# Omega Proteins Ltd.

## Penrith

| | |
|---|---|
| **Report Title:** | **Environmental Permit Variation Application** |
| **Permit:** | **EPR/HP3238AF** |
| **Issue Date:** | **Updated Nov 2021** |
| **Report Reference:** | **OP-PV-R01A Blood Line.v3.0** |

**Submitted to:**

Environment Agency

**Authorised for issue by:**

Group Technical Manager

# Contents

# 1 Introduction

## 1.1 General

The site is currently permitted by the Environment Agency under Permit EPR/HP3238AF and operated by Omega Proteins Limited. The installation is a Category 3 animal by-products processing plant which processes poultry and mixed species by-products (including offal, skin, carcase and off-cuts), poultry and mixed species blood, and poultry feathers to produce animal feed (meal) and oils (tallow) via the following lines:

- Poultry offal rendering line comprising cooker, press and milling system.
- Mammalian offal rendering line comprising cooker, press and milling system.
- Feather processing line comprising hydrolyser, condenser, dryer and milling system.
- Poultry blood processing line comprising coagulator, dryer, and milling system.
- Mixed species blood processing line comprising coagulator and steriliser.

The main processes are delivery, receipt and storage of raw materials; product processing (cooking, drying and milling) and final product storage. Ancillary processes include the operation of the boiler; biofilters; thermal oxidisers; chemical and oil storage and washing and cleaning.

This current report is part of a series of supporting reports relating to variation applications to upgrade and enhance the performance at the installation. The current report is concerned with upgrading the blood processing operation for the production of blood meal.

This report should be read in conjunction with the following associated reports:

1) Updated Environmental risk assessment
2) Updated site condition report
3) EMS summary
4) BAT summary
5) Site maps showing the location of the equipment

## 1.2 Variation Summary

Blood processing is included in the current permitted activities as an A(1) scheduled activity:

> *Section 6.8 Part A(1)(c)*
>
> *Disposing of or recycling animal carcasses or animal waste, other than by rendering or by incineration falling within Section 5.1, at a plant with a treatment capacity exceeding 10 tonnes per day of animal carcasses or animal waste or both in aggregate.*

The installation currently has poultry blood processing (including drying) and mixed species blood processing permitted as two separate activities. Avian blood is stored and processed separately to ruminant (or mixed species) blood to allow for the differences in permitted use of the end product.

The current proposal is to maintain the poultry blood scheduled activity with improvements to the current equipment and to enhance the quality and marketability of the mixed species blood product by the introduction of a dedicated drying stage. Blood meal will be produced which has a value for pet food ingredients and fertiliser. In addition self-contained chemical scrubbers will be installed to provide dedicated odour and chemical species abatement to the blood lines.

# 2 Process Description

## 2.1 Current Operations

### 2.1.1 Delivery and Storage

Category 3 blood is delivered to site in a vacuum tanker and unloaded into an externally located storage tank. The tank is fitted with an overfill alarm and level gauge which repeats a signal to the control room to give the operators a measure of the tank contents.

The blood tank vents via a carbon filter to provide primary odour abatement. The outlet from the carbon filter is directed to a bio filter for abatement via the existing ductwork system. This provides both additional abatement and a contingency abatement option in the event of carbon filter problems.

Avian blood is stored and processed separately to ruminant (mixed species) blood to allow for the differences in permitted use of the end product.

### 2.1.2 Processing

To process, the blood is pumped into a proprietary coagulator via a macerator that guarantees reduction in particle size to 50mm. The blood is heat treated to sterilise it in a closed loop system at a rate of 4-5 tonne/hour. Heat is supplied by steam injection from the site's steam system. Processed blood is pumped to an externally located storage tank. The process is validated by the Competent Authority (APHA) under Method 7 of the Animal By-products Regulations and processing conditions cannot be changed without a revalidation.

