

TECHNICAL ABSTRACT

Optimization of MDF-200 for Reduced Logistics Footprint and Increased Performance

BACKGROUND INFORMATION

The United States Department of Energy at Sandia National Laboratories has developed a broad-spectrum chemical and biological decontaminant that has been fielded to replace DS-2. The foam formulation, based on a surfactant system to solubilize sparingly soluble agents, has been integrated into several system developments. Results have shown highly effective decontamination of Chemical and Biological Warfare agents and industrial chemical toxants. Modec, Inc. of Denver, Colorado produces MDF-200 for military use.

By stoichiometrically adjusting our proprietary MDF-200 formulation, Modec has produced a logistically superior concentrated decontaminant that can be rapidly reconstituted in the field with either fresh or salt water. This blended formulation is:

- substantially lower in weight and volume
- non-hazardous and environmentally friendly
- stabilized for high temperature storage
- has an extended shelf-life of over five years, can be recharged
- can withstand extreme low temperature conditions ($< -15^{\circ}\text{ F}/-26^{\circ}\text{ C}$)
- incorporates enhanced corrosion inhibitors and wetting agents
- chemically equivalent to MDF-200.

By virtue of existing chemical and scientific data, this version of the formulation will retain its high decontamination efficiency and broad-spectrum effectiveness.

SCIENTIFIC RATIONALE

The original objective of the research project at Sandia was to develop an effective, rapid, and safe (non-toxic and non-corrosive) decontamination technology. The technology is applicable to a variety of scenarios such as the decontamination of open, semi-enclosed, and enclosed facilities, vehicles, personnel and sensitive equipment.

Research focused entirely on neutralization of chemical and biological compounds and chemical toxants. The development of the decontaminant resulted in a compound that is 1,000 times less corrosive than bleach and 10,000 times less than DS2. This Program was funded by the United States Government under contract DE-AC04-94AL85000 awarded by the U.S. Department of Energy's DOE-NN-20 CBNP Program's Decontamination and Restoration Thrust Area. The table below summarizes test results of Df-200 on live chemical agents.

Chemical Agent	% Destruction of Chemical Agent		
	1 minute	15 minutes	60 minutes
GD	99.98 ± 0.01	99.97 ± 0.01	99.98 ± 0.01
VX	91.20 ± 8.56	99.80 ± 0.08	99.88 ± 0.04
HD	78.13 ± 10.53	98.46 ± 1.43	99.84 ± 0.32

Further, the formulation works against Toxic Industrial Chemicals (“TIC’s”) and has proven to be a highly effective sporicide, virucide, bactericide and sterilant. MDF-200 is approved for use in all commercial and hospital settings and has been shown to be effective in independent and AOAC testing against the following organisms:

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|---------------------------------|--------------------------------------|
| B. anthracis AMES-RIID | B. anthracis ANR-1 |
| Y. pestis (ATCC 11953) | Bacillus Subtillus (ATCC 19659) |
| Bacillus globigii (ATCC 9372) | Bacillus anthracis ANR-2 |
| Erwinia herbicola (ATCC 39368). | Escherichia coli (ATCC 15597) |
| Microbial Biofilms | Stachybotrys chartum |
| Trichophyton mentagrophytes | Bacillus atrophaeus |
| Influenza A & B | E. coli (ESBL/O157:H7) |
| Bovine Corona Virus | Noroviruses and VRE’s |
| Foot and Mouth Virus | Aspergillus Niger |
| Penicillium variable | Clostridium difficile |
| Listeria monocytogenes | Salmonella choleraesuis |
| Pseudomonas aeruginosa | Meth-resistant Staphylococcus (MRSA) |
| Klebsiella pneumoniae | Proteus mirabilis |
| Oocystis and Phormidium | Mycotoxins |

CHEMICAL PROPERTIES AND FIELD OPERATING CHARACTERISTICS

Modec’s concentrate version of its formulation is ¼ the weight of fully constituted Df-200 and 1/3 the volume. This represents tremendous benefits for storage, handling and logistics. The concentrate is considered non-hazardous and has a DOT 5.1 rating. It is currently packaged to be reconstituted into 5, 50 and 250 gallon sets. The 50-gallon set consists of 3 x 5 gallon pails containing Parts A (surfactant/antimicrobial/accelerant package); B (stabilized peroxide) and C (powder).

A standardized pallet set would consist of 12 x 50-gallon sets that would produce 600 gallons of finished MDF-200 in the field. This is three times less the footprint of MDF-200-100 drums. Based upon analytical testing to date, the stabilized peroxide will have an extended shelf life of greater than five years.

ABOUT MODEC, INC.

Modec Inc., located in Denver, Colorado since 1987, is a leading organization engaged in the design, development and production of advanced NBC decontamination applications. Modec was awarded the first commercial license from Sandia National Labs for Aqueous Foams for the Decontamination and Mitigation of Chemical and Biological Warfare Agents in July 2000. We market our products worldwide under our License 00-C00872 with Sandia Corp. Modec has also produced mobile personnel decontamination systems for the U.S. Army Chemical Surety Program at all nine Arsenals. Modec supplies the military and first responders with its proprietary version of MDF-200

Modec has registered its Decontamination Formulation with the US EPA pursuant to FIFRA regulations. Our firm has been actively involved with many of the regulatory issues surrounding decontamination applications and environmental effects. Our commercial version MDF-500 is sold to a variety of vertical markets including health care, agriculture, environmental remediators and consumer applications.

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