FEDIOL code of practice for the management of mineral oil hydrocarbons presence in vegetable oils and fats intended for food uses

The Code of Practice developed by FEDIOL, in cooperation with its members, is a non-binding recommendation developed for the use of members and non-members.

In 2008, sunflower oil contaminated with mineral oil hydrocarbons (MOH) from unknown origin was exported from Ukraine to the EU\(^1\).

Since this incident, FEDIOL has proactively set up monitoring measures to address MOH contamination in the supply chain of vegetable oils and fats. FEDIOL has also worked on best practices for its sector to manage both identified and possible sources of MOH. These best practices are presented in this Code of Practice (CoP).

This code shall be applicable to all vegetable oils and fats intended to be used (as such or after processing) for food uses.

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\(^1\) RASFF notification on 23 April 2008.
1. **Introduction**

MOH comprise complex mixtures of hydrocarbons derived from crude mineral oil which are varying in carbon number and structure.

Many plants contain natural hydrocarbons (which nearly exclusively consist of odd-numbered n-alkanes) which should not be confused with MOH.

MOH are often divided into two main types:
- **Mineral oil saturated hydrocarbons or MOSH**: correspond to linear and branched alkanes and alkyl-substituted cyclo-alkanes.
- **Mineral oil aromatic hydrocarbons or MOAH**: correspond mainly to alkyl-substituted polyaromatic hydrocarbons.

In 2012, the European Food Safety Authority (EFSA) published an opinion related to MOH in food\(^2\).
- In its opinion, EFSA found that MOH was present at different levels in nearly all foods.
- For MOSH, EFSA estimated that there was potential concern associated to the background exposure to MOSH and with the use of white oils as release agents in bread and for spraying of grains.
- EFSA also considered the exposure to MOAH through food to be of potential concern because of its specific health risk.

There is today no EU legislation regulating the limits of MOH in vegetable oils and fats.

FEDIOL is committed overall to ensuring the safety and quality of its products. FEDIOL has therefore engaged proactively in the MOH issue in order to better understand the issue and to reduce the occurrence of MOH in its products.

The following CoP is setting best practices:
- To prevent MOH contamination in vegetable oils and fats.
- To manage and mitigate identified sources of MOH.

2. **Possible sources of contamination in the vegetable oil and fat production**

MOH may be introduced at different stages of the vegetable oil and fat production:
- **Agricultural stage**: leaks of diesel or lubricant from the agricultural vehicles, use of pesticides, contamination from the environment (exhaust gasses from vehicles, ...).
- **Storage of the seeds/beans**: use of anti-dusting agent in the grain handling facilities/silos, leaks of diesel or lubricant (during handling of the seeds/beans), contamination from environment (drying of the beans/seeds with wood or diesel fire combustion gases, ...), migration (in case of packaging of the seeds/beans).
- **Transport of the seeds/beans**: use of anti-dusting agent (during oversea shipping), contamination from the environment (debris from tires and road tar,...), leaks of diesel or lubricant from the transport vehicles.

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• **Processing**: leakage from the mineral oil absorber system (during crushing), contamination by lubricant (during crushing, refining or during maintenance procedures in the processing plant).
• **Transport of the oil**: contamination by a previous cargo, leaks from equipment (e.g. pumps).
• **Voluntary adulteration**

### 3. Scope of the Code of Practice

This CoP shall be applicable to all vegetable oils and fats (as such or after processing) intended for food uses.

### 4. FEDIOL action plan

#### 4.1. Prevention in vegetable oil and fat crushing and refining plants

FEDIOL members will verify that in their HACCP\(^3\) systems, each point where MOH contamination may occur during crushing and refining operation has been identified and that procedures are in place so that the associated risk is kept under control.

In that respect, it is reminded that special consideration should be given to the **lubricants** and **special fluids** used in crushing and refining plants which may accidentally come into contact with vegetable oils and fats due to leaks:

- In this regards, critical lubrication/fluid points\(^4\) in the plants should be identified and clear procedures for the correct management of the lubrication/fluid systems should be in place through the HACCP system in order to prevent/minimize leakages.
- In all critical lubrication points, only lubricants suitable for incidental contact with food should be used\(^5\).

