Antimicrobial Stormwater Treatment Methods to Protect Beaches

AbTech INDUSTRIES

MAKERS OF smart sponge® PRODUCTS

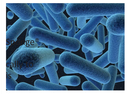
Antimicrobial Treatment Media Description

Filter Media Generally

AbTech's Smart Sponge® technology is at the heart of its product innovation. Its unique molecular structure is based on innovative polymer technologies that are chemically selective to hydrocarbons. Smart Sponge® fully encapsulates recovered oil, resulting in a substantially more effective response that prevents absorbed oil from leaching. It is also capable of removing low levels of oil from water, thereby successfully removing sheen.

Once oil is absorbed, the Smart Sponge® transforms the pollutants into a stable solid for easy recycling, providing a closed-loop solution to water pollution. Smart Sponge® technology provides cost-effective BMPs with low installation and maintenance labor costs. In comparison to other products, the Smart Sponge® technology also allows for less expensive and less problematic handling and disposal of the waste product, since its technology transforms liquid oil and other pollutants into a stable solid. The Smart Sponge® was designed not to deteriorate in water, allowing for a longer product life, and it remains buoyant in calm or agitated water, permitting it to remain in place until fully saturated and resulting in no wasted product.

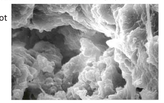
Polypropylene (ADsorbent) *Smart Sponge (ABsorbent)*



Media-Bonded Organosilane Antimicrobial Treatment Mechanism

AbTech has developed an antimicrobial technology synergistic with the Smart Sponge® technology. Smart Plus contains an antimicrobial agent that is effective in reducing coliform bacteria found in stormwater, industrial wastewater, and municipal wastewater. Smart Sponge® Plus permanently binds this antimicrobial agent chemi- the Smart Sponge polymer surface in a proprietary process. Due to this permanent bond, the antimicrobial agent active but does not leach or leak, avoiding any downstream toxicity issues.

The Agent used for this innovative technology is an Organosilane derivative which is widely used in a variety of fields including medical, consumables, pool equipment, and consumer goods to impart biostatic activity to the surface of a wide variety of substrates. This Smart Sponge® Plus mode of action, through its bound agent, is very simple (no chlorine or heavy metals involved) and - in surface-bound applications – it neither introduces chemicals into the treated water nor produces toxic metabolites. The antimicrobial mechanism is based on the patented agent's interaction with the microorganism cell membrane, causing microorganism inactivation, but no chemical or physical change in the agent. Antimicrobial activity therefore does not reduce the agent's capability or cause its depletion, and maintains long-term effectiveness. Additionally, the hydrocarbon absorption capability is not inhibited. Smart Sponge Plus can be engineered using controlled test parameters (such as modifying flow rates and coliform bacteria concentration) to meet desired performance requirements.



EPA Antimicrobial Registration

U.S. EPA Approves Smart Sponge® Plus Technology for Reduction of Bacteria in Stormwater Runoff

FILTRATION TECHNOLOGY WILL ADDRESS ONE OF THE LARGEST SOURCES OF WATER POLLUTION IN THE U.S.

SCOTTSDALE, AZ (August 9, 2010) – AbTech Industries is pleased to announce that its innovative Smart Sponge® Plus technology has been approved by the U.S. Environmental Protection Agency (EPA) for the reduction of harmful coliform bacteria in stormwater runoff, responsible for 20,000 beach closures per year.

Robert F. Kennedy, Jr., the renowned environmental advocate and attorney, notes, "Hydrocarbons, bacteria, and other harmful toxins swept from our streets into our rivers, lakes, and oceans are the major source of water pollution in the U.S. AbTech now gives us hope that technology can cure this intractable problem."

"We are excited to provide our Smart Sponge technology to local governments and others who seek to address our nation's most critical water pollution challenges, including coliform bacteria plaguing our public beaches, oil tainting our Gulf Coast region, and stormwater pollution running off our streets into public waterways," says AbTech Industries President and CEO Glenn Rink. "AbTech is prepared to address these challenges, and we are grateful to the EPA for their timely approval of our stormwater pollution filtration technology."

