Verification Trials of an Oyster Purification Tank for Mr. J W Gardner

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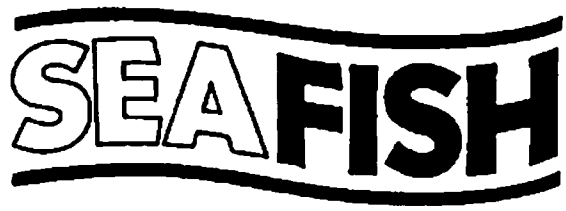
The Sea Fish Industry Authority

Seafish Technology



Verification Trials of an Oyster PurificationTank for Mr J W Gardner

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1. Introduction

Mr Gardner has installed a single fibreglass/wood purification tank situated at 21 Liquorpond Street, Boston, having initially taken advice on current design requirements from Seafish. The tank was built for the purification of locally grown Pacific oysters.

The aim of this vertification study conducted by Seafish, was to assess whether the tank met the MAFF design requirements and to monitor the environmental conditions found during the first trial run of the purification tank.

The tank was designed for use with oysters, *Crasstostrea gigas*, but was tested with mussels as they use more dissolved oxygen (DO) and hence give a worst case scenario regarding the combined effects of water flow and temperature. It is also easier to obtain mussels which will consistantly give a Class B pre-purification result, which is necessary for testing purposes.

The pre and post bacteriolgoical results from two trial runs are included in this report. Samples for bacteriological analysis were taken by the local Environmental Health Officer from Boston District Council.

2. Site/Buildings

The purification tank is situated in a basic building with fresh water supply and drainage facilities.

3. Seawater Supply

The system uses artificial seawater (ASW) made up with mains water using bags of pre-mixed salts, to provide a salinity of 29 ppt, which simulates local growing conditions.

4. Purification Tank

The purification tank has been constructed by sandwiching a 10mm plywood tank between an inner and outer layer of fibreglass to give internal dimensions of 2500mm x 610mm x 500mm deep. The tank is finished with an internal and external smooth epoxy paint.

The tank holds 18 Allibert 41015 trays with external dimensions of 550mm x 320mm x 130mm. These are of mesh construction and suitable for purification. The trays stack side on to each other, six to a layer, three layers of trays deep. They sit on a lip holding them 90mm off the tank floor, providing adequate depth for the settlement of sediment.

In commercial use each tray will hold approximately 85 oysters or 8.5kg of mussels to give a total capacity of 1530 oysters, or 153kg of mussels. The tank holds a working volume of 750L of seawater which covers the top layer of shellfish with approximately 50mm of water. Water is drawn out through a suction bar running the width of the tank situated 90mm above the base, level with the bottom layer of oysters. The water circulates through 2 wall mounted 30W Coastair UV sterilizers, which is in excess of MAFF requirements. The sterilized water re-enters the tank at the opposite end to the suction bar through a full width spraybar, 60mm above the water surface. A drainage valve is situated in the tank base, at the suction bar end of the tank.

A valve and flow meter are incorporated into the pipework before the spraybar to adjust and monitor the flow. All the pipework is in ABS plastic and wall mounted along with the pump and UV lamps, but plumbed such that it can be readily disassembled for cleaning.

5. Verification Trials

5.1 Trial 1

A 42 hour purification trial was carried out between 21st-23rd November 1994. The tank was filled with 150kg of mussels harvested from the Wash into 18 trays.

Once loaded the tank was filled with 750L of A.S.W. The water flow achieved was 4800L per hour. This gives a nominal water flow of 6.4 recirculations per hour with a water/shellfish ratio of 5:1.

Between 26-30 hours into the trails DO at the inlet and outlet ends of the tank, water temperature and air temperature were monitored.

The environmental conditions and the bacteriological results from Trial 1 are shown in Table Nos. 1 and 2 respectively

Table No. 1 - Environmental Conditions in the Tank

Time (hours)	DO % Saturation		Water Temp °C	Air Temp °C
	Inlet End	Outlet End		
26	90	86	14.1	10.5
28	91	90	14.8	11.00
30	90	88	14.5	10.5

Table No. 2 - Bacteriological Results from Trial 1

	Samples	*E.coli* count cfu/100g
	Pre-purification	430 and 310
Post Purification	Top layer - suction bar end	<20
	Top layer - middle	500
	Bottom layer - spray bar end	70

This trial showed two good reductions and one poor bacteriological result. The poor result is put down to some dead or dying mussels in that particular sample.

The DO levels recorded, at fairly high water temperatures, are very good. This is due to the high water flow rate and water/shellfish ratio.

Due to the poor bacteriological result from the middle of the tank a second trial was subsequently carried out by Mr Gardner and Boston B.C., EHO's.

5.2 Trial 2

This trial was carried out between 20th-22nd march 1995. The bacteriological results are shown in Table No. 3.

Table No. 3 - Bacteriological Results from Trial 2

	Samples	*E.coli* count cfu/100g
	Pre Purification	500 and 750
Post Purification	Top layer - suction bar end	20
	Top layer - middle	<20
	Bottom layer - spray bar end	<20

The results show a consistant reduction in *E. coli* from Class B levels at all locations in the tank.

6. Discussion

Overall the purification system is well made and meets current MAFF design criteria. The bacteriological results indicate that effective purification of *E.coli* was achieved, except for the one erroneous result discussed earlier. However, there are some aspects of the system operation that need further consideration and are discussed below.

Flowmeter

The flowmeter is of a too high capacity for the flow in this system as the readings were below the bottom end of the scale. It is recommended that the flowmeter is changed for an appropriate capacity unit.

Re-use of Artificial Seawater

Seafish trials with Pacific oysters in a vertical stack system demonstrated that artificial seawater could be re-used over a period of a month provided 10% was replaced after each purification cycle. This was with up to 2,000 oysters in 600l of artificial seawater. In commercial use this system would have up to 1,530 oysters in 750L of seawater, almost double the seawater to oyster ratio and its use over a month could be approved. However, at present the tank can only be drained down, via the tank drain, to waste. To re-use the seawater will require the feed to the spraybar to be fitted with a 'T' and valves to permit water to be pumped to a reservoir tank. Return to the purification tank would ideally be via a similar modification on the pump inlet side. Water left in the bottom of the tank once pump suction is lost is estimated at 15% of the volume and will drain to waste.

7. Conclusions and Recommendations

1. The purification system meets the technical design criteria currently required by MAFF.

2. The purification system was shown to purify mussels *(M. edulis).*

3. Improvements to the purification system can be made but are not considered a necessary part of the issue of "Conditions of Approval" by MAFF.

4. It is recommended that MAFF issue a Conditions of Approval document for this purification tank.