



U.S. Department of the Interior  
Minerals Management Service  
Gulf of Mexico OCS Region

FOR RELEASE: March 15, 2001

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**Deepwater Program: Literature Review, Environmental Risk of Chemicals  
Used in Gulf of Mexico Deepwater Oil and Gas Operations  
MMS Study 2001-011 and 012**

A new study report from the Minerals Management Service of the Department of the Interior finds that only two chemicals used by the oil and gas industry could be potential hazards in the Gulf of Mexico. The matter is of interest because chemicals have been used in offshore Gulf of Mexico oil and natural gas exploration and production (E&P) since development of the offshore resources over a half a century ago. From 1947 to 1985, E&P activities focused on the shallow waters of the continental shelf. Since the mid-1980s, however, the pace of exploration and development in the deep waters of the Gulf has accelerated rapidly. By the end of 1999, approximately 1,200 wells had been drilled in water depths exceeding 1,000 ft (305 m) and production from these deepwater wells has now surpassed production in shallow water, despite the fact that only 4 percent of all producing fields in the GOM are in deepwater.

Charged with managing the development of GOM oil and natural gas resources, while ensuring safe operations and protection of the human and natural environment, the Minerals Management Service must consider possible impacts to both nature and human beings from chemicals used in oil and gas development. To do this, MMS needs to know the types and quantities of chemical products used offshore, especially in deepwater, as well as their potential impact. This commissioned report identifies the types of chemicals used in the Gulf and presents their properties, toxicity, usage patterns, and storage and handling practices. Through the use of spill modeling, the potential for environmental risk for a select group of chemicals is evaluated. In addition, this report includes an overview of relevant legislation.

Chemicals perform critical functions during drilling; cementing; well completion, stimulation, and workover processes; and producing processes. Without these essential chemicals, the safe, cost-effective extraction of oil and gas resources would not be practical. In offshore operations, chemicals fall naturally into four major classes: drilling fluid chemicals; cementing chemicals; completion, stimulation, and workover chemicals; and production-treating chemicals. Definite differences are apparent in chemical use in deep and shallow waters in the GOM. For individual locations, these differences include higher amounts of drilling fluid chemicals needed in individual wells in deepwater, a situation that may be caused by the nature of the formations and reservoirs being accessed; higher amounts of some production-treating chemicals (for example, hydrate inhibitors) needed in deepwater production, which may be caused by the deepwater environment; and higher amounts of other production-treating chemicals (for example, defoamers) needed in deepwater production, possibly because of the nature of the produced fluids.

This study identifies the types and volumes of hazardous substances used, handled, and stored in offshore E&P operations. Hazardous chemicals were defined as those substances listed in the U.S. Code of Federal Regulations (CFR) – Chapter 40, Protection of the Environment, Part 116, that designates hazardous substances per the Clean Water Act. Only eight hazardous substances were found to be stored in amounts exceeding reportable quantities: sodium hydroxide, potassium hydroxide, zinc bromide, hydrofluoric acid, diethylamine, toluene, xylene and naphthalene.

As part of the risk characterization, the results of the modeling effort were integrated with the toxicity data collected for the chemical profiles. The results of this analysis indicate that a potential for impact exists for only two chemicals, zinc bromide and ammonium chloride. The modeled impacts for zinc bromide were predicted based on a 45,000 gallon release to the environment. While a spill of ammonium chloride was not modeled, a review of the chemical's structure and properties indicate that it would behave similarly to potassium chloride. Using the modeled exposure concentrations for potassium chloride as a surrogate for ammonium chloride, a comparison with marine toxicity thresholds was conducted that indicates a positive potential for environmental impact. Since the analysis was conducted by proxy, this prediction must be qualified as only an indicator of potential risk and the need for a more focused study on the effects of ammonium chloride on the marine environment.

Results from this report are being used by MMS to modify reporting requirements from operators in the Gulf of Mexico.

To access the Technical Announcement click on [MMS Study 2001-011 and 012](#) or contact Public Information at 1 800 200-GULF. For additional information about this study or the Environmental Studies Program in general, contact the Environmental Sciences Section (MS 5430), 1201 Elmwood Park Boulevard, New Orleans, Louisiana 70123-2394, telephone (504) 736-2752.

The MMS, a bureau in the U.S. Department of the Interior, is the federal agency that manages the nation's natural gas, oil and other mineral resources on the outer continental shelf. The agency also collects, accounts for and [disburses more than \\$5 billion per year in revenues](#) from federal offshore mineral leases and from onshore mineral leases on federal and Indian lands.

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MMS's Website Address: <http://www.mms.gov>