMAL DRYER

The thermal dryer has reached the end of its useful life and requires replacement. As part of this project NPDC undertook a master planning study to consider a wide range of options as shown in Table 2. This study found that vermi-composting by a third party had the lowest whole of life cost and highest multi-criteria analysis score, but was subject to a unacceptable level of commercial risk. Solar drying and thermal drying were found to be 2nd equal and thus were taken forward to concept design.

Treatment Process	Multi-Criteria Analysis Score	Beneficial Reuse	Whole of Life Cost	Commercial Risk	Secondary Disposal routes	Process Redundancy
Vermi Compost	84%	Yes	$15m To $20m	High	None	Good
Solar Drying	77%	Yes	$15m To $20m	Moderate	Landfill or Land application	Good
Thermal Drying	67%	Yes	$15m To $20m	Moderate	Landfill or Land application	Poor
Windrow Composting	67%	Yes	$20m To $25m	Very high	None	Good

Landfill	55%	No	$20m To $25m	Low	None	Good
Incineration	32%	Partial	$25m To $30m	Moderate	Landfill	Poor

Table 2:Comparison Different Biosolids Treatment Options

Concept design considered four technologies in a total of 6 options as shown in Figure 6. As NPDC has a target of zero waste by 2040, the solar drying option was modified to a solar thermal hybrid in order to reliably achieve compliance with the Guidelines for Safe Application of Biosolids to Land in New Zealand 2003 and the new Draft Guidelines.

The final outcome of this analysis was there was no "right" or ideal answer. The final decision has been to use single line drum as it was the only process that would produce a product that could reliably meet the needs of bioboosts customers and thus our target of 100% beneficial reuse. Since that decision was made there has been increased focus on climate change, with NPDC joining the Global Covenant of Mayors for Climate and Energy and we are currently working on an Efficiency and Emissions Policy. It would be interesting to see whether the decision would change with these added to Councils strategic drivers and targets.

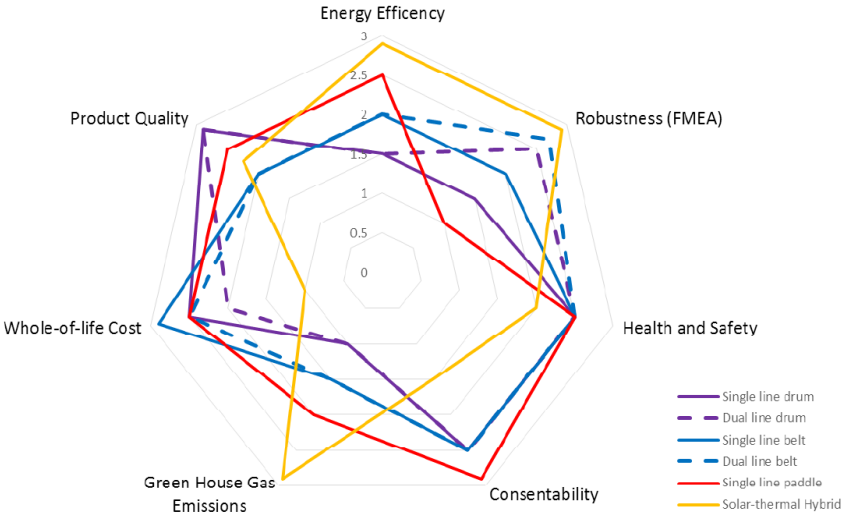

Figure 6 – NPDC Sludge dryer multi criteria comparison

5.2 CONTINUED ACCESS TO MARKETS

There are two risks in relation to market access, the beliefs of the ultimate consumer of the resultant produce grown in soil where biosolids have been applied and the beliefs of the user (ie farmer or gardener). The beliefs of the user can, and have been, addressed though good education about the benefits and limitations of the product. Once a reluctant potential customer has used the product our experience is they soon become enthusiastic about its use.

The beliefs of the ultimate consumer are more difficult to manage. Recent examples of this have been the restriction by Fonterra on the use of human derived biosolids and onion crops supplied to Japan. This risk can only be managed at a national scale, or by ensuring a wide customer base, such that loss of one sector will not affect the overall viability of the product.

5.3 INVESTMENT IN BRAND DEVELOPMENT AND MARKETING

To ensure the market security for Bioboost® into the future, and increasing the financial return, more investment and energy needs to be put into marketing. How this is achieved is something NPDC needs to grapple with.

We can either do what a number of successful USA Biosolid processors do, manage storage and distribution of Bioboost® gaining control of pricing, quality and technical education thereby enhancing strong Bioboost® branding, *or* continue with our current model of partnering with a distributor in the private sector who would undertake these functions.

Diversifying the market by getting more product into the high value package market may be the best way to ensure continuing demand for Bioboost®. Adding value to the product, by for example, blending with other fertiliser products to make special blends is something Bioboost® lends itself very well to. Sieving the product to produce special size ranges of product would also add value, such as targeting golf greens.

5.4 EMERGING ORGANIC CONTAMINANTS (EOC'C)

The level of EOC's in WWTP sludge's is poorly understood at present and where concentration levels might be set is yet to be decided. These chemicals are also expensive to get testing for. NPDC has undertaken some screening for these which shows them at low levels in our sludge if present. As such our current approach is to keep a watching brief as the science evolves.

6.0 NEXT STEPS FOR THE INDUSTRY

Working together to get the proposed new 'Guidelines for Beneficial Use of Organic Materials on Productive Land' adopted will certainly make a big difference as these guidelines significantly smooth the way when applying for resource consents or looking to demonstrate compliance against the rules in the regional plans.

Following on from this developing a National Environmental Standard along the lines of the guidelines would give certainty for the development and marketing of high quality biosolid products.

Collectively changing the language around how we talk about biosolids, as already discussed, will help change the public's perception.

Finally, we believe the marketing of biosolids reuse should be approached as a collaboration for all municipalities involved or interested in being involved. We should not treat each other as competitors. Our competitors are the other fertilizer and compost products. Due to the small size of NZ, negative publicity about any biosolid product has the potential to affect all biosolid products. As such we believe it is important that we come together as an industry to promote this great product in a coordinated manner.