Sterilised blood can be used as a liquid, generally for use as a fertiliser /soil improver (subject to the appropriate approvals) or can be dried to produce a blood meal product. At present there is no equipment installed at the Penrith site to allow mixed species blood to be dried to a meal.

Sterilised blood destined for fertiliser is loaded directly from the storage tank to the transport tanker, with the tanker back venting to the storage tank and carbon filter to give fugitive odour control. The blood is dosed with sodium hydroxide as it is loaded for despatch, a requirement of the ABP regulations, to adjust the pH. The storage tanks and sodium hydroxide container are kept in bunded areas.

## 2.2 New Drying Line

### 2.2.1 Basis

The new system is based on the same initial principles as described above, but a purpose built and self contained system will replace the existing systems post sterilisation. This document refers to the additional equipment to be installed to allow for the drying of mixed species blood and changes to the existing process for drying avian blood.

### 2.2.2 Process

Avian Blood:

To produce a dried meal sterilised blood is first pumped from the storage tank into 2 decanters. The purpose of the decanters is to provide initial separation of the solid fraction of the blood from the liquid. The separated liquid will then be pumped into an external storage tank.

The blood solids produced from the decanting process will be fed into the drier, heated by a natural gas burner. The dried solids are then separated using a cyclone collecting system and the dried product discharged via a rotary airlock using a pneumatic air transportation system (i.e. air blown) to a bulk collection bag.

Mixed Species:
The blood solids from the decanting process are dried within a natural gas fired convective air ring, which is connected to the main site gas line. The solids from the decanter are fed into a feed hopper to supply the Ringdryer and are air dried. The time spent within the dryer is designed to ensure adequate evaporation of residual water without causing heat damage to the blood meal.
A cyclone collecting system separates the dried product from the air flow and dried product is discharged via a rotary air lock using a pneumatic air transportation system (i.e. air blown) to a bulk collection bag.

The decanted liquid (from both) is despatched from site in vacuum tankers. As it has already been through the APHA validated process this material is suitable for use as a fertiliser and is also dosed with sodium hydroxide prior to despatch. It is also suitable feedstock for Anaerobic Digestion plants. If there is no demand for this product, the liquid is discharged through the on site effluent treatment plant (see 3.6).

