Crustacea processing waste management

Introduction

With changes in waste legislation, shellfish waste management has become increasingly difficult and expensive. This has significantly affected the shellfish processing sector, particularly the crustacea sector as there is a lack of cost-effective outlets for their waste. Disposal costs of £60 to £200 per tonne are common, which is not economically viable for many businesses.

To establish whether it is possible for UK processors to generate an income or reduce the costs of crustacea waste disposal, Seafish initiated a project to look at the range of options available for crustacea waste management and identify which have potential for success. The project looked at all the crustacea species processed in the UK and the range of products or extracts that can be produced. This document summarises the findings of this work.

The UK crustacea sector and waste production

Crustacea is a generic term covering a number of shellfish species. In the UK this includes crab (brown), lobster, *Nephrops norvegicus* (also referred to as langoustine, Dublin Bay prawn or nephrops), cold water prawns, warm water prawns and shrimp.

It is impossible to accurately quantify the amount of crustacea waste produced in the UK because there are so many variables. For example, the extent of processing varies according to whether the crustacea is sold whole or fully processed. The following table provides an estimate of the range of quantities of crustacea waste produced and how it is currently used or disposed of.

	Estimated quantity (tonnes)	Current usage
Crab	3,485 to 6,970[(a)]	Disposal (incineration, composting) Land application Landfill Product (for dressed crab) Bait
Nephrops	6,526 to 13,052[(b)]	Heat treated and used in other products Exported with product Disposal (incineration, composting) Land application Landfill
Lobster	None – typically sold live or whole	None
Shrimp	No information	No information
Prawns	Processed elsewhere – no significant waste presumed in UK	None
Other shrimps and prawns	Processed elsewhere – no significant waste presumed in UK	None

a – assumes between 25% and 50% of whole crabs are processed in the UK.
b – Assumes 50% of *Nephrops* are landed as tails only with the waste discarded at sea. Of the *Nephrops* which are landed whole, between 50-100% will be processed on-shore.

Options for crustacea waste management

Crustacea processing waste can be utilised in other products or disposed of as waste. The type and properties of shell dictate how it can be managed after processing. For example, soft shells are unsuitable for many uses which are relevant for hard shell, or the head and claws of Nephrops and prawns may be used for products that are not derived from just the tail shell alone.

There are two main options for crustacea waste management;

- Option 1 - use or disposal as 'waste' off-site or
- Option 2 - making it available for use in other products.

Each option has its own issues; legalities, technical feasibility, outlets for the products etc.

Use or disposal of waste as is (Option 1)

Use or disposal of the waste as-is involves a cost to the waste producer. Where facilities are available, disposal costs range from approximately £40 per tonne for composting up to £160 per tonne for incineration. Although more licensed facilities are expected to be available in future, it is unlikely that the costs will fall below current levels.

Waste utilisation or treatment option	Range of costs (per tonne) to the producer (2007 costs)
Aerobic digestion **Anaerobic digestion** **Composting** **Landfill**	£40 - £60 plus transport costs
Alkaline hydrolysis **Autoclaving** **Crustacea meal** **Mechanical and biological treatment**	No data available
Ensiling (excluding heat treatment)	£25 excluding transport and off-site treatment
Direct animal feeding (bait)	From free (for bait) to £40
Incineration	£100 - £160 plus transport
Land spreading (including initial treatment)	£10 to £200 depending on extent of initial treatment and including licensing and transport costs
Rendering	£60 - £100 plus transport

Unfortunately, not all these uses or disposal routes are currently available for crustacea waste.

Supply for the development of other products (Option 2)

Making crustacea waste available for the development of other products is a possibility. There is a wide range of extracts and products which can be made from crustacea waste and much research and development work has been devoted to identifying processes and end uses for these derivatives. Some of these products have a high market value with a significant global demand.

Products that can be made from crustacea waste

High / added value	Food or feed use	Non-food use
• Chitin • Chitosan • Carotenoid pigments • Glucosamine and chondroitin sulphate • Alkaline phosphatase • Glycosaminoglycans • Omega 3 and 6 fatty acids	• Crustacea meal / fish feed • Flavouring • Pet food	• Fertiliser • Lime • Filter media • Free of flesh shell – technical uses • Free of flesh shell – use at sea

In order to develop other products from crustacea waste, crustacea processors would be required to treat or stabilise the material on-site, incurring a financial cost. It is very difficult to determine these costs as they will vary between businesses and type of method used. Each business would have to undertake a cost-benefit analysis of the options before investing in any in-house treatment facility. It is particularly important that an established outlet for the stabilised product is available, which may cover the costs of stabilising the crustacea processing waste. At best, such an outlet may generate a small income.

However, the processes used to derive the extracts and products require significant investment, are expensive to run, and need a high level of expertise to operate in order to deliver ingredients to the desired price and consistency. On this basis, it is not considered feasible for a seafood processor to develop an in-house extraction facility. Instead, it is best undertaken by a separate company which specialises in this field. However, there are currently no major crustacea extraction facilities in the UK and this situation is unlikely to change for the foreseeable future.

There is a possibility of exporting stabilised crustacea waste, but again there are issues to resolve with cost, logistics, technical feasibility, legal compliance and quality/traceability requirements. Each business will have to investigate this option in more detail.

Conclusion

On the basis of the information collected and the current situation, it will continue to be difficult for the crustacea industry to meet the demands of waste legislation through cost-effective means. Companies have little alternative other than to continue to use disposal routes where available.

Although there are opportunities to generate a small economic return from crustacea waste, this requires the processor to invest in equipment and facilities to produce stabilised waste. In addition, it requires a facility to be developed to extract a range of different products from the crustacea waste. Significant time would be required to evaluate all the regulatory, financial, logistical, quality and market issues. Even then, there are no guarantees that this will become commercial reality in the UK.

Further Information

- Further detailed information about the crustacea waste project is available on the Seafish website http://www.seafish.org This includes an Excel workbook.
- Seafish has undertaken a number of projects on the treatment and utilisation of shell. This includes;
    - Shell in aggregates project
    - Use of shellfish waste as bait
    - Disposal at sea of seafood waste
    - Land application of shellfish by-products
    - Autoclaving shellfish waste

  These are available to download from the publications page of our website – http://www.seafish.org/resources/publications.asp (search for 'waste')
- We have also produced a summary of the 'Legal requirements for animal by-products' http://www.seafish.org/upload/file/legislation/ABPQAV2.pdf
- For further information contact Michaela Archer at m_archer@seafish.co.uk or tel 01472 252332

- For a list of companies approved to treat animal by-products - http://www.defra.gov.uk/animalhealth/inspecting-and-licensing/abp/premises/index.htm

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