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Oil Spill Program Update

The U.S. EPA's Oil Program Center Report

ABOUT THE UPDATE

EPA's "Oil Spill Program Update" is produced quarterly, with information coming from the Regions in response to their needs. The goal of the Update is to provide straight-forward information to keep EPA Regional staff, other federal agencies and departments, industries and businesses, and the regulated community current with the latest developments. The Update is distributed in hardcopy and is available on the Oil Program homepage at ***www.epa.gov/oilspill***.

About this Issue

EPA's Oil Program Center developed this Update to help storage facilities, industries, businesses that handle ***vegetable oil and animal fats***, other federal agencies, states, and the regulated community gain an understanding of the Federal Oil Pollution Prevention Regulation, Title 40 Code of Federal Regulations (CFR) Part 112. This regulation includes the Spill Prevention Control and Countermeasure (SPCC) Plan requirements and the Facility Response Plan (FRP) requirements. We focus this entire issue of the Update on vegetable oils and animal fats, with articles from various sources. An overview and applicability of the requirements, a summary of EPA's Vegetable Oils/Animal Fats Decision Document, articles on the increased use of vegetable-based lubricants, and actual spills highlight this edition. Richard Franklin of EPA Region VI and Don Rigger of EPA Region IV contributed with reports describing the response work during such spills. The International Bird Rescue Research Center in Berkeley, California, enhanced this edition with specific information relating to the effects of hydrogenated oil on seabirds. The photos included in this edition help to illustrate the harmful effects of these spills and reinforce the importance of preventing spills of vegetable oils and animal fats in the environment.

Protecting Human Health and Ecology

Vegetable oils, animal fats, and petroleum oils share common chemical and physical properties and produce similar environmental effects. They can also contain toxic components and produce similar acute toxic effects, chronic toxicity, and carcinogenicity. They can foul shorelines and interfere with water treatment. Vegetable oils, animal fats, and petroleum oils can cause devastating physical effects, such as smothering, coating, oxygen depletion and suffocation, egg contamination, and destruction of existing and future food supply, breeding animals, and habitat.

Vegetable oils, animal fats, and petroleum oils can persist in the environment or degrade very rapidly. Usually only a small portion of vegetable oils or animal fats is volatile, unlike the volatile fractions in petroleum oils. Most vegetable oils or animal fats do not present a significant fire or explosion hazard, unless other chemicals or ignition sources are present.

Oil spills can have a severe impact on drinking water resources. Moreover, oil pollution seriously damages the terrestrial and aquatic environment. It does not take a spill of catastrophic magnitude to

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have a serious impact on an aquatic habitat. The complex food chain or web, from microorganisms and plants to shellfish, mammals, and birds, is affected by even small spills. In fact, a single ***pint*** of oil released into the water can cover ***one acre*** of water surface area. Ecosystems may take years to recover or may never recover from spills.

In addition to causing threats to human health when an oil spill (petroleum oils, vegetable oils, animal fats, or other non-petroleum oils) occurs, significant environmental harm can result. Physical effects, such as coating with oil, suffocation, contamination of eggs and destruction of food and habitat, short and long term toxic effects, pollution and shutdown of drinking water supplies, rancid smells, and fouling of beaches and recreational areas, are examples of the consequences of these spills. Many distressed birds and animals have no chance of survival. Birds and other wildlife affected by a spill need immediate intervention. They can be taken to treatment centers or temporary facilities for medical treatment and cleaning (see "Hydrogenated Oil Spill Affects California Seabirds" on page 12 of this issue). However, these measures are not always effective. The best approach to avoiding oil spills is a strong prevention program that includes prevention measures, adequate training of personnel in the operation of a facility, including equipment inspection and health and safety training, and knowledge of what steps to take when a spill occurs.

What is an Oil?

Oil is defined under several statutes, including the Clean Water Act (CWA) and the Oil Pollution Act of 1990 (OPA). As a result, overlapping regulatory interpretations exist. For this reason, EPA and the U.S. Coast Guard are currently developing a nationally consistent program policy and methodology for facilities to determine whether a given substance is considered an oil under the existing CWA as amended by OPA.

Under the CWA, the definition of oil includes oil of any kind and any form, such as petroleum and nonpetroleum oils. Generally, oils fall into the following categories: crude oil and refined petroleum products, animal fats and vegetable oil, other oils of animal or vegetable origin, and other nonpetroleum oils.

Many substances are easily recognizable as oils (e.g., gasoline, diesel, jet fuel, kerosene, and crude oil). Under the CWA definition, many other substances are considered oils which may not be easily recognizable as oils by industry, including mineral oil, the oils of vegetable and animal origin, and other nonpetroleum oils. Therefore, facilities should work closely with EPA and USCG (if applicable) to make determinations for the substances they handle.

Economic Considerations of Spills

Facilities that are in full compliance reduce the number and severity of discharges and avoid the high cost of environmental cleanups, restoring natural resources. Additional permitting requirements could be imposed in the event of a discharge. By being in full compliance, facilities may reduce the severity of penalties and avoid high costs. Facilities that implement these measures are more likely to prevent and control oil spills that may result due to human operational error, equipment failure, vandalism, or natural disasters.

The cost of a cleanup would not only include repairing the damage to the facility (e.g., soil removal or equipment repair) but could extend beyond the facility's boundary to

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impacted offsite areas, including damage to natural resources. Regulators and permitting agencies may require modifications to operations or revisions to plans.

Heavy fines and penalties are often associated with oil discharges, especially when negligence can be proven.