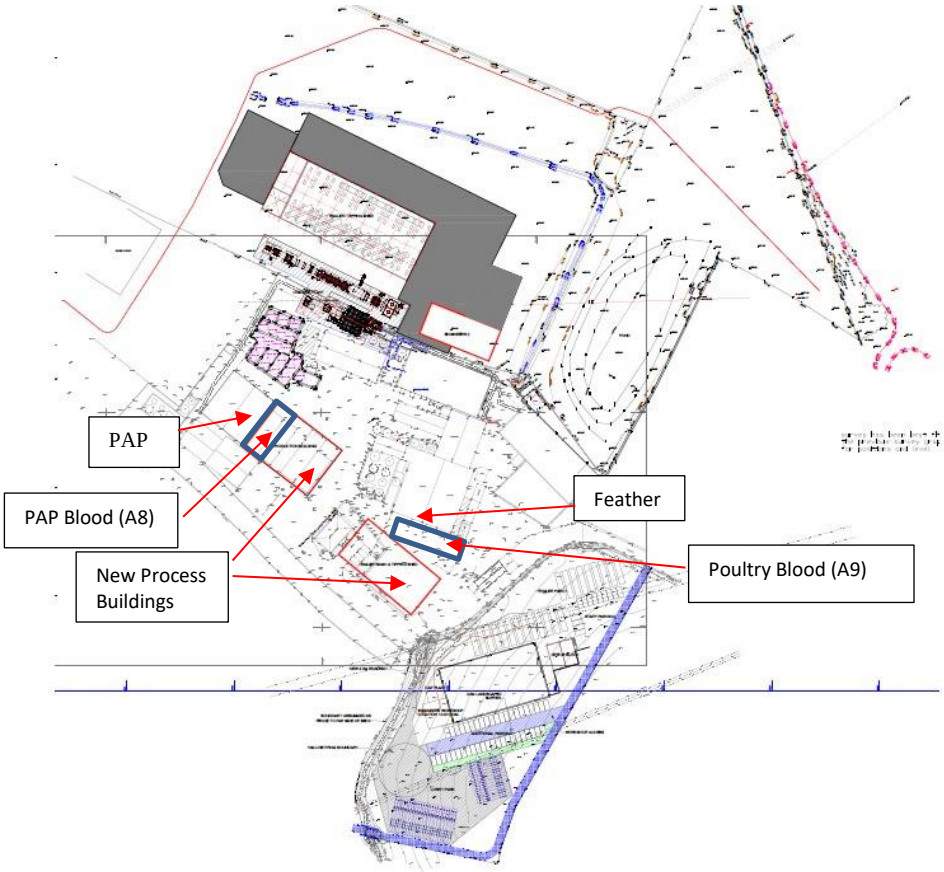
### 2.2.3 Location

The existing mixed species blood will remain in the PAP building on the site. The new separation and drying equipment will be located within the adjacent building as shown on the revised site plan. The avian blood process will be housed in an extension to the feather processing building.

The storage tanks remain in the same positions.

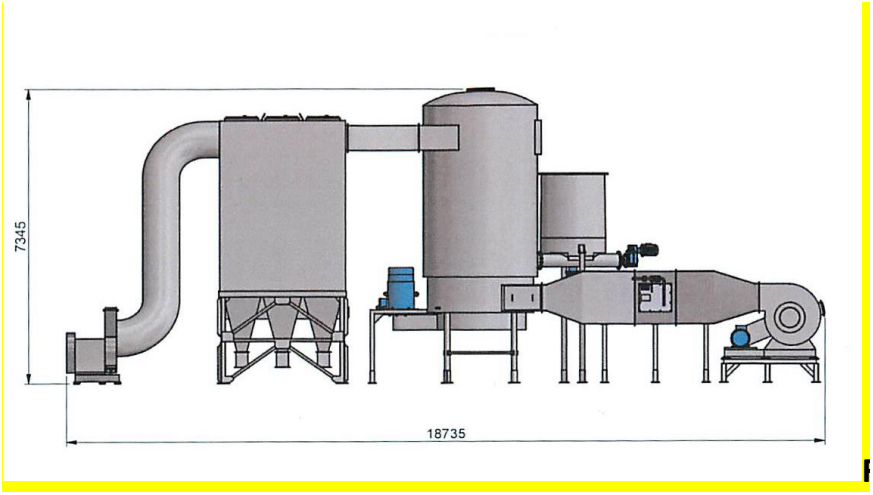
Where required, planning permissions have been obtained for the changes to the buildings.

**Site Layout Plan:**

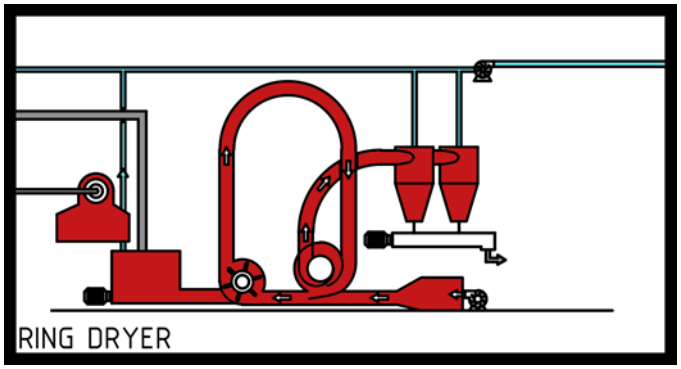


### 2.2.4 Process Detail

The diagrams below show the two different drying systems.




Flash Drying System (poultry blood)




Mixed Species Blood

The equipment in each case is slightly different, but the process and end result is the same.

