

# Smart Sponge<sup>®</sup> Technology

## *What is it?*

**Smart Sponge<sup>®</sup>** is a multi patented and patent pending hydrocarbon recovery system based on innovative polymer technologies. This technology consists of a proprietary blend of polymers called the **Smart Sponge<sup>®</sup>** which is chemically selective to hydrocarbons and readily encapsulates oil and bonds it within the structure. This process virtually transforms liquid petroleum hydrocarbons into a manageable solid waste that is fully recyclable. The Smart Sponge<sup>®</sup> repels water and remains completely buoyant for easy retrieval even when fully saturated.

## *How is Smart Sponge<sup>®</sup> formulated and packaged?*

The Smart Sponge<sup>®</sup> is produced by a proprietary manufacturing process into several different forms to optimise performance.

## *What is Smart Sponge<sup>®</sup> Popcorn for Filtration?*

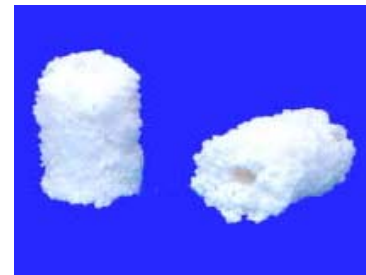
Smart Sponge<sup>®</sup> Popcorn is a non-leaching filtration media that resembles a piece of popcorn. It is designed for the filtration of aqueous solutions contaminated by hydrocarbon pollutant levels of 1,000 ppm or less. Smart Sponge<sup>®</sup> Popcorn will function under a wide range of flow rates and pressures. Laboratory and field tests have shown it to be a superior media for stormwater filtration, with an average hydrocarbon removal of better than 80%.



Smart Sponge<sup>®</sup> Popcorn

## *What are Smart Sponge<sup>®</sup> Propellets for Surface Skimming?*

Smart Sponge<sup>®</sup> Propellets are non-leaching absorbent units, cylindrical in shape and approximately 65 mm in length. The Propellets have a rough exterior and a very high internal surface area. Smart Sponge<sup>®</sup> Propellets are packaged in mesh containers and are designed to remove floating hydrocarbons, including sheen, from aqueous surfaces. Packaged Smart Sponge<sup>®</sup> Propellets float on the surface where the pollutant is most concentrated. The Smart Sponge<sup>®</sup> absorption process works equally well in calm or agitated environments.



Smart Sponge<sup>®</sup> Propellets

## *What is Smart Sponge<sup>®</sup> Particulate for land-based spills?*

Smart Sponge<sup>®</sup> Particulate is a non-leaching absorbent that is a lightweight powder-like material used to clean up and stabilize a wide variety of hydrocarbon spills on land. Smart Sponge<sup>®</sup> Particulate is placed upon the entire surface of the spill to stabilize hydrocarbons. After several minutes, the absorbed Smart Sponge<sup>®</sup> Particulate can be swept up for disposal or recycling. Smart Sponge<sup>®</sup> Particulate is not recommended for use on water.



Smart Sponge<sup>®</sup> Particulate

## *How has Smart Sponge<sup>®</sup> been developed and tested?*

Since its inception in the USA in 1993, Smart Sponge<sup>®</sup> has undergone an extensive research, development, and test program to optimize the Smart Sponge<sup>®</sup> formulation and assure the integrity of the product.

Extensive laboratory testing has been conducted at the company's facilities in Tucson, Arizona, at contract facilities in Albuquerque, New Mexico, and at many other independent research laboratories and universities. In addition to field tests on oil spills, field testing of Smart Sponge<sup>®</sup> products installed for stormwater treatment is ongoing in California, Massachusetts, and Texas as well as other locations around the USA and Europe.

# Smart Sponge® Test Results

*The following individual tests have been carried out on Smart Sponge®*

1. **In a series of tests on the Smart Sponge® using ASTM method F716-82(1993)**  
*Absorbency ratios ranging from 2:1 to 14.5:1 were achieved (weight of absorbed oil to weight of absorbent), depending on the viscosity of the oil and the duration of exposure.*
2. **Tests to demonstrate Smart Sponge® effectiveness in retaining the oil once absorbed:**  
*Fully absorbed Smart Sponge® were flushed with water for ten minutes, producing leachate values of 1.3 to 2.2 mg/L (average 1.7 mg/L), well below the allowable value of 10 mg/L.*
3. **Tests demonstrating the effectiveness of Smart Sponge® in absorbing low-level dissolved hydrocarbons.**  
*Smart Sponge® recovered up to 97% of an 8 ppm benzene solution in a simple gravity feed lab test.*
4. **EPA Method 1311/TCLP (Toxicity Characteristic Leaching Procedure) Test**  
*This test for volatile and semi-volatile organics, indicated that no detectable levels of leachable analytes were present in the Smart Sponge® saturated with used motor oil and diesel fuel.*
5. **EPA Method 9095 for Free Liquids (Paint Filter Analysis)**  
*The Smart Sponge® saturated with used motor oil and diesel fuel, have successfully passed this test, indicating no free liquids were present.*
6. **EPA Method 1010 for Flashpoint**  
*Smart Sponge® saturated with used motor oil and diesel fuel, have successfully passed this test. Saturated Smart Sponge® samples were tested at greater than 100°C.*
7. **Tests to establish the effect of differing pH values**  
*These tests indicated neither high nor low pH affects the integrity of the Smart Sponge®, or its absorbing characteristics.*
8. **Tests to establish Spark Generation**  
*These results show that the Smart Sponge® Passive Skimmers are static resistant and do not generate any spark in a zero humidity and -18°C environmental chamber. The surface charge is 1.82 x 10<sup>-9</sup> A SEC/m<sup>2</sup>, which is 50% less than polypropylene sorbents.*
9. **Tests to establish effectiveness of Ultra-Urban® Filters**  
*Tests on the Smart Sponge® Ultra-Urban® Filter have shown the product to significantly decrease hydrocarbon pollution in stormwater. Tests run in storm drain simulators confirm that the Ultra-Urban® Filter removed over 83% of the hydrocarbons present in a 28 ppm hydrocarbon stormwater solution.*

