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TYPE PRODUCT(S): I, D, H, F, N, R, S Microbiocide

DATE ACCESSION NO (S).

PRODUCT MANAGER NO. J. Kempter Product Manager 32

PRODUCT NAME (S) Vantocil 1B

COMPANY NAME ICI Americas Inc.

SUBMISSION PURPOSE Proposed new use for oil field recovery systems

SHAUGHNESSEY NO.	CHEMICAL AND FORMULATION	% A.I.

Ecological Effects Branch Review

Pesticide Vantocil 1B, microbiocide

100.0 Submission Purpose and Label Information

100.1 Submission Purpose and Pesticide Use

Registrant seeks to amend label for new use for injection water used in oil field recovery systems.

100.2 Formulation Information

Vantocil 1B:Poly(iminoimidocarbonyliminoimidocarbonyl imino hexamethylenehydrochloride). 20%

Inert Ingredients [redacted] trace metals). 80%

100.3 Application Methods and Rates

Directions for Use [excerpted from submission]

It is a violation of federal law to use this product in a manner inconsistent with its labeling.

OIL RECOVERY

Not for use in oil recovery systems which employ holding ponds for spent liquids.

Specific rates of use of VANTOCIL IB should be determined by bacteriological tests made prior to treatment. These tests should establish (a) the presence of microorganisms, (b) the severity of the problem, and (c) required treating ratio. The effectiveness of a treatme can be evaluated by similar bacteriological tests. The compatibility of VANTOCIL IB Microbiocide with the water should also be determined prior t treatment.

Some suggested treatment methods and treating rates for water systems include:

OIL FIELD INJECTION WATERS

1. SLUG METHOD - When the system is noticeably fouled, apply 4 gallons c VANTOCIL IB per 1,000 barrels of water (95 ppm of product). VANTOCIL IB should be added to the system at a point where it will be uniformly mixed. Repeat on a weekly basis, or as needed to establish control.

   When microbial control is evident, the treating rate may be lowered t 2 gallons of VANTOCIL IB per 1,000 barrels of water (47 ppm of produc weekly, or as needed to maintain control.

   Badly fouled systems should be cleaned before treatment is begun.

INERT INGREDIENT INFORMATION IS NOT INCLUDED

2. CONTINUOUS METHOD - Before beginning a continuous treatment, apply a slug treatment of 4 gallons of VANTOCIL IB per 1,000 barrels of water (95 ppm of product). Continue treatment by applying 0.15 to 0.8 gallons (19 to 102 ounces) of VANTOCIL IB per 1,000 barrels of water (4 to 20 ppm of product).

DRILLING MUDS

1. Calculate the total volume of the drilling mud system, and using this volume calculate the number of gallons of VANTOCIL IB Microbiocide needed to produce a concentration of approximately 3,000 ppm. For example, 126 gallons of VANTOCIL IB Microbiocide per each 1,000 barrels of total volume will produce this concentration.

2. While the system is circulating, add the amount of VANTOCIL IB Microbiocide calculated above in a thin stream.

3. As the well depth increases, increasing the total volume of the system, add additional VANTOCIL IB Microbiocide as required to maintain the proper concentration.

WORKOVER FLUIDS

1. Calculate the total volume of the workover fluid system, and using this volume calculate the number of gallons of VANTOCIL IB Microbiocide needed to produce a concentration of approximately 3,000 ppm. For example, 126 gallons of VANTOCIL IB Microbiocide per each 1,000 barrels of total volume will produce this concentration.

2. Add VANTOCIL IB Microbiocide into the system.

3. Circulate the workover fluid system until the fluid returns clear.

4. Shut the system down and idle for several hours.

5. Remove the workover fluid. The well should be ready for productive use.

100.4 Target Organisms

Microorganisms which grow within oil recovery equipment pipelines and equipment,causing corrosion and buildup of H_2S gases.

100.5 Precautionary Labeling

"This pesticide is toxic to fish. Do not discharge into lakes, streams, ponds, or public waters unless in accordance with NPDES permit. For guidance contact your Regional Office of the Environmental Protection Agency."

101.0 Hazard Assessment

101.1 Discussion

The proposed new use of Vantocil 1B in oil recovery operations involves three types of uses. The first is as an additive to eliminate bacterial growth in the water injection systems used to force water into oil deposits which in turn forces the oil to the surface well. A level of 95 ppm is suggested for this application. A second proposed use would be as an antimicrobial to be added to the drilling muds which are injected to cool the drilling bits, seal the shaft in order to maintain downhole pressure, and to bring the rock cuttings to the surface for disposal. A concentration of 3000 ppm in the drilling mud is suggested for this application as well as for the third applicational use which is as an additive to the workover fluids circulated internally to clean the drilling system.

Vantocil 1B does not hydrolyze readily. Halflife in water is 59 days at pH of 7. At pH's of 5 and 9 the halflives are 28 and 32 days respectively. It shows high solubility in water but no solubility in hydrocarbons. It shows low mobility in soils with 90-95% remaining in the top 5 cm of soil after 32 cm of equivalent rainfall in leaching tests. Soil adsorption is high in sandy or calcareous loams and also with coarse sand. It is expected that the material could be readily tranported by soil erosion into aquatic habitats.