The blood processing is a batch operation, the limiting factor being storage of raw blood delivered and processed liquid produced.

Capacity of the plant (as stated by the supplier):

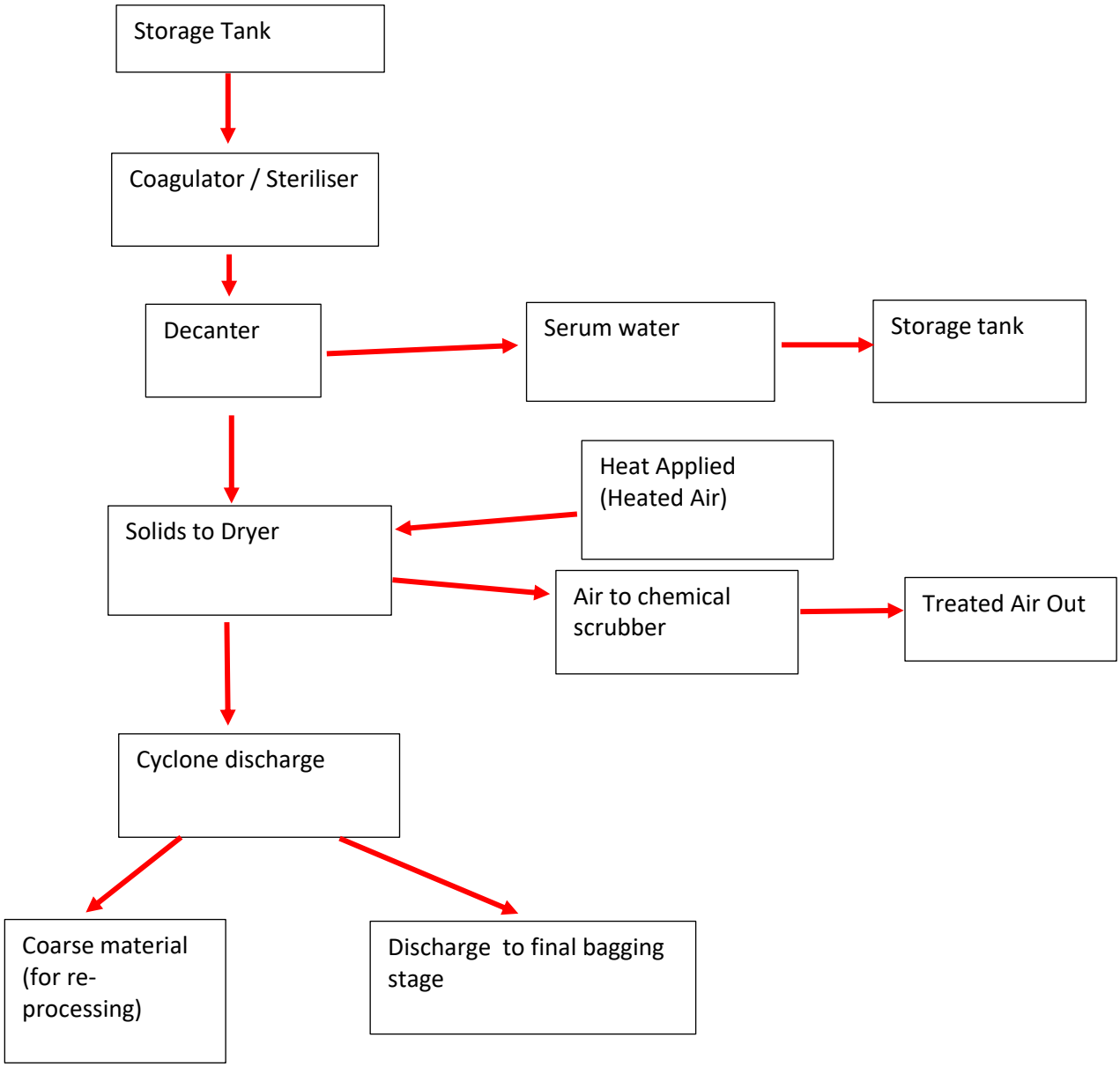
Mixed species system – 5.5 tonnes / hr

Avian system – 14 tonnes / hr

This is based on raw blood delivered.