**Remark**: equipment in the production chain requires proper lubrication to operate at optimum performance and reliability. In specific cases where no H1 lubricant could meet the particular lubrication requirements of an equipment, a specific assessment of the lubricant to be used should be performed, including consideration as regards the absence of MOAH.

- Similar considerations should be given to the mineral oil used as absorber in the hexane recovery system: such oil should be free from MOAH.
- During the processing of vegetable oils and fats it is possible that a system failure may lead to the accidental contamination by the heating system used. Steam, which is the most acceptable medium from a toxicological perspective, should be used in processing installations\(^6\).

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\(^3\) Hazard Analysis Critical Control Points  
\(^4\) A critical lubrication/fluid point is a lubrication point where there is some possibility of incidental contact with the lubricant/fluid.  
\(^5\) H1 lubricants are considered safe in case of incidental contact with food. They may only be composed of one or more approved basestocks, additives and thickeners listed in the Food and Drug Administration (FDA) guidelines set for in the paragraph 178.3570 of the 21 Code of Federal Regulation (21 CFR 178.3570). H1 lubricants may be registered by the lubricant manufacturers through either the National Sanitation Foundation (NSF) in the US or through InS Services (InS) in Europe.  
\(^6\) FEDIOL Code of Practice on the Heating of Edible Oils during Processing
4.2. Control of possible sources of MOH contamination in the vegetable oil and fat supply chain

Through detailed risk assessment along the main vegetable oil and fat supply chains, particular points of attention are being identified so that appropriate controls (and measures) can be implemented. In the context of such controls, sampling shall be handled in accordance with ISO 5555:20017.

From a global supply chain perspective, FEDIOL members are reminded the following:

- The FEDIOL CoP for the transport in bulk of oils into or within the EU8 stipulates that:
  - For transport in bulk by road or rail tanks, tank containers, by barge and in drums, thermal heating fluids shall not be used in direct heating systems.
  - For transport in bulk by sea in ocean carriers, transhipment vessels and short sea voyage vessels, the ships should comply with the latest version of the “FOSFA qualifications and operational procedures for ships engaged in the carriage of Oils and Fats in bulk for edible and oleo-chemical use” in force at the date of the bill of lading. This means that thermal heating fluids shall not be used in direct heating systems.

- White mineral oils9 are today included in the EU list of previous cargoes. In its 2012 opinion10, EFSA concluded that white mineral oils were meeting the criteria for acceptability as previous cargoes since exposure to MOH via contamination of edible oils and fats from previous cargoes occurred only rarely and at very low levels.

- The spraying of white mineral oil as anti-dusting agent on soy beans has become a common practice in most exporting countries. In the US, grain elevators are obliged by OSHA regulation (29 CFR 1910.272) to control dust accumulation. Moreover, larger facilities are bound to reduce to 0% dust emission according technology-based pollution control standards promulgated by the Environmental Protection Agency (EPA). In several States, local legislation adds to EPA requirement regarding dust emission. Addition of mineral oil is one of the technology to meet these requirements. This common practice is permitted by the US Food and Drug Administration (21CFR172.878, since 1983)11. For those soybeans coming from origins where spraying is a common practice, FEDIOL recommends its members to particularly monitor MOH levels in products derived from these soybeans and to verify that MOAH are not present, as required by FDA regulations.

4.3. Monitoring scientific developments and next steps

FEDIOL is continuously monitoring scientific developments including latest research on toxicology, analytical methods and mitigation in order to have a better understanding of this issue and to increase the knowledge of its members.

To better mitigate the risk of MOH contamination in vegetable oils and fats, FEDIOL is currently working to identify more precisely the possible entry sources of MOH across the vegetable oil and fat supply chain.

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7 ISO 5555:2001 Animal and vegetable fats and oils -- Sampling
8 14COD152
9 White mineral oils are highly refined petroleum products which are virtually free of MOAH.
11 Food and Drug Administration (FDA) Regulation 21 CFR Sec.172.878 (revised as of April 1, 2013) allows the use of white mineral oil as a dust control agent for grains with a limit of 0.02 percent by weight of grain.
FEDIOL strongly recommends its members to work on the MOSH and MOAH removal capability of refining. FEDIOL is currently working on information sharing and best practices regarding MOH mitigation strategies through refining.