Findings of a Basic Water & Effluent Survey Carried Out at D. Couper Limited

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Sea Fish Industry Authority
Seafish Technology

Findings of a Brief Water and Effluent Survey carried out at D. Couper Limited

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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 D. Couper Limited carried out on 27th 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

D. Couper Limited is a white fish primary processor with about 150 employees. The main processes carried out are:

Hand filleting
Machine skinning
Packing
Freezing
Box washing
Cleaning

The company has introduced good housekeeping measures, particularly in the filleting process, resulting in an overall water reduction from approximately 1100m^3 per week in 1998 to approximately 800m^3 per week so far in 1999 (28% reduction).

Due to the complexity of the water supply and inaccessible water points, water flow rates were not taken during the brief survey.

Meter readings collected by the factory indicate hot water consumption is approximately 33% of the total weekly water use. In some weeks it is equivalent to or even exceeds the water consumption in filleting. This must have significant energy cost implications as well as the water costs.

3. The Main Operations

3.1 Hand Filleting

3.1.1 Water Use

Water consumption is metered and through improved housekeeping has already been reduced from approximately 600m^3 per week to approximately 275m^3 per week (54% reduction in the filleting process). No wastage was observed. Management controls should be maintained to ensure the reduced level of water consumption is maintained and opportunities for further reductions identified.

3.1.2 Effluent Production

Problem areas:

- A large amount of waste ends up on the floor, with a significant proportion entering the drainage channel, increasing the strength of the effluent and future Mogden calculated trade effluent charges. Waste ends up on the floor because:

  - the majority of filleters did not use a waste collection box
  - where used, the majority of trimmings missed the collection boxes
  - ineffective waste chute design
  - when emptied, the position of the bench drain washed solids off the waste conveyor
  - poorly aligned conveyors/conveyor guards.

- Trimmings are flicked into the central tub and left soaking, which increases the strength of the effluent. This problem is made worse as a proportion of the trimmings is left in the tub when the water is emptied.
- Frames become stuck and are further broken up at the ends of the conveyors where they meet the elevator. Water draining from the conveyor washes through these frames, washing out additional organic material.

Recommendations:

- To keep waste off the floor and out of the central tub, a small (approx. 30mm) guard could be used between the cutting board and the tub, continuing around the top of the waste chute to ensure all waste flicked towards the chute goes down. If the trimmings are collected separately for sale, the box should be moved closer to the cutting board or a second chute arrangement used to keep the waste off the floor. The guards on the waste chute to the conveyor should be extended to ensure waste ends up on the conveyor and not on the floor.
- Management controls should be introduced to ensure compliance with changes in working practices.
- Bench drain holes should be repositioned to prevent the water from the tub washing over the waste conveyor.
- Conveyors should be properly aligned and guards introduced/improved.

3.2 Machine Skinning

3.2.1 Water Use

Problem areas:

- Water is left on when the machine is not in use.
- An open-ended hosepipe is used to lubricate the waste chute.

Recommendations:

- Where possible, ensure the water supply is turned off when not in use.
- Fit spray nozzles over the waste chute, or increase the incline of the chute to eliminate the need for lubrication with water.
- Check water flow rates to the machines are in line with manufacturers recommendations. Reduce flow rate further if practicable.

3.2.2 Effluent Production

Problem areas:

- Water washes through the skins in the catch basket and so increases effluent strength.
- Mis-aligned conveyors and catch baskets result in waste 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 Freezing

Recommendations:

- Determine that water use in lubrication/washing is in line with manufacturers' recommendations. Consider improving the lubrication/washing action by replacing the drilled copper pipe with a spray bar incorporating effective nozzles.

3.4 Box Washing

Recommendations:

- Determine the water use in relation to the manufacturers recommended level. Reduce the flow rate to lowest practicable level, particularly if this is an area of hot water use.

3.5 Drainage and Drain Catch Baskets

Problem areas:

- Solids enter the drain through large aperture slots/holes on the drain covers.
- Catch baskets are ill fitting, enabling solids to by-pass the basket. The design of the baskets 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:

- Use smaller aperture drain covers, particularly in the filleting area (see Seafish Guidelines).
- Install effective wedge wire catch baskets (see Seafish Guidelines). Trials have shown a separator catch basket to reduce effluent strength about 50%.

3.6 Cleaning

Problem areas:

- Waste on the floor is often left for long periods of time and only cleaned up at breaktimes. Although large pieces of waste are shovelled up off the floor, smaller pieces are left. It is likely that these will end up down the drain.

Recommendations:

- All waste on the floor should be shovelled up as soon as possible, however, measures should be taken to prevent waste from ending up on the floor in the first place.

4. Conclusions

4.1 Water Use

The use of the water in filleting (which was the main water use area) has already been substantially reduced, however, there are other areas which require consideration for improvements. These include all processing equipment and hot water consumption. It is likely that addressing these other areas could reduce water consumption further. The hot water consumption must be of particular concern because of the associated energy costs.

4.2 Effluent Production

When the Mogden formula comes into effect it will be particularly important to reduce the strength of the effluent generated. Filleting is the main source of high strength effluent discharged from the site. Priority should be given to prevent waste left soaking or ending up on the floor and 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 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	80
Use effective bungs in drain plugs	80
Reposition drain holes	180
Bench modifications – introduce guards around top of waste chutes	1840
Extend and modify waste chutes	1840
Introduce guards / catch trays at ends of conveyors	300
Mechanised Skinning	
Install flow regulators	60
Install solenoid valves	420
Introduce separator waste chutes	1200
Modify the initial waste chute (increase the angle to eliminate need for water)	300
Introduce guards to ensure correct placement of catch basket	120
Cleaning	
Regularly squeegee all areas throughout the day*	1600
Develop and manage an effective cleaning schedule*	255
Drainage and Catch Baskets	
Smaller aperture drain covers	3500
Separator catch baskets	4800
Subtotal	**16,575**
Introduction of Waste Management Programme* Obtain management commitment Establish action plan Designate project responsibility Allocate resources	170
Carry out initial water and effluent audit	1250
Select appropriate waste minimisation measures	1700
Implement waste minimisation programme	425
Train all personnel	3895
Monitor and review programme	425
Subtotal	**7,865**
Overall Total	**24,440**

* involves mainly the cost of personnel time over one year