# Reducing wastewater generation

About 85% of fresh water intake in an abattoir will become wastewater. Slaughter and evisceration areas consume the largest amount of water with the majority being used for cleaning and sterilising equipment.

Variation in water usage is not only related to water efficiency practices but is also influenced by:

- product market and export requirements;
- type of animal/s processed;
- amount of value adding that is performed;
- number and length of shifts;
- abattoir layout and design; and
- age and variation in processing equipment.

**Table 1: Typical water consumption in a meat processing plant and typical flow and strength**

| Key areas of water consumption | Percentage of total fresh water consumption | Flow volume | Strength |
|---|---|---|---|
| Stockyards & truck washing | 7 - 24% | Medium | High |
| Slaughter and evisceration | 44 - 60% | High | Low |
| Boning | 7 - 38% | | |
| Offal processing | 9 - 20% | Medium | High |
| Casing processing | 2 - 8% | | |
| Rendering | 2 - 8% | Low | Very High |
| Chillers | 2% | Low | Low |
| Boiler losses | 1 - 4% | | |
| Amenities | 2 - 5% | | |

## The characteristics of wastewater

Characteristics of wastewater include both volume and pollutant load. Materials that typically enter the wastewater stream and add to pollutant load include:

- **Organics** - BOD, COD, TSS, oil and grease: If wastewater treatment is not well managed odour issues can result from the degradation of these organics by bacteria.
- **Nutrients –** Nitrogen (N) and Phosphorous (P): The disposal route for the wastewater will determine the level of nutrient removal required. High levels of removal is typically required for discharge to water bodies while partial removal is generally suitable where wastewater is irrigated.
- **Salt (typically NaCl)** - salt enters wastewater streams via urine, water supplies and cleaning chemicals. The removal of salt is particularly important where wastewater is irrigated.
- **Micro-organisms** - the presence of pathogenic (disease forming) and non-pathogenic microorganisms from animal manure and paunch.
- **Chemicals** - salt, surfactants and chlorine from cleaning and disinfection agents which impact on the pH of wastewater.

The temperature of wastewater from meat processing plants also varies widely from hot to cool. Fats may liquefy in water greater than 38°C and as a result may not be captured by primary treatment processes.

These components not only impact on the level and cost of treatment but also signify the loss of valuable resources.

The majority of wastewater is generated from cleaning and sterilising equipment.
Image: JBS, Dinmore

## Wastewater Classification

Wastewater streams are typically classified as 'green' or 'red':

- **Green** streams are initially treated separately to red streams and are generated from manure and paunch wastes from the emptying of the animal stomach and internal organ processing.
- **Red** streams are generated from the slaughter, evisceration and boning areas as well as any rendering processes. These streams contain fat and nitrogen from blood and urine and proteins from meat tissue.

## Wastewater Disposal

The choice of whether a meat processing plant disposes of treated wastewater to sewer, surface water bodies or land irrigation will depend on the plant's location i.e. rural or urban with residences nearby; and its surrounding environment e.g. available land to irrigate or the presence of suitable nearby waterways.

The disposal method impacts the level of treatment required. There are three main wastewater treatment levels.

- Primary treatment to remove suspended solids, oil and grease.
- Secondary treatment to remove nutrients, organics and pathogens.
- Tertiary treatment for disinfection.

The required regulatory disposal standard varies from state to state and local jurisdictions.

## Wastewater minimisation strategies

It is easy to underestimate the cost of water and wastewater treatment. In addition to purchase price, the full cost of wastewater includes any incoming treatment and then final treatment and disposal. The full cost of wastewater treatment can also include electricity cost for pumping, equipment operation, aeration and mixing during treatment, chemical costs such as those for pH balancing and flocculation and sewer discharge fees.

Water consumption also equates to energy consumption with 30-40% of water used being either warm (43°C) or hot (82°C) because food safety regulations stipulate high temperature requirements in certain areas.

Turning off continuous flow knife steriliser with shut off valve at the end of operations.
Image: JBS, Dinmore

Another benefit of reducing water consumption can be the recovery of cleaning chemicals which previously may have been lost to wastewater streams. This has the added benefit of lowering effluent strength, further reducing treatment costs and discharge fees.

In order to reduce water and wastewater costs, it makes sense to take measures to reduce water consumption and minimise volumetric and pollutant waste loads as far as possible.

