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UNL's Livestock Environmental Issues Committee
Includes representation from UNL, Nebraska Department of Environmental Quality, Natural Resources Conservation Service, Natural Resources Districts, Center for Rural Affairs, Nebraska Cattlemen, USDA Ag Research Services, and Nebraska Pork Producers Association.

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Pit Additives

Rick Stowell, UNL Extension Engineer

As producers have been trying to deal with odor issues on their operations, many have been inundated with product advertisements and solicitations for pit additives. Understandably, producer concerns arise over product effectiveness, reliability and value. Results of an NPPC-supported study on the effectiveness of many pit additives were released this year. This article summarizes major findings of that *Odor Solutions Initiative* study. A full report of results from that study is available through NPPC.

Background:
The Purdue University Agricultural Air Quality Laboratory evaluated thirty-five additive products for use in manure storage pits. Dr. Albert Heber led the research team. Each product was voluntarily submitted and was tested using consistent methods over three 42-day periods. Product effectiveness was based on odor, hydrogen sulfide, and ammonia measurements of the air in the sample headspace with and without the use of the products.

Interpreting the data:
The results provide three basic pieces of information for each set of product measurements that address the following questions:

1) Was the measured level lower (better) or higher (worse) with use of the product?
2) What was the extent of the reduction (or increase) in odor/H_2S/NH_3 level with use of the product?
3) How confident can one be that the product will perform as reported?

Confidence is often indicated by a term called statistical significance. If a product is reported to have x% reduction in odor at $P < 0.05$, then there is less than 5% chance that separate, but identically run tests would not also find a reduction in odor (although the percentage value x might change).

Effective additives, then, will produce lower levels of odor and odorous gases; will have noticeably large reductions; and will be verified by statistically significant results. A

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product that apparently produced an average reduction, but did not have good statistical confidence, cannot be relied upon to produce any reduction the next time, and may at times produce elevated measurement levels. On the other hand, a product that consistently reduced measured levels (results were statistically significant), but had a low percent reduction (say less than 10%), would not make enough of a practical difference in most situations on the farm to merit its use.

Most-effective additives for odor:
Four additives were effective at $P < 0.25$, meaning that there is better than a 75% chance that less odor would be produced with their use, based on measurements of odor dilution threshold. Odor dilution threshold measurements use human odor panels and represent detection levels. The four additives and the manufacturer and average odor reductions of each are listed below according to their relative reduction in odor dilution threshold. No additives were effective at $P < 0.05$. Odor measurements were also made regarding odor intensity and odor offensiveness. In some cases, these measures responded differently than did the odor dilution threshold.

Product brand name	Manufacturer/supplier	% decrease	Other effects
Super Microbial Odor Control	SMSI, Inc.	32	
Zymplex	World Wide Enzymes, Inc.	28	+ 9% intense
Alken Clear-Flo®	Phoenix Processes, Inc.	27	+ 4% NH_3
Biological Manure Treatment	K-Zyme Laboratories	25	+ 58% H_2S

The fact that these products were effective in reducing odor levels does not necessarily mean that their use will be cost effective, of course. Application rates and cost information are available in the report or can be obtained directly from the product manufacturer or supplier. Also, information on the method and frequency of application should be evaluated to determine if management can readily accommodate use of the product. Producers should have a fairly clear idea of the level of odor control desired and the value of odor control to the operation before committing funds to any odor-control additives or technologies.

Effective additives for odorous gases:
Several products reduced hydrogen sulfide and/or ammonia concentrations. These additives and the manufacturer and average effectiveness of each are listed below according to their level of statistical significance and relative reductions in gas concentrations.

95% certainty of reduction in H_2S

Product brand name	Manufacturer/supplier	% decrease	Other notes
Alken Clear-Flo®	Phoenix Processes, Inc.	47	+ 4% NH_3
Super Microbial Odor Control	SMSI, Inc.	37	
Biocharge Dry	Biotal, Inc.	37	
INHIBODORÒ	Conklin Company, Inc.	36	+ Odor & NH_3
GT-2000OC & BC-2000AF	G.T. Environmental Tech	34	+ 2% NH_3
Zymplex	World Wide Enzymes, Inc.	27	+ 9% intense
Roebic Odor Eliminator	ROEBIC Laboratories, Inc.	23	+ 9% NH_3

75% certainty of reduction in H_2S

MBA-S	Desert Microbial Products	19	
UC-40Ô Microbe Formula	UCI Bioaugmentation Research and Technology	15	
PS1	A.D. Associates, LLC (ADA)	14	

95% certainty of reduction in NH_3

EM Waste Treatment	EM Technologies, Inc.	15	+ Odor & H_2S
AWL-80	NatRx, Inc.	10	
Biocharge Dry	Biotal, Inc.	7	
Krystal AirÔ	Fischer Enterprises, Inc.	7	
AgriKlenz Plus	Aqualogy BioRemedics	6	+ 34% H_2S
Manure Management Plus™	Cytozyme Laboratories, Inc.	6	+H_2S, - Offense
Biological Manure Treatment	K-Zyme Laboratories	5	+ 58% H_2S
Peroxy Odor Control	Kennedy Enterprises	3	+ 27% H_2S

75% certainty of reduction in NH_3

MBA-S	Desert Microbial Products	3	
N-P 50	NEO Products	3	+ Odor & H_2S
Agricycle™ & Microcycle™	American Bio Catalysts	3	+ 41% H_2S
Digest 54 Plus	Alltech, Inc.	2	- 13% intensity

While the use of additives may reduce gas concentrations, use of some of the products also increased other gas concentrations and/or did not have a desirable effect on perceived odor. Also, some products did not show any improvement in gas or odor levels and, in some cases, use of the products resulted in higher levels than in untreated manure.

Use of the additives frequently changed the manure characteristics, which is another topic in itself. One quality of additives that manufacturers frequently tout is reduction of solids. Of the 35 products tested, only EM Waste Treatment (- 4%) and Lagoon Aid (- 3%) demonstrated any verifiable reduction in solids content.

Illustration of sample collection for odor analysis

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