Vista Chemical Company

15990 N. Barker's Landing Rd.
Post Office Box 19029

Houston, Texas 77224
Phone (713) 531-3200

JJH: JCL: TGG: RF
XF: _____

May 1, 1985

VISTA

Mr. Greg Guidry
Shell Oil
One Shell Square
Room 2656
P. O. Box 60159
New Orleans, La. 70160

Dear Greg;

Enclosed are copies of a technical data sheet, aquatic toxicity summary and a Material Safety Data Sheet for VISTA ODC Drilling Fluid Base Oil.

Also, I spoke with Bill Martin at MMS and have sent him the same information. Hopefully you won't have the problem you experienced yesterday again.

Sincerely,

Thomas G. Grumbles, C.I.H.
Director, Industrial Hygiene &
Product Safety

Enclosure

cc: Chuck Putnik
Jordan Layer

VVV 000015764

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JUN: JUL: 1985: RF

RF: _____

May 1, 1985

VISTA

Mr. Bill Martin
Minerals Management Service
P. O. Box 7944
Metarie, Louisiana 70010

Dear Bill;

Per our discussion, enclosed is a technical bulletin and aquatic toxicity summary for VISTA ODC Drilling Fluid Base Oil. I trust this is enough data to demonstrate that this product is environmentally safe for use offshore.

Please call me at 713-531-3445 if you have any questions on this material.

Sincerely,

Thomas G. Grumbles, C.I.H.
Director, Industrial Hygiene &
Product Safety

Enclosure

cc: Chuck Putnik
Jordan Layer

VVV 000015765

VISTA ODC ™ DRILLING FLUID BASE OIL

DESCRIPTION:

Vista ODC™ Drilling Fluid Base Oil* is a light colorless oil with a very low aromatics content, low viscosity, and a mild odor. It is well suited for use as a high-performance, low-toxicity, nonpolluting replacement for diesel oil in oil field drilling applications. Vista ODC Oil has been successfully field-tested as a base oil in drilling muds, as a water-based mud additive, and as a spotting fluid.

Properties Test	Typical
Distillation range, ASTM D-86 F	
IBP, °F	370
EP, °F	518
Aromatics, wt.%	1.0
Flash Point, Pensky-Martens, °F	144
Water, ppm	20
Aniline point, °F	160
Fluorescence	None
Appearance	Clear, water-white
Specific gravity, 60°/60°F	0.8063
API gravity, 60°F	44.1
Viscosity, cSt	
At 70°F	2.10
At 100°F	1.80
Pour point, °F	-75
Sulfur, ppm	1.0
Nitrogen, ppm	1.0
Interfacial tension versus 30% $CaCl_2$ solution, dynes/cm	34.2

The values shown above are representative of current production. All values vary within nominal ranges.

Applications:

Vista ODC Drilling Fluid Base Oil has been successfully used as a low toxicity, nonpolluting replacement for diesel in oil-based drilling mud systems. Vista ODC Oil retains the desirable drilling mud properties of a diesel or mineral oil-based drilling fluid and minimizes or eliminates diesel's undesirable features.

The low viscosity of Vista ODC Oil provides more efficient transmission of hydraulic horsepower to the drill bit, with resultant energy savings. Oil-based muds prepared with Vista ODC Oil have also been shown to increase drilling rates as compared to equivalent diesel-based drilling fluids. Reduced mud maintenance costs can result when using Vista ODC Oil-based muds because of the exceptional chemical stability of the ODC oil mud system. Ask your Vista Representative for details.

Based on results from established testing protocols, Vista ODC Oil greatly reduced aquatic toxicological concerns associated with the use of diesel in oil-based drilling fluids. Vista ODC Oil produces no undesirable sheen on water surfaces in offshore applications. Unlike diesel oil, cleanup of an ODC Oil mud is relatively simple (comparable to a water-based drilling fluid). Vista ODC is also a nonfluorescent product, which simplifies the detection of hydrocarbons in drilling cuttings. Solids control in ODC oil mud systems is improved by the use of shale shakers having finer screens (100 and 120 square mesh vs. oblong mesh). Use of additional solids control equipment is significantly reduced. However, special operations, such as series centrifugation, can be accomplished more efficiently because processed mud viscosities are lower than equivalent diesel muds.

