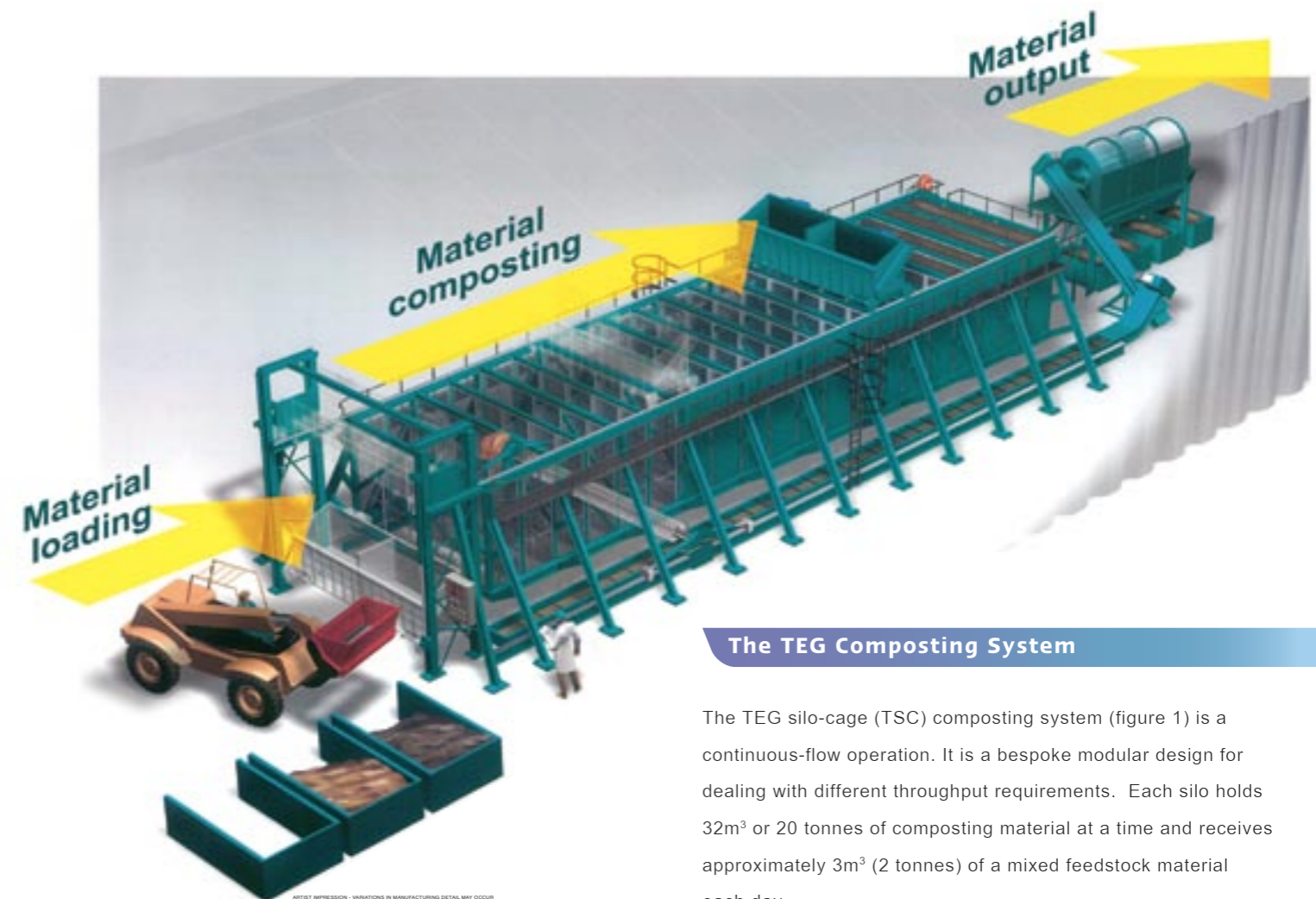


Introduction

The seafood industry is in urgent need of alternative disposal outlets due to increasing environmental controls and restrictions on the disposal of animal by-products. Trials in 2003 showed that composting is one suitable process for treating different types of seafood waste. Since then, Seafish has carried out a number of commercial scale trials with composting companies.

In 2005, Seafish commissioned a project in north west England to assess the suitability of commercial scale composting for the disposal of cooked whelk waste. AM Seafoods of Fleetwood provided the cooked whelk waste, comprising flesh and shell and TEG Environmental carried out the composting, using their commercial facility near Preston.



The TEG Composting System

The TEG silo-cage (TSC) composting system (figure 1) is a continuous-flow operation. It is a bespoke modular design for dealing with different throughput requirements. Each silo holds 32m³ or 20 tonnes of composting material at a time and receives approximately 3m³ (2 tonnes) of a mixed feedstock material each day.

