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HEALTH, SAFETY AND ENVIRONMENT

GUIDELINE

GUIDELINES ON THE USE OF OIL SPILL DISPERSANT

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This revision of PTS 60.3301 – Guidelines On The Use Of Oil Spill Dispersant (January 2011, Revision 1) has been updated to incorporate PETRONAS Lessons Learnt, Best Practice and new information issued by relevant industry code and standards.

The previous version of this PTS 60.179 (September 1995) will be removed from PTS binder / e-repository from herein onwards.

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PREFACE

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ABBREVIATION

ADDS Pack	Aerial Dispersant Delivery System Pack
ASEAN	Association of Southeast Asian Nations
CONCAWE	Conservation of Clean Air and Water in Europe
Cst	Centistoke
DG	Director General
DOE	Department of Environment
ESI	Environmental Sensitivity Index
FRI	Fisheries Research Institute
IMO	International Maritime Organization
IPIECA	International Petroleum Industry Environmental Conservation Association
ITOPF	International Tanker Owner Pollution Federation
MOA	Ministry of Agriculture
NEBA	Net Environmental Benefit Analysis
OSC	On Scene Commander
PPE	Personal Protective Equipment
PTS	PETRONAS Technical Standard
PSCs	Production Sharing Contractors
UKOOA	United Kingdom Offshore Operators Association
UNEP	United Nation Environment Program

1.0 FOREWORD

This document reviews the use of chemicals to disperse oil spills at sea. It describes the types of dispersants available, their mode of action, their application and their environmental impact.

Although the mechanical recovery of spilled oil is the preferred environmental option, constraints on the availability and deployment of containment and recovery systems make the use of chemical dispersants an important option for dealing with oil spills.

Success in the use of chemical dispersants requires an understanding of their action, the effects of using them and their limitations. Dispersants enhance the natural processes of degradation by physically breaking up the oil film and increasing the surface area available for biodegradation and dissolution. If used inappropriately, the effects of dispersing large volumes of oil and dispersant rapidly into the water column can present greater ecological problems than would have resulted from leaving the oil to degrade naturally. The use of dispersants in shoreline clean up has to be carefully balanced with possible short and longer-term environmental damage. Purely cosmetic operations should be avoided, and advice should be sought from specialists on the optimum clean-up operation.

Key points:

- the use of dispersants must always be agreed with local competent authorities,
- modern dispersants can effectively disperse oil if the viscosity is lower than 2000 centistokes. Dispersion becomes progressively more difficult with increasing viscosities up to 5000 centistokes when little oil is dispersed.
- oil on water generally attains an average slick thickness of 0.1 mm or less in an hour or two. This gives a coverage of 100 m³/km². The manufacturers' recommended application rate is typically one part dispersant to 20 parts oil. Therefore with a typical slick, dispersant is applied at 5 m³/km².
- dispersants are most effective when applied soon after the oil is spilt. The decision to use dispersants must be made rapidly. It is important to note that the unsuccessful use of dispersants may preclude the subsequent recovery of oil using oleophilic skimmers.
- the efficiency of dispersants is affected by the characteristics of the oil. i.e. oil density, oil viscosity and emulsification properties, the mixing of oil and dispersants, the slick thickness, the available mixing energy, water salinity and seawater temperature.
- when dispersants are considered for use on the coast the extent of the clean-up operation should be carefully balanced with the possible ecological effects.
- dispersant application rate can be varied. This can be done by changing the pump rate, boat or aircraft speed, number of spray nozzles or number of applications.
- only relatively small spills can be effectively treated by boat.
- control of offshore spraying operations from a surveillance aircraft is recommended, both for application by boat and by air. Aerial application of dispersants can be a rapid and effective method for treating oil slicks. Large aircraft can have high application rates; rapid response times and can treat large areas quickly.
- helicopters can also apply dispersants. Their advantages are maneuverability and convenience (they do not need an airfield).

- the recommended dispersant droplet diameter for aerial application is 500 to 700 micrometers. This size minimizes wind drift and evaporative losses.
- offshore dispersal is the best technique for reducing longer-term impact where sensitive inshore and onshore habitats are threatened by oil.

2.0 INTRODUCTION

2.1 PURPOSE

This Manual is intended to provide guidance on the decision to use, or not to use, oil spill dispersants. The general principles of dispersant use are described in a simple way that should be understood by decision-makers with different levels of expertise in various disciplines. The factors that need to be taken into account are also described to enable a rapid decision to be made about dispersant use.

The basis for application of dispersants is the reduction of possible environmental damage and/or the elimination of possible amenity or economic impacts. When deciding upon the use of dispersant, the advantages of removing the oil from the surface of the water have to be balanced against the disadvantages of possible environmental damage, caused by acute effects of large quantities of oil and dispersant entering the water column.