# Opportunities to reduce wastewater generation

## Cleaning

- ☐ Ensure good workplace design and layout (e.g. smooth and impervious floors and walls, easy-to-clean, self-draining and correctly-sized drains, slip-resistant floors made of appropriate strength material and sloped to drains).
- ☐ Schedule production to reduce cleaning requirements and minimise equipment in use e.g. number of knives needing sterilization.
- ☐ Provide operator training and adequate, readily accessible, dry cleaning equipment.
- ☐ Use low flow / high pressure water after dry-cleaning (only suitable for areas where aerosols are not a problem).
- ☐ Monitor and replace worn hand held triggers on hoses. Ensure they are easily accessible and the diameter of the hose is appropriate for the task.
- ☐ Use floor cleaning machines for large areas.
- ☐ Install electrical sensors on hand and apron wash stations (if an electrical supply does not pose a problem). Optimise spray nozzles on hand, boot and apron washers.

## Stock washing

- ☐ Use non-potable water for prewash.
- ☐ Provide operator training and monitoring.
- ☐ Screen effluent before it enters the wastewater treatment system.

## Stockyard washing

- ☐ Screen effluent before it enters the wastewater treatment system.
- ☐ Dry-clean manure before floor washing.
- ☐ Install suspended mesh flooring to allow for easier cleaning (hard hooved stock).
- ☐ Provide operator training and monitoring.
- ☐ Use non-potable water for wash down.

## Knife sterilizers

- ☐ Insulate sterilisers and drop pipe to reduce heat loss and therefore water use.
- ☐ Fix continuous flow sterilisers to the minimum flow rate necessary to maintain required temperatures and sanitation levels.
- ☐ Install a shut off value to discontinue flow at the end of sterilisers at the close of operations.
- ☐ Reuse knife steriliser wash water to wash cattle and yards.

## Evisceration Tables

- ☐ Install on and off controls linked to a sensor to ensure sprays only flow when required.
- ☐ Determine the minimum flow rate required to effectively clean and sterilise tables.
- ☐ Optimise and maintain spray nozzles.
- ☐ Improve the design of the moving table so less cleaning is required.
- ☐ Use water efficient pumps to collect steriliser water from clean end on the viscera table and use it for the initial viscera table wash.

## Carcass washing

- ☐ Manual system - ensure operators are trained as efficacy is directly related to the skill and motivation of the operator.
- ☐ Automated systems - Optimise flow rates, dwell times, temperatures and spray nozzle performance and monitor. Recirculate and treat hot water for reuse.
- ☐ Chemical treatment - Consider using chemical rinses if they meet hygiene standards.

**Inedible and edible offal processing**

- ☐ Replace wet paunch dumping with dry paunch dumping.
- ☐ Install flow meters on tripe and bible wash machines.
- ☐ Install more water efficient tripe and bible wash machines.
- ☐ Ensure casing machines do not run unnecessarily.
- ☐ Use recycled water for inedible offal washing.
- ☐ Replace shower roses on offal wash stations with efficient roses or spray nozzles.

**Boilers**

- ☐ Install conductivity sensors and check that blowdown is initiated only when necessary.
- ☐ Return steam condensate to the boiler.
- ☐ Inspect and maintain steam traps and condensate lines regularly.

**Cooling tower**

- ☐ Optimise cycles of concentration to reduce blowdown losses (to safe levels depending on quality of makeup water).
- ☐ Clean conductivity probes and recalibrated regularly.
- ☐ Consider additives such as softeners of acid to minimise blowdown

**Stormwater**

- ☐ Exclude uncontaminated stormwater from the waste treatment areas to reduce volumetric loads.

## Wastewater reuse

Reuse opportunities for treated wastewater can reduce water consumption. Australian Standards and the 2008 Meat Notice issued by the federal controlling quarantine and inspection authority state that only potable water can be used for the production of meat and meat production unless the water is only used for steam production, which is not direct or indirect contact with meat or meat products:

- fire control; and
- the cleaning of yards and the washing of animals (other than final wash).

Treated wastewater can also be used for purposes where there is no risk of the water coming in contact with or contaminating meat and meat products such as:

- cooling tower and boiler makeup;
- outdoor paved area cleaning and around the wastewater treatment plant;
- watering of landscaped areas or irrigation;
- cattle truck washing; and
- inedible offal processing.

An approved arrangement must provide for the use of non-potable water. Approved arrangements are those approved by the federal controlling authority and provide for the implementation of a HACCP (Hazard Analysis and Critical Control Points) plan.

These fact sheets have been prepared by The Ecoefficiency Group Pty Ltd in association with Johns Environmental in 2017.