Applicability of the Requirements

- **Spill Prevention, Control, and Countermeasure (SPCC) Plan**

EPA's Spill Prevention, Control, and Countermeasure (SPCC) requirements (40 CFR 112.1 through 112.7) apply to facilities that are nontransportation-related or fixed. These facilities are the ones that could reasonably be expected to discharge any type of oil into or upon the navigable waters of the United States or adjoining shorelines. They also must have (1) an aboveground oil storage capacity of more than **660** gallons in a single container; or (2) a total aboveground oil storage capacity of more than **1,320** gallons; or (3) a total underground buried storage capacity of more than **42,000** gallons. These requirements apply only to a facility's storage capacity, regardless of whether the tanks are completely filled. Some transportation-related facilities or activities may have components considered to be "fixed" under 40 CFR Part 112 (e.g., certain tanks at a pipeline facility, trucks containing product stationed within a fixed facility). SPCC-regulated facilities must also comply with other federal, state, or local laws, some of which may be more stringent.

Other facilities may not be regulated if, due to their location, they could not reasonably be expected to discharge oil into or upon the navigable waters of the U.S. or adjoining shorelines. This determination is made without consideration of man-made structures. The majority of facilities in the U.S. have the potential to discharge to navigable waters.

- **Facility Response Plan (FRP)**

The facilities subject to 40 CFR Parts 112.1 through 112.7 are required to prepare an SPCC Plan and conduct an initial screening to determine whether they are required to develop a Facility Response Plan (FRP). Those facilities that could cause "substantial harm" to the environment must prepare and submit an FRP to EPA for review. Only a small number, no more than 1 ¼ percent of the total SPCC community regulated (approximately 5,400 of a total of 435,000 facilities) under 40 CFR part 112.1- 112.7, meet the criteria for substantial harm under 40 CFR 112.20.

As outlined in 40 CFR 112.20(f)(1), a facility has the potential to **cause substantial**

What are Navigable Waters of the U.S.?

Navigable waters are defined generally under the Clean Water Act (CWA) Section 502(7). EPA's regulatory definition can be found at 40 CFR 110.1.

For the purposes of 40 CFR Part 112, the term *navigable waters* means the waters of the United States, including the territorial seas, and includes the following:

- All waters that are currently used, were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters subject to the ebb and flow of the tide
- All interstate waters, including interstate wetlands, mudflats, and sandflats
- All other waters, such as intrastate lakes, rivers, streams (including intermittent streams), wetlands, mudflats, sandflats, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation, or destruction of which could affect interstate or foreign commerce, including any waters that could be used for recreational purposes, or from which fish or shellfish could be taken and sold in interstate or foreign commerce, or that are used or could be used for industrial purposes by industries in interstate commerce.

The CWA has been interpreted to cover all surface waters, including any waterway within the United States. Also included are intermittently dry creeks through which water may flow and ultimately end up in public waters, such as a river, stream, tributary to a river or stream, lake, reservoir, bay, gulf, sea, or ocean within or adjacent to the United States.

harm in the following circumstances:

- The facility transfers oil over water to or from vessels **and** has a total oil storage capacity, including both aboveground storage tanks (ASTs) and underground storage tanks (USTs), of greater than or equal to 42,000 gallons; **or**

- The facility's total oil storage capacity, including both ASTs and USTs, is greater than or equal to one million gallons **and one of the following is true**:

  – The facility does not have secondary containment for each aboveground storage area sufficient to contain the capacity of the largest AST within each storage area plus freeboard to allow for precipitation;

  – The facility is located at a distance such that a discharge could cause injury to an environmentally sensitive area;

  – The facility is located at a distance such that a discharge would shut down a public drinking-water intake; or

  – The facility has had a reportable spill greater than or equal to 10,000 gallons within the last five years.

Overview of the Requirements

The **SPCC requirements** apply to facilities that meet the minimum applicability standards to prevent oil spills from reaching the navigable waters of the U.S. or adjoining shorelines. The SPCC Plan must describe discharge prevention structures, such as secondary containment, proper operation and maintenance at the facility, and adequate training of facility personnel.

In 1990, Congress passed the Oil Pollution Act which amended Section 311 of the Clean Water Act to require "substantial harm" facilities to develop and implement FRPs. Under the **FRP requirements,** owners and operators of facilities that could cause **"substantial harm"** to the environment by discharging oil into navigable water bodies or adjoining shorelines must prepare and implement plans, training, and drills for responding to a worst-case discharge of oil, to a substantial threat of such a discharge, and to discharges smaller than worst-case discharges.

EPA-regulated facilities that may cause substantial harm are required to submit their FRPs and response resources to implement the plan to EPA for review. EPA reviews and approves plans from facilities identified as having the potential to cause **"significant and substantial harm"** to the environment from oil discharges. Other regulated facilities that do not meet the "substantial harm" criteria and are not required to prepare an FRP are required to document their determination.

Based on information provided by industry, **EPA estimates only 50 to 100 vegetable oil or animal fat facilities** are presently required to prepare FRPs. In addition, only a small number of the 5,400 substantial harm facilities (EPA estimates between 50 to 100) that store or use vegetable oil and animal fat are required to prepare and submit FRPs.

What is considered a discharge?

For purposes of section 311(b)(4) of the Clean Water Act, discharges of oil (of any kind) in quantities determined to be harmful* to the public health or welfare, include discharges of oil that:

(a) Violate applicable water quality standards; or

(b) Cause a film or sheen upon or discoloration of the surface of the water or adjoining shorelines or cause a sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines.