Every oil spill incident will have specific circumstances that are particular to the oil spill and all these circumstances will contribute to the decision to use, or not to use, oil spill dispersants in the response. The use of dispersants must always be agreed with local competent authorities. A number of national authorities, including Malaysia, maintain lists of approved dispersants, emulsion breakers and surface-film collecting agents.

2.2 OBJECTIVE

This guideline is developed with the following objectives:

- To provide information and guidance on the use of dispersant in handling oil spill;
- To assist OPU's in making decision as to when dispersant should be used in responding to an oil spill; and
- To include the use of chemical dispersant in contingency planning.

2.3 SCOPE AND APPLICABILITY

All requirements established in this document shall be applicable to all PETRONAS OPU's / JV's / Business Units worldwide. In locations where local statutory requirements are more stringent, such requirements shall take precedence.

In locations where the local law prohibits any of the requirements stated in this document, the local law shall take precedence.

This document also provides guidelines for the use of dispersant near shore, onshore and for inland oil spill.

3.0 DECISION MAKING AT THE TIME OF THE SPILL

3.1 THE DECISION TREE INVOLVING THE USE OF DISPERSANT

Appendix 1 of this document provides a clear explanation on the characteristics of dispersant and its type.

Decision making in the use of dispersant should not begin with the actual spill. Decision making should be a part of pre-planning process and covered in the contingency plan. A proper organization should be in place, with well-defined task and responsibilities. Equipment and materials must be identified and in place, along with trained operators, so that rapid action is possible. Contingency plan should include arrangements for rapidly obtaining information on sea state, meteorological conditions and oil characteristics.

The hydrography, bathymetry and ecological characteristics of the shore and near shore areas may be referred to environmental sensitivity maps.

Upon occurrence of an oil spill, time is of the essence, especially in regard to the use of dispersant. Agreement and prior approval for dispersant use are essential to facilitate successful response. A recommended procedure for deciding whether dispersant should be used is shown in **Figure 1**.

The first step is to collect as much information as possible on the oil spill incident. This includes:

- estimates size of the spill
- location of the spill
- characteristics of the oil
- current and the predicted weather/wind conditions.

A key question will be whether a shoreline or sensitive resources is threatened. If there is no threat, surveillance of the oil should continue, since it should always be borne in mind that conditions may change quickly.

3.2 PROHIBITION OF USING DISPERSANT

However, dispersants should not be used:

- In very shallow water, less than 10 metres deep because the 'cloud' or plume of dispersed oil will come into contact with the sea-bed and expose benthic organisms (those that live in the mud and sediment) to high concentrations of dispersed oil.
- On spilled oil that is directly above shellfish beds. Marine filter-feeders such as shellfish that eat plankton may ingest the dispersed oil droplets.
- On spilled oil that is directly over corals, sea grass and fish spawning areas as these may be highly sensitive to dispersed oil.

In general:

- The use of dispersants would **not** normally be recommended in the vicinity of fish cages, shellfish beds or other shallow water fisheries due to the increased risk of 'tainting' (imparting an unpleasant oily taste to the flesh of fish and shellfish).
- The use of dispersants close to industrial water intakes which are normally protected by fixed booms is **not** advisable, since dispersed oil will pass under the booms and may contaminate heat-exchangers.

