SELENDANG AYU INCIDENT – FUEL PROPERTIES AND IMPLICATIONS FOR POTENTIAL SPILLAGES

1. Identity of Oil

The fuel carried by the ship is stated to be IFO 380, a heavy residual oil commonly used as fuel for large vessels. The POLREP of 04.12.16 states that there are three different fuels being carried by the ship, and identifies them as bunkers loaded in Seattle (one of the three) and Singapore (the other two). The three oils have different properties, with stated pour points of -6, -9, and 0°C, respectively. The variability in the pour points indicates that the three oils may have somewhat different properties if they enter the marine environment.

2. Properties of Heavy Fuel Oils

It should be noted that the commonly-used terms, "Bunker C" and "Heavy Fuel Oil", are not specific enough to completely characterize an oil from the perspective of spill-related properties. These are blended fuels, consisting mainly of residual oil from the refining process, with small amounts of lighter, distillate fuel added to bring the mixture's viscosity to specification. The density and pour point of different batches of the oil may vary somewhat while still meeting the viscosity specification. Although the fuel on the Selendang Ayu is stated to be IFO 380, from the pour point information, and the fact that they were loaded in two different ports, would suggest possible variability in their spill behavior.

For comparison, the density, pour point, and flash point of a number of heavy fuel oils are listed below. The products are ranked by pour point for comparison.

As noted in the table, the properties of the fuel loaded at Seattle are known from a fuel quality report provided by the fuel supplier. Based on the reported pour points of the fuel loaded in Singapore, it is likely that the density of that fuel is within the range of densities in this table.

S L Ross Environmental Research Limited
717 Belfast Road • Suite200 • Ottawa, Ontario K1G 0Z4 • Canada
Tel: (613) 232-1564 • Fax: (613) 232-6660 • www.slross.com

Table 1: Comparison of heavy fuel oil properties

Name of oil	Pour point, °C	Density[1], g/mL	Flash point, °C
Intermediate fuel oil 180	-10	0.9778	91
Singapore bunkers "light"	-9	unknown	unknown
Intermediate fuel oil 300	-6	0.9964	>100
Seattle bunkers[3]	-6	0.989 at 15°C	88
Bunker C (Alaska)[2]	-2	0.9954	>95
Heavy fuel oil 6303	-1	1.0015	111
Singapore bunkers "heavy"	0	unknown	unknown
IFO 380 (SLRoss analysis)	6	0.995	90

1. Density at 0°C.
2. One of many reported analyses for Bunker C, termed "Alaska" as it was sampled from a crude oil tanker in Valdez.
3. Fuel quality report supplied by Maritec, analysis of fuel loaded on Selendang Ayu at Seattle 04.11.23

4. Implications for Spilled Oil Behavior

Oils with densities in the range of those in the above table will be buoyant in salt water. It is unlikely that the oil would sink to the sea bottom. However, in all but calm seas, wave energy will cause the oil to be temporarily submerged or overwashed. The oil will likely be broken into pancakes and blobs, eventually forming tar balls. Because they are not present on the surface, their transport will not be as affected by winds as a surface slick would be; rather, tidal currents and larger-scale circulations will determine their trajectory. This can be modeled, but subsurface currents are not generally well known. Given the oil properties and a specified wave energy (wave height), the depth of submergence can also be modeled, but this would not be of great use unless water currents were known for various depths, in which case depths of submergence would be of interest for modeling oil transport.