Smart Sponge has long been a cost-effective technology proven to remove oil and other pollutants from stormwater runoff. Smart Sponge Plus contains an antimicrobial agent that is effective in reducing coliform bacteria found in stormwater, industrial wastewater, and municipal wastewater. These types of persistent pollution have been described as "death by a thousand cuts." No one event typically causes dramatic problems, but the gradual buildup of these pollutants in U.S. waterways has a huge environmental impact.

Smart Sponge's versatile technology is currently deployed in more th throughout the world including, domestically, Long Beach, CA; Nor NC. The EPA's approval of AbTech's Smart Sponge Plus technolog coliform bacteria is an important milestone for AbTech, and will allo the private sector to better tackle this growing problem.

2

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Registration of First Outdoor Use of 3-(Trimethoxysilyl) Propyldimethyloctadecyl Ammonium Chloride for use in Filtration Medium in the Form of a Sponge used to Treat Storm water, Industrial Waste Water, Process Water, and Municipal Waste Water

Approved by: Joan Harrigan-Farrelly

Joan Harrigan-Farrelly, Director
Antimicrobials Division

Date: 7/28/2010

Engineered Deployment and Infrastructure Integration

Smart Sponge® Plus can be engineered using controlled test parameters (such as modifying flow rates and coliform bacteria concentration) to meet desired performance requirements. Field deployment solutions incorporating Smart Sponge® Plus technology are non-mechanical, require minimal structural changes to stormwater systems and are easily installed and maintained. Products such as the Ultra-Urban® Filter with Smart Sponge® inside fit into most existing catch basins. Typically vaults are designed with water quality treatment flows of 1, 2 or 4CFS, and are engineered with bypass capabilities to avoid flooding during major storms. Larger vaults can be engineered to address higher treatment flow rates. The Smart Sponge® and Smart Sponge® Plus technologies are deployed in engineered deployment systems that offer customized solutions for stormwater pollution prevention, oil spill response, process water filtration and other industrial applications to meet specific environmental needs. AbTech Industries offers an extensive product line that is upgradeable to meet evolving community needs and regulatory requirements.

Key Engineering Design Parameters

- Hydraulic Flow
- Influent Concentration
- Treatment of highly contaminated first flush
- Bypass to prevent flooding

Infrastructure/Community Integration

- Maintains High Flow Rates
- Simple Design
- Minimal Infrastructure
- No Chemicals, No Electricity, No Operator
- Simple Maintenance
- Long Life

Retrofitted Drain Inserts for Stormwater Runoff Treatment

Ultra Urban Filter – Curb Opening

The Ultra Urban Filter (UUF) Curb Opening Series is a simple yet effective tool for stormwater filtration of hydrocarbons, trash and sediment. When UUFs contain Smart Sponge® Plus, the filters also reduce coliform bacteria. The unique micro-porosity of Smart Sponge allows each CO1414 filter a hydraulic flow rate of more than 250 gallons per minute and has proven effective in removing more than 80% of hydrocarbons and total suspended solids (TSS) (300 microns or greater). Additionally, a significant reduction in coliform bacteria can be obtained.

The unique design of the Curb Opening Series allows crews to easily hang the appropriate number of filters in each drainon a simple mounting bracket. The product is designed with a lateral bypass to utilize each box as well as an overflow capability to eliminate the potential for street flooding in the event of a plugged filter.

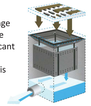
Case Study – Long Beach, CA

Actual field data collected by the City of Long Beach based on the installation of 1900 Ultra Urban Filters in 2004 demonstrated over the 3 year test period an estimated 91,963 pounds of trash, debris, sediment, oil, grease and organics were removed. Contact AbTech for antimicrobial test results.

Ultra Urban Filter – Drain Insert

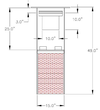
The Ultra Urban Filter Drain Insert Series offers the same filtration characteristics of the CO series for stormwater filtration of hydrocarbons, trash and sediment. The unique micro porosity of Smart Sponge allows the DI2020 a hydraulic flow rate of more than 500 gallons per minute, and has proven effective in removing more than 80% of hydrocarbons and TSS (300 microns or greater). Additionally, a significant reduction in coliform bacteria can be obtained.

