Findings of a Basic Water & Effluent Survey Carried Out at A. Christies Limited

Consultancy Report No. CR 163

June 1999

SEAFISH

Sea Fish Industry Authority
Seafish Technology

Findings of a Brief Water and Effluent Survey carried out at A. Christies Limited

Confidential Report No. CR163

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June 1999

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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 A. Christies Limited, carried out on 28th 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

A. Christies Limited is a white fish primary processor with approximately 38 employees. The company has not carried out any water/effluent minimisation to date.

The main processes carried out are:

- Mechanised filleting
- Hand trimming
- Hand filleting
- Machine skinning
- Packing
- Cleaning

Baader 417/184, 210 and 189 filleting machines are installed but only the 417/184 header/filleter was in use during the visit.

A four station conveyor type hand trimming line was in use in conjunction with the Baader 417/184.

A ten station conveyor type hand filleting line and four of the traditional two person filleting bench/tubs are installed but only the traditional benches were in use during the visit and they were being used for monkfish preparation.

Two Baader 51 filleting machines are installed and one was being used during the visit in conjunction with the Baader 417/184.

It was not possible to observe the cleaning operations during this brief visit.

3. The Main Operations

3.1 Mechanised Filleting

The Baader 417/184 used 3 l/min and 35 l/min of water respectively. The water is fed onto the various mechanisms by fourteen, 4mm bore copper pipes.

3.1.1 Water Use

Problem areas:

- Excessive water consumption by processing machines
- Leakage from the connection of water supply hoses

Recommendations:

- Baader recommend a flow rate of 5 l/min and 27 l/min for the 417 and 184 respectively. The flow rate of the 184 should be checked and reduced to the lowest rate at which the machine operates effectively. This should allow water consumption to be reduced by at least 18%. Flow regulations can be fitted.

In the development of pelagic processing equipment, Baader have reduced the water consumption of the older 482/35 machines from 30 l/min to 23 l/min for the newer 484/35. This has primarily been achieved by fitting nozzles to the open ended pipes to use the water more efficiently. Similarly reductions in water consumption may be possible by fitting nozzles to the 417/184.

- Hose clips should be fitted to the water supply hose pipes to prevent leaks.

3.1.2 Effluent

Problems:

- A large amount of the solid waste from the 184 falls directly onto the floor although the frames are conveyed to a bin and the heads from the 417 fall into a box.

- The water falls from the machines and passes through the waste on the floor (and in the box), increasing the effluent strength and directly flushing solid material into the drains.

Recommendations:

- Catch trays should be installed under the machines to collect all the water and waste, with separator chutes (see Seafish Guidelines) to separate the waste from the water as close as possible to source. In trials with a Baader 51 skinning machine, fitting a wedge wire separator chute to prevent the water passing through the waste reduced effluent strength and costs by 60% and 50% respectively.

3.2 Hand Trimming

Problem Areas:

- Waste falls onto the floor from the end of the transport conveyor.

Recommendations:

- Detail design of the conveyor should be improved to prevent this problem and/or boxes should be sited to collect the waste.

3.3 Hand Filleting (Mechanised Bench)

Although not in use during the visit, it was noted that the water supply to the large conveyor type filleting unit was left on for a period until it was turned off.

Water was not used for monkfish preparation and the waste was collected.

3.4 Mechanised Skinning

3.4.1 Water Use

Problem Areas:

- Flow rate to the machine was excessive (32 l/min)

Recommendations:

- The flow rate to the Baader 51 could be reduced by up to 68%. Baader recommend 25 l/min however many companies operate Baader 51's with flows as low as 10 l/min without problems. To prevent water wastage, the flow rate should be reduced to the lowest level where the equipment operates effectively. A flow regulator (cost approximately £10) could be fitted to maintain the optimum flow rate.

3.4.2 Effluent Production

Problems areas:

- Water washes through the skins in the catch basket significantly increasing the strength of the effluent.

Recommendations:

- Seafish have developed a simple wedge wire separator chute which prevents this happening (see Section 3.1.2).

3.5 Drainage and Drain Catch Baskets

Problems:

- Fairly large solids enter the drainage system as a result of large slotted holes in the covers

- The design of the catch basket is such that effluent washes through the waste in the basket, which will wash out additional waste material, causing the effluent strength to increase.

Recommendations:

- Smaller aperture covers should be used to help waste out of the drain (see Seafish Guidelines).

- 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

Based on the processes observed during the visit it was estimated that water consumption could be reduced by about 43% for those processes. Although the hand filleting line was not in operation during the visit, as waste minimisation measures have not yet been put in place, it is estimated that similar savings can be made overall.

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. These processes could be improved or modified to prevent waste soaking, ending upon the floor, or entering the drain. Effective separator chutes and catch baskets should be installed to reduce the strength of effluent leaving the factory.

It is likely that a effluent strength could be reduced by approximately 50% by implementing waste minimisation measures.

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	20
Use effective bungs in drain plugs	20
Reposition drain holes	60
Introduce guards / catch trays at ends of conveyors	200
Mechanised Filleting	
Flow regulators on water points	20
Fit nozzles onto open pipes	600
Fit hose clips to hoses	20
Introduce separator waste chutes	600
Introduce guards / catch trays at ends of conveyors	100
Mechanised Skinning	
Install a flow regulator	20
Install a solenoid valve	140
Introduce separator waste chutes	400
Introduce guards to ensure correct placement of catch basket	40
Cleaning	
Use trigger sprays on open hosepipes	120
Regularly squeegee all areas throughout the day*	1600
Develop and manage an effective cleaning schedule*	170
Drainage and Catch Baskets	
Smaller aperture drain covers	700
Separator catch baskets	1200
Subtotal	**6,030**
Introduction of Waste Management Programme*	
Obtain management commitment Establish action plan Designate project responsibility Allocate resources	170
Carry out initial water and effluent audit	1025
Select appropriate waste minimisation measures	1700
Implement waste minimisation programme	425
Train all personnel	1991
Monitor and review programme	425
Subtotal	**5,736**
Overall Total	**11,766**

* involves mainly the cost of personnel time over one year