Shellfish waste disposal and opportunities for by-products

Michaela Archer

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Why is waste an issue

• The utilisation & disposal of all waste is already highly regulated in the UK
• Regulation is becoming more stringent
• Particular problems with recent animal by-products legislation
  • controls the collection, transport, storage, handling, processing and use or disposal of animal by-products and processed animal by-products
  • Includes seafood waste
Shellfish
very diverse range
of species, wastes
and by-products
What is shellfish waste?

- Captured and discarded shellfish, comprising under-utilised / undersized / non-quota species
- Parts of the shellfish that are not usually used directly for human consumption
- Can include shell, viscera, heads, legs...
## Ratio of shellfish waste by species

<table>
<thead>
<tr>
<th>Species</th>
<th>Approximate ratio of waste (% of liveweight)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cockle</td>
<td>88%</td>
</tr>
<tr>
<td>Oyster</td>
<td>86%</td>
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<tr>
<td>Scallop</td>
<td>86%</td>
</tr>
<tr>
<td>Mussel</td>
<td>86%</td>
</tr>
<tr>
<td>Mollusc - average</td>
<td>80%</td>
</tr>
<tr>
<td>Winkle</td>
<td>77%</td>
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<tr>
<td><em>Nephrops</em> - whole</td>
<td>76%</td>
</tr>
<tr>
<td>Crab</td>
<td>68%</td>
</tr>
<tr>
<td>Brown shrimp</td>
<td>65%</td>
</tr>
<tr>
<td>Crustacea - average</td>
<td>61%</td>
</tr>
<tr>
<td>Prawn</td>
<td>60%</td>
</tr>
<tr>
<td>Whelk</td>
<td>58%</td>
</tr>
<tr>
<td>Lobster</td>
<td>56%</td>
</tr>
<tr>
<td><em>Nephrops</em> - unshelled tails</td>
<td>42%</td>
</tr>
</tbody>
</table>
## Estimated on-shore processing waste (1999)

<table>
<thead>
<tr>
<th></th>
<th>On-shore processing waste (tonnes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demersal</td>
<td>154,143</td>
</tr>
<tr>
<td>Pelagic</td>
<td>50,269</td>
</tr>
<tr>
<td>Molluscs</td>
<td>67,166</td>
</tr>
<tr>
<td>Crustacea</td>
<td>29,459</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>301,037</strong></td>
</tr>
</tbody>
</table>
Summary of the Estimated Quantities of Seafood Waste Produced in the UK Industry (1999)

- Human consumption: 43%
- Discards: 17%
- Processing waste at sea: 5%
- On-shore processing waste: 35%

Total resource of 851,984 tonnes
What can be done with shellfish waste

- All seafood waste
  - incineration
  - rendering
  - petfood
  - technical products
  - biogas or composting
  - bait for hooks & pots (disease free)
- Clean shell
  - under general approval can only be used for land drainage, aggregates, garden uses, footpaths, ornamental uses
What can’t be done with shellfish waste

• Landfill of any raw shellfish waste, including shell
• Landfill of cooked shellfish waste after end 2005
• Direct land application of untreated waste - has to be free of flesh
• Disposal at sea without a licence
• Widespread dispersal at sea of ‘cultch’
Definitely not recommended
Molluscan by-products
Extracts & pharmaceuticals

- Enzymes
- Nutraceuticals
- Hydrolysates

A natural bio-medical glue from mussels?

Enzyme from scallops may give new medicine
Destroys dangerous bacteria

Fiskeriforsknin
has discovered an
enzyme in the Iceland
scallop that destroys
bacteria associated

New compounds from
marine organisms

In recent years, several research
groups have shown that marine
organisms can be a source for
new pharmaceutical compounds.

Mussel milling in New Zealand

A KEK Cone type grinding mill,
supplied by Kemutec Group
Ltd, is being used for the unusual
application of producing an
encapsulated powder from
mussels, which is popular in
Japan as a treatment for arthritis.

