Findings of a Basic Water & Effluent Survey Carried Out at Andrew Leiper Limited

Consultancy Report No. CR 168

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Sea Fish Industry Authority
Seafish Technology

Findings of a Brief Water and Effluent Survey carried out at Andrew Leiper Limited

Confidential Report No. CR168

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1. Introduction

As part of the North East Scotland Strategic Study, Seafish has been involved in briefly visiting representative companies in the region to survey water use and effluent production. The purpose of these visits is to estimate the general reductions in both water use and effluent strength which could be made by introducing waste minimisation. This report summarises the findings of the brief visit to Andrew Leiper Limited carried out on 29th April 1999.

These brief visits of approximately half day duration only provide an initial indication of the water and effluent problems of each business and of what can be done about those problems. Few measurements of water usage and none of effluent strength were made, but the visits have enabled comparison with other businesses where detailed water and effluent audits and further work have been carried out. The problems and the required waste minimisation measures are often common to many businesses.

Some obvious problems and appropriate waste minimisation measures have been identified in this report, but this should not be considered as a substitute for the extensive water and effluent audit and the implementation of a targeted waste minimisation programme as recommended in the Seafish document "Guidance for Fish Processors on Water and Effluent Minimisation".

2. Background Information

Andrew Leiper Limited is a white fish primary processor with about 27 employees. The main processes carried out are:

Hand filleting
Mechanised skinning
Cleaning
Box Washing (manual)
Packing

It was not possible to observe cleaning and box washing operations in this brief survey.

2.1 General Comments

Monitoring the main site meter over a period of 1.5 hours identified that 4.3m^3 of water was used. During this period, there was a 20 minute break when processing was not carried out.

Water flow rates to different processes were measured. The following table summarises the findings.

Process	Flow rate (l/min)	Water use/wastage during breaktime (m^3)	Water use over 1.5 hour period (m^3)
Filleting			
- 6 station bench	25	0.5	1.50
- 8 station bench	16	0.32	1.44
Skinning (Townsend)	8	0.16	0.72
Others	-	-	0.64
	Total	0.98*	4.3

* incomplete figure due to unmeasured 'other' areas.

General Problem Areas:

- Taps and hoses being left on during the breaktime wasted approximately 23% of the water used during the measurement period.
- Leaking taps and valves (to the 8 station filleting bench and to the skinning machines) also waste water.

General Recommendations:

- Ensure water is turned off during breaks by improving management controls or by installing a solenoid valve to enable the water supply to be turned off at particular times of the day. The valve could be operated by a timer.
- Regularly check hoses, valves and pipework for leaks and repair as necessary.

3. The Process Operations

3.1 Hand Filleting

3.1.1 Water Use

Problem areas:

- Despite using an empty/fill method, the water supply was often left running continuously resulting in water overflowing onto the floor.
- Tub drain holes were not properly blocked with a plug, resulting in water leaking from the tub onto the conveyor.

Recommendations:

- Ensure water is only used on an empty/fill basis, by improving management controls and further education/training of staff.
- Use effective bungs in the tubs to prevent water leakage.

3.1.2 Effluent Production

Problem areas:

- When the benches are emptied, any waste on the waste conveyor is washed onto the floor.
- Although the 6 station bench had effective waste chutes, some trimmings are flicked into the central tub and left soaking. This increases the strength of the effluent discharged to drain. The 8 station bench has less effective waste chutes which allow waste to fall off the edges of the chute onto the floor.
- Waste ends upon the floor from around the edges of the cutting boards.

Recommendations:

- Bench drain plugs could be repositioned to prevent water from the tub washing over the conveyor.
- Waste could be prevented from being flicked into the central tub by incorporating a small (approximately 30 mm) guard between the cutting board and the tub, continuing around the top of the waste chute to ensure all the waste flicked towards the chute goes down. If trimmings are collected separately for sale, the box should be moved close to the cutting board or a second chute arrangement used to keep waste off the floor.
- The waste chutes on the 8 station bench should be modified to extend the guards along the edges of the chute.
- Ensure waste on the cutting boards is regularly deposited into the waste chute.

3.2 Machine Skinning

Although two skinning machines are used, only the Townsend was in operation during the survey. The water to both machines is supplied from one water point. The hosepipe is divided to enable water to be supplied to both machines.

3.2.1 Water Use

Problem areas:

- Water is left on when not in use.
- The flow rate was approximately 8 l/min. It is known that a skinning machine of this type can work effectively at 6 l/min without affecting the operation of the machine.

Recommendations:

- Ensure the water supply is turned off when not in use. Consider installing an easily accessible valve on the water supply to the machine so that it can be easily turned off. Alternatively, a solenoid valve could be used.
- Check water flow rates to the machines are in line with manufacturer recommendations. Reduce the flow rate further if practicable. Install a flow regulator to maintain a fixed flow.

3.2.2 Effluent Production

Problem areas:

- Water washes through the skins in the catch basket and so increases effluent strength.
- The catch basket is only emptied when full, resulting in waste overflowing and ending up on the floor.

Recommendations:

- Install a wedge wire separator chute (see Seafish Guidelines) to prevent water washing through the skins. In trials with a Baader 51 skinning machine, this reduced effluent strength and costs by 60% and 50% respectively.
- Ensure catch baskets are aligned properly to catch all waste and empty regularly to prevent waste ending up on the floor.

3.3 Drainage and Drain Catch Baskets

3.3.1 Effluent Production

Problem areas:

- Drain covers are slightly too small for the holes, allowing water to pass around the edges.
- Currently all waste material in the effluent ends up directly down the main drain instead of in the catch basket. This is due to the walls of the drainage channel being chipped/cracked, allowing all the water to drain around the outside of the catch basket and the catch baskets being slightly too small.

