Oil and Grease in Wastewater

Oil and Grease

* Found in domestic wastewaters & certain industrial wastes

* Cause problems

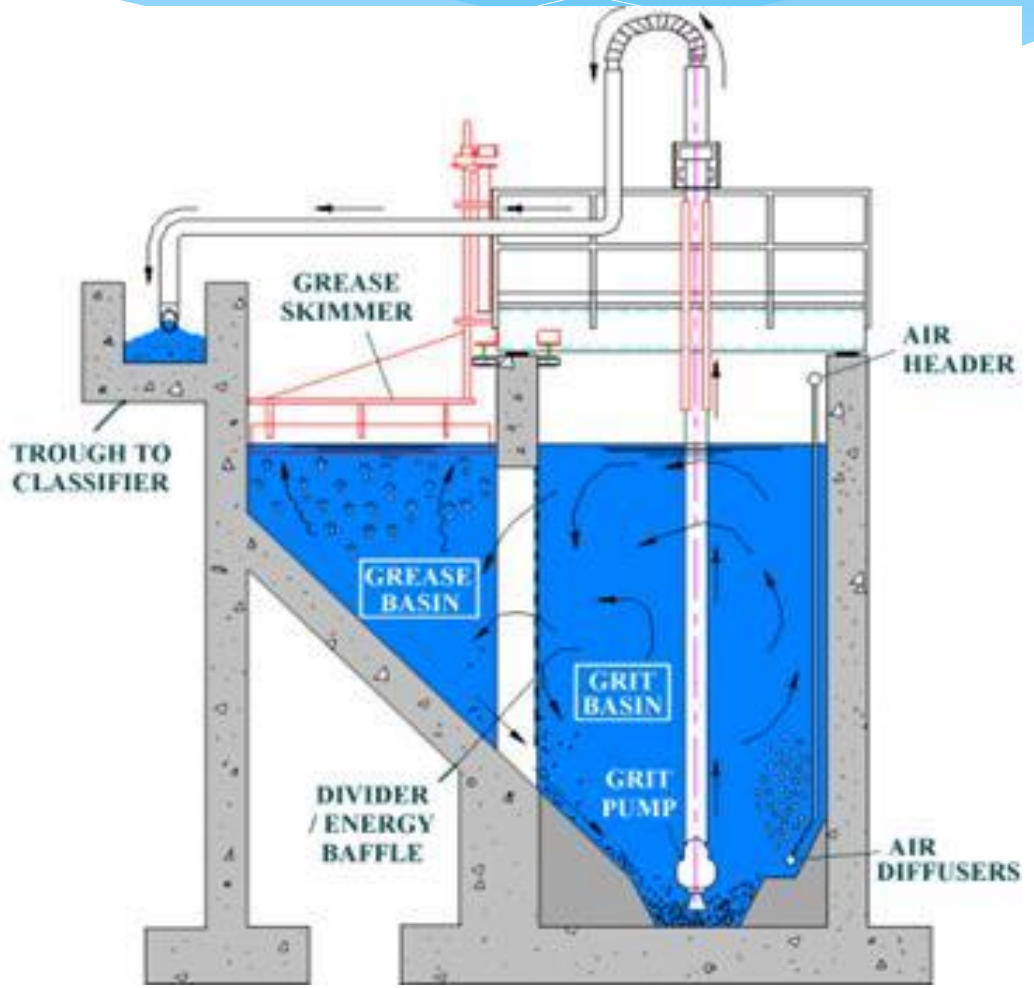
transportation of sewer through pipelines

during treatment and

ultimate disposal into receiving waters

Oil and grease → Poorly soluble in water and tendency to separate from aqueous phase