*Defined in 40 CFR 110.3.

Vegetable Oils and Animal Fats: Summary of Decision Document

Background

Under the Clean Water Act (CWA), as amended by the Oil Pollution Act of 1990, vegetable oils and animal fats are considered oils. As mandated by the Oil Pollution Act (OPA) of 1990, EPA has developed regulations for response planning. The Facility Response Plan (FRP) rule requires certain facilities whose discharge could cause significant environmental harm to prepare and implement response plans. While the rule applies to facilities storing petroleum oils and non-petroleum oils, including vegetable oils and animal fats, it provides greater flexibility to vegetable oil or animal fat facilities in the development of these plans than what is required for petroleum facilities.

Based on information provided by industry, only a small number (approximately 50 to 100) of vegetable oil or animal fat storage facilities have to prepare FRP's under the rule. These facilities meet the rule's substantial harm criteria due to their potential to impact sensitive areas, including drinking water intakes, or due to certain facility characteristics.

In the FRP rule, EPA established different and more flexible response planning requirements for facilities that handle, store, or transport non-petroleum oil, including animal fats and vegetable oils. For example, in calculating required response resources for non-petroleum facilities, the owner/operator of a facility which handles, stores, or transports animal fats or vegetable oils is not required to use emulsification or evaporation factors in Appendix E of the rule. Rather, these facilities need only (1) show procedures and strategies for responding to the maximum extent practicable to a worst case discharge; (2) show sources of equipment and supplies necessary to locate, recover, and mitigate discharges; (3) demonstrate that the equipment identified will work in the conditions expected in the relevant geographic area, and respond within the required times; and (4) ensure the availability of required resources by contract or other approved means. (40 CFR Part 112, Appendix E, section 7.7.) It is important to note that EPA does not determine the type or amount of equipment that preparers of response plans for non-petroleum oil discharges must identify.

EPA also set forth definitions for both ''animal fat'' and ''vegetable oil'' in the preamble to the FRP rule (59 FR 34070, 34088 (July 1, 1994)). To assist owners and operators in distinguishing between oil types, EPA defined ''animal fat'' to mean ''a non-petroleum oil, fat, or grease derived from animal oils not specifically identified elsewhere.'' EPA also defined ''vegetable oil'' to mean ''a non-petroleum oil or fat derived from plant seed, nuts, kernels or fruits not specifically identified elsewhere.'' These definitions are nearly identical to those in the Edible Oil Regulatory Reform Act of 1995.

History of EPA's Facility Response Plan Rulemaking

EPA's FRP rule was developed following an extensive rulemaking process. The proposed FRP rule was published in the February 17, 1993, Federal Register (58 FR 8824). A total of 1282 comments were received on the proposed rule, the majority being one-page form letters from members of environmental professional groups that addressed the issue of whether certification of response plans by an independent party was appropriate. EPA summarized and provided responses to all comments received on the proposed rule.

On July 1, 1994, the final FRP rule was published in the Federal Register (40 CFR 112.20-.21). The rule establishes risk-based factors for evaluating the potential to cause substantial harm, discusses response plan requirements and elements, and provides a model response plan.

Several agricultural trade organizations petitioned EPA to allow facilities that store vegetable oils or animal fats to use different and less stringent response methods in planning for spills of these oils under the FRP rule. On October 26, 1994, EPA requested broader public comment on issues raised by the Petitioners in a notice and request for data (59 FR 53742, October 26, 1994) because of the differing scientific conclusions reached by the Petitioners, Federal natural resource trustee agencies, other groups, and agencies. EPA received 14 comments, which were considered during evaluation of the Petition. No new data was received during the comment period.

Therefore, EPA began a comprehensive review of existing research.

On October 20, 1997, EPA published its decision to deny the petition in the Federal Register (62 FR 54508). The Decision Document is summarized below, and the complete decision document is available at ***http://www.epa.gov/fedrgstr/EPA-WATER/1997/October/Day-20/w27261.htm*** through the Internet. EPA is currently evaluating another request to change the FRP rule that was submitted by a coalition of agricultural trade associations on January 16, 1998, and amended on April 9, 1998.

Summary

The following summarizes EPA's decision to deny the petition of the agricultural trade organizations in their attempt to seek an exception to the FRP rule. EPA has considered the physical, chemical, biological, and other properties and environmental effects of petroleum oils, vegetable oils, and animal fats, which are the criteria now to be evaluated under the Edible Oils Regulatory Reform Act of 1995. EPA finds that petroleum oils, vegetable oils, and animal fats share common physical properties and produce similar environmental effects. Like petroleum oils, vegetable oils and animal fats and their constituents can do the following:

- ♦ Cause devastating physical effects, such as coating animals and plants with oil and suffocating them by oxygen depletion;
- ♦ Be toxic and form toxic products;
- ♦ Destroy future and existing food supplies, breeding animals, and habitat;
- ♦ Produce rancid odors;
- ♦ Foul shorelines, clog water treatment plants, and catch fire when ignition sources are present; and
- ♦ Form products that linger in the environment for many years.

The petitioners did not demonstrate that spills of animal fats and vegetable oils are free of adverse impacts on the environment. Scientific research and experience with actual spills have shown that spills of animal fats and vegetable oils kill or injure fish, birds, mammals, and other species and produce other undesirable effects. Waterfowl and other birds, mammals, and fish that are coated with animal fats or vegetable oils could die of hypothermia, dehydration and diarrhea, or starvation. They can also sink and drown or fall victim to predators. Fish and other aquatic organisms may suffocate because of the depletion of oxygen caused by spilled animal fats and vegetable oils in water. Whether these oils are "toxic" to wildlife or kill wildlife through other processes is not the issue. Spills of animal fats and vegetable oils have the same or similar devastating impacts on the aquatic environment as petroleum oils.