Blood drying will be determined by demand for the finished product therefore at certain times there will be no blood processing on site. The blood will then be diverted to alternative outlets such as AD plants, a system that is currently established.

Flow Chart for Blood Processing



# 3 Potential Emissions and Control

## 3.1 Introduction

This section addresses the potential emissions and amenity impacts associated with the proposed upgrades to the mixed species blood processing plant and sets out the planned mitigation measures and residual impacts.

## 3.2 General Amenity

### 3.2.1 Pests

Blood is delivered in liquid form in closed tankers and is then stored and processed in enclosed systems. This enclosure of the blood ensures it is not subject to creating pest problems (rodents and flies in particular). Blood meal will be stored in accordance with the existing and approved pest control procedure.

### 3.2.2 Litter

Blood is delivered in liquid form in closed tankers and is then stored and processed in enclosed systems. There is no realistic probability of litter release.

### 3.2.3 Dust

Potential particulate emissions from the drying system are discussed in the later section on controlled releases. There are no other credible mechanisms for the generation or release of dust or particulate material

## 3.3 Odour

### 3.3.1 Existing

The blood storage tanks and coagulator are already installed and included in the existing permit. Improvements have been made to the storage tanks by inserting carbon filters before the ducting to the bio filters. This will protect the bio filters from any potential surge in odour on loading or unloading blood.

### 3.3.2 Process Abatement Selection

Odour from the drying process needs to be abated before it can be discharged to atmosphere. The abatement options considered and their pros and cons were:

*Duct the hot gas directly to the thermal oxidiser system.* Undoubtedly thermal oxidation would provide a high degree of abatement. However, the blood drying process operates on its own direct heating system and does not rely on steam from the site main. The ring main system installed operates most effectively when running at a relatively constant throughput and load and without regular fluctuations. As such it is entirely feasible, and probable if efficient operation is desired, for the blood drying to operate when the main oxidisers are on rundown prior to cessation or have indeed stopped operating. Maintaining the oxidisers at abatement temperature purely for abatement of blood drying gases is not BAT – the turndown ratio on the oxidisers is such that large quantities of unnecessary fuel would need to be burned and large quantities of steam dumped to atmosphere.

*Add the gas directly to the biofilter load.* Blood processing and drying have the potential to create high odour concentrations which are not always compatible with treatment via the biofilter systems without some intervention.

*Duct the hot gas via condensers to the boiler.* For the reasons set out for the thermal oxidiser option it is highly likely that the blood drying system will generate load when the condensers and boiler at less than full capability.

*Install specific scrubber abatement.* The exclusions set out above restrict the options for odour abatement to those that can be fitted directly to the outlet and operate independently. Carbon filters would not be safe in the hot moist gas environment and bag filters would not provide abatement against odours on their own. The option which provides the most flexible abatement is to install chemical scrubbing: the chemicals can be modified if necessary to match odourous chemicals; the system can be turned on and off relatively quickly; and the overall turndown is relatively high. This would also provide some pre-treatment if used in conjunction with a biofilter.

### 3.3.3 Abatement Operation

Two Stage Scrubber System:

The air from the drying process is treated in a wet venturi scrubber consisting of 2 polypropylene towers. At the inlet of the first stage, a venturi tower sprays water across the fast air flow to humidify and cool it as well as wash out any entrained solids particles. After emerging from the first stage and passing the ventilator, the humidified air/ gases are blown through the second tower where chemical absorption of the pollutant gases takes place. The treated air/ gases leave the system via a chimney situated on top of this second tower via a demister to prevent emission of drops to atmosphere and loss of washing solution.