* Advantageous for separation by flotation

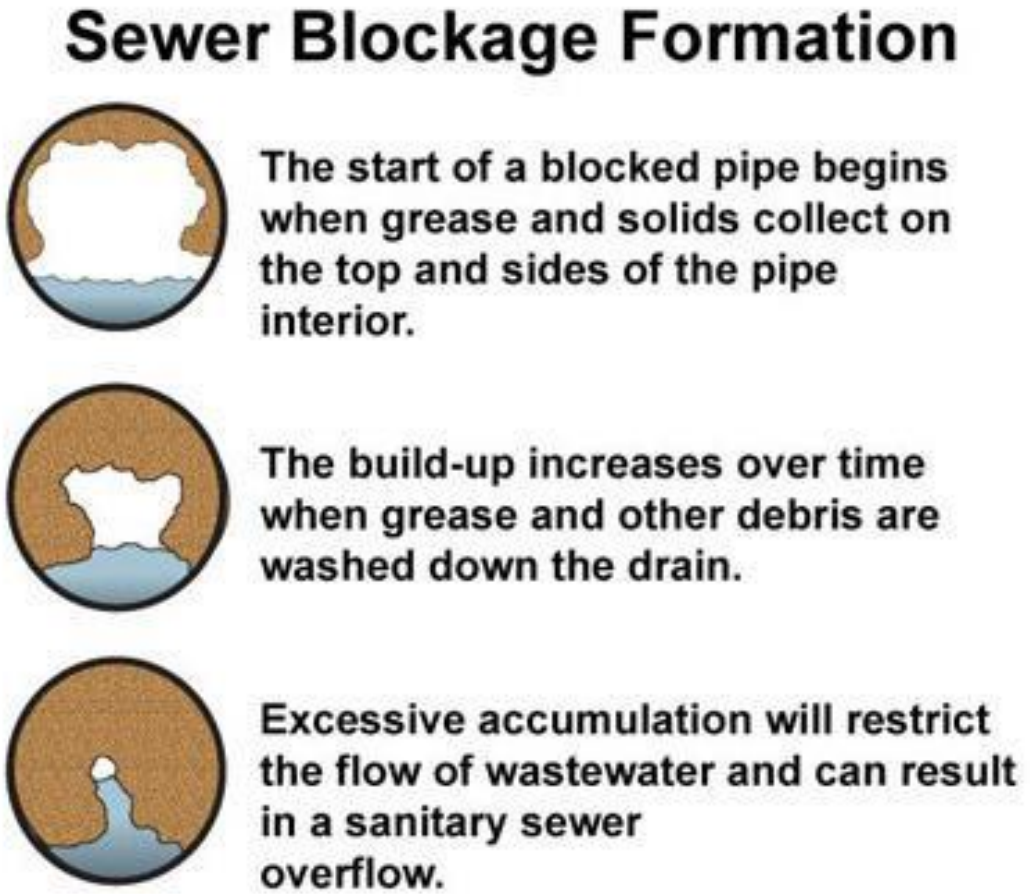


Wastewaters from meat packing industry, slaughter houses and restaurants are high in oil and grease content.

Decrease carrying capacity of sewers.

Such industries should apply preliminary treatment for the recovery of oil / grease before discharge.

* When discharged into sewer lines, O/G accumulates and sticks to pipe walls causing clogs in the sanitary sewer system.



Classification

FATS	OILS	GREASE
Solid at room temperature	*Liquid at room temperature*	*Turns to liquid during cooking, but solidifies when cooled*
Butter, shortening, margarine Peanut butter Meat trimmings Uncooked poultry skin Dairy: Cheeses, milk, cream, sour cream, Ice cream	Vegetable oil Canola oil Olive oil Corn oil Salad dressings Cooking oils	Gravy Mayonnaise Melted meat fat Bacon and sausage Boiled poultry skin Salad dressing

In domestic ww → oils, fats, waxes and fatty acids are classed as O/G

Industrial ww → oils, fats, waxes, fatty acids and esters

* Oil →Low to high molecular weight HC (petroleum, heavy fuel, lubricating oils)

* Grease →Higher molecular weight HC, glycerides of animal and vegetable origin

The O/G Problem…

In wastewater treatment plants:

Oil/grease separates as scum in primary settling. Sent to sludge treatment with settled solids.

In sludge digestion →Oil/grease float to the surface and form dense scum layer (due to poor solubility in water and low specific gravity)

All O/G cannot be separated in primary sedimentation. Also remain in the clarified water in a finely emulsified form. During biological attack emulsifying agents are destroyed → Fine particles form large particles and separate from water.