Real-World Oil Spills

The table that follows describes several vegetable oil and animal fats spills that have occurred. These spills demonstrate that factors, such as the nature of the oil, its environmental fate, and the proximity of the spill to environmentally sensitive areas, determine the adverse effects of these oils in the environment. Many spills are never reported. Animals injured or killed by oil may never be found, for they are highly vulnerable to predators or may drown and sink. Thus, the reports that are summarized below are not a comprehensive study of the adverse effects of spills of vegetable oils and animal fats, but rather a snapshot revealing some of the deleterious effects caused by spills of oil into the environment.

These real-world spills demonstrate that large and small quantities of vegetable oils can wreak havoc. The complex food chain, from microorganisms and plants to shellfish, mammals, and birds, is affected even by smaller spills. Ecosystems may take years to recover or may never recover from spills. Vegetable oil discharges can be more damaging than petroleum oils, do not have strong odors when newly discharged into the environment, and they are not iridescent like petroleum oils. Under certain conditions, as in the Minnesota soybean spill, vegetable oils can form rubbery strings that float or sink, do not biodegrade, and linger in the environment for a long time.

REAL WORLD OIL SPILLS

NAME AND LOCATION OF SPILL	OIL SPILLED	EFFECTS
Minnesota Soybean Oil and Petroleum Oil Spills (1962-1963) [1,2]	1 to 1.5 million gallons soybean oil from storage facilities, 1 million gallons low viscosity cutting oil	Killed thousands of ducks and other waterfowl and wildlife or injured them through coating; 5,300 birds injured or died, 26 beavers, 177 muskrats Formed stringy, rubbery masses with slicks; sank to bottom; milky material and hard crusts of soybean oil with sand on beaches Soybean oil caused much of waterfowl loss, as shown by lab analysis of oil scraped from ducks
Fanning Atoll Spill (1975) [3]	Cargo ship with coconut oil, palm oil, and edible materials; ran aground, dumped cargo onto coral reef	Effects similar to petroleum oil spill Killed fish, crustaceans, mollusks; shifts in algal community continued for 11 months
Kimya Spill, North Wales (1991) [4, 5,6,7,8]	Cargo of unrefined sunflower oil	Killed mussels, shifts in ecological communities around spill Polymerized, covered bottom, killed benthic organisms; formed impermeable cap, shut out oxygen, bacteria cannot break down; polymers remain nearly 6 years later Concrete-like aggregates of oil and sand on beach Lab studies of mussels show small amounts of sunflower and other vegetable oils kill mussels after 2 weeks; affect mussel lining
Soybean Oil Spills in Georgia (1996) [14]	Soybean oil from tanker truck and soybean vegetable oil refinery with overfilled aboveground storage tank	Aesthetic effects at Lake Lanier; rancid oil as weathered; adhered to boats and docks At Macon, rapid response prevented significant damage from oil, which flowed through storm water system and entered stream; previous spills from facility had entered sanitary sewer system and damaged sewage treatment plant
Fat and Oil Pollution in New York State Waters (1967) [11]	Wide variety of sources	Killed waterfowl, coated boats and beaches, tainted fish, created taste and odor problems in water treatment plants Grease-like substances on shore or floating on Lake Ontario; shoreline grease balls smelled like lard, analyzed as mixtures of animal and vegetable fats

NAME AND LOCATION OF SPILL	OIL SPILLED	EFFECTS
Spills of Fish Oil Mixtures near Bird Island, Lamberts Bay, South Africa (1974) [12]	Fish factory effluent pipe near breeding ground for Cape Gannets	Killed at least 709 Cape Gannets, 5000 Cape Cormorants, and 108 Jackass Penguins Penguins with sticky, white, foul-smelling coat of oil shivering; gannet chicks dead Milky white sea and clots of oil on island smelling of fish
Releases at two other fish factories at St. Helena Bay and Saldanha Bay, South Africa (1973) [13]	Two other fish factories; storage pits and processing effluents and off loading water from vessels	Two other fish factories; at one, killed 10,000 rock lobsters and thousands of sea urchins probably from oxygen depletion; at second, killed 100,000 clams and black mussels, prawns, polychetes, and anemones; foul smelling and adversely affected aesthetics of beaches and camping site
Wisconsin Butter Fire and Spill (1991) [16,17,18,19,20,21,22,23]	Butter, lard, cheese, as well as meat and other food products	Released 15 million pounds of butter and 125,000 pounds of cheese into the environment and damaged at least 4.5 million pounds of meat; thousands of pounds of butter ran offsite; rapid response prevented flow of buttery material through storm sewers to nearby creek and lake, where fish and other aquatic organisms could have suffocated from oxygen depletion Destroyed two large refrigerated warehouses with $10 million to $15 million in property damage Cost tax payers $13 million for butter and cheese stored under USDA surplus program Damage to fire equipment from grease, loss of business, overtime pay for 300 firefighters and responders, costs for cleaning equipment and drains, rodent control Environmental cleanup costs; thousands of gallons of melted butter; butter and spoiled meat declared hazardous waste