These units are designed to be suspended beneath a collar installed under the stormwater grates. This simple design allows easy access for maintenance while eliminating the potential for street flooding in the event of a plugged filter.



Case Study – Norwalk, CT

Norwalk, CT installed 275 Ultra Urban Filters in 2004 and conducted field testing indicating a 75% reduction in hydrocarbons. Three rounds of cleaning also yielded 37,976 pounds of trash and debris. Contact AbTech for antimicrobial test results.



Ultra Urban Filter – Customized Drain Insert

Customized drain inserts are available for those customers with shallow drains or requiring deeper bed depths. AbTech's team of engineers will work with our customers to understand the site characteristics, including hydraulics and contamination levels and will confirm the appropriate bed depth using Smart Paks to achieve the projects filtration goals.

Case Study – South Carolina Coastal Community

AbTech recently installed 46 customized drain filters with treatment bed depth up to 2 feet while meeting hydraulic requirements.

City of Long Beach Case Study

The City of Long Beach

The City of Long Beach occupies a land area of about 50 square miles; operates and maintains an international deep-water harbor; manages close to 2,000 oil wells; has 11 linear miles of beaches covering 541 acres, operates two city owned marinas, oversees 468 acres of navigable waterways, manages the Southeast Resource Recovery Facility (SERRF), and hosts a regional airport. The City faces many challenges and opportunities to continue its environmental leadership role.

Project Challenge

The City of Long Beach is located south of Los Angeles and bordered by the Los Angeles and San Gabriel rivers. It faces significant environmental challenges with one of the most pressing issues being the ability to maintain and improve receiving water quality. To compound these environmental challenges, the Los Angeles and San Gabriel Rivers run along the east and west borders of the city carrying urban and stormwater runoff and pollutants from over 80 Southern California cities directly to its ocean and beaches. The Colorado Lagoon , San Gabriel River, and Los Angeles River are 303(d) listed and impaired for constituents such as copper, algae, oil, lead, zinc, and coliform bacteria and impact Long Beach economically and environmentally. The City in search of a solution, took innovative and proactive action by seeking and allocating funding for the Long Beach Stormwater Project.

As part of this progressive environmental effort, the City of Long Beach launched a clean water initiative that resulted in the deployment of an innovative stormwater filter called the AbTech Ultra-Urban® Filter (UUF) with Smart Sponge® Plus technology. The technology and product were chosen by the City based upon a matrix of product attributes. Perhaps most significant was the Smart Sponge technology's ability to reduce coliform bacteria (EPA Registration #86256-1) while providing removal of trash, sediment, and hydrocarbons.

Project Description

Within the City limits, there are about 383 miles of active storm water carriers, which include pipes, open channels, ditches, culverts, connector pipes and drains. Of those carriers, 180 miles are City-owned, 142 miles are Los Angeles County-owned, and 40 miles are Caltrans-owned with various other owners making up the difference. The City maintains 5.5 miles of channel and ditches. Los Angeles County has 32 miles of open flood control channels, i.e.; Los Angeles River, San Gabriel River, Los Cerritos Channel, etc. Caltrans has 11 miles of channels and ditches. In addition, the City of Long Beach has an approximate population of 465,000 people.

A comprehensive stormwater management program was developed to protect the city's waterways from nonpoint-source pollution. This Project was one of several initiatives funded by the City of Long Beach in an effort to better manage stormwater runoff. An integral part of this program involved the use of Ultra-Urban Filters (UUFs).

The City of Long Beach sought to exceed its compliance with local, State and Federal water quality guidelines as mandated by the Federal Clean Water Act and RWQCB-issued TMDLs, initiated a two-phase program. In the first phase, the City deployed 1,318 UUF catch basin insert filters in 328 catch basins (approximately 10% of the citywide total of 3,300). In the second phase, the City installed an additional 529 inserts in 175 catch basins for a total of 1,904 inserts in 503 catch basins (15% of the citywide total). The City gave installation priority to drains that are tributary to waters used for recreation. A wide variety of installation locations were selected based on land use, projected pollutant loads and beneficial use designation.

