



**GUIDANCE NOTE ON
THE BEST PRACTICABLE MEANS
FOR
RENDERING WORKS
(FISH MEAL FACTORY)**

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**Environmental Protection Department
Air Policy Group**

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1. INTRODUCTION

- 1.1 This Note is one of a series issued by the Environmental Protection Department to provide guidance on air pollution management for processes specified under Part IV of the Air Pollution Control Ordinance (the Ordinance). It also serves as a guide for the assessment of an application for Specified Process licence under the Ordinance.
- 1.2 It should be understood that this Note sets out the basic requirements for the applicant to provide and maintain the best practicable means for the prevention of emission of air pollutants. The applicant should recognize that whether a licence is granted or refused, and on what conditions, will depend on all the circumstances of an individual application besides the requirements set out in this Note. The Authority may devise specific requirements for individual facility carrying out the specified process.
- 1.3 This Note covers specified and associated processes for the fish meal manufacturing process, which comes within the specified process "Rendering Works" in Schedule 1 to the Ordinance. Rendering Works are works in which the processing capacity exceeds 250 kg per hour (expressed as the raw materials), and in which rendering or reduction or drying through application of heat, or curing by smoking, of animal matter (including feather, blood, bone, hoof, skin, offal, whole fish, and fish heads and guts and like parts, and organic manures but not including milk or milk products) is carried out. This Note does not cover other processes which are also defined as Rendering Works under the Air Pollution Control Ordinance, such as by-product plant at slaughter-house.

2. EMISSION LIMITS

- 2.1 All emissions to air, other than steam or water vapour, shall be colourless, free from persistent mist or fume, and free from droplets.
- 2.2 Emissions from the specified process and associated processes as covered by this Note shall not:
- (a) exceed the concentration limits set out in Annex I, and
 - (b) appear to be as dark as or darker than Shade 1 on the Ringelmann Chart when compared in the appropriate manner with the Ringelmann Chart or an approved device.
- 2.3 All odorous emissions from the specified process and associated processes shall be contained and treated by a properly designed odour abatement system(s) meeting appropriate emission limits (in terms of odour units) to be approved by the Authority so as to prevent odour nuisance or imposing unacceptable constraint on land use. .

(Note: An odour unit is the measuring unit of odour level and analogous to pollutant concentration. It shall be determined by dynamic olfactometry in accordance with BS EN 13725 or other similar methods acceptable to the Authority. In this context, the odour level is defined as the ratio of the volume which the sample would occupy when diluted with air to the odour threshold, to the volume of the sample. In other words, one odour unit is the concentration of the odorant which just induces an odour sensation)

3. FUEL RESTRICTION

- 3.1 All fuels to be used shall comply with the Air Pollution Control (Fuel Restriction) Regulations in force.

4. CONTROL OF EMISSIONS

- 4.1 Emission of air pollutants shall be minimized to prevent:

- (a) harm to the environment, adverse effects to human health, or creation of any nuisance situation;
- (b) threatening the attainment or maintenance of the relevant air quality objectives;
- (c) giving rise to an odour noticeable outside the premises where the process is carried out; and
- (d) imposing undue constraint on the existing and future development or land use.

- 4.2 To satisfy the emission limits set out in section 2 of this Note, prevention or reduction of emissions at source is the choice. Where the emission cannot be prevented or reduced at source to a sufficient extent to meet these requirements, air pollution control equipment shall be provided.

- 4.3 Clean energy sources and fuels which have proven benefits to reduce air pollution shall be used whenever possible in relevant rendering operations. The use of electricity or gaseous fuel for process heating is recommended.

Plant design

- 4.4 The rendering process uses animal by-products from meat production. It mainly comprises the following processing stages:

- Raw material preparation; generally involves size reduction;
- Feedstock treatment, such as pressing, drying or other fish meal manufacturing processes;
- Products processing, such as separation of liquefied fat and the solid protein; and

- Products storage, blending, packing and dispatching.

4.5 To prevent odorous emissions arisen from the above rendering process from causing air pollution, suitable plant facilities and odour management measures shall be provided to contain fully the emissions from rendering works and associated processes as well as odorous plant ventilation. Properly designed operation process shall be installed and operated to contain and treat concentrated emissions, such as vapours and noncondensable gaseous products emitted directly from fish meal manufacturing processes and process air from the handling of feedstocks, intermediates or products. Feedstock treatment appliance(s) shall be of a totally enclosed vessel type to reduce process emissions and vented to an effective odour management system for treatment. The oily fume and odorous emissions from fish meal manufacturing processes shall be collected and passed through a suitable oily fume and odour abatement equipment before being discharged to the open air.