Chemicals to be used :

- Scrubbing liquid Stage 1 – $H_2O$ plus $H_2SO_4$
- Scrubbing liquid Stage 2 – NaClO plus NaOH (at pH10)

The chemicals will be stored in self bunded containers next to the processing buildings with automated dosing into the scrubber.

Water consumption is estimated at 1000 kg per hour.

The ratio of chemicals for treating this type of odorous emission is estimated at NaClO – 15%, NaOH 25%, $H_2SO_4$ 40%.

Consumption figures will be finalised during commissioning.

Information available for these type of units being used in this industry indicates that the odour removal efficiency is similar or better than a biofilter

The input odour concentration loadings will vary according to the plant area being served, with typical loadings of around 15,000 $OU_E/m^3$ reported.

The reported odour reduction efficiencies of chemical scrubbers in the sector are typically between 85 – 95%, occasionally higher. Outlet concentrations reported are typically around 250 - 2,500 $OU_E/m^3$.

Single Stage Scrubbing System:

As an alternative proposal the vapour would be treated by water sprays and pH monitoring within a single scrubbing tower.

- The majority of solids will be washed out of the airstream.
- Any substance soluble in water, will to some extent be dissolved into the water stream, and a dilution will take place by the pH regulating system on the scrubber, that ensures replacement of the water / solution, when pH is going up or down beyond the setpoints. This keeps it on the side of alkaline, but more water added if the re-circulating water becomes more acidic.

The principle of the pH system is that there are acid conditions for the removal of ammonia, amines and other nitrogen compounds. These form non-volatile salts that are removed in the scrubber effluent. Ammonia also dissolves readily in water, although at a more alkaline pH it will be released as a gas. The alkaline conditions will oxidise acidic compounds such as hydrogen sulphide and reduced sulphur compounds.

Tests will be carried out during the commissioning stages and the most effective method chosen. While the testing is being carried out the scrubber outlets will be directed to the biofilter for abatement.

## 3.4 Noise and Vibration

### 3.4.1 Noise

The fans and conveyors associated with the new processes are potential noise sources and therefore, where feasible, these will be inside a building. Fans mounted externally will have suitable acoustic enclosures (constructed of acoustic gypsum or fibreboard panels) to minimise noise propagation if required. Further abatement should not be required where equipment has been selected in order to minimise noise (such as low noise motors) and will be subject to routine maintenance (e.g. for bearings and balancing).

### 3.4.2 Vibration

The system does not use equipment that will have sufficient power to generate vibrations that could be felt beyond the installation boundary.

## 3.5 Air Emissions

### 3.5.1 General

Two additional emission points to air have been added to the site plan, corresponding to the outlet of the chemical scrubbers (A8 and A9).

### 3.5.2 Particulate

The only potential particulate release is of dried blood after the ring dryer system but these are anticipated to be insignificant. The system is fully enclosed and the dried blood is collected via a cyclone. The cyclone is designed to have a high collection efficiency – the blood is after all a valuable product – and only small, residual quantities of blood are anticipated to exit the cyclone. The cyclone outlet passes through the scrubber system prior to discharge and this is designed to knock-out residual particulates.

### 3.5.3 Combustion Gases

The burners supplying the hot air for the drying process are supplying heat directly to a process and so are out with any MCPD ELVs. The burner design is a modern low-NOx unit and will have low emissions. The rating is 2200 – 2600 kwh thermal output and they use approximately 200 $Nm^3$ gas

per hour. Thermal input is calculated as 2.0 MWth. The output passes through the dryer as hot air, with no direct emission point to atmosphere.

## 3.6 Waste

There is no 'waste' from the drying process. The blood is separated into solid and liquid phases, both of which have uses as an end product.