Recommendations:

- Ensure drain covers are a good fit, by improving the seals around the edges.
- Repair the walls of the drains.
- Install effective wedge wire catch baskets in processing areas (see Seafish Guidelines). In trials in a whitefish company, a separator catch basket reduced the strength of the effluent by about 50%.

4. Conclusions

4.1 Water Use

Based on the brief survey, water is wasted in all process operations and through poorly maintained taps and valves. Wastage is a particular problem during break times. Tackling these areas, by improving management controls and installing appropriate solenoid valves and flow regulators will significantly reduce water use. The following table outlines the findings of the brief survey and the areas for reduction.

Process	Estimated current water use/day (m^3)	Reduced volume (m^3)	Changes
Filleting	8.33	5.87	Flow regulators Solenoid valve/timer
Skinning	4.08	3.06	Regulate flow Turn off when not in use
Others	3.6	1.8	Turn off when not in use
Domestic	0.5	0.42	Fit cistern bags
Total	16.51	11.15	

Introducing these changes would result in a reduction of approximately 33% of current water consumption.

4.2 Effluent Production

When the Mogden formula comes into effect it will be particularly important to reduce the strength of the effluent generated. The main sources of high strength effluent are filleting and skinning. Priority should be given to prevent waste left soaking or ending up on the floor and passing down the drain. Effective separator catch baskets could be installed to reduce the strength of effluent leaving the factory.

It is estimated that a 50% reduction in effluent strength could be achieved by implementing the waste minimisation measures outlined in this report and in the Seafish Guidelines.

Appendix I

Estimates of the Cost of Waste Minimisation

It must be recognised that there are costs associated with waste minimisation. These costs must be included in the strategic study as well as the savings made from minimising water supply and effluent discharge bills.

The costs can be broadly divided into the direct costs associated with modifying or installing new equipment and carrying out new working practices; and the indirect costs of training staff, carrying out water and effluent audits and monitoring performance. These indirect costs are very largely a matter of staff time.

Experience suggests that significant reductions in water use and effluent strength can be made at no or low cost and over a short timescale — for example by turning off the water at break times and by shovelling waste up off the floor rather than flushing it down into the drains — but that further savings may require further study and investment in equipment and will take longer to deliver.

Based on the brief visits to each of the sample businesses, the costs of carrying out the recommended waste minimisation measures have been estimated. It must be emphasised that these estimates can only be considered as gross approximations for the purpose of establishing indicative levels of cost for the strategic study. Indeed the estimates include the costs of training key personnel and carrying out a detailed water and effluent audit of each business; and only after that has been done can the required waste minimisation measures and costs be specified more precisely.

The costs have been calculated on the following basis:

Time Period

It is assumed that training, waste audits and waste minimisation measures are all carried out during a period of one year. The capital costs involved may be discounted over a larger period in the strategic study. Some of the costs, e.g. of carrying out the new practices, will be repeated in subsequent years.

Physical Changes

New items — generally based on knowledge of actual levels of cost from manufacturers/fabricators for Seafish work.

Modifications — generally based on knowledge of actual levels of cost from fabricators for Seafish work.

Installation — it is crudely assumed that the cost of installing new equipment will be equal to the purchase price of the equipment.

Staff Time Costs

Time — based on estimates of the staff time necessary to carry out the task.

Costs — based on employment costs for the appropriate category of staff taken from the 1995 Seafish Processors Survey, with a factor of 1.084 for inflation. This includes NI, tax, etc.

Audit Costs

Staff Time Required — based on Seafish experience of carrying out detailed audits.

Metering and Sample Analysis — based on costs of purchasing meters and taking samples to the extent appropriate for each type and scale of business from Seafish experience of carrying out detailed audits.

Training Costs

Waste Champion — based on Seafish Training Division time estimates for training suitable person and providing the necessary training materials.

Staff Training (by Waste Champion) — based on each of the staff receiving two hours basic training.

Although all of the above has been accounted for, it may be the case that businesses have suitable maintenance personnel to carry out much of the modification/installation work themselves and that significant parts of the various staff time costs involved in waste minimisation (e.g. for training) can be absorbed by businesses without increasing total wage costs.

Estimated Costs of Implementing Waste Minimisation

Recommendations	Cost of purchase and installation (£)
Manual Filleting	
Turn off water when not in use	0
Flow regulators on water points	40
Use effective bungs in drain plugs	40
Reposition drain holes	120
Bench modifications – introduce guards around top of waste chute	720
Extend and modify waste chutes	400
Introduce guards / catch trays at ends of conveyors	200
Mechanised Skinning	
Install a flow regulator	40
Install a solenoid valve	280
Introduce separator waste chutes	800
Introduce guards to ensure correct placement of catch basket	80
Cleaning	
Use trigger sprays on open hosepipes	30
Regularly squeegee all areas throughout the day*	800
Develop and manage an effective cleaning schedule*	170
Drainage and Catch Baskets	
Improve drain cover seals	200
Repair walls of drains	1000
Separator catch baskets	1200
General	
Repair valves / water points where necessary	100
Subtotal	**6,220**
Introduction of Waste Management Programme*	
Obtain management commitment Establish action plan Designate project responsibility Allocate resources	170
Carry out initial water and effluent audit	1020
Select appropriate waste minimisation measures	1700
Implement waste minimisation programme	425
Train all personnel	1943
Monitor and review programme	425
Subtotal	**5,683**
Overall Total	**11,903**

* involves mainly the cost of personnel time over one year