The feedstock material is delivered by an overhead feeder system. Each layer of material stays in the silo for approximately 14 days, during which time it moves down through the silo. The bottom layer of composted material is unloaded onto a conveyor system and is taken away for maturation.

Figure 1 The TEG composting system

Further information

technology implementation Key Features

Composting whelk waste



The Project

Cooked whelk waste was delivered to the TEG site during March and April 2005. Initially, approximately 1 tonne of whelk waste was mixed with 1.8 tonnes of amendment material, comprising shredded green waste, draff (spent grain), broiler litter and recycled compost. Following mixing, 2.5m³ (1.7 tonnes) of material was loaded into a silo cage each day over a period of six weeks. Additional green waste was included in the mix to achieve the required temperature of 70°C.

Samples of material were taken for microbiological and chemical analyses, whilst temperature monitoring was carried out throughout the period of the project.



Whelk waste as delivered to the TEG site

Results

Temperature

Composted animal by-products must reach 70°C for at least one hour, across all the material. Initially the mixed material struggled to reach this temperature as the green waste was too woody and the whelk waste contained little flesh. Following the addition of extra green waste, the temperatures quickly rose to over 70°C which lasted approximately 36 hours.

Microbiology

Composted animal by-products must pass tests for the indicator pathogens Salmonella and Enterobacteriaceae. Samples of the whelk waste and the finished compost were taken. The results show that the compost passed the legal limits for composted animal by-products (Table 1).

Chemical tests

The compost was analysed to see whether it was safe and suitable to use in land-based applications (Table 2). The compost was found to be a good material with satisfactory nitrogen, phosphorous and potassium levels for use as a fertiliser or soil improver. However, high calcium levels could restrict some uses. Conversely, this could be beneficial in producing alkaline conditions. Excess calcium levels can be avoided if shell is mixed with amendment material in a higher ratio. The compost was not suitable for direct use as a growing medium as the nutrient levels are too high.



Mixing whelk waste with other materials

Table 1

	Total coliforms	E. coli	Salmonella in 25g
	colony forming units/gram (cfu/g)		
Whelk offal	4,200	230	Not detected
Compost	<10	<10	Not detected

Table 2

	% dry weight
Dry matter	65.4
Calcium	11.1
Nitrogen (total)	1.2
Phosphorous	0.5
Potassium	0.5



Mixed feedstocks for composting

Economics

Seafood businesses who want to send their waste for treatment at a site operated by a composting company will have to pay a gate fee. This fee varies according to the type, quantity and difficulty of the waste to be treated. It is estimated that animal by-product composting gate fees are currently about £40-60 per tonne. TEG have indicated that the gate fee for them to compost whelk waste would be within this range.

Businesses can establish a composting facility themselves or in partnership with other businesses. The economics and viability of composting vary significantly depending on plant size, throughput, gate fees for receiving other materials, sales of the finished composts, and so on. As such, costs will vary from the estimate provided.

All composting facilities require capital expenditure on land and equipment. It is estimated that it would cost around £1 million for a new 10,000 per tonne per year in-vessel facility which conforms to current legal standards. Operating costs and gate fees for the receipt and treatment of other materials are variable but the unit cost of composting is estimated at about £50 per tonne in an in-vessel system.

To establish a composting facility using the TEG system also

requires substantial capital investment. An eight-silo plant could process approximately 2,600 tonnes of whelk offal (without shell) each year. This would need mixing with other materials (shredded green waste, other food wastes, for example) which could generate a gate fee. The costs for purchasing the TEG system for an eight-silo site are estimated at about £0.5m whilst a 24-silo facility would cost about £0.9m. This does not take into account operating costs or any revenue from other waste streams which could make the economics more favourable.

Conclusions

This project found that whelk waste is suitable for treatment in a commercial composting system. Providing it is properly mixed with other materials, it can be used in land based applications. Operating a well designed and managed system reduces any potential problems, such as odour, from the seafood.

Composting is generally considered suitable for treating a wide range of biodegradable wastes. It is a potential solution for shellfish waste but it is preferable to use soft shell, shell with high levels of flesh attached or to ensure shell is well 'diluted' with other feedstocks to preclude elevated calcium levels.

During the project, AM Seafoods purchased a shell-flesh separator to treat their whelk waste. The clean, flesh-free shells are classed as a technical product and supplied to a local company for use in other products. Only the flesh waste is supplied to TEG for composting. As the shell is largely removed, the resultant compost does not have high calcium levels. AM Seafoods maximises the amount of shell that is used for other purposes and reduces the amount of waste for disposal. This highlights the benefit of looking at seafood waste streams and choosing the most suitable waste management option available for the different types of waste produced, which could reduce the costs of waste disposal in many cases. It also shows that working in partnership with local solution providers can help solve waste disposal problems.