Ibiza Spill Scenario
Vessel: sank, 40 m depth
Oils: 50 metric-tons heavy fuel oil, and 100 metric-tons light diesel
Conditions: Very light winds and waves

Notes:
Heavy refined products vary greatly, so predictions of long-term fate and weathering (including emulsification) are an estimate until details of the particular fuel are available. The diesel is expected to evaporate quickly, but is more toxic to local marine life. Lubricating Oil information is included as all vessels carry some volume of lubricating oils. Some lubricating oils can emulsify, depending on how they are made.

Weathering and Fate
Heavy Fuel Oils
Heavy refined products, such as Intermediate Fuel Oils (IFO), Fuel Oil No. 6 and Bunker C, are more persistent than lighter refined products. The refining process has removed the lighter components and left them somewhat pre-weathered. As a result they can present quite persistent floating pollutant problems. These oils do occasionally form an emulsion, but usually only slowly, and after a period of days. These oils do not spread into very thin films and often simply break up into smaller patches and then tarballs. Commonly these oils lose enough of their light ends so that they do not rapidly form sheens and the resulting scattered tarball fields are very difficult to observe using visual, or remote sensing techniques. This, combined with the persistence of the tarballs, makes these kinds of spills quite likely to result in long range, and occasionally unexpected, beach impacts.

Fuel Oil No. 6 has a much lower vapor pressure than diesel and will thus be less volatile. The proportion lost to evaporation will be small as will the amount permanently dispersed into the water column. Fuel Oil No. 6 can emulsify with a typical water content of around 30% but usually does so slowly.

Oil Name = FUEL OIL NO.6
API = 12.3 Pour Point = 59 deg F
Wind Speed = constant at 5 m/s Wave Height = computed from winds
Water Temperature = 75 deg F
Time of Initial Release = July 16, 1000 hours
Total Amount of Oil Released = 50.0 metric tonnes

Hours Into Spill	Released metric ton		Evaporated percent		Dispersed percent		Remaining percent
1	50.0	-	1	-	0	-	99
2	50.0		2		0		98
4	50.0	-	4	-	0	-	96
8	50.0		5		2		93
12	50.0	-	6	-	3	-	91
16	50.0		7		4		90
20	50.0	-	7	-	5	-	88
24	50.0		7		5		87
30	50.0	-	8	-	7	-	86
36	50.0		8		8		84
42	50.0	-	8	-	9	-	83
48	50.0		8		10		82
54	50.0	-	9	-	11	-	81
60	50.0		9		11		80
66	50.0	-	9	-	12	-	79

72	50.0		9		13		78
78	50.0	-	9	-	14	-	77
84	50.0		9		15		76
90	50.0	-	9	-	15	-	75
96	50.0		9		16		75
102	50.0	-	9	-	17	-	74
108	50.0		9		17		73
114	50.0	-	10	-	18	-	72
120	50.0		10		19		72

Diesel

Light refined products, such as diesel (or Fuel Oil No 2), typically have very high evaporation rates and do not tend to create persistent slicks. However, the terminology for refined products is not standardized, and, sometimes, heavier intermediate fuel oils are referred to as 'marine diesel'. These heavier products are much less volatile than normal Fuel Oil no 2 and can form a more persistent slick.

When spilled, the diesel spreads quickly into thin films often forming patches of rainbow and silver sheens. If the sheens reach the shoreline in a few hours, a slight staining, or greasy film-like bathtub ring is common. These oils usually do not form a stable emulsion and, as a result, do not form a heavy or sticky residual to clean up.

Note that lighter refined products do have a relatively high concentration of light aromatic compounds and tend to be more soluble and more toxic than heavier oils. These oils do not generally present an involved cleanup problem. <u>However, they can result in an initial toxic shock to biota and can persist as a biological threat in low energy marine environments.</u>

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Oil Name = DIESEL FUEL OIL (SOUTHERN USA 1997)
API = 37.6                                Pour Point = 7 deg F
Wind Speed = constant at 5 m/s            Wave Height = computed from winds
Water Temperature = 75 deg F
Time of Initial Release = July 16, 1000 hours
Total Amount of Oil Released = 100 metric tonnes
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Hours Into Spill	Released metric ton		Evaporated percent		Dispersed percent		Remaining percent
1	100	-	3	-	0	-	97
2	100		6		1		94
4	100	-	13	-	3	-	84
6	100		21		10		69
8	100	-	27	-	19	-	53
10	100		31		29		39
12	100	-	34	-	37	-	29
14	100		35		44		21
16	100	-	36	-	48	-	16
18	100		37		52		11
20	100	-	37	-	54	-	8

Lubricating Oils

Lubricating oils are ubiquitous. They are used in all types of engines operating on land, at sea, or in the air. All lubricating oils are composed mainly of high-boiling point (>400 °C) hydrocarbons containing 25 to 40 carbon atoms per molecule. Compound classes that impart undesirable qualities to a lubricant (waxes, polar compounds, and others) are removed in the refining processes.

To meet the requirements of many different engine types and operating conditions, a multitude of oil products have been developed. These can be divided into two groups: 1) oils used in continuous service, such as turbine oils and 2) oils used in intermittent service, such as motor oils.

Oils used in continuous service operate at a fairly constant temperature for prolonged periods without frequent shutdown or renewal. Stability is of prime importance. Oils used in intermittent service must show little viscosity change with temperature (high viscosity indices). These oils must also be changed at frequent intervals to remove particulates collected during service. Stability of these oils is, therefore, a secondary consideration.

Additives

Additives are used to improve or impart various properties to the highly refined lubricating base oil. Automotive engine oils can contain a wide variety of additives including metallic detergents or ashless dispersants for controlling deposits, oxidation inhibitors, corrosion inhibitors, anti-wear additives, low temperature flow improvers, viscosity and friction modifiers. Railway locomotive diesel engine oils and marine diesel engine oils typically contain ashless dispersants and metallic detergents. Zinc-free detergents and silver lubricity agents are used where silver bearings are present.

Environmental Behavior

Lubricating oils, for all their differences in formulation, have many similarities. When spilled into a lake, river, or ocean they will spread rapidly to a thin slick. They will not evaporate, and they will disperse fairly readily in high energy conditions without the addition of chemical dispersants. In general, lubricating oils will be of low to moderate aquatic toxicity. While the base oils used in the production of lubricating oils are generally of extremely low toxicity to aquatic organisms, the large number of different additives, in varying amounts, make it impossible to issue more specific statements, unless details of the composition (usually proprietary) are known.