

Volatile Organic Compound Release from Mink Feed

Introduction

Volatile organic compounds (VOCs) are gaseous compounds given off by organic material undergoing decomposition by microorganisms like bacteria and fungi. Examples of VOCs are ammonia, hydrogen sulphide and amines. Mink feed in Nova Scotia usually uses fish or fish by-product ingredients. When these proteins are broken down by bacteria, dimethylamine and trimethylamine oxides are released. These amine compounds give the fishy smell to fish. Other sources of organic material on farms release VOCs and add to the various smells emanating from farms. Two areas of potential VOCs release on mink ranches are the manure and the feed.

Mink feed is 35-40% dry matter, and comprised primarily of by-products from the fisheries, poultry processing and livestock slaughter industries. Feeding mink is a tremendous way to recycle processing industry by-products that would otherwise be composted, rendered or dumped. These raw ingredients will break down due to microorganism activity and if not stored properly can produce fairly pungent odours during warm, humid summer days. When mink feed is fed, the decomposition of high protein ingredients, oxidation of fats and proliferation of bacteria and molds are all accelerated under warm summer feeding conditions.

Background

A recent study by Perennia looked at the nature of the volatile organic compounds emanating from wet mink feed. A literature review indicated that although there could be 50 or more VOCs related to feed; ammonia, amines and hydrogen sulfide have the greatest potential for the unpleasant feed smells identified on-farm. In this study the effectiveness of various feed additives in reducing the production of these compounds was examined. Production or reduction of these 3 gaseous compounds should be a direct indicator of whether or not a feed additive could effectively reduce odours.

Detecting VOCs

Initially a Gastec gas detection system (supplied by Levitt Safety Supply) was used in this study as it had the potential for detection of gases at low levels. It was found that the levels of these compounds (ammonia, hydrogen sulphide and amines) were too low to be detected by the Gastec equipment. A more sensitive photoionization detector (PID), also from Levitt Safety Supply, was used to measure the total VOCs released by the feed samples (not individual VOCs).



Fresh Feed

“Feeding mink is a tremendous way to recycle processing industry by-products that would otherwise be composted, rendered or dumped.”



Fishery By-products for Mink Feed



Gastec Pump and Tubes

Materials and Methods

High and low-fish mink diets were collected at a mink feed kitchen and samples tested at the Perennia Lab in Kentville, where 3 kg samples were measured and sealed in buckets for testing. At various time intervals and temperatures, VOCs measurements were made using the PID. The initial tests determined no significant differences between high and low-fish diets. Subsequent sampling was done solely on low-fish rations supplied by Willowdale Farms Inc.



Various feed additives with the potential to reduce the release of VOCs and compatible for feeding to mink, were obtained:

Ammonia Control 250 - a humic acid based product from MTS

Deodorase - a Yucca shidigera extract based product from Alltech

Calcium propionate – a common preservative in high moisture diets

Ethoxyquin - an antioxidant used to prevent fatty acid oxidation

Zeolites - aluminosilicate minerals used as adsorbents in feed to bind toxins

Feed additives were weighed and added at the rate recommended by the suppliers. VOC production went up directly with temperature and humidity levels. None of the feed additives had any significant effect on reducing production or release of VOCs from the mink feed samples. Along with the PID readings a sniff test was used by Perennia staff that indicated corresponding increased odour levels with increased temperature and humidity levels. From the sniff test, the presence of yeast and mold compounds was detected. These compounds may be more of an issue than the breakdown of protein by bacteria and oxidation of fats in the mink rations tested.

Conclusions

1. The low, undetectable levels of specific gases (ammonia, hydrogen sulphide and amines) suggest the acid used currently in feed manufacturing is adequate to control bacterial growth.

2. Total VOC release was at detectable levels and was directly related to temperature, time and humidity.

3. VOC originating from yeast/mold/fungi were being released. Confirmed by PID readings and sniff tests.

4. High standard plate counts of mink feed can be influenced by the yeast/mold/fungi levels of feed ingredients.

5. Storage conditions for raw by-product feed ingredients and cereal ingredients must be monitored to help minimize microorganism growth during storage.

6. Disinfectants used in the feed kitchen and mink ranch sanitation programs must be able to control fungi as well as bacteria and viruses.

7. Mink ranch practices need to continue to address minimizing VOC release from organic materials on the ranch such as manure, wetlands, ponds, soil, other livestock, and other wet organic matter, in addition to feed.

For more information, contact:

Nancy Smith or Alex Oderkirk, Specialists
Extension and Advisory Services Team
Perennia

Tel:

Nancy (902) 896-0277

Alex (902)678-7722

Email:

nsmith@perennia.ca

aoderkirk@perennia.ca

July 2013