[1] Minnesota, 1963
[2] USDHHS, 1963
[3] Russell and Carlson, 1978
[4] Salgado, 1992
[5] Mudge et al., 1993
[6] Mudge et al., 1995
[7] Mudge, 1997a
[8] Mudge, 1997b
[9] McKelvey et al., 1980
[10] Smith and Herunter, 1989
[11] Crump-Wiesner and Jennings, 1975
[12] Percy-Fitzpatrick Institute, 1974
[13] Newman and Pollock, 1973
[14] Rigger, 1997
[15] Zoun et al., 1991
[16] Wisconsin, 1991a
[17] Wisconsin, 1991b
[18] Wisconsin, 1991c
[19] Wisconsin State Journal, 1991a
[20] Wisconsin State Journal, 1991b
[21] Wisconsin State Journal, 1991c
[22] Wisconsin State Journal, 1991d
[23] Wisconsin State Journal, 1991e

Complete references available in the October 20, 1997, Federal Register

Above is a large vegetable oil storage facility in EPA Region VI.

Use of Vegetable-Based Lubricants on the Rise

*The following information was based on the articles "Legumes and Greases" by Peter S. Adam and "Think Green: Biodegradable Lubes Glow with Promise" by Mike Woods, both in the July 1997 issue of **Lubes 'N' Greases**.*

Nearly 21 billion pounds of fats and oils were consumed in the United States in 1992, according to the 1996 edition of Bailey's Industrial Oil and Fat Products. About 15 billion pounds were edible oils. Nearly six billion pounds supported inedible uses, including soap, paint or varnish, feed, resins and plastics, lubricants, fatty acids, and other products. With each year that passes, these uses continue to expand.

Consumer and industry interest in vegetable oil and animal fat products is increasing. One area in which advances in research have yielded new products is lubricants. Until recently, lubricants have been developed from mineral-based stocks (petroleum) combined with an additive package. Uses of vegetable-based stocks include metal forming paste; rail, flange, and switch lubricants; wire rope lubricants; industrial hydraulic fluids and gear oils; gear and hydraulic fluid supplements; drip oils; and dedusting and bar/chain oils.

Commonly used vegetable oils in vegetable-based lubricants are rapeseed (canola), soybean, corn, sunflower, safflower, peanut, and olive, with rapeseed and soybean used most frequently. These renewable sources often have higher viscosity indices, higher lubricity, and lower evaporation loss than petroleum-based lubricants. In addition, the United States produces high yields of many of these crops each year, most notably soybean oil. However, vegetable-based lubricants have less thermal, hydrolytic, and oxidative stability than mineral-based lubricants due to the carbon-carbon double bond in the molecular structure of triglycerides. In spite of this drawback, vegetables are being genetically engineered so that their oleic acid content increases, thereby increasing the oxidative stability of the vegetables. For example, DuPont has a patent for genetically engineering soybeans. Most likely, hydraulic fluids and lubricants will be available within five years due to genetically engineered vegetable oils. Currently, rapeseed hydraulic fluids are offered by Mobil, Texaco, and E.F. Houghton, and Pennzoil offers a sunflower-based Ecolube product.

However, if industry decides to utilize non-petroleum oils instead of the petroleum oils for their products, it will still have to follow the same guidelines for the storage of these oils. The environmental effects of spills or discharges of petroleum and non-petroleum oils, including vegetable oils and animal fats, are similar. Physical and chemical properties are common to both. Many of the most devastating effects of spills of petroleum oils and vegetable oils and animal fats are physical effects, such as the coating of animals, suffocation, or coating of food leading to starvation. In conclusion, some tests measuring BOD (biochemical oxygen demand or biological oxygen demand, which indicates oxygen depletion) suggest that certain vegetable oils and animal fats may present a greater environmental risk of suffocation to organisms than spilled petroleum oils do.

EPA Responds to Texas Cooking Oil Spill

On February 1, 1998, the EPA Region VI Response and Prevention Branch (EPA-RPM) was notified of a spill of an unidentified type of oil in Chambers Creek, located in a residential area of Everman, Texas.

The spill was originally reported by a local television station and thought to be an oil pipeline spill. Local authorities contacted EPA for assistance because they lacked the resources to handle such a spill. Investigation by EPA Region VI found that the spill was probably the result of an illegal dumping of 10 to 20 barrels (about 42 U.S. gallons per barrel) of cooking oil. Chemical analyses showed no trace of petroleum components.

The spill impacted approximately 2 miles of Chambers Creek, and was initiated 1.5 miles upstream of the confluence of Chambers Creek and Village Creek. Village Creek flows an additional 1.5 miles to Arlington Lake, which is a municipal water reservoir for the surrounding communities.

Upon notification of the spill, EPA dispatched the Region VI Superfund Technical Assessment and Response Team (START) to monitor the on-site investigation and to work with the local authorities in site cleanup. Neither analyses by START nor by the City of Arlington were able to positively identify the contaminant, which is thought to be cooking oil. No evidence of a sheen was observed past the underflow dam containment area constructed by the Everman Fire Department (EFD).

After assessment of the site impact by START, the Region VI Emergency and Rapid Response Services (ERRS) contractor was mobilized to begin oil spill removal support. ERRS deployed containment booms to isolate the spill for absorption by absorbent pads and Dica-Sorb® absorbent powder. Air-blowers were used to facilitate creek flow and

movement of the sheen to oil removal areas.

After a final sweep to remove oil-contaminated absorbent materials, the ERRS was demobilized. The underflow dam was left intact to collect any remaining sheen. The removal of the dam is now the responsibility of the EFD. No follow-up inspection has been requested of START.