Safety and Handling:

The handling of Vista ODC Oil presents no significant health hazards. ODC Oil-based muds are more efficiently removed from drilling equipment and work areas, which improves working conditions in comparison to diesel-based oils. Normal operating procedures and housekeeping should ensure personnel safety. In any event, normal care should be taken to avoid contact with eyes or prolonged contact with skin by Vista ODC Oil.

Physiological Data:

Acute toxicities of the water-soluble fractions (WSF) of Vista ODC and diesel oils have been compared according to EPA-approved procedures, using mysid shrimp (Mysidopsis bahia) as the test organism. There was found to be no statistically significant difference in survival rate with exposure to water soluble fractions of Vista ODC oil and a control medium of simulated sea water. Testing was done to determine the 96-hour median lethal concentration (LC_{50}, which is the concentration at which 50 percent survival is found, for the WSF of Vista ODC Oil. Even with exposure to 100 percent WSF, survival rates were consistently above 50 percent, and no LC_{50} could be calculated. However for diesel, LC_{50} values have ranged from 7 to 36 percent of the WSF for the same time period. Details of these tests are available upon request.

Vista ODC is clear and nonfluorescent and, unlike diesel oil, will not cause a sheen or discoloration of surface water. Such pollution is prohibited by 1976 EPA regulations based on Section 311 of the Federal Water Pollution Control Act and by Section 402 of the Clean Water Act. The nonfluorescent characteristic also benefits geological data collection because unlike diesel oil, Vista ODC does not mask the natural fluorescence from formation hydrocarbons.

Such favorable toxicological and environmental properties make Vista ODC Oil an excellent choice for base oil to be used on all offshore drilling rigs and in other ecologically sensitive environments.

Storage and Transfer:

Vista ODC Drilling Fluid Base Oil is classified as a combustible liquid and should be shipped in accordance with DOT regulations, Title 49, Part 172, Subparts C--shipping papers, D--making, and F--placarding, as directed by Part 173.118(a). Storage and transfer should be in accordance with Department of Labor, Title 29, Section 1910.106. Storage in carbon steel tanks is suitable. Conventional lines, pumps, hoses and fittings are satisfactory for use. Normal precautions against corrosion of equipment from water leaks or condensation should be taken.

THE DATA CONTAINED HEREIN ARE FOR GENERAL INFORMATIONAL PURPOSES ONLY. PLEASE REFER TO THE VISTA CHEMICALS COMPANY MATERIAL SAFETY DATA SHEET FOR SPECIFIC, COMPLETE INFORMATION REGARDING THIS PRODUCT.

The above data are based on tests and experience which Vista believes reliable and are supplied for informational purposes only. Vista disclaims any liability for damage or injury which results from the use of the above data and nothing contained therein shall constitute a guarantee, warranty, or representation (including freedom from patent liability) by Vista with respect to the data, the product described, or their use for any specific purpose, even if that purpose is known to Vista. For detailed information regarding this product, please refer to the respective Vista Chemicals Company Material Safety Data Sheet.

*Patent Pending.

VISTA

TECHNICAL INFORMATION

Toxicity of Drilling Fluid Base Oils

Background

Recent years have seen an increase in the use of oil-based drilling fluids, primarily because of performance advantages of these fluids over water-based fluids under difficult drilling conditions. Such conditions include the drilling of deep, hot holes and high-angle holes and the drilling of water-sensitive shale and H_2S- or CO_2-bearing formations.

