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The Effectiveness of Vault-Toilet Odor-Control Products: An Update

Mark Zavala, Mechanical Engineer
Brenda Land, Senior Sanitary Engineer

From campground hosts to recreation technicians, many people need to manage vault-toilet odor to minimize its adverse impact on recreational visitors to Forest Service, U.S. Department of Agriculture, lands. There are many products marketed as vault-toilet additives to eliminate odor. The purpose of this study was to find effective products. One product, Armor Research's "Blanket 510" (figure 1), did significantly reduce odors in both the laboratory study and in field tests. The product had the added benefit of reducing fly populations around the treated toilets.

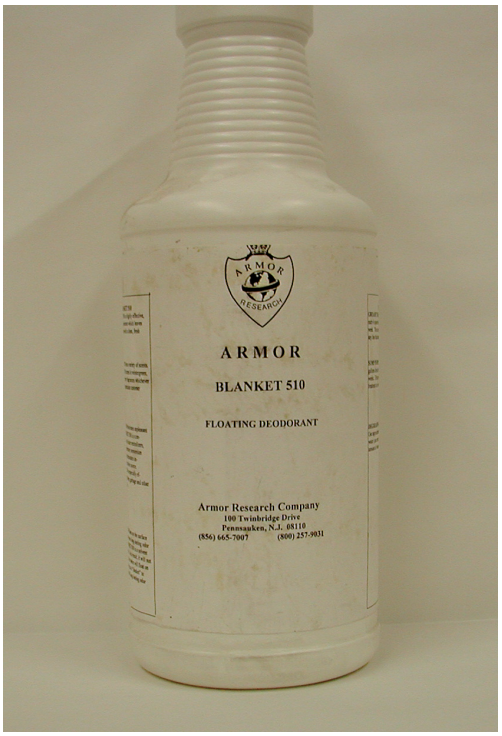

Figure 1—Armor Research's "Blanket 510."

Introduction

In 1990, San Dimas Technology and Development Center (SDTDC) conducted an evaluation on a variety of biological and chemical products claiming to control unpleasant odors emanating from vault-toilet waste. The 8-week study concluded that none of the products tested was satisfactory as a vault toilet additive (Hoshide). Many new and revised odor-control products have come on the market since 1990 (figure 2), and vault-toilet odor is still a problem at some recreation sites.

Figure 2—New odor-control products.

A 6-week laboratory study in 2004 found similar results to the 1990 study for most products. However, three products seemed to warrant further evaluation. BioWorld's "Liquid Optimizer Plus," NoStink's "Special Powder," and Armor Research's "Blanket 510" did reduce odors during the study and were field-tested during the summer of 2006.

For additional information, contact: Recreation Management Program Leader, San Dimas Technology & Development Center, 444 East Bonita Avenue, San Dimas, CA 91773-3198; Phone 909-599-1267; TDD; 909-599-2357; FAX: 909-592-2309
Lotus Notes: Mailroom WO SDTDC@FSNOTES • Intranet (web site): http://fsweb.sdtdc.wo.fs.fed.us • Internet e-mail: mailroom_wo_sdtdc@fs.fed.us

Background

Vault toilets differ from flush toilets—with sewage or septic systems—because they are waterless and the solid and liquid waste accumulates inside a sealed vault (typically 500- to 1,500-gallon capacity) until it is pumped out. Vault-toilet odors are primarily attributed to ammonia and gases from the anaerobic decomposition of the organic (fecal) matter present. Odors also can be caused by other substances (such as trash, food, drinks, etc.) dumped in the vault. The importance of odors in low concentrations is an aesthetic issue as opposed to a health issue.

Objectives

The focus of this study was to determine the validity of odor-elimination claims made by manufacturers of odor-control products in their application to the waterless vault-toilet system. The study was not intended to be a complete scientific analysis, but rather to establish a practical guide for those odor-minimizing products suitable for Forest Service vault-toilet use at recreation sites.

Conclusions

The majority of the products studied are best suited for septic systems, sewage treatment plants, and other systems that receive influent water, according to their marketing and directions for use. The waterless vault-toilet system, which receives only pure waste as influent, is very concentrated and can have biochemical oxygen demand 50-times higher than a septic or sewer system (Hoshide). The high biochemical oxygen demand and high solids content may have an adverse effect on the products' function.

Some products studied increased foul odors, when compared with the control samples. The control samples were allowed to undergo natural bacterial processes, resulting in greatly diminished odor over the 6-week study period.

The following products seemed to work during the laboratory study, and were further studied under actual vault-toilet conditions (table 1). A product cost comparison is shown in table 2.

Table 1—Products field tested.

Manufacturer	Product	Form	Type
BioWorld	Liquid Optimizer Plus	Liquid	Biological
No Stink	Special Powder	Granular	Mineral
Armor Research	Blanket 510	Liquid	Solvent based

Table 2—Cost comparison summary.

Manufacturer	Product	Treatment	Frequency	Cost (2006)
BioWorld	Liquid Optimizer Plus	One quart.	Once a week.	$63 per gallon.
No Stink	Special Powder	One quart.	Once or twice a week, as needed.	$75 per 5-gallon bucket.
Armor Research	Blanket 510	Enough to make a 1⁄4-inch-thick blanket (6.5 square feet per gallon).	Once when vault is pumped.	$10.59 per gallon 5 to 10 gallons needed.

Field Results

BioWorld's Liquid Optimizer Plus

Liquid Optimizer Plus is applied with a wand and pressure sprayer to mist the vault walls and surface of the vault content. It reduces odor and almost eliminates flies when added to the vault weekly. Odor and flies return to pretreatment levels when treatment stops.

No Stink's Special Powder

Special Powder is a granular product broadcast across the surface of the vault's content. It minimizes odor for 2 or 3 days after treatment. Odor and flies return to pretreatment levels when treatment stops.

Armor Research's Blanket 510

Blanket 510 is poured through the manhole or vault riser after the vault is pumped and surcharged with water. The product is lighter than water and floats on the surface (see figure 3). It can be sprayed onto the vault walls for additional odor reduction. It minimizes both odors and flies and is added only when the vault is pumped and recharged with water.

Figure 3—Blanket 510 floats on top of liquid.

Reference

Hoshide, G. T. 1991. Do biological or chemical additives really control vault toilet odors? GTR-9123-1203-SDTDC. San Dimas, CA: Forest Service, U.S. Department of Agriculture, San Dimas Technology and Development Center.

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For further information on odor control in vault toilets contact Brenda Land by phone at 909–599–1267 ext. 219; or by e-mail at bland@fs.fed.us.

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