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INTRODUCTION:

This Environmental Code of Practice for fish Meal Plant Operations was prepared internally by the Industrial Environmental Engineering Division of the Department of Environment and Lands. The Code was developed in an effort to provide the members of the fish meal industry with a better idea of what the Department of Environment and Lands expects of a fish meal plant operation. It outlines steps which must be taken by fish meal plant operators to reduce the potential negative impact that fish meal plants have on the environment.

As a reminder, it should be noted that, with respect to environmental matters, the operation of fish meal plants in Newfoundland and Labrador is regulated under The Department of Environment and Lands Act and the following associated regulations:

1. The Storage and Handling of Gasoline and Associated Products Regulations and Amendments
2. The Air Pollution Control Regulations
3. The Environmental Control (Water and Sewage) Regulations
4. The Waste Material (Disposal) Act and Amendments

There are two major types of pollution associated with the production of fish meal and fish oil:

1. the release of malodours
2. the release of liquid effluents with high Biological Oxygen Demand (BOD) and Total Suspended Solids (TSS) contents.

In an effort to control these pollutants methods of prevention and treatment will have to be incorporated into the production process. Preventative measures must be taken so that methods of treatment will be more successful.

PREVENTION:

Raw Material:

The fresher the raw material the less odour produced during processing and storage. Hence, fish/fish waste should be delivered to a fish meal plant within 24 hours of its generation. The maximum holding time for fish/fish waste at a meal plant prior to processing is as follows:

April 1 to April 30	4 days
May 1 to October 31	2 days
November 1 to November 30	4 days
December 1 to March 31	12 days

If equipment failure in the meal plant causes process line shutdown these holding times may be extended by 24 hours to a maximum of one occasion per week.

If there are problems with equipment or excessive quantities of offal available then deliveries should be reduced or cut-off or controlled in some fashion as not to exceed the aforementioned time limits.

When fish waste exceeds the above maximum storage times, the fish meal plant owner must, with prior Newfoundland Department of Environment and Lands approval, dispose of it as a waste. This will probably but not necessarily be by burial.

At all times the following must apply:

The most odorous (i.e. the oldest) material should be processed first.

Any containers (including trucks) used for transporting raw material must be covered, leak-proof, resistant to corrosion and easily cleaned and emptied. Each container must be cleaned every day, to prevent build up of odorous deposits. To decrease the amount of water polluted a high pressure spray should be used for these cleaning purposes.

Storage areas at the plant should be easily cleaned and sufficiently large to cope with supplies. They should also be kept cool. Once full, no more fish must be accepted. The raw material must be enclosed at all times and any air should be vented and treated.

The raw material storage areas must also be liquid leak-proof, to prevent any bloodwater from escaping, with designated drainage facilities so that the bloodwater can be collected and, if possible, incorporated in the processing or else carefully disposed of in a manner described in the treatment section of this Code. In order to decrease the amount of bloodwater produced as little water as possible should be used to unload or transport the raw material to these storage facilities. Dry fluming is preferred.

Any spillage of raw material or liquors must be immediately removed and the surface cleaned.

Fish waste storage facilities and handling equipment should be washed regularly.

Processing:

The plant should be operated so as to use the minimum of air but all air associated with the process e.g. in dryers and other equipment should be contained and ducted directly to odour reduction equipment. Collection hoods placed above separators, presses, cookers, etc. are useful and air captured here must also be treated. Ducts must be regularly maintained and inspected. Solids spilling from equipment onto hot surfaces should immediately be removed, and leakage of liquid

or oil from process or storage equipment or from piping should be absolutely minimized[1]. All equipment should be designed and installed with ease of cleaning and odour control/reduction in mind.

Dryer exhaust gases should not exceed 200EF (93EC). The higher the temperature of the gases, the more difficult and the more costly is the removal of odours. Scrubbers/chlorinators do not work satisfactorily for gases at temperatures exceeding 200EF.

Vapour leaks from processing equipment should be kept to a minimum by regular maintenance. Where vapour and gas venting is necessary, it should be directed via ducts to the odour reduction equipment.

If stickwater must be stored its deterioration can be slowed down by adjusting the pH to 4.5 with sulphuric acid.

Handling and Storage:

The finished product should be stored in dry cool weather-proof conditions. Conveyors and grinders for the final product can create considerable fish meal `dust' and steps should be taken to isolate this equipment in one room and to clean it frequently.

The Fish Meal Plant:

[1] "absolutely minimized" would effectively mean "eliminated"

A new plant should be sited so as to minimize risk of nuisance, away from housing and downwind of prevailing winds. The plant should have adequate water supplies. Floors should be impermeable, easy to clean and slope towards drains. Walls should be free of ledges and projections and finished in hard washable material; ceramic tiles are ideal. Ceilings should be smooth and non-absorbent. All these surfaces should be regularly cleaned. Equipment should be maintained rigorously so that it is leakproof, and easy to clean. Installation should be such as to allow easy access and avoid corners where spillage and leaks can accumulate. Hot pipes should be insulated with an impervious material. There should be good cleaning facilities throughout the facility such as high pressure hoses, brushes, detergents, etc.