Unfortunately, diesel oil, which has been by far the most commonly used drilling fluid base oil, carries the disadvantage of an unfavorable environmental impact when used offshore or in ecologically sensitive areas, such as wetlands. Either accidental mud releases or the intentional discharge of unwashed cuttings can lead to environmental problems. Thus the trend toward offshore drilling has been accompanied by the use of low-toxicity, environmentally safe drilling fluid base oils.

Environmental Concerns

The adverse environmental effects of diesel-based drilling fluids fall into two categories: water pollution and toxicity. In the present context, pollution is defined by 1976 EPA regulations (Title 40, Chapter I, Part 110) as sheen, film, or discoloration of surface water or adjoining shorelines. Section 311 of the amended Federal Water Pollution Control Act of 1977 prohibits any oil discharge causing such pollution. Section 402 of that act regulates the discharge of drill cuttings via National Pollution Discharge Elimination System (NPDES) permits. These permits allow for the release of drill cuttings provided that any oil released from the cuttings does not cause a sheen or discoloration of the surface water. In no case is the discharge of whole drilling mud allowed.

In North Sea waters, interim regulations by the UK Department of Agriculture and Fisheries allow for the discharge of diesel oil-based drill cuttings containing less than 5 weight percent diesel. Where a mineral oil is used as the base oil, surrendered cuttings may contain up to 15 percent oil by weight. Again, whole mud discharges are prohibited.

The release of toxic substances into contiguous or navigable waters is also prohibited by Section 311 of the amended Federal Water Pollution Control Act of 1977 in cases where such releases pose an imminent and substantial danger to public health and welfare, including fish, shellfish, and other fauna.

These regulations exist in addition to moral and ethical restraints against pollution and toxicity. In any case, there is a growing demand for drilling fluid base oils which have less environmental impact than diesel. Future regulations may eventually prohibit the use of diesel-based muds offshore.

Vista ODC Oil- Description

Vista ODC Drilling Fluid Base Oil* is a light, colorless oil with a very low aromatics content, low viscosity, and a mild odor. It is well suited for use as a high-performance, low-toxicity, nonpolluting replacement for diesel in oil field applications. Vista ODC Oil has been field-tested as a base oil in drilling muds as a water-based mud additive, and as a spotting fluid, with excellent results. Vista ODC Oil also produces no undesirable sheen on water surfaces in offshore applications.

Properties

Test	Typical
Distillation range, ASTM D-86 F	
IBP, °F	370
EP, °F	518
Aromatics, weight percent	<1.0
Flash point, Pensky-Martens, °F	144
Water, ppm	20
Aniline point, °F	160
Fluorescence	None
Appearance	Clear, water-white
Specific gravity, 60°/60°F	0.8063
API gravity, 60°F	44.1
Viscosity, cSt	
At 70°F	2.10
At 100°F	1.80
Pour Point, °F	-75
Sulfur, ppm	<1.0
Nitrogen, ppm	<1.0
Interfacial tension versus 30% $CaCl_2$ solution, dynes/cm	34.2

Toxicity Testing - Water-Soluble Fractions

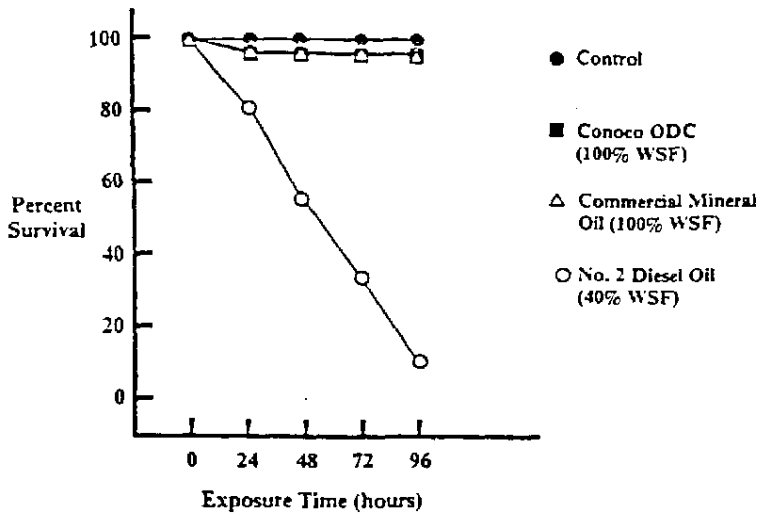
One aspect of the aquatic toxicity testing of Vista ODC Oil has been the evaluation of acute toxicities of the water-soluble fractions (WSFs) of various drilling fluid base oils to mysid shrimp (Mysidopsis bahia). All tests were performed by an independent aquatic toxicology laboratory according to procedures identified in Section F of the U.S. EPA procedures manual entitled "Bioassay Procedures for the Ocean Disposal Permit Program" (U.S. EPA, 1978).