4.6 A well designed ventilation system shall be provided and operated at the plant including, but not limited to storage, handling and processing areas to control odour emission. The ventilation system shall be capable of maintaining a reasonable negative pressure to prevent an uncontrolled escape of odorous air to outdoors. The areas from which ventilation is provided shall be connected to suitable odour abatement plant.

4.7 Dusty or potentially dusty materials shall be handled in a totally enclosed system, whether practicable, and the dust laden exhaust shall be treated by properly designed dust abatement equipment (such as bag filter) to meet the emission limits set out in Section 2 of this Note.

Design of chimney

4.8 Chimneys include structures and openings of any kind, including vents and process exhausts, from or through which air pollutants (including odorous gases), generated from combustion, pressing, separation, drying and/or other fish meal manufacturing processes of the plant, may be emitted.

4.9 The design of chimneys is to be determined by mathematical or physical dispersion modelling techniques acceptable to the Authority. The aims are to ensure:

- (a) the relevant air quality objectives (AQOs) will not be threatened;
- (b) the emission of non-AQO pollutants, including odours or oily fumes, will not cause any adverse effect to human health or environment; and
- (c) no undue constraint will be incurred to the existing and future development or land use.

4.10 In any case, the design of chimneys shall at least satisfy the following conditions:

- (a) Chimney Height

- (i) For combustion process, the final chimney height should be agreed with the Authority but as a general guideline, the chimney height, in a flat terrain situation, should not be less than the sum of the Building Height and 1.5 times of the lesser of the Building Width or the Building Height. Suitable adjustment should be made to take into account local meteorological data, local topography and background air pollutant concentrations. In any case, the minimum chimney height shall be at least 8 metres above ground level or 3 metres above the roof top of the building to which it is attached, whichever is the greater.
 - (ii) For non-combustion process, the same guideline should be observed as far as practicable and in any case, the chimney height shall be at least 3 metres above the roof top of the building to which it is attached.
- (b) Efflux Velocity
The efflux velocity of the chimneys shall not be less than 15 m/s at full load condition or at a velocity as determined by mathematical or physical dispersion modelling techniques acceptable to the Authority.
- (c) Exit Temperature
For combustion process, the exit temperature of flue gas from the chimneys shall not be less than the acid dew point.
- (d) Mode of Discharge
Releases to air from chimneys shall be directed vertically upwards and not restricted or deflected by the use of, for example, plates, caps or cowls.
- (i) In order to obtain maximum thermal buoyancy, hot emissions shall as far as practicable be discharged from the minimum number of chimneys, i.e., a multi-flue chimney design shall be used.
 - (ii) Chimney for release of hot emissions should, wherever possible, be insulated. The insulation materials shall be free of asbestos.

Odorous emission control and prevention

4.11 All possible odorous sources including, but not limited to, process gases and vapours from fish meal manufacturing processes and associated ductwork conveying the gases to a properly designed odour abatement plant shall be fully identified and investigated. Adequate odour control measures shall be implemented to ensure that the operation of the fish meal factory would not:

- (a) cause any odour nuisance; or
- (b) impose unacceptable constraint on land use.

4.12 For buildings in which there are possible odorous sources, they shall be designed to prevent the uncontrolled escape of odorous air from the building. Typical odour management measures may include maintaining a reasonable negative pressure and

fitting self-closing doors at workplace to contain odorous emission. The odorous air shall be effectively collected and vented to suitable odour abatement equipment.