Are Edible Oils Really that Different?

This article contains excerpts from a presentation by Don Rigger of EPA Region IV at the 1997 International Oil Spill Conference and from the Vegetable Oil and Animal Fats Decision Document published by the U.S. EPA, on October 20, 1997.

In recent years, industry has pushed hard for changes in environmental regulations governing edible oils. The Clean Water Act and Oil Pollution Act apply to oil of any kind. Industry tends to use the term "edible oils" in a general way to describe vegetable oils and animal fats. EPA sought to clarify the distinction by comparing petroleum oils (which include crude oil and refined petroleum products) to non-petroleum oils (which include vegetable oils, animal fats, synthetic oils, and other oils that are not derived from petroleum).

The non-petroleum oil industry has huge facilities with millions of gallons of oil storage capacity. These are common throughout the country. Transportation of non-petroleum oils takes place by highway, rail, tanker, and barge. Non-petroleum oils are not handled differently from petroleum oils, so it stands to reason that the threat of spills of non-petroleum oils is no different than that of petroleum oils.

An example of a large vegetable oil spill involved a tanker truck accident in Georgia. On September 26, 1994, a tanker truck carrying low-grade soybean oil crashed, spilling 5,000 gallons of oil into a tributary of Lake Lanier in Georgia. Within two hours of the spill, the U.S. Army Corps of Engineers deployed containment booms to contain the spill. The EPA Federal On-Scene Coordinator proceeded with oil removal after the responsible

party failed to initiate an appropriate response to the spill. Oil was skimmed or swept to areas for removal by sorbent pads and vacuum trucks. The cleanup took six days and cost nearly $43,000.

The spill was quickly contained and fish could move to non-affected areas easily. While there was some property damage to boats and docks located within the containment area, the most significant effects of the spill were aesthetic. However, damage to the property and the lake would have been more substantial if not for the quick containment actions of the response team.

In another spill from a vegetable oil refinery in Macon, Georgia, soybean oil was released from an aboveground storage tank (AST) that was accidentally overfilled. Rapid response prevented significant damage from the spilled oil, which had flowed through a storm water system and entered a stream. Investigation of the spill incident revealed that previous spills from the facility had entered the sanitary sewer system and damaged the sewage treatment plant.

Spills of petroleum and vegetable oils and animal fats can affect drinking water supplies, and have forced the closure of water treatment systems. Rancid smells, fouling of beaches, and destruction of recreational areas have been reported after spills of vegetable oils and animal fats. Small spills of petroleum and vegetable oils and animal fats can cause significant environmental damage. Real-world examples of oil spills demonstrate that spills of petroleum oils and vegetable oils and animal fats do occur and produce deleterious environmental effects. In some cases, small spills of vegetable oils can produce more environmental harm than numerous larger spills of petroleum oils.

Prevention measures and rapid response offer the only effective means of minimizing the immediate, devastating effects and long-term environmental effects of spills of petroleum and non-petroleum oils, including vegetable oils and animal fats.

Canola Oil Spill in Aberdeen, MD

In the early morning hours of February 5, 1998, a tanker truck full of canola oil headed for a Frito Lay plant overturned, in Aberdeen, Maryland, spilling approximately 5,000 gallons of oil and some diesel onto the road and into a nearby drainage ditch. The oil then ran from the drainage ditch into an unknown creek. The canola oil solidified approximately one-half mile

Overturned truck carrying canola oil

downstream and was very deep in some pockets.
A contractor performed booming operations on the creek and then proceeded to vacuum and drum the now semi-solid oil. Approximately 5,200 gallons of oil and water were vacuumed and drummed up. A temporary road had to be constructed in order for the vacuum truck to gain access to the creek. The U.S. Coast Guard declared the site clean on February 13, 1998. One week later, when the vacuum truck was cleaned, live fish and crayfish, as well as several dead animals, were found in the tank after the oil had settled to the bottom. The spill caused a fish kill downstream where the creek joined the Chesapeake Bay.

Hydrogenated Oil Spill Affects California Seabirds

The following information was provided by the Bird Rescue Research Center in Berkeley, California.

In late October 1997, approximately 2,300 gallons of a mixture of vegetable, sardine, and fish oils was found contaminating the waters of Monterey Bay, along the central coast of California. This discovery led to the activation of the Oiled Wildlife Care Network, part of the Office of Spill Prevention and Response, California Department of Fish & Game. Pending identification of the oil, efforts to clean it up were limited. The oily substance was not similar to petroleum and, therefore, did not respond to the mechanical clean up methods (pads or netting) used in other oil spills. A total of 505 live birds were recovered. The majority of these birds were Western grebes, Clark's grebes, common loons, and surf scooters. Birds that were recovered from the field were brought to the newly constructed Marine Wildlife Veterinary Care and Research Center in Santa Cruz, California. Originally intended for the care of sea otters, the center had to be quickly converted from a salt water to a fresh water facility, complete with the soft water treatment necessary for the care of oiled seabirds.

