



Excess nitrates in water can be harmful to crops, livestock, and humans.

NECI SUPERIOR ENZYMES

Food, water, and energy are fundamental needs for survival, but what is sometimes known as the water-food-energy nexus has been garnering increasing amounts of attention in recent years. In short, water security, energy security and food security are inextricably linked, therefore, actions in one area have an impact on one or both of the others. Developing solutions to these complex and interconnected security challenges draws upon many different disciplines, including analytical chemistry.

PHASE III SUCCESS

NECi is in the final stages to receive EPA certification as a standard method for all nitrate testing under the Clean Water Act and its nitrate test kits are used as the standard method within all US Geological Survey (USGS) soil laboratories.

AGENCIES

DOE, EPA, HHS, USDA, NSF

SNAPSHOT

NECi has grown from a husband and wife research team into a thriving business helping to solve the water-food-energy nexus by providing analytical chemistry solutions to government and industry.

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One key challenge to the food-energy nexus is nitrogen and phosphorus containing fertilizers that promote optimal crop growth, but can also pollute nearby waterways through runoff, compromising public and environmental health. When a surge of these nutrients hits a large area, huge toxic algal blooms can occur, creating dead zones in large bodies of salt and fresh water. Excess nitrate in drinking water can pose health threats, especially to infants and the elderly. As a means of enforcement to protect public and environmental health, the U.S. EPA initiated the Clean Water Act and the Safe Drinking Water Act to set limits on the amount of nitrate, phosphate, and other compounds present in environmental and drinking water.

That's where the Nitrate Elimination Company (NECi) comes in – it developed nitrate test kits that allow farm managers to determine nitrate accumulation levels on the farm. This test kit will help agricultural producers manage nitrate concentrations, reduce costly nitrogen fertilizer applications, and protect the environment from pollution. The company was founded by a husband and wife team of scientists, Dr. Bill and Ellen Campbell following their successes in the research and academic realms. In 1995, NECi received its first SBIR grant from the U.S. EPA for developing the nitrate removal system and gained two new customers who purchased Nitrate Reductase for their own nitric oxide research products. After learning more about the water treatment market, the Campbells decided that bootstrapping was not a viable option.



NECi provides user-friendly test kits and enzymes for analytical chemistry applications.



“SBIR has been very good for us as academics because we’re used to writing proposals, but we didn’t know how to start a business. SBIR was a wonderful source for applied research funding, which is difficult to get any other way. Because of SBIR we are the only investors in the company, which lowers development cost and makes the technology more affordable,” said Ellen Campbell.

In order to better protect the nation’s drinking water, the US Environmental Protection Agency periodically updates laboratory testing methods. As part of this effort, NECi is currently in the final stages to receive EPA certification as a standard method for all nitrate testing under the Clean Water Act through two

separate approvals; one for safe drinking water hit the Federal Register in July 2016 on its list of Alternate Test Protocols (ATP) and the second, pending approval, is for waste water. Additionally, the company’s nitrate test kits are currently used as the standard method within all US Geological Survey (USGS) soil laboratories.

Excessive levels of nitrate in potable water is dangerous for infants and can be harmful to people and livestock. Therefore, the EPA is careful to allow methods that

are proven to give accurate answers when public health is at stake and has listed nitrate as one of only sixteen inorganic ions on the EPA’s Primary Contaminants list. NECi/SE’s new test is the first enzyme-based method permitted for measurement of any primary contaminant. Enzymes can replace hazardous materials in legacy test methods. In addition to its unsurpassed accuracy and sensitivity, NECi/SE’s new nitrate test method is safer for the lab technician and dramatically reduces hazardous waste.

The new test method will help to replace the incumbent method, which is specific for lab “robots” termed Discrete Analyzers. NECi/SE has formats for many applications, including simplified, user-friendly test kits. Coupled with the company’s new handheld photometer, test kit users can view, track, and store data on Android devices. The lab method has been validated by the US Geological Survey and by ASTM International. Full approval for Clean Water Act compliance monitoring is anticipated for early 2017.

To help the company commercialize its products, NECi worked diligently to get the word out.

“We just worked and worked at it by publishing in trade publications to get the word out there,” said Campbell. “Trade publications are a great tool to expand your reach – from these publications and conferences distributors from Europe and elsewhere sought us out and we have now cultivated a large, international distribution network through these efforts. Furthermore, these distributors also help publicize.”

In 2015, Nitrate Elimination Company, Inc. re-branded to NECi Superior Enzymes, developed a new focus and logo. The company continues to leave its mark on the community by buying and working from historic buildings and maintaining close relationships with local institutions, including Michigan Tech. The company is located on the upper peninsula of Michigan and with its ten employees is the third largest employer in the village. The Campbells believe that small business can have a big impact and introduce science to a new community by hiring interns and employees from local high schools and the university.

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ELLEN CAMPBELL
CO-FOUNDER



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