Housekeeping/Maintenance:

Good house keeping practices must be maintained. These include:

1. All plant equipment should be kept in reliable operating condition through a program of regular preventative maintenance. A regular supply of spare parts should be kept to minimize equipment failure downtime.

2. Process equipment must be emptied of fish waste prior to shut down and cleaned as design permits.

3. Plant equipment, floors, and walls must be kept free of fish waste and fish meal by a program of regular cleaning.

Preventive measures taken before the treatment stage will enable other reduction measures to be more effective.

TREATMENT:

Malodours:

Odour reduction equipment must be operated as designed whenever fish/fish waste is being processed. Under no circumstances is the plant to operate without the using at least one of the following types of treatment:

A. Water scrubbing and chemical treatment

B. Incineration

C. Other processes approved by the Department of Environment and Lands

Water scrubbing leads to a marked reduction in odour by removal of water soluble constituents. A simple scrubbing tower in which effluent air is passed up through a tower while water cascades down through the tower is normally adequate. The principle is to ensure good air/water contact and the tower is sometimes fitted with ceramic rings or with sprays so as to achieve this. Sea water is perfectly suitable if available. An indirect system where the warm moist effluent air passes over a series of cooled coils is preferred but not required. In the indirect system the condensed water from the air will remove some of the water soluble compounds and the water in the coils can then be recooled in a cooling tower and recycled.

All scrubbers/condensers must be maintained in top working condition. If water scrubbing is deemed to be insufficient by an official of this Department and strong odours still exist then the plant operator may be required to incorporate chemical or thermal oxidation or a combination of both into the process. Chemical oxidation is basically an extension of scrubbing in which chemical oxidants such as chlorine or potassium permanganate or ozone are dissolved in the water and have an oxidizing or other chemical effect in addition to the scrubbing effect of the water. Thermal oxidation can take place in an incinerator built specifically for this purpose or the gases can be partially mixed with fresh air and burnt in the furnace of the direct flame dryer.

Incineration is the only feasible method presently available to control odours from dryers operated under high temperature conditions (dryer gases higher than 300EF or 148.9EC). Incineration consists of heating the odorous air to about 700E-800EC for one or two seconds.

Depending on weather conditions, effluent gases may be dispersed through the use of high stacks, in which case the odour laden air is released at a sufficient height above the ground so that a natural mixing with the atmosphere reduces the concentration of odourants to below the detection threshold limit by the time it reaches ground level. However, if this method is used the plant will not be authorized to operate when meteorological conditions are not favourable. If the air is cold and moist the odorous gases will be drawn toward the ground level and in this case very little dispersion will occur.

In deciding which type of treatment is necessary to prevent the malodours each plant will be considered separately. The nature of the raw material, type of dryer, availability of scrubbing water, proximity of local housing and businesses, production rates, existing equipment, past operating history, and several other factors will be considered.

Liquid effluents:

All major effluents associated with fish meal plants are of sufficient strengths to require some type of treatment. In the majority of cases the removal of solids is adequate treatment to protect the receiving environment as this will prevent the build up of sludge around the effluent outfall with its consequent effect on dissolved oxygen. While there is some flexibility in the type of odour control employed, all fish meal plants must adhere to the following requirements:

1. When fish waste is flumed to the fish reduction plant from the fish processing plant, the discharge water should be treated to pass screening with openings of 5mm maximum.

2. A clean up area must be available for fish waste delivery trucks with wastewater solids removal equivalent to 0.71mm screening or finer. The same screening requirement applies to general plant wash up water.

Following screening these effluents must be discharged through an outfall which allows sufficient

tidal flushing action to dilute the remaining effluent and thus minimize pollution problems. All solids collected by the screens must be incorporated back into the process or disposed of along with any excess or deteriorated offal either on a gurry ground (if a permit for dumping is obtained) or buried at an approved waste disposal site.

3. Wastewater discharges which may be permitted are:

(i) From barometric condensers

(ii) From air pollution scrubbers

(iii) Screened truck wash water

(iv) Screened plant wash up water

(v) Screened flume water

These effluents be discharged if and only of they meet the standards set by the Water and Sewer Regulations, i.e. they do not exceed the legal limit for fecal coliforms, BOD, and TSS contents. Again, these effluents must be discharged through an outfall which allows sufficient tidal flushing action to dilute the effluent and thus minimize pollution problems. In cases where the provision of this level of primary treatment produces an effluent which still creates pollution problems, then either flotation or biological treatment must be considered.

4. **Presswater, stickwater, bloodwater, and waste chemicals are not to be released into the environment**. Oil separators may be used to remove the fish oil from the presswater. The remaining stickwater may then be recovered in an evaporator. Other methods of treating these effluents include: 1. Biological treatment - build lagoons and use sludge treatment

2. Flotation - air is bubbled into the effluent. The dissolved air particles then attach themselves to solid or oil particles present. These rise rapidly to the surface and must be skimmed off for recovery of protein and oil.

Waste chemicals must be disposed of as directed by the Department of Environment and Lands.