- 4.13 The plant surfaces, floor, yards and equipment liable to come into contact with the raw materials, semi-processed or processed materials shall be of impervious construction, capable of being readily cleaned and shall be kept clean.
- 4.14 A good housekeeping shall be maintained. Suitable methods shall be provided for the effective cleaning of any area of spillage and for the effective cleaning of the plant. Spillages shall be cleaned up as soon as possible.
- 4.15 Without prejudice to the above general requirements, the following control measures shall be implemented:-

(a) Materials Handling and Processing

- (i) All raw materials should arrive at the plant in totally covered vehicles or containers designed to minimize odour and spillage of any liquid or solid matter. The time interval between the materials arising and their delivery to the plant should be kept to a minimum. Raw materials should remain in lorries parked within an enclosed area on the site for as little time as possible and be kept covered until they are discharged for processing.
- (ii) Raw materials should be transported from the point of production to the processing plant in enclosed containers and handled in a designated work area operated under negative pressure and with extractive ventilation connected to an effective odour management system, as quickly as practicable. The design of containers shall be such as to minimize the emission of any odour or spillage of any liquid or solid matter. Alternatively, enclosed conveyor system vented to the odour management system should be provided to reduce the process emission.
- (iii) Empty containers shall be kept clean.
- (iv) Raw materials should be processed as soon as possible and normally not later than 24 hours after receipt. They should be kept dry and cool, out of direct sunlight and in enclosed containers. When it is not possible to treat the raw materials or by-products before their decomposition starts to cause odour problems, refrigerate them as quickly as possible.
- (v) Raw materials shall not be left unattended in any place other than designated storing areas and shall be kept dry and cool, out of direct sunlight and in fully enclosed containers inside the factory.
- (vi) Containers and any other equipment used for the collection, transfer and handling of raw materials and waste shall be readily cleanable, impervious and kept clean.

(vii) Odorous processes should be carried out in confined areas. The ventilation of these areas shall be vented to a suitable odour management system before discharging into the open air.

(viii) All tanks for storage of raw materials and by-products shall be lidded or sealed. Catchment provisions shall be provided to contain spillage if any.

(b) Odour and Oily Fume Control Equipment

The principal technologies used to control plant odours are afterburners, condensers, chemical adsorbers, scrubbers and bio-filters. The design of an effective odour control equipment is influenced greatly by the moisture content of the odorous emissions or, conversely, by the percentage of non-condensable gases. For complete control of odours it may be necessary to use more than one of these techniques.

(i) The removal efficiency of control equipment for odours and oily fumes shall not be less than the following minimum performance requirements respectively:

- odours - by thermal oxidation at a temperature of 760°C for a period of 0.5 second; or other suitable treatment process which is equally or more effective for the purpose of odour abatement, as determined by the Authority;
- oily fumes - by condensation or other suitable treatment process to abate oily fume emissions with an efficiency of not less than 90% (by weight).

(ii) Odour-masking agents and counteractants shall not be used as a means of odour control.

(c) Odorous Emission from Liquid Effluent

(i) Liquid effluent which is produced by the process including odour control equipment shall be properly handled and treated so as to prevent the emission of odours from the effluent.

(ii) Where condenser is used for the purpose of minimizing odours, it must ensure that the type of condensers being used or proposed is acceptable both in relation to the quantity and quality of liquid discharges.

5. OPERATION AND MAINTENANCE

5.1 Best Practicable Means requirements include the proper operation and maintenance of equipment, its supervision when in use and the training and supervision of qualified staff. Specific operation and maintenance requirements may be specified for individual equipment.

- 5.2 All control and monitoring equipment shall be operational and functioning properly when the fish meal processing plant or other associated processes are in operation.
- 5.3 Operating staff shall be properly trained in their duties relating to control of the process and emissions to air. Particular emphasis shall be given to training for start-up, shut down and abnormal conditions.
- 5.4 In case of malfunctioning and breakdown of the process or air pollution control equipment which would cause exceedance of the emission limits or breaches of other air pollution control requirements, the incident shall be reported to the Authority without delay. Moreover, all practicable means (including refraining from using the defective fish meal processing plant) shall be taken to minimize the abnormal emission.

6. FUGITIVE EMISSION CONTROL

- 6.1 Boundary ambient standards
- (a) The 24-hour ambient level(s) of particulates shall not exceed the relevant Hong Kong air quality objectives.
 - (b) Odour : 2 odour units
- 6.2 The control of the fugitive emissions of air pollutants shall be agreed with the Authority. As a general guideline, the loading, unloading, handling and storage of fuel, raw materials, products, wastes or by-products should be carried out in a manner acceptable to the Authority so as to prevent the release of:
- (a) visible dust emissions; and/or
 - (b) emissions of organic vapours; and/or
 - (c) other noxious or offensive emissions.
- 6.3 A high standard of housekeeping shall be maintained and typical good work practices measures may include:
- (a) Collect and transport animal by-products and processed products in sealed packaging or covered leak-proof containers or vehicles.
 - (b) Properly treat vehicles and re-usable containers, and all re-usable items of equipment or appliances that come into contact with animal by-products or processed products by adopting the following recommended practice:
 - (i) cleaned, washed and disinfected after each use;
 - (ii) maintained in a clean condition; and

(iii) clean and dry before use.

