Overview

The Symposium on Dispersants: New Ecological Approach Through the 90's held in Williamsburg, Virginia, in October 1987, summarized research and development on dispersants and other chemical countermeasures and their use during the past 5 years. It was one of the best attended symposia of Committee F-20 on Hazardous Substances and Oil Spill Response in many years with over 145 total participants representing 7 countries.

In the January 1987 call for papers, the chairman requested that papers be submitted stressing the positive developments and uses of innovative countermeasures. There was sound reasoning behind this request. Since the Torrey Canyon grounding in 1967, little "good" or "positive" has been said or written about dispersants. In the United States, the two major agencies controlling the use of dispersants have had what many refer to as an *unwritten* prohibition on their use. This may have been somewhat warranted because of the toxicity of the early first generation dispersants produced from the late 1960s through the early 1970s. However, in the case of the Torrey Canyon spill, the oil itself was highly toxic, the dispersants were almost totally improperly applied, and explosives and napalm were also heavily used. Just the latter two on their own were responsible for tremendous fish kills.

The time has come to add to the technical literature positive papers that address many new and advanced areas, such as guidelines for dispersant use in freshwater and the effects of elastomers on the efficiency of oil dispersants. Several papers in this book discussed modern computer usages to assist response application while another paper described using a computer for both training and contingency planning. Other papers also related the crisis in response training, while another makes an indepth analysis of the behavior of dispersed and nondispersed fuels in sewer systems. The papers assembled in this book break new ground in many innovative areas of chemical countermeasures.

Let it be said from the beginning that the preferred countermeasure will always be to recover the oil as completely as possible and recycle it. Up until recently, recovery of oil was confined to small-scale operations in calm waters and, because it was a labor intensive endeavor, it was generally not very cost-effective. Now, new products and techniques discussed in this book make recovery both a broader and more economical reality.

In the past five years, noted marine biologists, oceanographers, and environmental scientists have spoken out on the positive aspects and overall usefulness of dispersants. Again, it is important to qualify the application of dispersants by repeating what must always be understood . . . When a properly selected dispersant is applied with correct techniques at an approved rate and in a timely manner to an oil that is fresh and known to be dispersible, in water of 10 m or more with some current or flushing action, then one should expect to obtain good results. While this may connote an idealistic scenario, emergency response personnel can today use dispersant chemicals correctly with only minimal training and good contingency planning.

We are definitely in the third generation of dispersants (many will say the fourth). While these newer dispersants are slightly more specialized in their applicability, they are considerably more effective and less toxic than the earlier generations of products. Generally,

when we spoke of dispersants in the past, we simply meant a chemical formulation of surfactants, solvents, and additives which, when applied and agitated, formed an oil-in-water emulsion. Today, there are products listed as dispersants that are designed and formulated for land use only while others may be formulated primarily to emulsify oil or gasoline on street or highway spills. Some products are designed for use in holding ponds and small streams; yet others are designated to be used to clean offshore rigs or bilge tanks. Furthermore, there are probably another half dozen cleaners or emulsifiers for specialized applications that are also called "dispersants." It is, therefore, a case of caveat emptor. One must scrutinize carefully what one buys in order to stock for the appropriate application.

For those of you who may read this book with the intention of formulating or designing a new dispersant or other type of chemical countermeasure, let us in a few words address what might be considered an ideal product. It should be reasonably priced, effective on all types of oil (both fresh and weathered), and easy to apply from shipboard, aircraft, or fire hose. It should be nontoxic to fish and other aquatic life, good for both fresh and saltwater, be self-mixing or require minimal agitation, should help break down the "mousse," and perhaps even be effective on land as well as on the sea. It is obvious that no product could possibly satisfy all these criteria, but low toxicity and high effectiveness are the key elements, and the ability to work on a wide variety of oils (weathered and otherwise) is also crucial.

One can see from the above list of effectiveness standards that there are many qualifications involved in formulating and marketing a new product. A true dispersant should principally be designed for water application rather than as a cleaning agent. Furthermore, a really *good* dispersant will serve naturally as a deterrent to fires and subsequent explosions.

It is also important that we consider the cost-effectiveness of dispersant used in cleaning up spills to navigable waters. When an effective dispersant is used on an oil known to be dispersible, in water which has adequate current or wave action and is of sufficient depth, there is now little doubt that dispersants are probably the most cost-effective method of cleanup short of total removal by vacuum truck or skimmers followed by recycling. Use of dispersants at sea is certainly 10 to 30 times safer and more economical and effective than any attempts to remove an oil slick on shore.

There is a soon-to-be-released (if not already published) National Academy of Sciences, National Research Council, Marine Board two-and-one-half year study on dispersants which, in essence, states that third and fourth generation dispersants are both effective and of minimum toxicity. It was hoped that this book would contain an executive summary of these findings; however, the printing deadline did not allow the release of the data in time.

Over the past five or six years (and perhaps longer), a new breed of oil spill countermeasure products has come to the attention of the Environmental Protection Agency. The first of these were called gelling agents. They originated in Japan and have been in use there for quite some time. These products work well in still waters but are labor intensive and require disposal after utilization. Another group of products is known as emulsifiers. Emulsifiers differ from dispersants in the manner in which they suspend the oil. On the other hand, dispersants disperse it in very small droplets in the upper 3 or 4 m of water. Finally, there is a relatively new line of products known as elasticizers or viscoelastic enhancing agents. One of these is a two-step chemical procedure that forms the oil into a carpet, which can be rolled up and retrieved from the aqueous environment; another process, accomplished in one step, temporarily congeals oil into an elastic bond which can be vacuumed or collected by a skimmer with little or no water separation required. Initially, it was believed that this latter product could only be used in the relatively calm waters of bays or tributaries; however, recent trials 25 miles (40 km) off the coast of Saint Johns, Newfound-

land, indicate that it can achieve outstanding results in open, heavy seas and particularly in holding oil within boomed areas. Films of the test spill of 18 000 gal (68 000 L) of oil indicated great increases in oil recovery using this new agent.

In addition to dispersants, other innovative countermeasure products were demonstrated during the "show-and-tell" session and indicated great increases in oil recovery using this new agent. Products that show tremendous potential are the new sorbents, which for the first time can truly be called ABsorbents in that they collect and retain oil. These absorbents and this viscoelastic enhancing agent indicate great hope for future oil spill cleanups. Some were demonstrated at a special show-and-tell period during the last days of the Williamsburg symposium. The session included about ten booths and was greeted enthusiastically by participants. It is hoped that organizers of future symposia will consider this as an educational and profitable element of the overall program.

Appreciation of help in the review and critique of papers should be recognized. A special expression of gratitude is extended to Bill Katz and Stephen Kaufmann, who, as assistant chairmen gave greatly of their time and valuable knowledge that contributed to the success of the symposium and the completion of this book.

L. Michael Flaherty

U.S. Environmental Protection Agency (retired), 10332 Democracy Lane, Potomac, MD; symposium chairman and editor