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EFFEICIENCY OF FINASOL OSR52 vs IFO 180 AND HFO 380

INTRODUCTION

The primary benefit of dispersant use is to prevent or reduce the amount of oil entering coastal habitats, thereby reducing damage to habitat and species.
Dispersants remove oil from the surface of water, distributing it as small droplets into the water column where it is diluted by currents and undergoes natural biodegradation processes.
An oil spill response strategy should include all possible techniques – mechanical recovery (limited), booming/containment, in-situ burning, and dispersant application. The key consideration is the net environmental benefit of dispersant use in the overall response.

Dispersants and how they work
Dispersants promote the formation of numerous tiny oil droplets and retard the coalescence of droplets into slicks because they contain surfactants which reduce interfacial tension between oil and water. Surfactants are molecules with hydrophilic heads which associate with water molecules and oleophilic tails which associate with the oil. Oil droplets are surrounded by surfactant molecules allowing rapid dilution by currents.
The formation of numerous oil droplets improves biodegradation by increasing oil surface area exposed to bacteria and oxygen. Evaporation of volatile hydrocarbons can be enhanced, and the formation of stable mousses (water-in-oil emulsions) may be inhibited and distribution of oil into the water column is of course increased.

The purpose of this work was to determine:
The effectiveness of a commercially available dispersant, namely Finasol OSR 52, against an Intermediate Fuel Oil (IFO180) and a Heavy Fuel Oil (HFO 380).

3. THE MACKAY TESTER
For a number of years The MacKay Tester has been used extensively by a number of international testing facilities in Canada (where it is first developed), the U.S.A., the U.K., Europe and Scandinavia, as a means of evaluating the performances of Oil Spill Dispersants on different oils. The test method has proved to be both robust and reliable over the past 30 years, and has been recognised by authorities world-wide. Australia adopted the method about 27 years ago and it has been in use here ever since.

How the MacKay Tester Works
The MacKay Tester uses a wind-driven wave action in a circular tank to provide the natural shear and mixing forces necessary to cause chemically treated oil to break away from the surface slick and enter the water column in the form of tiny particles. By varying the wind speed and air/water temperatures, one can simulate a wide range of weather conditions from near-arctic to tropical. The temperatures of the water and air systems can be kept within plus or minus one degree of the desired test temperature. The salinity can be varied from fresh to estuarine to oceanic.

TESTS
The MacKay apparatus was set to an air and seawater temperature of 20 ºC with a moderate wave action height of approximately 3.5 cm.

A 1:20 ratio is aimed at for the dispersant/oil mixture.

MacKay Apparatus Settings

Wave height	3-4 cm
Wind	13-15knots
Temp water	20°C
Salinity	35.63

After a 10 minute period of mixing (agitation caused by wave action) in the MacKay test chamber, a subsample is taken (10A). The wind is then turned off. After a further 5 minutes, another subsample is taken (5Q) and samples are subsequently extracted with Methylene Chloride.
Calibration standards are made up with the oil used and both standards and extracted samples are analysed by Spectrophotometry.

RESULTS
A good dispersant will immediately break up the oil to really fine droplets and will produce a coffee coloured appearance in the Mackay test chamber. The finer the droplets the longer they will stay in suspension and therefore the % recovery of oil in the "Q cut" (quiescence) ultimately determines this.

IFO180
Finasol OSR52 managed to disperse the IFO180 quite well achieving an average of 82% oil dispersed in the active phase (10A).
After the wind and wave action was stopped, the size of the oil droplets would cause them to return to the surface due to their buoyancy thus resulting in an average of 21% recovery.

FINASOL OSR52 vs IFO180

		% Oil dispersed IFO 180	
Rep	**Dispersant**	**10A**	**5Q**
#1	**FINASOL OSR 52**	**81**	**22**
#2	**FINASOL OSR 52**	**83**	**19**
#3	**FINASOL OSR 52**	**81**	**22**
	MEAN	82	21

HFO380
HFO 380 is a very heavy fuel and solidifies at room temperature. This makes it difficult for dispersants to penetrate the surface and therefore diminishes its effectiveness.

Finasol OSR 52 managed to give an average of 16% oil dispersed in the active phase (10A). This result is typical of very heavy fuel oils.

FINASOL OSR52 vs HFO380

		% Oil dispersed HFO 380	
Rep	**Dispersant**	**10A**	**5Q**
#1	**FINASOL OSR 52**	**15**	**5**
#2	**FINASOL OSR 52**	**16**	**5**
#3	**FINASOL OSR 52**	**17**	**6**
	MEAN	16	5