

# Kerosene and Jet Fuel Spills

## Definition

Kerosene is a light refined product (C<sub>6</sub>-C<sub>16</sub>) that has a lower boiling point range than diesel/No. 2 fuel oils. Jet-A (freeze point of -40°C) and Jet-A1 (freeze point of -47°C) are highly refined kerosene-type fuels used in commercial and general aviation turbine engines. JP-8 is military fuel that similar to Jet-A1 but contains additional additives (de-icing, antibacterial, anti-corrosive and anti-static agents), that are added in amounts equal to a few 100 ppm. These are the most commonly used jet fuels today.

## Properties

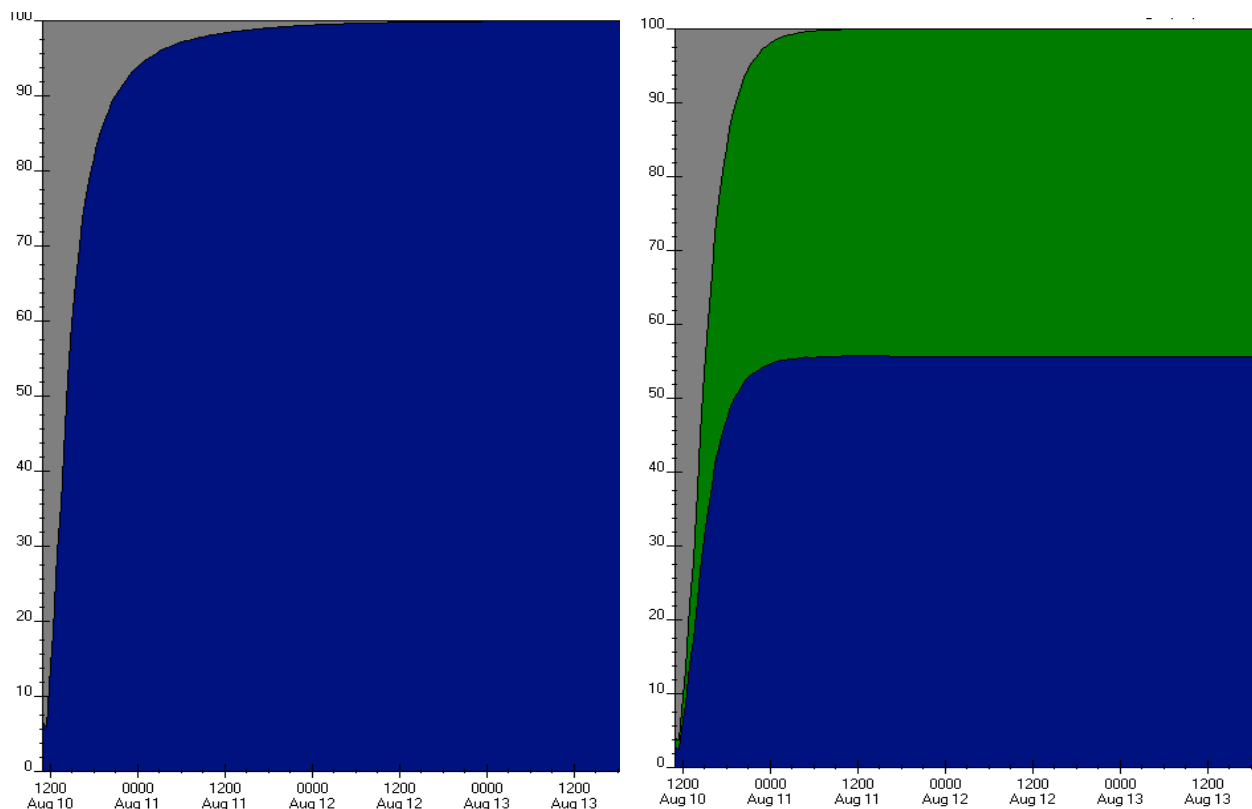
- All of these light refined fuels are composed light hydrocarbons with a relatively narrow boiling range and have low viscosities, meaning that, when spilled on open water, most of the oil will evaporate or naturally disperse within a day or less (see ADIOS® oil weathering plots on the next page). Thus, seldom is there any oil on the surface for responders to recover from open water.
- These oils are much lighter than water (specific gravity is 0.77-0.85, compared to 1.00 for freshwater and 1.03 for seawater). The API gravity is >40.
- Water solubility at 70°F ranges from 50-80 ppm and is linear with temperature. The water-soluble fraction contains about 6-7 ppm aromatics, which are mostly the mono-aromatic compounds, with xylenes, ethylbenzene, and trimethylbenzenes being the dominant compounds in solution.
- Kerosene and jet fuels are virtually clear and extremely difficult to see on the water.

## Environmental Behavior

- When spilled on water, kerosene-type oils spread very quickly to a thin film. Even when the oil is described as a heavy sheen, its thickness may be less than 0.0004 inches (0.01 millimeters) and there will be about 1,000 gallons per square nautical mile of continuous coverage. The volume of oil in areas covered by streamers would be much less. Silver sheen only contains about 75 gallons per square nautical mile.
- Jet fuel or kerosene that is dispersed in the water column can adhere to fine-grained suspended sediments, which then settle out and get deposited on the bottom of a waterbody. This process is more likely to occur in streams and rivers with significant suspended sediment loads. It is less likely to occur in open marine settings. This process is not likely to result in measurable sediment contamination for small spills.
- Kerosene-type fuels are not very sticky or viscous, compared to black oils. When small spills do strand on the shoreline, the oil tends to penetrate porous sediments quickly, but also to be washed off quickly by waves and tidal flushing. Thus, shoreline cleanup may not be needed.
- Where larger amounts of oil soak into wetland soils, expect high mortality of animals and plants.
- Kerosene-type fuels are completely degraded by naturally occurring microbes, under time frames of 1-2 months when there is sufficient oxygen. Fuel that has penetrated to 1 ft in sandy soils can take more than 18 months to degrade. Nutrient addition and vegetation may speed this process in soils.

## Environmental Effects

- The rapid loss by evaporation for spills to open water reduces the exposure to aquatic organisms, thus fish kills are seldom reported.
- Spills to small streams with dense vegetation cover will evaporate much slower, allowing the fuel to persist and impact both animals and vegetation. For example, the release of 112,000 gallons of JP-5 into a mangrove creek in Puerto Rico in October 1999 resulted in impacts to 50 acres of mangrove forest and mortality of 30 acres. There was extensive mortality of fish, shellfish, and birds. A culvert was plugged to prevent the fuel from spreading further downstream, which raised the water level by 3 ft. The mangrove canopy slowed evaporation, allowing recovery of 15-20% of the spilled fuel.
- Jet fuels are relatively less acutely toxic than diesel. Aquatic organisms that come in direct contact with naturally dispersed and entrained jet fuel in the water column may be killed. However, small spills in open water may not result in fish kills. Fish kills may occur for small spills in confined, shallow water and in streams, where weathering and mixing are reduced. Fish and invertebrates in small streams can be affected for miles downstream of a jet fuel release into the water.



ADIOS model output for a jet fuel spill of 100 bbl; winds of 5 knots (left) and 7 knots (right). Jet fuel and kerosene are lighter than diesel/No. 2 fuel oil, with higher rates of evaporation under similar conditions. **Blue = evaporated; green = dispersed; grey = remaining.**

ADIOS (Automated Data Inquiry for Oil Spills) web link: <https://response.restoration.noaa.gov/adios>