A diet with mussels could avoid problems later in life

Increased Yield of Hydrolysates from Shellfish
Construction materials

• Wall renders
• Aggregates
Land application

- Garden uses e.g. mulch
- pH amendment
- Land drainage
- Fertilisers
- Land remediation

Aqua Shell
Mulch around your favourite plants with this attractive organic product. It helps to retain moisture and suppress weeds, as well as deterring slugs and snails (who find it uncomfortable to cross!) and, being made from crushed sea shells, it is environmentally friendly. Ideal for patio container plants too. Please allow 21 days for delivery.
56 21 50 20kg Aqua Shell
£15.95

Applications of Marine Biotechnology

Environmental Remediation

French Turn Slipper Limpets Into Fertiliser
Biofilters

Breeze sells sea shells

Specialist in odour control and VOC abatement, Bord na Móna, has launched a new technology that enables companies to meet their environmental obligations with regard to keeping odours and solvent emissions from polluting the air. The technology uses natural sustainable resources to accomplish this and one of its key components is sea shells.

The technology has been installed at bpi-industrial Ardeer, part of British Polythene Industries, bpi produces polythene products, and its product range utilises complex printing processes to produce high quality images on its customers’ polythene packaging.

The sea shells are stocked in a tank with a perforated base. This allows air from the printing processes to be passed up through the shells. The sea shells are then inoculated with a starter culture of naturally occurring, harmless bacteria to set the system into action. At the top of the tank nozzles spray water onto the shells to create a moist atmosphere for the bacteria to grow in. The water is collected and re-radiated through the biofilter. Equally, the air that passes through the biofilter is sent around the system once more to be certain the VOCs have been treated. The VOC compounds are dissolved into the water and are destroyed by the bacteria on the shells.

Bord na Móna has called the process Enhanced Biofiltration (EBF) and branded the product Monashell. Bob Maloney, the company’s commercial manager, said: “Sometimes biofilters experience unforeseen conditions outside the design parameters for which the system is specified and built. This can lead to significantly reduced operational efficiency and high maintenance. So we have looked at ways to protect the microbes from swell unforeseen conditions and our research found that allowing them to make their home on a bed of sea shells is the best way to accomplish this.”

The micro-organisms in a biofilter do not like acid conditions. Unfortunately, sometimes as the microbes destroy the VOCs they produce acidic by-products. The sea shells are nature’s buffering agent, made of calcium carbonate, so they offer the perfect natural balance for any acidic products formed. Another important consideration is ensuring the micro-organisms see their food. Air needs to be distributed evenly through the biofilter and dissolve into water evenly throughout the tank for the VOCs to be metabolised by the microbes. The sea shells are ideal as they have a large surface area for all this to happen.

- Water treatment systems
- Air filters
- Odour control
Ornamental goods

- Jewellery
- Ornaments
- Decorative goods
Crustacea by-products
Chitin & chitosan

- medical uses
- effluent treatment
- land remediation
- fungicide
- dietary aids
- cosmetics
- food applications
  .....etc

Boffins develop nasal spray from shrimps
Carotenoid pigments

- Fish feed
- Pharmaceuticals
- Nutraceuticals
Flavourings

- Stock / concentrates
- Soup
- Sauces

NorthTaste All Natural Seafood Stocks

Seafood Bases by Redibase

Activ "Marinextracts"

Activ International Frozen Seafood Mince
Miscellaneous treatments
Shellfish waste composting

Seafood waste

Growing trials

The process

Compost
On-site treatment

Seafood waste → Heat treat & grind → Powdered product for direct sale
Crocodiles to control waste problem?
In summary

• Lots of research carried out but little commercial reality in UK
• Opportunities exist but issues to overcome include
  • technology
  • markets
  • economics
  • dispersed nature of industry & low volumes of raw materials
  • legislation
Seafish Waste Working Group
- a way forward

- Functions include
  - strategy development
  - identify and prioritise further work
  - co-ordinate solutions & best practice

- Members from the seafood & waste management industries, officials, regional agencies

- First meeting 6th April
Further information on the Seafish website

www.seafish.org.uk