Grease accumulates into “grease balls”→ unsightly appearance to the surface of final settling tank

Grease coat the biological forms → interfere oxygen transfer

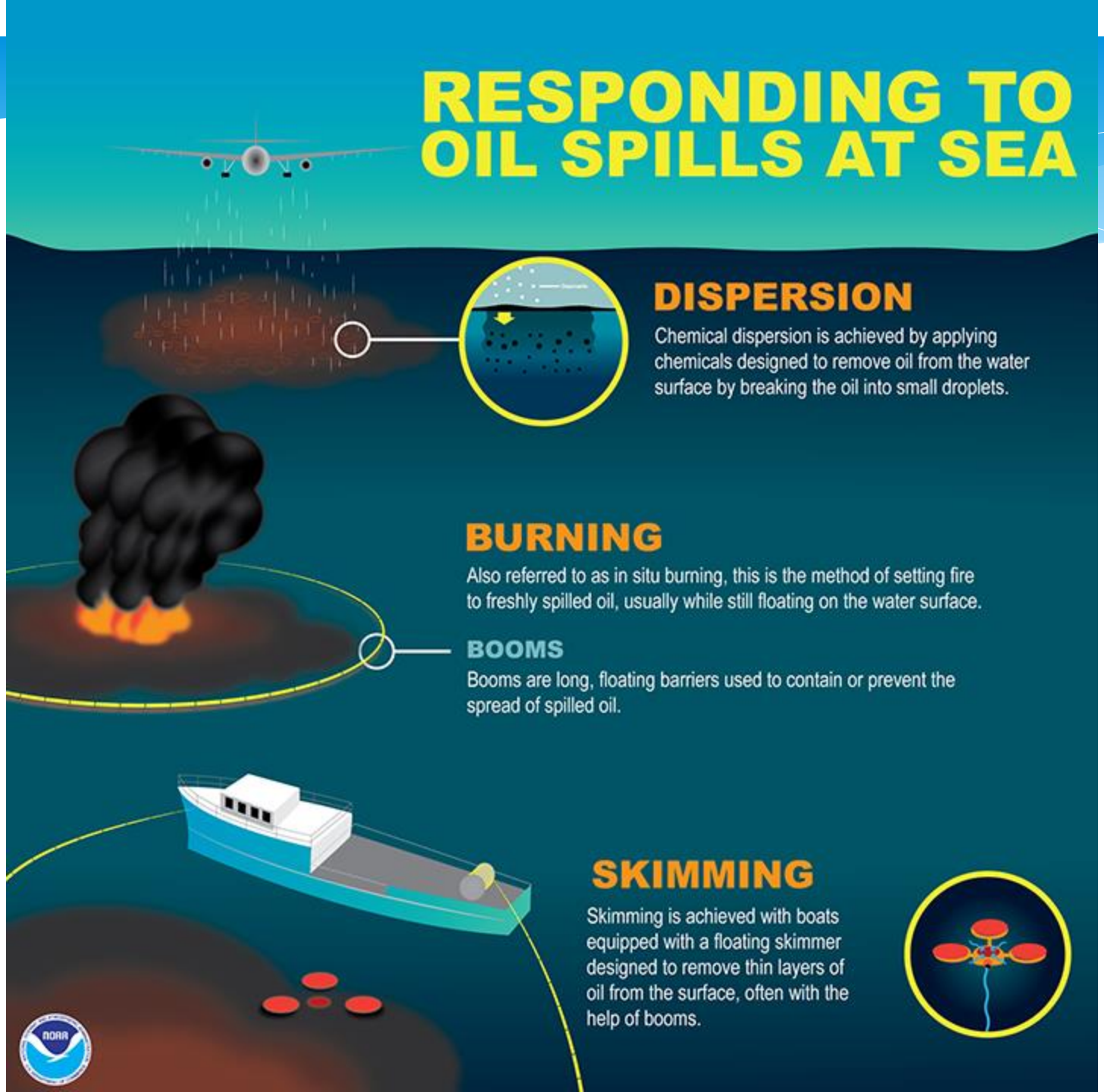
SMOTHERING EFFECT


Oil Spill

Oil Spill Pollution

* Accidental Spills during
  * Storage (leakage fromunderground and aboveground storage tanks)
  * Handling- during transfer
* Offshore drilling
* Routine maintenance activities- cleaninf of shi,ps
* Water sports- motorboards, jetskis leak fuel
* Intentional oil discharges

RESPONDING TO OIL SPILLS AT SEA



DISPERSION

Chemical dispersion is achieved by applying chemicals designed to remove oil from the water surface by breaking the oil into small droplets.

