



**Oil Types  
and  
Physical and  
Chemical Properties  
of Oil**

# Petroleum Oil Types

Asphalt

Biodiesel

Diesel Fuel, High Sulfur

**Diesel Fuel, Low Sulfur (LS) and Ultra Low Sulfur (ULSD)**

Diesel Fuel, Non-Road and Locomotive Marine (NRLM)

Gas Oil

Gasoline, Unleaded E-10 with 10% Ethanol

**Gasoline, Unleaded: Regular, Mid-Grade and Premium**

Jet Fuel

Av Gas

Kerosene, K1 and K2

Light Cycle Oil (LCO)

Bunker C

Marine Fuel Oil

Marine Gas Oil

Motor Oils

Lube Oils

TransMix

Utility Fuel Oil

Crude Oil

# Petroleum Oil Types

Petroleum oils can be classified into four types:



1. Very Light Oils (jet fuel, gasoline, kerosene)
2. Light Oils & Middle Distillates (fuel oils, diesels, light crudes)
3. Medium Oils (most crude oils)
4. Heavy Fuel Oils (heavy crude oils, No. 6 fuel oil, Bunker C, IFO)

# Key Chemical or Physical Properties of Oils

## Solubility

- the ability to dissolve in water. Oil and water do not mix, and oil will generally not dissolve in water, but some of the components of oil will dissolve in water.

## Viscosity

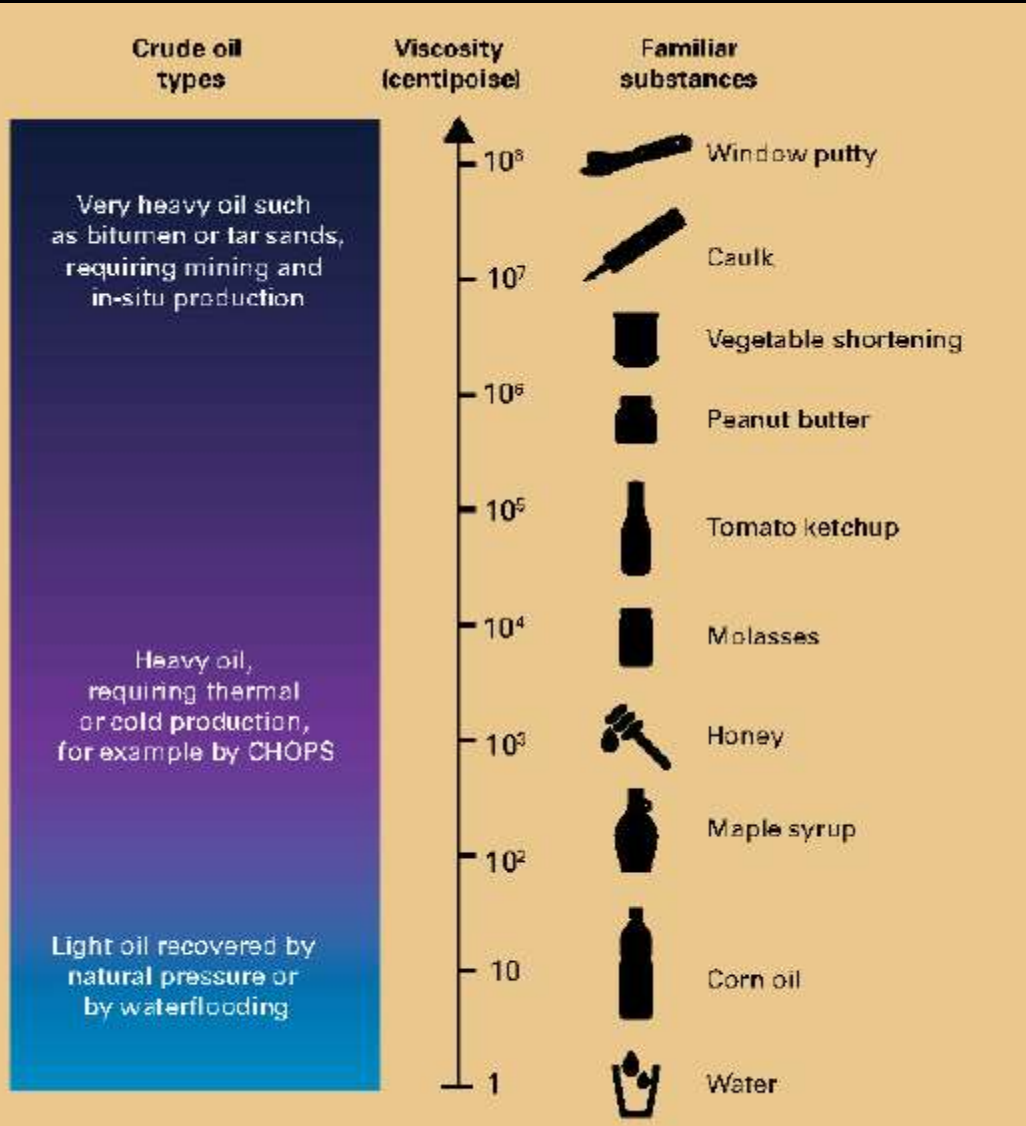
- refers to a liquid's resistance to flow and therefore affects the rate at which a spilled liquid will spread. Low viscosity = more easily it flows (thinner). Higher viscosity = less easy it flows (thicker).