*Patent Pending.

Water-soluble fractions were prepared by stirring each base oil with artificial seawater in a 1:9 (oil:water) volumetric ratio for 20 hours, settling for 2 hours, then siphoning off the seawater phase. Toxicity testing using these WSFs might be envisioned as modeling a situation in which organisms are living in water which is or has been in contact with the base oil. Mysid shrimp were selected as the test organism because of their sensitivity to toxic wastes.

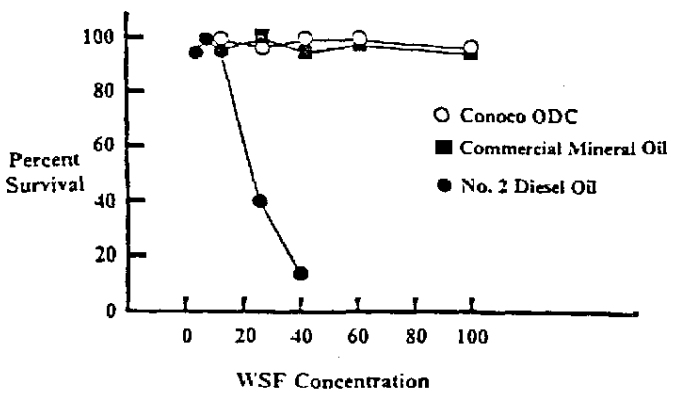
In three separate toxicity tests employing over 2,000 individual mysid shrimp, the organisms were exposed to various dilutions of WSFs of ODC™ Oil, No. 2 diesel oil, and a commercial mineral oil for 96 hours. For ODC™ Oil and the commercial mineral oil, there was found to be no statistically significant decrease in 96-hour survival (at the 95 percent confidence level) as compared to the control medium of artificial seawater, even for the undiluted aqueous extracts (100 percent WSF). For No. 2 diesel oil, however, the 100 percent WSF was found to be far too toxic to yield nonzero 96-hour survival data. For a 40 percent diesel WSF dilution, an average survival of 11 percent was found. Figure 1 shows plots of average survival versus time for mysid shrimp exposed to 100 percent WSFs of ODC™ and commercial mineral oils and 40 percent WSFs of No. 2 diesel.

Figure 1
Average Survival Versus Time for *Mysidopsis Bahia* In Water-Soluble Fractions



Testing was done to determine the 96-hour median lethal concentration (LC_{50}) which is the concentration at which 50 percent survival is found, for the WSF of Vista ODC Oil. Even with exposure to 100 percent WSF, survival rates were significantly above 50 percent, and no LC_{50} could be calculated. For diesel oil, however, LC_{50} values have fallen in the range of 7 to 36 percent WSF. Figure 2 shows plots of average percent survival versus the WSF concentration, as taken from a recent toxicity study employing over 1,350 mysid shrimp. The figure depicts the low survival of shrimp exposed to even low concentrations of the diesel WSF.