BURNING

Also referred to as in situ burning, this is the method of setting fire to freshly spilled oil, usually while still floating on the water surface.

BOOMS

Booms are long, floating barriers used to contain or prevent the spread of spilled oil.

SKIMMING

Skimming is achieved with boats equipped with a floating skimmer designed to remove thin layers of oil from the surface, often with the help of booms.

A Skimmer

Typical concentrations in wastewaters

Wastewater	Range, mg/L
Sewage	10 - 100
Food Processing	100 - 1,000
Textile	10 - 500
Refining	100 - 1,000
Primary Metals	
Rinse Waters	10 - 1,000
Concentrates	10,000 - 50,000
Metals Fabrication	10,000 - 100,000
Metal Cleaning	
Rinse Waters	10 - 1,000
Concentrates	100 - 5,000
Commercial Laundries	100 - 2,000

Oil and Grease Measurement

O/G are organic substances that are extracted from aqueous solution or suspension by

hexane or

1, 1, 2 - trichloro -1, 2, 2-trifluorethane

(Freon-113 or CFC – 113)

Hydrocarbons, esters, oils, fats, waxes and high-molecular weight fatty acids

→ dissolved by these solvents

- Hexane → Explosion hazard
- CFC-113 → Currently recommended solvent

But it's a CFC (phased out of production → ozone depletion.)

Chloroform, diethyl ether → other solvents

How to seperate

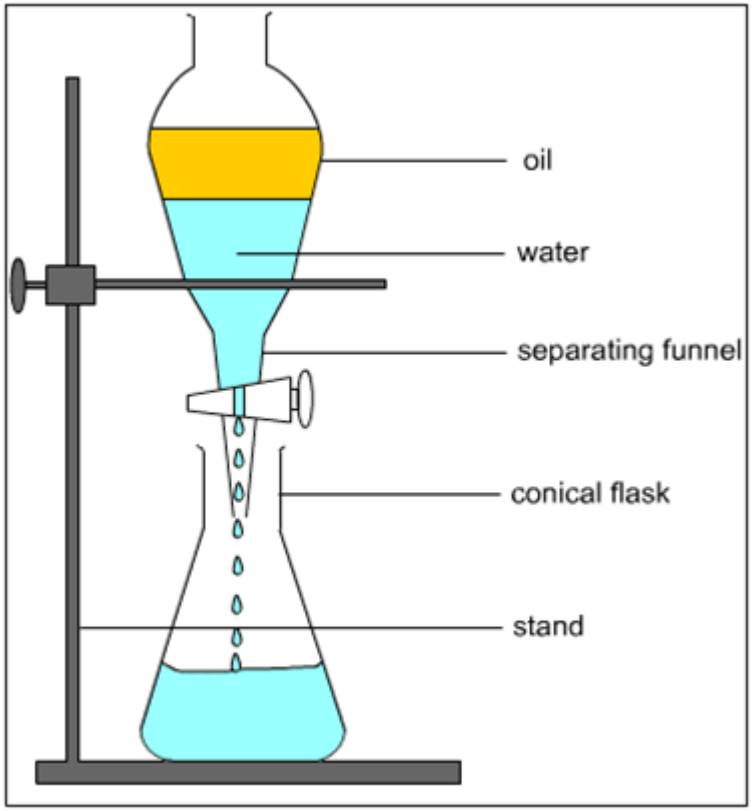


Diagram of Apparatus

•Solvent extraction

Hexane extraction does not measure low molecular weight HC
(Gasoline do not partition well into the solvent)

Require sample drying @103°C prior to extraction

Materials with boiling points below this temperature are lost. Choice of analysis method depends upon the volatility of the contaminants

O/G is seldomly measured in clean waters.

Methods for O/G measurement in water and wastewater:

-Initial extraction into CFC-113

in partition-gravimetric method → CFC-113 separated from water and evaporated → use the remaining in the measurement

Partition – infrared →Extracted materials measured with IR scanning