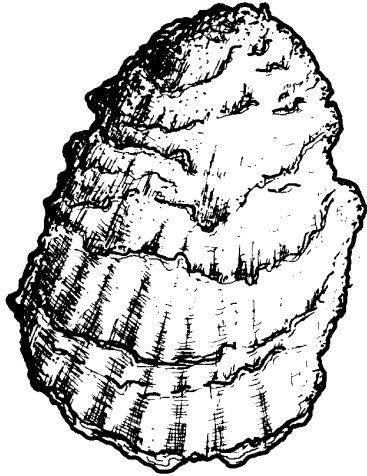


Mollusc Purification Advisory and Consultancy Service



For further information on the manufacturers of equipment, system design and consultancy services please contact:-

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Seafish Technical Reports

Seafish Technical Reports describing much of the work upon which the Standard Systems have been developed can be obtained from Seafish.

Report No.	Title
312	Mussel Purification - Commercial Trial of Multi-layered Purification.
339	Mussel Purification - Repeated re-use of Artificial Seawater in the Purification Process.
355	Commercial Trial of a Multi-layer Mussel Purification Tank with re-use of Artificial Seawater.
380	Design and Commission of a Mussel Purification Plant at Kings Lynn.
387	Mussel Purification, Development of a Medium-scale Deep Stack Purification Tank.
413	Artificial Dosing of Bivalve Molluscs with <i>E.coli</i> for the Testing of Purification Tanks.
418	Scallop Purification - Initial Trials at Ardtoe, September 1992.
427	Summary Report into Oyster and Clam Purification Criteria.
433	Biological Criteria for the Depuration of the Pacific Oyster (<i>Crassostrea gigas</i>) and the Design of Prototype Small Scale Depuration Plant.
456	Development of a Bulk Bin, Deep Layer, Down Welling Mussel Purification System.
459	Repeated re-use of Artificial Seawater in a Small Scale Vertical Stack Oyster Purification Plant under development by Seafish.

Consultancy Service

Seafish extends its general advisory role to deal in detail with the purification and handling requirements of particular businesses.

At an early stage Seafish can help with the choice of purification system, be it a standard design or one tailored to the needs of an individual operator. Site visits can be made to ensure that Ministry requirements are met, both in the design and bacteriological testing. Operating instructions can be produced and close liaison is maintained with Ministry Departments and Local Food Authorities to facilitate approval.

General advice, usually given by post or telephone, is provided free of charge, but for these consultancy services Seafish makes charges based upon a fixed daily rate together with travel costs.

Mollusc Purification Advisory and Consultancy Service

The Need for Purification

The Food Safety (Live Bivalve Molluscs and Other Shellfish) Regulations 1992 require all areas, from which bivalve molluscs are harvested and sold for human consumption, to be classified in accordance with their measured levels of bacterial contamination. Molluscs from areas with low levels of contamination (Class B) must be purified, or be relayed or be heat treated prior to sale in order to make them as safe to eat as possible. In the UK purification is the method usually used for marketing live molluscs.



What is Purification

Bivalve molluscs are filter feeders, extracting food from the water around them. Purification involves the transfer of the molluscs from the harvesting area into purpose built shore based tanks containing clean seawater. Here they continue filtration and normal digestive activity and over a period of about 2 days they purge themselves of any bacterial contamination present. Purification alone is not suitable for cleansing molluscs harvested from highly contaminated areas or areas

subject to contamination by hydrocarbons, heavy metals, pesticides etc., or by marine toxins.

System Design

To ensure that the natural cleansing activity of the molluscs occurs, careful design of the purification system is required. The system loading and water flow conditions must be such that sufficient clean seawater of the correct quality, temperature and dissolved oxygen level is circulated to all bivalve molluscs within it. To ensure these conditions, purification systems must be built to comply with certain criteria. These were specified originally for England and Wales by the Ministry of Agriculture, Fisheries and Food (MAFF) but have since been adopted by the Scottish Office Agriculture and Fisheries Department (SOAFD) and the Department of Health and Social Security (DHSS) for Northern Ireland.

Approval

In addition, the Food Safety Regulations require a purification system to be operated within a purification centre to which a unique approval number has been allocated by the Local Food Authority. This approval is given if the Food Authority is satisfied that the requirements of the regulations are met, and this includes the issue of approval conditions for each purification system by the relevant Ministry Department (MAFF, SOAFD or DHSS). Approval will be given only if the system design complies with the specified criteria and there is confidence that the system will purify molluscs satisfactorily. This usually requires a site visit and a bacteriological test.

How can Seafish help

Seafish has been investigating the handling and purification of bivalve molluscs for a number of years. As a result our Fish Technologists have developed considerable technical knowledge and practical expertise and are able to offer advice to industry, Food Authorities and Ministry Departments. This advice can be provided directly or via the Industry Guidelines currently being prepared. The development of standard purification system designs and a practical method of artificially dosing bivalve molluscs can also further assist in obtaining approval. The work on mollusc handling has resulted also in the development of improved equipment which causes less physical damage and shock to the molluscs. Consultancy services are provided in addition to advice.