Figure 2
Average 96-Hour Survival Versus WSF Concentration for *Mysidopsis Bahia*

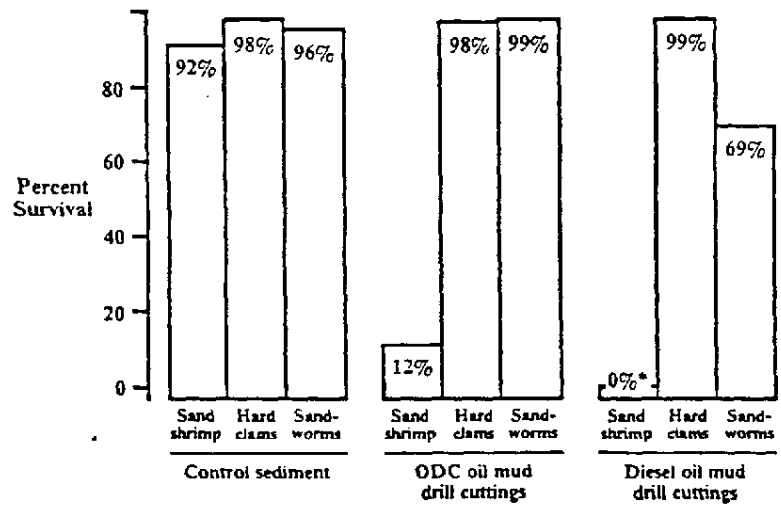


Toxicity Testing—Drilling Cuttings

A second aspect of aquatic toxicities of ODC and diesel oils involves a study of the acute effects of mud-saturated drill cuttings upon two benthic organisms and one shrimp species. In these tests, hard clams (*Mercenaria mercenaria*), sandworms (*Nereis virens*), and sand shrimp (*Crangon septemspinosus*) were exposed for 10 days to the two different oil mud cuttings plus a control sediment. Again, an outside aquatic toxicology laboratory carried out the studies, following basic procedures identified in Annexes I and III of the protocols developed by Region II, U.S. EPA, and the Offshore Operators Committee (1980).

The solid phase bioassays showed that only the ODC Oil mud cuttings allowed the survival of any sand shrimp (12 percent of the shrimp exposed to these cuttings survived the 10-day exposure). However, the toxic effect of the diesel mud drill cuttings was so great that none of the sand shrimp survived within the 48 hours of exposure. Sandworms were unaffected by the ODC Oil-containing cuttings, while the diesel mud cuttings led to only 69 percent survival after the 10-day exposure. Hard clam survival was not affected by either type of cuttings. Figure 3 presents a graphic illustration of these toxicity results.

Figure 3
Survival of Sand Shrimp, Hard Clams, and Sandworms After 10-Day Exposure To Oil-Mud Drill Cuttings



*All sand shrimp exposed to diesel oil mud drill cuttings perished after only 48 hours.

Conclusions

Acute aquatic toxicity tests carried out under EPA approved procedures have shown the 100 percent WSF of Vista ODC Oil to cause no significantly different mortality to mysid shrimp than does a control medium. A 40 percent WSF of diesel oil, however, is found to yield only 11 percent average survivals after 96 hours in such tests. Calculated median lethal concentrations (LC_{50}) range from 7 to 36 percent WSF for diesel oils tested but are always in excess of 100 percent WSF for Vista ODC Oil.

Solid phase bioassays employing drill cuttings saturated with whole ODC Oil mud and whole diesel mud show the diesel mud cuttings to have much greater toxic effects upon sand shrimp and sandworms than ODC mud cuttings. A third organism, hard clams, was unaffected by either type of drill cutting.

The high survival rates (or high LC_{50} values, where appropriate) associated with Vista ODC Oil versus diesel show ODC Oil to be a highly desirable substitute for diesel oil in oil-based drilling fluids from the standpoint of toxicity. Vista ODC Oil is not apt to form a sheen or film on water surfaces, making it an excellent choice over diesel from the standpoint of pollution.

Further Information

Further information concerning the properties, handling, and performance of Vista ODC Drilling Fluid Base Oil can be obtained by contacting your Vista Chemicals Representative.

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VISTA

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