When birds are oiled, a variety of detrimental physiological effects result. The primary initial problem is that oil disrupts the microstructure of the feathers, leading to a loss of waterproofing. The particular substance involved in this spill was especially sticky and penetrated deep into the feathers of the affected birds. Once waterproofing was disrupted, the birds no longer were protected from cold seawater and very quickly became hypothermic. As is common in all spills, this hypothermia forced the birds to beach themselves, where they were vulnerable to predators and were unable to feed, leading to starvation. In addition, the birds involved in this spill were already weakened from migration and molting. Because of the compromised physiological status of birds on admission, it was necessary to stabilize them before the oil could be removed from their feathers. This process, which is always necessary in spill response, included restoring normal core body temperature, rehydration, supplemental nutritional feedings, and the resolution of any individual medical needs. During this spill response, the washing process was complicated by the especially viscous nature of the oil, necessitating pretreatment of feathers with special substances that softened the fish oil. Other

Volunteers wash a California seabird coated with a mixture of fish and vegetable oils.

complications ensued from captivity related problems. Loons are very highly stressed in captivity and have a very short "window of opportunity" for rehabilitation. If they are held out of water for longer periods in captivity, they are prone to developing pressure sores on their breastbones, legs, and feet. In addition, most seabirds are susceptible to a fungal respiratory disease in captivity, caused by the organism *Aspergillus fumigatus*. Necropsies performed on some of the birds that died during this spill response indicated that bacteremia and pneumonia due to *Salmonella* further contributed to loss of life. Because this was not a petroleum-based product, some of the complications associated with exposure to polyaromatic hydrocarbons, toxicity such as hemolytic anemia, were avoided in these birds. However, exposure to vegetable oils and animal fats has been documented to produce such toxic effects as diarrhea, lipid pneumonia, liver toxicity, reproductive failure, and various types of cancer. Of the 505 live birds recovered in this spill, 254 were released, 189 were euthanized, and 62 died.

In general, vegetable and fish oil spills present their own unique set of problems. While the toxicity associated with the polyaromatic hydrocarbons of petroleum are not a factor, other contaminants in the oil can lead to seabird morbidity and mortality. In this spill response, it is theorized that the *Salmonella* found in some of these birds may have been associated with the product itself. Dyes associated with some vegetable oils, for example, potato chip frying oils, can stain feathers and be difficult to remove. In addition, the viscous nature of most of these oils not only leads to complications with washing feathers but can cause corrosion of these feathers, causing irreparable problems with waterproofing.

After extensive washing, birds still have oil coated on feathers.

Whether or not the product is petroleum based, a spill response of this magnitude requires a tremendous amount of effort. In this case, members of the Oiled Wildlife Care Network, public agencies, and trained volunteers all contributed to a smoothly running incident response.

Animal Fat Spill Clogs Major Artery

The following article contains information excerpted from the May 1, 1998, edition of the Cincinnati Enquirer.

At approximately 8:30 a.m. on April 30, 1998, a tanker truck carrying 46,000 pounds of animal fat overturned on Interstate 74 in Cincinnati, Ohio, spilling all but residual amounts of its load. The animal fat was originally destined for processing for use in soaps, detergents, and personal-care items. The tanker spill became a slippery traffic hazard, affecting over a quarter-mile of a bridge deck and forcing the closure of an eastbound section of I-74. Some sections of the roadway were covered with two to three inches of animal tallow. Storm water drain holes in the bridge deck allowed the tallow to reach areas below the deck before clogging some of the drains. Ditch and land areas below the ramp system contained pooled tallow. Tallow was also found in Mill Creek, but was unrecoverable due to high flows.

Cleanup response began when the EPA Duty Officer notified the On-Scene Coordinator (OSC) of a citizen's report of the truck accident. The OSC met with representatives of the Cincinnati Fire District and the Cincinnati Metropolitan Sewer District, and the responsible company was contacted.

Cleanup was initiated by the Ohio Department of Transportation, and the responsible company contracted with Clean Harbors to perform cleanup operations.

The first priority of cleanup operations was to return the bridge deck to conditions which would allow traffic usage. Clean Harbors performed solids pickup, brooming, and washing of the bridge deck. As directed by the OSC, all waste waters were collected for disposal. Several products were tested for effectiveness on patches of the spill. The OSC found the detergents chosen to be chemically acceptable, but still advised that all waste waters should be collected for disposal. When the acceptable (by the National Oil and Hazardous Substances Pollution Contingency Plan, NCP Product Schedule) detergents were not effective in cleaning some areas of the roadway, the OSC advised Clean Harbors that use of a caustic cleaner, which appeared to work on more heavily contaminated areas, was recommended in inland areas. Contaminated soil was removed from areas under the bridge and sprayed with a microbe/bacteria bio-degradation material in areas where excavation was not feasible to enhance bio-degradation of the remaining tallow.

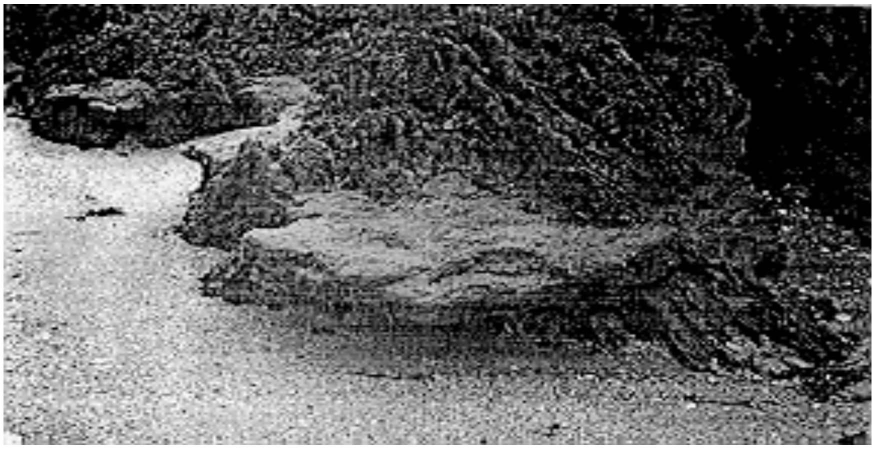
Frozen animal fat from overturned tanker truck

Toxic Effects on Mussels

The following is an excerpt from the October 20, 1997, edition of the Federal Register and a selection from articles published by Dr. Stephen Mudge, who holds a Bachelor of Science degree from the University of Wales, Bangor, and a Ph.D. from the NERC Unit of Marine Invertebrate Biology. Currently, Dr. Mudge is a lecturer at Bangor and is performing research on a variety of studies, including organic pollutants and biomarkers in the marine environment, and the use of BIODIESEL to clean up oil spills.