Standard Systems

Seafish has introduced the concept of standard purification systems. These have been developed by Seafish and tested extensively in a wide range of conditions. They are made to a specified design and can be purchased as a complete package. Being proven designs they do not usually require further bacteriological testing and consequently have a more predictable, simplified, less time consuming and less expensive approval procedure. Four types of system exist, all of which occupy only a small floor area and can be housed indoors in controlled conditions, and incorporate the recirculation of seawater.



Multi-layer

To overcome the space and handling problems associated with the traditional purification of mussels in a single shallow layer, Seafish has developed two modular tank designs incorporating multi-layer stacking and a seawater circulation system.

The mussels are held in mesh type containers stacked up to six high in a deep tank. A uniform flow of sufficiently oxygenated seawater is directed to all containers by cascading or jetting it into the tank at one end and passing it through flow-screens. The two

designs have nominal capacities of 750kg and 1500kg of mussels per tank. Multiple tank units have been installed. The 750kg tank is made in either fibreglass or marine grade stainless steel and the 1500kg tank in stainless steel only. These tanks may be suitable for other species.

Vertical Stack



This design adopts the space saving approach of the multi-layer system in a different way. Molluscs are held in purpose designed, solid sided containers which are stacked above one another in a frame over a sump-tank. Seawater is drawn from the sump to the top container, it flows through that container and then cascades down from one container to another until returning eventually to the sump. This system has the advantage that individual containers of molluscs can be accessed without draining down the whole system and is ideally suited for oyster purification and subsequent wet storage. The system incorporates two eight high stacks of containers and has a nominal capacity of 2000 oysters.

Shallow Tank

To meet the needs of the smallest-scale operators a standard plastic pallet box of 650 litres capacity is fitted with a seawater circulation system to hold six containers stacked three deep. Being more shallow than the multi-layer systems, flow screens are not required. The tank has a nominal capacity of 1000 oysters but can be used for other species.

Bulk Bin



This system has been developed for mussels only, as they remain active in deeper layers than most molluscs. The mussels are held in a 350mm deep layer in a number of specially modified plastic pallet bins. Each bin is transportable and is connected to a common seawater supply and return system.

Seawater from a sump is pumped to each pallet bin, it flows down through the mussels and is then returned back to the sump where it is re-oxygenated and any debris settles out. For large capacity requirements this system has the advantage of relatively low capital cost and lower

labour cost through mechanised handling of the pallet bins.

Seawater Supply and Use

Clean seawater must be used for purification and advice should be sought from the relevant Ministry Department on the suitability of an intended supply. Difficulty in obtaining such a supply on a continuous basis has led to purification systems in the UK operating with seawater re-circulation and all the standard systems developed by Seafish are designed to operate in this way. Seawater used may require initial settlement or filtration before use and during re-circulation must be continuously sterilised (ultra-violet light is currently used) and may require heating or chilling. Artificial seawater (ASW) can be used, particularly where there is uncertainty over, or access to, a suitable seawater supply.

Access to a fresh supply of seawater for successive purification cycles is often not practical and its re-use is usually permitted over a period of two weeks. Under specified and controlled circumstances, agreed with the relevant Ministry Department, this may be extended further. The Seafish 1500kg multi-layer tank and vertical stack systems have been developed and approved for the re-use of ASW over a period of a month.

Artificial Dosing



The bacteriological test normally required as part of the approval procedure, requires the bacteria *Escherichia coli* (*E.coli*) to be present in sufficient number in molluscs at the start of the test and to be reduced to safe levels by the end. The start condition has often been difficult to achieve with naturally or artificially dosed molluscs and can result in the expense and delay of repeated testing over a period of weeks. A new method developed by MAFF and Seafish is to dose only a small quantity of molluscs using a standard culture *E.coli* under controlled conditions in a mini standard tank. These molluscs can then be placed at known sampling points in the purification system

under test. The technique has been used successfully both for mussels and oysters.

Handling Trials

Exposing molluscs to physical shock, unnecessary delay and extremes of temperature inhibits or even prevents subsequent purification. In addition the storage life and quality of live molluscs is reduced. Seafish has carried out considerable investigative work, and in particular of current industry practices.

As a result we have developed a combined mussel de-clumping and grading machine which reduces damage and shock, removes waste and undersized mussels and requires less effort to use than other more traditional methods and equipment. After extensive testing the machine is now available from a manufacturer.



Industry Guidelines

Seafish, in collaboration with the Trade, Local Food Authorities and relevant Government Departments are currently preparing a comprehensive set of Guidelines covering the harvesting, handling and distribution of bivalve molluscs. Recommendations are based on good practice but includes legal requirements. The first initial document deals with facilities and equipment.