

Chitosan and the CTAPE Process: Overcoming bias with science

Introduction



For years, controversy surrounded the use of chemical treatment of stormwater because of possible risks to aquatic species. Chemicals for stormwater treatment can do more harm than good when used inappropriately. For one of these chemicals, chitosan acetate, Ecology applied its stormwater treatment technology review process. A particular formulation of chitosan acetate successfully completed this testing and met the stringent requirements for use in Washington State. The rigorous testing regime approved by Ecology showed that when used as directed, chitosan acetate is effective at removing particulates from stormwater while not exhibiting aquatic toxicity.

Problem

Controlling soil-laden stormwater runoff at construction sites often presents a challenge. Flocculants, substances that make suspended particles clump into larger particles, can reduce turbidity in construction site runoff. The larger particles settle and filter out of the water more easily. However, if dosed improperly, chitosan acetate—a chemical flocculant—is toxic to aquatic species and has the potential to cause fish kills.

Project goals

The Water Quality Program aims to increase the number of available, effective stormwater treatment options. To accomplish this goal, staff need to (1) better understand chemical treatments and their proper uses and (2) develop an efficient review process.

Ecology and the Chemical Technical Review Committee (CTRC) subject emerging technologies to a rigorous review process before allowing their use in Washington State. This process, known as the Chemical Technology Assessment Protocol – Ecology (CTAPE) process, involves review by members of Ecology as well as local governments. Through this process, Ecology identifies effective stormwater treatments and determines how to apply them safely.

Turbidity measures
water clarity



Ecology issues use-level designations for innovative stormwater treatment technologies. The use level designation allows for use of the product with safeguards. The three use level designations are:

- Pilot use level designation (PULD).
- Conditional use level designation (CULD).
- General use level designation (GULD).

Those granted a PULD or a CULD must conduct field tests in the Pacific Northwest to verify their product's performance.

Company submits product for testing

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Chitosan product passes the test

In 2004, after a long and often contentious review, Ecology granted Natural Site Solutions, a Redmond-based company, a conditional use level designation (CULD) for StormKlear™ LiquiFloc™.

Natural Site Solutions' CULD included many safeguards such as continuous influent, effluent, pH, and flow monitoring to ensure that stormwater runoff from construction sites meets water quality standards. The CULD also required automatic turbidity and pH sensors to shut the system down if the output values exceeded preset values. This ensures that only treated water leaves the site.

Natural Site Solutions monitored the stormwater at several sites to make sure that the chemical was safe for aquatic life when used correctly. Through the testing, they defined what "used correctly" meant. Natural Site Solutions, with direction from Ecology and the CTRC:

- Described procedures users of the CESF process must follow.
- Determined a proper dosing rate for the chitosan acetate product.
- Developed a field test to detect residual chitosan in water that has passed through the sand filters.

These procedures require operators to receive field and classroom training provided by a highly trained specialist before operating CESF systems.

Project highlights

In March 2007, Ecology granted StormKlear™ Liquifloc™ a general use level designation. The general use level designation means that Ecology has enough performance data to allow use of the product statewide with no further testing. Ecology believes the product can perform as claimed and, when used according to the use level designation, is safe and effective.

In addition, two other products are undergoing the CTAPE process. Ecology granted Flocclear™ a CULD in January 2006 and ChitoVan™ a CULD in January 2007. Ecology looks forward to seeing how they perform in the field.

These designations come at a pivotal point in the construction stormwater world. The 2005 permit requires sites of 1-5 acres to reduce their stormwater pollution. Ecology anticipates that the availability of CESF will have a positive effect on stormwater management in Washington.

Finding a safe, effective product to use in the CESF process has tremendous benefits for Washington State's waters. The CESF process, when used properly, can reduce turbidity from 600 Nephelometric Turbidity Units (NTU) to below 10 NTU—making muddy water from construction sites clear.

Partners

Members of the Ecology community: Stan Ciuba, Randall Marshall, Dewey Weaver, Mieke Hoppin, and Kathleen Emmett collaborated with members of the Chemical Technical Review Committee (environmental engineers and scientists from local governments, local consulting firms, and the Washington State Department of Transportation) and the owners of the products.

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