Dr. Mudge has published various articles, including "Vegetable Oil Spills on Salt Marshes" and "Deleterious Effects from Accidental Spillages of Vegetable Oils." Both publications are also referred to in the Federal Register.

The detrimental environmental effects of sunflower oil have been investigated extensively in laboratory studies and in the field at the North Wales site of the 1991 wreck of the cargo tanker M.V. Kimya, where much of its 1500-tonne cargo of crude sunflower oil was spilled over a 6-9 month period.



Sunflower oil on marine sandy sediment after three years

Mussels died in the intertidal shores at sites near the wreck; in other areas where mussels survived, their lipid profiles revealed an altered fatty acid composition reflecting the fatty acids in sunflower oil. Motile species that left the spill area were replaced with other species, affecting diversity.

Sunflower oil, olive oil, rapeseed oil, and linseed oil produced several types of adverse effects in mussels at low exposure rates in the laboratory. These four vegetable oils killed mussels or reduced their growth rate as much as fivefold within four weeks, even at low exposure rates (1 part of oil in 1000 in a flow-through sea water system). Mussels exposed to linseed oil were more likely to die. Exposure to sunflower oil, greatly reduced growth, created behavioral differences in the mussels, such as decreased foot extension activity and altered gaping patterns. Interference with foot extension activity that allows the mussels to form threads for attachment to the substratum can dislodge mussels and endanger their survival; removal of the oil reversed the effect.

All four oils killed mussels in mortality studies in the laboratory; 10% mortality was observed in mussels exposed to sunflower oil, rapeseed oil, or olive oil for up to four weeks, while 70% or 80% mortality was reported when mussels were exposed to linseed oil. No control mussels died. Mussels began dying the second week after exposure to linseed or sunflower oil, and later when exposed to rapeseed or olive oil. Death may have been caused by suffocation in mussels that refused to gape in the presence of the oil or by formation of a toxic metabolite. The death of mussels in aerated growth tanks where anoxia (lack of oxygen) was not the cause of death suggests that vegetable oils kill mussels through mechanisms of toxicity.

The shells of mussels exposed to the vegetable oils in the laboratory lacked the typical nacre lining, perhaps because of altered behavior in the presence of oil stressors. The internal shell surfaces of mussels treated with vegetable oils were chalky in contrast to controls that

Report Vegetable Oil/Animal Fat Spills

Call the National Response Center at:

1-800-424-8802.

Failure to notify the appropriate federal agency of an oil spill (including vegetable oils or animal fats) or chemical discharge may result in a maximum penalty of $250,000 and 15 years imprisonment for the individual or $500,000 for the organization. [Section 311(b)(5) of CWA].

exhibited an iridescent luster. Prolonged closure of the mussels in response to oil can cause anoxia and increase the acidity of the internal water with dissolution of the inner shell.

Sunflower oil from the wreck of the M.V. Kimya polymerized in water and on sediments and formed hard "chewing gum balls" that washed ashore over a wide area or sank, contaminating the sediments inhabited by benthic and intertidal communities near the spill. Concrete-like aggregates of sand bound together with sunflower oil remain on the shore near the site of the M.V. Kimya spill almost six years later. In field experiments on a saltmarsh with 35-day simulated spills, linseed oil percolated rapidly through the sediments, but sunflower oil polymerized and formed an impermeable cap, reducing oxygen and water permeability. In the environment, oxygen reduction would eventually produce anoxia in sediments with the death and removal of benthic organisms, changes in species from a community that is aerobic to an anaerobic community, and erosion of the saltmarsh sediments.

Some references that describe these studies in laboratories and field studies conducted by Dr. Mudge are listed as follows:

Mudge, Stephen M., A. Salgado and J. East. (1993). Preliminary Investigations into Sunflower Oil Contamination Following the Wreck of the M. V. Kymia. Marine Pollution Bulletin 26 (1): 40-43.

Mudge, Stephen M. (1995). Deleterious Effects from Accidental Spillages of Vegetable Oils. Spill Science and Technology Bulletin 2 (2/3): 187-191.

Mudge, Stephen M. (1996). Pollution caused by accidental spillages of vegetable oil in: Environmental Issues Facing the Edible Oil Industry (Eds) Allen, D.A. & Kochhar, S.P. 123pp SCI, P.J. Barnes & Assocs.

Mudge, Stephen M. (1997) Can Vegetable Oils Outlast Mineral Oils in the Marine Environment? Marine Pollution Bulletin, 34 : 213.

CORRECTION: In the April 1998 issue of the Oil Spill Program Update, the Office of Pipeline Safety was incorrectly stated as “OPA” in the article, “Recent Highlights from the Office of Pipeline Safety.” We regret any confusion this has caused.