The treated water fraction of the blood is a useful fertiliser / soil improver, but if there is no market for this it can be disposed of to anaerobic digestion or via the on site effluent treatment plant (subject to limitations on flow and adjustment of chemicals so as not to challenge the plant). There is sufficient capacity within the effluent plant to treat this waste stream. It does need a different ratio of chemicals for effective treatment (compared to normal site wash water) therefore a second DAF unit is being installed. This will ensure the appropriate focus of chemical addition, avoiding 'over treatment' of other waste streams.

Other waste water (from washing down) will be directed to the on site effluent treatment plant via the existing site drainage system.

**Disposal of Chemicals**

The chemicals are re-circulated within the unit. Blowdown can be tailored within the unit to give 0.1 or less fluctuation in pH, therefore it is estimated that 1% or less of the chemical would need to be disposed of. When 'spent' these can be disposed of to the effluent treatment plant (as advised by the equipment supplier) subject to the usual controls on chemical dosing for effective treatment, although a drip feed of less concentrated material may be a preferable option.

There are also options to dispose to a licenced contractor, should this be required. The on site laboratory currently has arrangements in place with contractors for the removal of waste laboratory chemicals.

# 4 Emissions and Monitoring

## 4.1 Introduction

This Section of the report identifies potential emissions from this process and details the monitoring methods to be implemented.

## 4.2 Point Source Emissions to Air

### 4.2.1 Point Source Emissions

The outlet from the chemical scrubber is a point source emission, odour being the main concern if the process is not effectively controlled.

The new emission points will be A8 (mixed species blood) and A9 (poultry blood). These will not be in operation until the odour abatement is proven. For the initial period of operation the outlets will be directed to the biofilters.

### 4.2.2 Components to be measured

Scrubber efficiency will be checked by continuous process control monitoring of pH / REDOX with linked alarms to warn of problems. Instrument readings should be observed regularly (for example, on start-up and then twice per shift) and the readings recorded. All checks will be incorporated into the site Standard Operating Procedures.

The operation of the extraction fan and pumping system will also be monitored. Chemicals will be automatically dosed.

Monitoring by extractive stack sampling and olfactometry will be undertaken annually to monitor effective odour removal. The predominant odour from this type of scrubber is often of “chlorine” or “bleach” from the scrubbing chemicals. This odour stream would be very unlikely to contribute to any off-site perception of “processing” odours but may be noticeable.

Process control monitoring of inlet and outlet air will be undertaken using gas detection tubes for ammonia and hydrogen sulphide at a frequency to be determined during commissioning of the equipment.

The system will require thorough cleaning on a weekly basis due to carry over of very fine blood meal particulate into the scrubber reservoirs.

## 4.3 Fugitive Releases to Air

The operations will take place within a building and the integrity will be checked as per the existing EMS procedures for building integrity.

## 4.4 Point Source Releases to Water

### 4.4.1 Surface Water Discharges

There is no direct discharge to surface water associated with this new plant. Any roof water will be dealt with as per the existing arrangements for the main installation. Contaminated and potentially contaminated surface water will be directed to the existing effluent system for treatment.

### 4.4.2 Foul Water Discharges

The blood plant does not need its own mess and toilet facilities so there are no specific foul water discharges associated with it.

### 4.4.3 Trade Effluent Discharges

Wash waters will be directed into the existing effluent system via the existing drainage system.

## 4.5 Fugitive Releases to Land and Water

The installation has in place an infrastructure monitoring programme designed to ensure there is no loss of integrity to the systems designed to prevent fugitive emissions to land and to controlled waters. The infrastructure monitoring programme forms part of the Fugitive Emissions Monitoring Programme within the EMS and incorporates the elements listed below:

- Tank, bund and pipe work inspections;
- Impermeable surfaces;
- Drainage system.

Where deficiencies are encountered these will be reported as part of the EMS using the incident and corrective action structure and repairs instigated.

Chemicals will be stored in self bunded containers and inspections for integrity added to the existing site procedures. Where IBCs are used for chemicals these will be stored in a bund or inside the building.