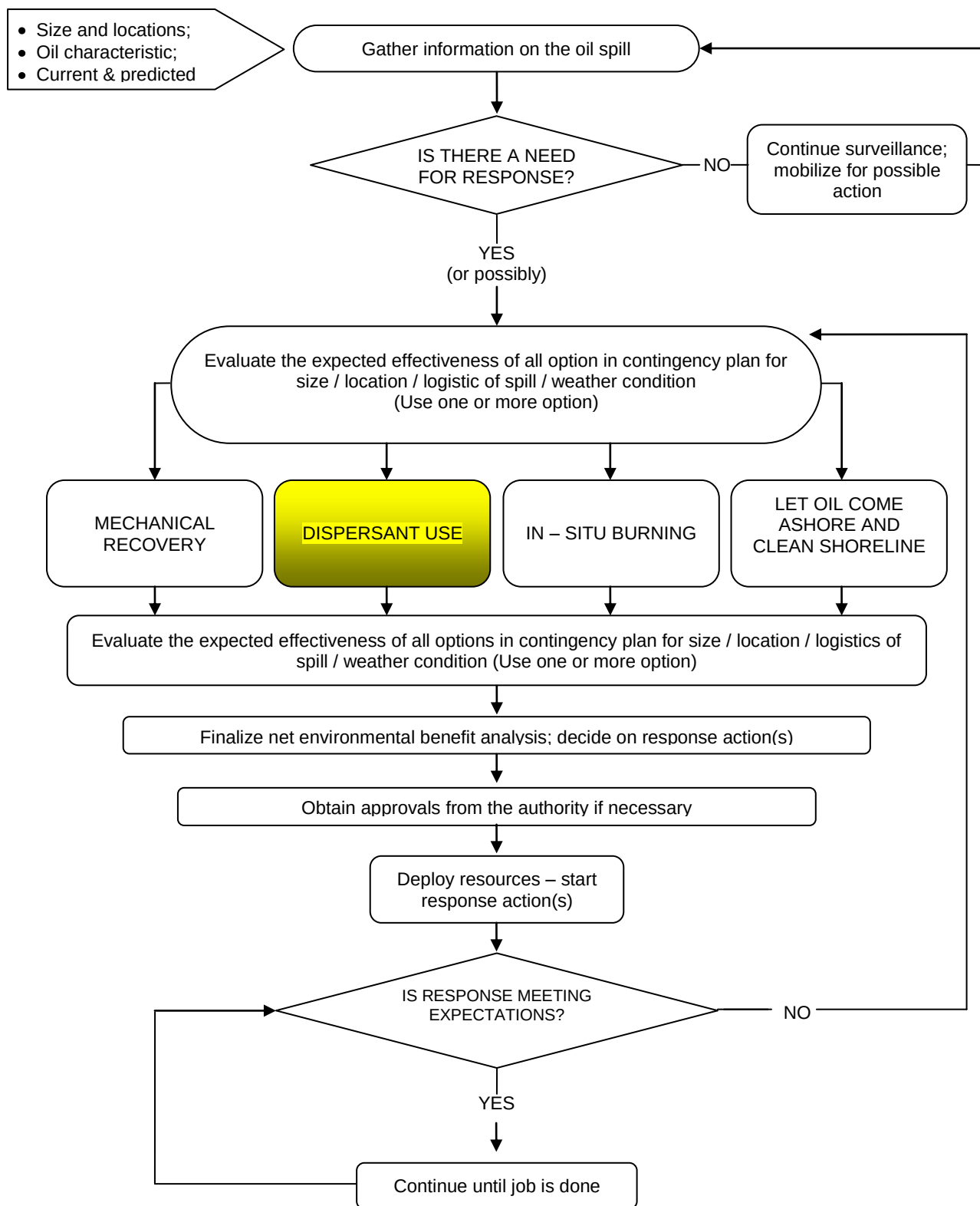


Figure 1: Decision flowchart on the use of dispersant

In **Figure 1** four options are considered, that is, mechanical recovery, dispersant use, in-situ burning and allowing the oil to come ashore. The expected effectiveness for each option should be estimated, based on the available equipment, weather conditions and logistics of the spill.

Surveillance and monitoring of the effectiveness of the response options should continue throughout the operations. If the effectiveness is not as expected, the spill response should be modified to ensure that money, time and effort are not wasted.

4.0 DISPERSANT AND CONTINGENCY PLANNING

4.1 DISPERSANT PRE-APPROVAL

In many large oil spills, there have been sequences of oil releases as a ship breaks up or as oil is released on each tide. The 'window of opportunity' will relate to each of the sequential oil spills and its duration depends on a number of factors. For light oils, the 'window of opportunity' may last up to a week or more. For heavy oils, the 'window of opportunity' may be too short to be practically useable. In general, the window of opportunity to use dispersant does not last beyond two to three days. It is essential that the dispersant option has pre-approval to facilitate rapid decision making.

First, there has to be approval in principle that dispersants can be sprayed at specified locations under defined conditions. This will require consideration of factors such as:

- relative importance of the resources at risk
- water depths
- currents
- wave characteristics and mixing energy
- distance from sensitive resources.

For any area covered by an oil spill contingency plan it is essential to have environmental information, preferably presented on sensitivity maps. Such information can be used in conjunction with prior case-history and experimental evidence (such as is summarized in this report) to help identify where dispersants are a valid option.

Second, named products have to be approved and stocked for use in particular areas. Product approval usually involves testing both for effectiveness and toxicity. Local conditions (e.g. salinity, key species of local flora and fauna) should be considered.

Third, there are logistical requirements, such as approval in principle for aircraft to operate in certain areas, with necessary back-up such as air traffic control and availability of refueling and loading facilities.

The pre-approval process should be established by potential responders in discussion with all relevant organizations (government departments, conservation organizations, research institutions), and involves:

- definition of oil types, scenarios and geographical locations where dispersants are a viable option from the logistical point of view;
- net environmental benefit analysis—consideration of advantages and disadvantages of dispersant use compared with advantages and disadvantages of other response options; and
- in the light of the above, identification of locations and situations where dispersant use can, and cannot, be pre-approved; any restrictions should be clearly indicated on sensitivity maps.

Some countries have defined zones along their coast lines where dispersant use may be restricted. These zones may be extended if there are particularly sensitive resources such as sea farms, marine reserves, fish ponds or estuaries nearby, or by the seasonal presence of migratory species, nesting and spawning activities.