



United States Department of Agriculture

2019 FLC Southeast Region Award – Excellence in Technology Transfer Project of the Year

LABORATORY:

USDA Agricultural Research Service (ARS) – Southeast Area

AGENCY:

Dept. of Agriculture (USDA)

REGION:

Southeast

STATE:

Mississippi



Odor and Ammonia Capping of Swine Lagoons Using High Performance Nitrifiers

Pictured L-R: Page George (NSWC Panama City) Southeast Regional Coordinator, Dr. Matias Vanotti (ARS Southeast Area), Benjamin Henry (VA) Deputy Regional Coordinator, and Kevin Brand (CDC) outgoing Southeast Deputy Regional Coordinator.

Gaseous emissions from swine lagoons aren't just annoying, they're a public health hazard. In addition to the environmental damage caused by vapors emanating from these lagoons,



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these odors in NC alone are also responsible for \$300 million in respiratory problems of the families who live nearby. A jury recently awarded more than \$50 million to neighbors surrounding a swine farm, in part due to the foul odor emanating from the farm's swine lagoons. There are currently 26 nuisance lawsuits against Smithfield Foods in North Carolina alone.

The technology transferred is a high-performance nitrifying bacterial composition (HPNS) for the economical removal of ammonia and odor from livestock wastewater. In the past, both the high ammonia concentration typical in livestock wastewater and cold winter temperatures inhibited nitrification (biological oxidation of the ammonia) resulting in very low nitrification rate. Therefore, the treatment needed huge tanks and capital investment. To solve this problem, ARS scientists were successful in the isolation of a novel nitrification microbial community from manure sludges, the HPNS (NRRL B-50298), that provided: 1) rapid reactor start-up and steady performance at high ammonia levels (95% ammonia control), and 2) the highest rate of nitrification treatment found in the world at low temperatures.

In addition to oxidizing the ammonia, the nitrification process creates an oxidized environment that substantially eliminates the odor-causing compounds in the wastewater. A significant advance was the placement of HPNS in media scaffolds in floating units in lagoons (odor and ammonia capping). Using computational fluid dynamics, the floating units provided treatment to just an upper layer of the swine lagoon. This biological odor and ammonia capping configuration and use of the HPNS reduces energy consumption and is done in the existing swine lagoon compared to the treatment of all the effluent in a separate tank. As a result, cost is significantly reduced compared to the use of plastic lagoon covers or other method used in the past to remediate odors and gaseous emissions in swine lagoons.

The HPNS was highly effective in a USDA SBIR project led by Pancopia Inc., that tested the feasibility of using the novel HPNS microorganism composition in floating modules to successfully treat swine wastewater and odor cap swine lagoons.

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AWARD YEAR:

2019

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