The results of the Project indicate that AbTech Industries' Ultra-Urban® Filter (UUF) with Smart Sponge Plus can significantly improve water quality by reducing coliform bacteria and intercepting large quantities of oil, grease, debris, and sediment. Over a three-year period, it was estimated that AbTech's Ultra Urban Filters removed over 90,000 pounds of total contaminants (trash, debris, sediment, oil, grease, organics, and heavy metals). Of the total contaminants captured, approximately 25,000 pounds were oil derivatives (i.e. volatiles, light hydrocarbons and heavy hydrocarbons). The City's decision to use Smart Sponge essentially prevented over 3,600 gallons of hydrocarbons from entering the ocean and surrounding water bodies.

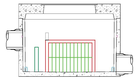
Our number one priority is to protect the public's health. With over 11 miles of public beaches and Colorado Lagoon, one of the few remaining inland recreational water bodies, the presence of bacteria and other harmful pathogens in our stormwater and urban runoff poses risks to human health, particularly after heavy rainfall. "I am pleased with the results of the pilot program in dramatically reducing bacteria in our stormdrains and thus allowing us to keep our beaches safe and open to the public. We hope to receive continued support from local and federal officials to sustain our efforts and expand the program.

Tom Leary, Stormwater Management Division Officer, Long Beach Public Works Department

Stormwater Treatment Vaults

Smart Sponge® Vault

As an alternative to treating individual catch basins Smart Sponge Vaults utilizing Smart Pak filtration modules are ideal for stormwater treatment at the end of pipe. Vault sizes can be adapted for various flow rates and contamination levels to solve a wide range of stormwater treatment issues.

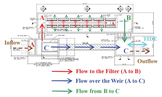


Case Study – End of Pipe Installation, Long Island, NY

As illustrated in the pictures below, precast vaults can be used for ease of installation. The prefabricated metal cage can be adjusted to contain the appropriate number of Smart Paks for filtration, while meeting hydraulic specifications. The vault lid can be easily removed for maintenance and replacement.

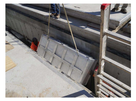
Smart Sponge® Custom Vault

Smart Sponge custom Vaults can also be engineered to treat a variety of large projects either as standalone applications or part of a treatment train to polish water working with retention ponds or hydrodynamic separators. These engineered solutions can be direct or radial flow, and can easily be adapted to treat first flush while allowing the later flow of a major storm event to pass around the systems to achieve the hydraulic requirements of the watershed.



Case Study – Outfall Pipe Installation, NC

The Conch Street Outfall, Nags Head, NC is a project managed by NC Division of Water Resources and designed by Moffatt and Nichol Engineering. AbTech supplied 980 Smart Paks meeting rigorous performance requirements for oil, grease and coliform bacteria.



City of Norwalk Case Study

City of Norwalk Stormwater Management Improvement Project

"The Filter Project," as Norwalk, Connecticut's city officials call it, began as a natural outgrowth of the Long Island Soundkeeper's mission of protecting the Sound's ecosystem coupled with Norwalk's commitment to clean up local waterways.

Hal Alvord, Director of Public Works in Norwalk, Connecticut, said that cleaning up polluted street runoff in storm water before it flows into the Long Island Sound was the highest priority of The Filter Project. The heart of this approximately $500,000 project involved fitting AbTech Industries' filtration systems to storm drains in south Norwalk to catch trash, debris, animal waste, hydrocarbons, oil, and grease before they enter the Sound.

Project Challenge

Alvord said that the project is of critical importance to the community and the environment. The Long Island Sound watershed houses 8 million people with another 20 million living within 50 miles of it. Regulation has resulted in many improvements over the last few decades, but it has done little to stop the largest source of toxins – nonpoint source pollution. This is the pollution that comes from nonspecific sources – it's the urban runoff that flows from paved surfaces through the storm drain system.

The project is a collaborative effort, which brought together an impressive roster of national businesses, nonprofit organizations, and local, state, and federal government officials. The City of Norwalk partnered with the Long Island Soundkeeper, The Maritime Aquarium, the Norwalk River Watershed Initiative, and AbTech Industries. Much of project cost – over $500,000 – resulted from legislation sponsored by U.S. Senator Joseph Lieberman and provided by the U.S. Environmental Protection Agency. Other funds were raised by private organizations.