Injection systems are generally closed systems in which the water/oil mixtures are recirculated through a series of separation tanks. After separation the water is returned to the system with the exception of a small percentage which is usually sent to holding ponds or injected into nonpotable aquifers. Due to the high toxicity of Vantocil to aquatic life use of Vantocil in recovery operations involving holding ponds is not permitted. The material would be introduced to the aquifer by subsurface injection procedures so negligible exposure to wildlife is expected here. Movement of water

from underground aquifers is generally such a slow process that it expected that complete degradation would occur before it could reach any aquatic habitats supplied by ground water.

Use of the material in drilling muds would pose low hazard to wildlife if drilling muds are disposed of in a manner that would prevent introduction into aquatic habitats. State and federal laws do exist to control introduction of drilling muds into aquatic habitats as they are also hazardous to aquatic life. Though much of the mud may be washed off rock cuttings and reused, a certain amount is in all probabilty introduced with disposed cuttings into the environment. In operations near or in water it expected that limited amounts of the drilling muds containing the antimicrobial would be introduced into the habitat. In terrestrial operations, after the well is discontinued, the used muds are often reinjected into the discontinued well and this method of disposal would pose little hazard to wildlife. Some operators do not reuse these drilling muds in which case all contaminated muds would be disposed before the well is discontinued. The labeling concerning pesticide disposal states only that wastes resulting from use of this product may be "disposed of on site or at an approved waste disposal facility."

It is not clear whether work over fluids used in flushing out well systems would be disposed of in a manner similar to injection waters. No mention of disposal methods for workover fluids is made in the introductory letter from ICI Americas.

Oil drilling operations encompass a wide geographical area containing a large diversity of habitats. This fact makes the use of Vantocil 1B in operations near marine and freshwater habitats a distinct possibility.

101.2 Liklihood of Adverse Effect to Non-Target Organisms

Vantocil is nearly non-toxic to mammalian and avian wildlife. The LD_{50} value for acute oral testing on Mallards was over 2510 mg/kg. Dietary studies on Bobwhite Quail listed LC_{50} values greater than 5620 mg/kg.

The major hazard of this antimicrobial would be to aquatic life. Vantocil 1B shows high toxicity toward fish and freshwater aquatic invertebrates. LC_{50} values for Bluegill and Rainbow Trout were .91 ppm and .4.4 ppm respectively. EC_{50} values for Daphnia are .18 ppm. The degree of hazard to surrounding aquatic life would be determined by the methods employed in disposal of drilling muds, injection waters, and workover fluids and waste products associated with these procedures. If contamination of aquatic habitats does occur then the degree of toxic effect would be dependent on a number

of factors including the dilution capacity of the particular water body involved, the amount of contaminated material introduced, and/or the ability of the inhabiting organisms to either escape the area or withstand the diluted concentration levels of the pesticide. The effects of a microbiocide to bacterial processes of an aquatic habitat would of course pose a serious threat to the entire ecological balance of such an ecosystem.

If adherence to laws governing disposal of drilling muds and waste waters are enforced and these measures effectively prevent introduction of Vantocil 1B contaminated materials into surrounding aquatic habitats then effects from the microbiocide should be low.

101.3 Endangered Species Considerations

The threat to listed species of aquatic organisms would be determined by many of the parameters discussed above. No data is available in EEB files concerning the toxic effects of Vantocil 1B to freshwater molluscs. It is assumed that contaminanted waste materials could be introduced into the aquatic ecosystems inhabited by them. However this threat is also expected to be minor provided proper disposal procedures are followed and enforced.

101.4 Adequacy of Toxicity Data

Uses in estuarine and marine oil field operations are not prohibited in the labeling precautions dated 4/4/89 and forwarded to EEB, though they were prohibited in labeling for Vantocil A, an earlier product containing the same active ingredient. The present data is inadequate to properly assess operations located over, or near estuarine or marine areas. The persistence of the material in water and its highly toxic effects on aquatic life at concentrations below .1 mg/l require that additional testing be conducted before a full hazard asssessment can be made concerning uses in, over, or near marshes, estuaries, or marine habitats. These studies are listed below.

Fish Early Life Stage

Invertebrate Life Cycle

Estuarine /Marine Fish Toxicity Testing

Estuarine/Marine Shrimp Toxicity Testing

48 hour Oyster/Embryo-Larvae Toxicity Testing

101.5 Adequacy of Labeling

Inconsistencies in the labeling instructions seem to exist for Precautionary Statements on the Vantocil 1B labeling revisions dated 4/4/89 and on those submitted to the Agency in 1988 for Vantocil A which contains the same active ingredient. The sentence which has been deleted reads "Do not apply in marine and/or estuarine oil fields." Deletion of this one sentence would presumably allow the use of Vantocil 1B in offshore or estuarine oil recovery operations, thereby requiring additional testing on marine organisms.

103. Conclusions

Vantocil 1B poses little hazard to terrestrial wildlife. The possible heavy use of this product in high volumes near aquatic habitats does pose potential risk to organisms indigenous to these areas. Without a clause excluding use in such environments it must be assumed by EEB that Vantocil 1B would be used in these operations. If this conclusion is correct then the additional requested data(see 101.4 above), will be needed before an accurate assessment of ecological risk can be made.

Brian Montague, Fishery Biologist Brian Montague 9/18/
Ecological Effects Branch
Environmental Fate and Effects Division(H-7507C)

Raymond Matheny, Supervisory Biologist Raymond W. Matheny 9/18/89
Section I, Ecological Effects Branch
Environmental Fate and Effects Division(H-7507C)

James Akerman, Chief
Ecological Effects Branch
Environmental Fate and Effects Division(H-7507C)