## Volatility/Evaporation

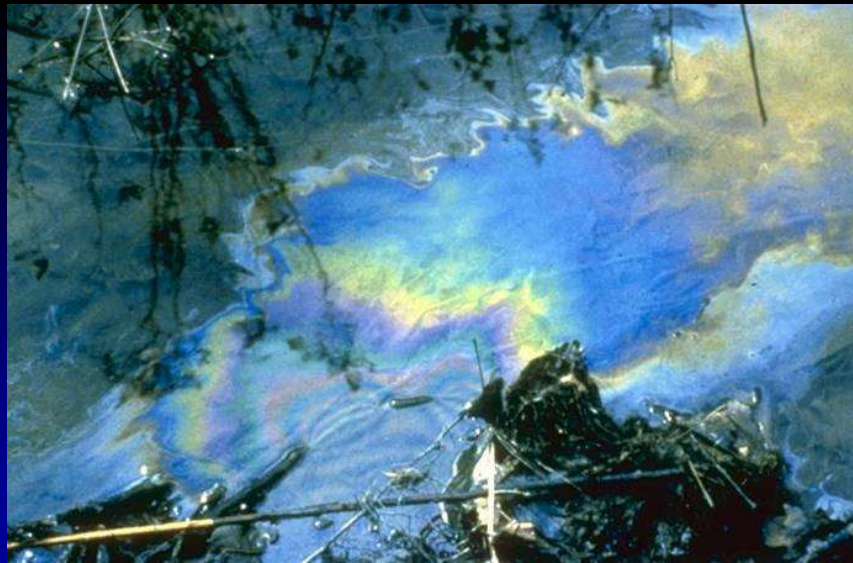
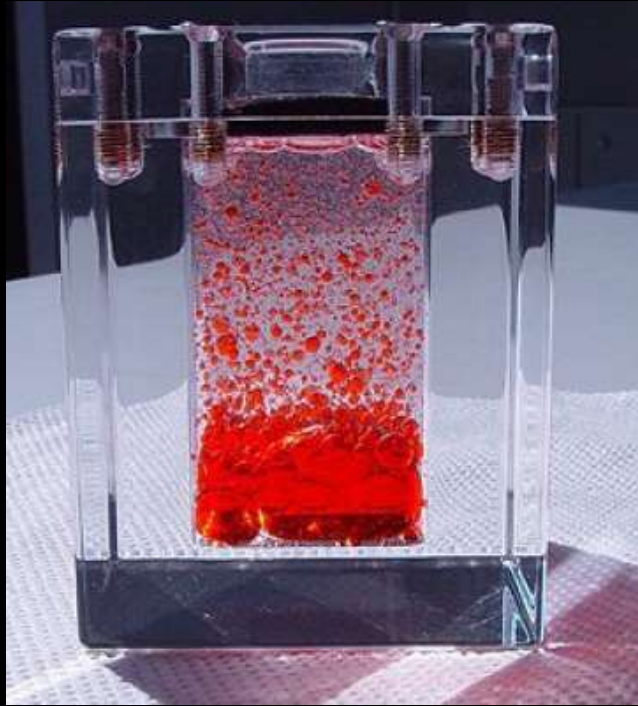
- the molecular process of a liquid changing to a vapor. Affects how quickly oil will evaporate. Contributes to the weathering of spilled oil. Oils are made of thousands of compounds and do not evaporate at a constant rate.

## Density/Specific Gravity

-the measure of a material's density compared to water, where the SG of water = 1.0. SG and density indicate whether a spilled material will sink or float on water.  
(1, <1, >1)



Approximate viscosity of crude oil types, compared with those of familiar household substances



# Oil in the Environment - Interaction Processes

- **Evaporation** – single most important process over the first few days (is directly related to volatility/vapor pressure and ambient temperature)
  - Gasoline – up to 100%
  - Crude Oils – 20-60%
  - Bunker C – 5-10%
- **Dissolution** – chemicals dissolve in in water
  - Benzene, toluene, xylene
  - Toxic to aquatic organisms

# Oil in the Environment - Interaction Processes, cont'd.

- **Emulsification** – the mixing of oil and water – can form a viscous and sticky “mousse”:
  - Recovery equipment works poorly on mousse
  - Slows weathering
  - Increases oil volume 2-3 times
  - Typically happens to crude oils, not gasoline or diesel





# Oil in the Environment - Interaction Processes, cont'd

- **Aggregation** - oil aggregates, or consolidates, in the form of lumps, tar balls, or pelagic tar. Aggregates can be found in rivers, open water, and beaches.
  - Aggregates can:
    - range in size from 1 mm – 50 cm.
    - exist for weeks to years.
    - degrade slowly and are persistent in the environment.



## Washington Dept. of Ecology Oil Spill Damage Compensation Schedule

### Relative Ranking Scores for Classified Oils

Oil Class	Acute Toxicity	Mechanical Injury	Persistence
Prudhoe Bay Crude Oil	0.9	3.6	5
Bunker C	2.3	5	5
No. 2 Fuel Oil	2.3	3.2	2
Gasoline	5	1	1
Kerosene	1.4	2.4	1
Kerosene-type Jet Fuel	1.4	2.4	1

Ranks are based on scale of 0 to 5, where 0 represents the least harmful effect and 5 represents the most harmful effect.

# American Petroleum Institute

## Numerical Scale for Relative Persistence of Oil and Oil Products in the Aquatic Environment

Oil/Oil Product	Relative Persistence Ranking <sup>1</sup>	Persistence Classification
Gasoline	1	"relatively nonpersistent"
Jet Fuel	2	
No. 2 Fuel Oil	8	
Lube Oils	55	"slightly persistent"
Light Crude Oil	320	"highly persistent"
No. 6 Fuel Oil	400	
Medium Crude Oil	450	
Heavy Crude Oil	590	
Residual Asphaltenes	1,600	

Relative ranking with "1" being least persistent to "1,600" being extremely persistent.

# Questions?