- 6.4 Adequate provision shall be made for the containment of liquid and solid spillages from the rendering operation and associated processes. As a good practice, overflowing protection device should be installed on suitable bulk storage tanks of raw materials, products, process waste and pollution control equipment, as appropriate. Such device will automatically detect the level of liquid in a vessel and send an audible and visual signal, first to warn that the capacity is close to full and then, if no action is taken, to actually stop the tank from filling. All spillages shall be cleared as soon as possible and discarded in closed containers for disposal according to local waste control requirements.
- 6.5 Areas where by-products, raw materials and waste are stored shall be cleaned frequently. The cleaning program can cover all structures, equipment and internal surfaces, material storage containers, drainage, yards and roadways.
- 6.6 The integrity of all buildings shall be maintained to prevent the uncontrolled escape of odorous ventilation air from the building. Doors should have seals and be kept closed other than for the movement of materials. Self-closing personnel doors should be provided and fitted with alarms which operate if the doors fail to close within a reasonable period of time.

7. MONITORING REQUIREMENTS

- 7.1 Necessary monitoring equipment and techniques, agreeable to the Authority, shall be provided and used to demonstrate that the process is properly operated and the emissions can be minimized to meet the air pollution control requirements. The scope, manner and frequency of the monitoring shall be sufficient for this purpose and will be determined by the Authority. In general, visual and olfactory assessment on the operation of process equipment, odour management system(s) and air emissions shall be made frequently and at least once a day to ensure proper operation and to identify any malfunctions and irregularities.
- 7.2 Monitoring results shall be recorded in such manner specified by the Authority. The record shall be retained at the premises for a minimum of two years, or other period specified by the Authority, after the date of last entry and made available for examination as and when required by the Authority.
- 7.3 Continuous monitoring of the performance of dust abatement system shall be implemented. Appropriate monitoring method should be selected and implemented with reference to the best practices of relevant trade overseas for dust abatement system. The monitoring method or equipment to be used shall be acceptable to the Authority.
- 7.4 Appropriate instrumentation shall be installed to monitor the operation of odour management system(s) including the emission extraction device and odour abatement

equipment. Essential operating parameter(s) that may significantly affect the emission of air pollutants, such as volumetric flow of ventilation / odour management system(s) or essential operating parameter(s) of odour abatement equipment, shall be displayed. In the case of thermal oxidisers or combustion plant, emissions should be continuously monitored and continuously recorded for carbon monoxide, or the operating temperature may be used as a surrogate measurement. It shall be fitted with audible and visual alarms with trigger levels for activation agreeable to the Authority.

- 7.5 Emission events that lead to the triggering of alarms of any of the above monitoring system(s) shall be properly recorded in such manner and format agreed with the Authority. All monitoring equipment shall be operated and maintained to ensure that they are functioning correctly in accordance with the manufacturer's instructions.
- 7.6 Monitoring of the odour and/or particulates concentration at the boundary of the premises, if required, shall be conducted in a manner specified by the Authority.

8. COMMISSIONING

- 8.1 Commissioning trials, to be witnessed by the Authority whenever appropriate, shall be conducted to demonstrate the performance and capability of the air pollution control measures. Unless otherwise agreed by the Authority, the report of the commissioning trial shall be submitted to the Authority within 1 month after completion of the trial.

ANNEX I CONCENTRATION LIMIT FOR EMISSION FROM RENDERING WORKS - FISH MEAL FACTORY

I.1 For non-combustion process, air pollutant emissions from the subject specified process and associated processes covered by this Note shall not exceed the concentration limit specified below. The air pollutant concentration is expressed at reference conditions of 0°C temperature, 101.325 kPa pressure, and without correction for water vapour content. Introduction of diluted air to achieve the emission concentration limit is not permitted.

Air Pollutant	Concentration Limit (mg/m³)
Particulates	10