



**ORANGE-SOL**

*The Leader In Citrus-Based Cleaning Technology™*

I. Description of the Product

De-Solv-it<sup>®</sup> is a surface collecting agent which mixes with crude oil and cleans tar or oil-soiled surfaces, thinning and floating crude oil to the water surface thereby allowing effective skimming.

II. Description of the Operation Mechanism of the Product

Although some of the components of De-Solv-it<sup>®</sup> are classed by regulations as chemical, no chemical action occurs in the use of De-Solv-it<sup>®</sup>. Rather, De-Solv-it<sup>®</sup> is considered as an effective cleaning agent for crude oil by reason of a physical operative mechanism. De-Solv-it<sup>®</sup> acts by the physical process of dissolving crude oil allowing effective cleaning and removal of oil spill materials.

De-Solv-it<sup>®</sup> is biodegradable; works in full concert with the bacteria used in bioremediation.

III. EPA Approval

De-Solv-it<sup>®</sup> is on the National Contingency Plan Product Schedule Listing and is currently used for cleaning oil spill equipment as well as personnel working the spill.

IV. Product History

A. Experience - For at least 55 years we have produced citrus oil cleaners and stand as the pioneer of this product area. De-Solv-it<sup>®</sup>, our citrus-oil type cleaner has been in the current form for at least sixteen years. This history has allowed efficacy and toxicity testing and the demonstration of the economic viability of De-Solv-it<sup>®</sup>.

B. Testing - In July, 1989, the EPA was provided with a Technical Data Summary of De-Solv-it. The supporting test reports are available for toxicity testing with *Fundulus heteroclitus*, rats, rabbits, muscle tissue and for heavy metal, chlorinated hydrocarbon analysis, and sea water solubility.

Acute Oral LD50	16 ml/kg
Draize Eye Irritation	0.00
Inhalation	No toxic manifestations
Primary Skin Irritation Index	0.2 (low)
Muscle Tissue	No deleterious effects
MEC Tests	LD50

De-Solv-it<sup>®</sup> Fundulus heteroclitus 2000

Cross & Bevan Test  
Ministry of Agriculture Fisheries & Food Protocol AEP2 - U.K.

De-Solv-it<sup>®</sup> Brown Shrimp 48 hrs. 300

Data supporting the relative non-toxicity of De-Solv-it<sup>®</sup> and product quality showed heavy metals or chlorinated hydrocarbons were not found in the product.

The physical properties are as listed.

1. Flash Point: 205°F (C.O.C.), (ASTM-D 92-78)
2. Pour Point: -60°F (ASTM-D 97-66)
3. Viscosity: 3.31 SFS at 90 F (ASTM-D 445-74)
4. Specific Gravity: 0.801. 6.69 lbs/U.S. Gallon (ASTM-D 1298-67)
5. pH: N/A
6. Surface Active Agent: Confidential
7. Solvents: Confidential
8. Additives: None
9. Solubility: Soluble to less than 0.000% in water. Solubilizes oil, grease, mousse, tar, wax, gum, etc.

Since the March 1989 oil spill in Prince William Sound, De-Solv-it<sup>®</sup> has effectively and safely cleaned over 6,000 boats. De-Solv-it<sup>®</sup> cleaned tar, mousse, oil, and grease from the hulls and hold of boats, barges, skimmers, fishing nets, protective clothing and all the various oil cleaning equipment that was being used. Letters from Exxon, Alaska DEC, VECO, etc. as well as the laboratory test results for the cleaning of the Mustang Suits are available.

Beach cleaning: Tests show that De-Solv-it<sup>®</sup> may be safely and effectively used for beach cleanup of crude oil spillage.



## RESEARCH AND DEVELOPMENT REPORT

### BACTERIAL BIODEGRADATION OF OILS AT EXTREME TEMPERATURES

Recent studies on the biodegradation of pollutant oils at a range of treatment temperatures have enabled us to isolate a number of bacteria capable of hydrocarbon degradation at temperature extremes. The following two organisms are of particular note:

#### 1 'Cold temperature' oil biodegrader

This bacterium, grows well in the temperature range of 2 to 37°C with an optimum at around 25°C. At 5°C it grows around 10% of optimum rate and is capable of sustained oil biodegradation at this temperature such that considerable degradation is achieved within the first 10-20 days. Degradation is progressive until no oil remains; the time taken is dependent upon the temperature, the nature of the oil, and other environmental conditions.

#### 2 'Hot temperature' oil biodegrader

This bacterium grows well in the temperature range of 20°C to over 50°C with an optimum at around 40°C. At 50°C it grows at around 85% of optimum rate and is capable of sustained oil biodegradation at this temperature such that considerable degradation is achieved within the first 5-10 days. Degradation is progressive until no oil remains; the time taken is dependent upon the temperature, the nature of the oil, and other environmental conditions but should be extensive within 21 days.

### BACTERIOLOGICAL SAFETY OF DBC PLUS TYPE R-5

DBC+ Type R-5 cultures are a blend of harmless saprophytic bacterial strains originally isolated from the natural environment and which utilise non-living organic matter as a food source. The bacteria are selected micro-organisms, carefully chosen for their ability to biodegrade hydrocarbons and related compounds to harmless end products, and are not mutated or genetically engineered species. Being saprophytic they are not pathogenic, toxic, caustic or corrosive and are therefore safe to use, having no harmful side effects. The cultures are harmless to both aquatic and land plants and animals and have been released into marine, fresh water and soil treatment areas with complete ecological safety.

The bacteria are not Salmonella, faecal coliforms, Shigella, Staphylococcus or Streptococcus. They do not include any known pathogenic bacteria and are not so identified by appropriate cultural and identification tests.

It is recommended that normal precautions are taken in handling DBC as would be given to any material which is slightly dusty. Since some persons may be sensitive to the related chemical compounds present it is suggested that direct skin contact should be avoided and that you wash your hands after use.

Acknowledgement - Dr. D.K. Necklen, Microbiological Consultant, Wolverhampton Polytechnic



Laboratory Analysis On "De Solv-it"

AIM

The sample of "De Solv-it" received in the laboratory on 16/7/90 was analysed to determine if this compound had any antimicrobial affects on DBC (Dried Bacterial Cultures).

PROCEDURE

An M.I.C. (minimum inhibitory concentration) test was set up with the "De Solv-it" sample. Doubling dilutions of the sample were set up in tryptone soya broth (T.S.B.) and inoculated with a DBC suspension. These were incubated at 20°C for 48 hours.

RESULTS

As this compound is a solvent it formed a separate layer on top of the T.S.B. Growth of the DBC only occurred in this layer and not the solvent layer.

Growth of DBC was observed in the T.S.B. layer of the highest concentration of the sample (1 vol of "De Solve it" to 1 vol of T.S.B.). No growth was observed in the neat sample indicating that neat "De Solv it" does not support growth of the DBC.

It was noted that in very dilute mixtures (1/128, 1/256) of the "De Solve it" no longer formed a separate layer on the T.S.B. but now easily mixed with the T.S.B. The sample had also changed from a transparent orange solution to a turbid yellow mixture in the T.S.B. This is visual evidence that the DBC was biodegrading this compound.

CONCLUSION

From these results we can conclude that this compound would not exert a significant antimicrobial affect on bacteria growing in a liquid that is in contact with this compound.

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