Project Description

The Filter Project is a part of Norwalk Public Work's stormwater management improvement program and involved fitting over 275 storm drains with high-technology filtration systems equipped with Smart Sponge® Plus. The Ultra Urban Filters performed extremely well: the average contaminant removal rate was over 75 percent, and the maximum removal rate was 99.9 percent. The first cleaning of the 275 catch basins yielded over 7.4 tons of trash, debris, leaves, and sediment – the weight of over six Ford Escorts. All this trash, and debris would have entered the Sound's recreational waters if it hadn't been captured by the filters.

The filtration systems – Ultra Urban® Filters with Smart Sponge® Plus – are produced by the Arizona-based company, AbTech Industries, which holds the technology's patent.

Approximately two years after installation, the Ultra Urban Filters had removed over 38,000 pounds of contaminants/pollutants. A "Black Box Characterization" was also performed on the used Smart Sponge media, which consisted of the deconstruction or meltdown of the media to determine what contaminants were trapped within the media itself. Upon analysis, it was found that approximately 49 pounds of contaminants were captured with the Smart Sponge of each filter, which included heavy metals (copper, titanium, zinc) and a variety of hydrocarbons (including oils, solvents, cosmetic product components, and chemical plasticizers). This testing showed a removal of an additional 13,500 pounds of contaminants, bringing the total amount of pollutants removed by the UUF's to approximately 51,500 pounds, which included preventing over 1200 gallons of hydrocarbons from entering the Long Island Sound.

An added benefit of the filtration systems is the ease at which the contents can be reused. Glenn Rink, President and CEO of AbTech Industries, said, "Our technology is not only effective in removing hydrocarbons, trash, and debris, but also in its ability to encapsulate and transform hydrocarbon pollutants into a stable solid for easy and beneficial reuse through waste-to-energy facilities. It provides a closed-loop method for disposal and allows for less costly and less problematic handling of the waste product."

The City of Norwalk, population 84,000, has a harbor, marinas, and a shellfish industry. Norwalk will continue to evaluate the project's success through a monitoring process shared by the Long Island Soundkeeper, the City of Norwalk, and AbTech Industries (through Longo & Longo, an AbTech Connecticut-based distributor).

What Others are Saying about the Project

"We've been looking for new and innovative approaches to solving the critical threat to our waterways. We see this project as a great opportunity to participate on the ground level using cutting edge technology to address nonpoint source pollution."

Hal Alvord, Director of Public Works in Norwalk, Connecticut.

"The Filter Project will help clean our waters for swimming, boating, and shell fishing. We are very excited about the success of the project and the rate at which the system was implemented."

Terry Backer, Long Island Soundkeeper Executive

"It [Smart Sponge Plus] offers a tangible and visible solution to water pollution. Through a test tube demonstration, you can show people the dirty water; they see it go through the sponge and it comes out clear."

Long Island Soundkeeper Grant Writer, Kim Courtney

About AbTech

AbTech Industries, Inc. is an environmental technologies firm dedicated to providing innovative solutions to communities and industry addressing issues of water pollutants and contamination. Its products are based on polymer technologies capable of removing hydrocarbons, sediment and other foreign elements from still (ponds, lakes and marinas) or flowing water (curbside drains, pipe outflows, rivers and oceans). In addition, Smart Sponge Plus reduces coliform bacteria found in stormwater, industrial wastewater, and municipal wastewater. EPA Registration # 86256-1. The company currently holds seventeen patents.

AbTech filtration products are currently being utilized in 36 states.

The Environmental Protection Agency lists AbTech's Ultra-Urban® Filter series with Smart Sponge® technology as a Best Management Practice (BMP) under the federal guidelines that local governments must follow.

AbTech offers a proprietary polymer technology unique in its ability to effectively remove, absorb and retain hydrocarbons from flowing or pooled water. AbTech has created a truly distinctive line of products developed specifically to overcome the various difficulties common to either traditional sorbent materials or their expensive mechanical alternatives. AbTech's filtration systems are adaptable, install quickly, and provide immediate BMP solutions with maximum flexibility for industrial, municipal and marina applications.

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