**Apart from the above, various other field tests have been carried out which confirm that Smart Sponge is one of the most effective methods of hydrocarbon removal available. For more detailed information please ask for any of the following field test results:**

1	UUF Evaluation	Hydroqual Engineers
2	UUF, Passive & Line Skimmers	Dulles Airport BP Maintenance Yard
3	UUF Evaluation	Westchester County Airport
4	UUF Field Tests	Astro Environmental
5	USA EPA Evaluation of UUF	US Environmental Protection Agency
6	UUF Field Tests	Santa Monica, California
7	Sediment Removal UUF's	Millsaps College, Mississippi
8	UUF Maintenance Report	City of Carson, California
9	UUF Technical Review	Resource Planning Assoc. Seattle

***What advantages does Smart Sponge® offer over other traditional sorbents currently on the market?***

Smart Sponge® offers a number of obvious advantages over polypropylene adsorbents - primarily its ability to fully encapsulate recovered oil, resulting in a substantially more effective response. Because Smart Sponge® safely "locks up" absorbed hydrocarbons and will not leak or leach, it can remain in place until fully saturated resulting in no wasted product and less expensive disposal options. This cost-effectiveness makes Smart Sponge® one of the most desired products on the market.

***What makes Smart Sponge® products a stormwater BMP (Best Management Practice)?***

Hydrocarbons from non-point sources are deposited on streets, carriageways, parking areas, and industrial sites which are washed into storm drains when it rains. Annual stormwater runoff from one square mile of roads and parking areas can contain as much as 18,000 litres of oil and grease. This number does not include deliberate dumping and accidental releases of oil. Smart Sponge® products strategically deployed in gullies, catch basins, oil/water separators, and sumps intercept this oil, remove it in a non leaching fashion, from the stormwater flow and prevent its discharge into receiving waters and aquifers.

***What Advantages does the Ultra-Urban® Filter with Smart Sponge® offer as a BMP***

The Ultra-Urban® Filter has the potential to address several targeted non-point source pollutants. Its Smart Sponge® lining is effective in filtering out hydrocarbons. Just as critical, its design makes it an effective catch basin which captures trash, sediment, and debris. Often attached to this solid waste are metals, pathogens, and other contaminants of concern.

***Can Smart Sponge® be recycled?***

Smart Sponge® can be immediately recycled by Ogden Waste Treatment Services (OWTS) within the USA in their waste-to-energy facilities, by beneficially reusing the spent Smart Sponge® as an alternative fuel in the production of electrical energy. OWTS will guarantee environmentally safe and efficient destruction of the spent product and provide a recycling certificate to the customer which will; in effect, reduce any downstream liabilities associated with land filling and will "close the loop" for product use.

Similar arrangements are currently being investigated for the UK with various potential partner organisations.

## Used Oil Facts - USA

### GENERAL STATICS

- Each year about 2.3 billion gallons of lubricating oil is sold in the United States
- A little more than 50% is sold as motor oil. The rest is sold to industry
- About 1.3 billion gallons of used oil is generated each year from industry and automobiles
- Almost one half of used motor oil is generated by do it yourselfers [DIYers] 300 million gallons

### EVERY YEAR:

- About 100 million gallons of base stock suitable for blending into motor oil are re-refined
- About 100 million gallons of metal working fluids are recovered from used industrial oil
- About 865 million gallons of used oil are recycled into industrial fuel oil
- The fate of about 235 million gallons of used oil, much from DIYers, is unknown
- Much of this oil, 180 million gallons, is presumed to be disposed of improperly
- Used motor oil contains toxic substances such as toluene, lead, cadmium and benzene
- The oil from a single oil change can foul a million gallons of drinking water
- One pint of can produce a slick on an acre of surface water
- Oil films prevent replenishment of dissolved oxygen, impair photosynthesis, and block sunlight
- Crankcase oil accounts for 40% of oil pollution of the nation's harbours and waterways
- Concentrations of 50 to 100 parts per million of used oil can foul sewage treatment plants
- Oil dumped on land reduces soil productivity
- Many industrialized countries, worldwide, recover a greater portion of their used oil as fuel and lubricants than the United States

## Stormwater Facts - USA

According to a 1998 EPA report, about **40%** of assessed U.S. streams, lakes and estuaries were **not clean enough** to support uses such as fishing and swimming. Leading pollutants in impaired waters include silt, bacteria, nutrients and toxic metals. Runoff from agricultural lands and urban area are the primary sources of these pollutants. Although the U.S. has made significant progress in cleaning up polluted waters over the past 30 years, much remains to be done to restore and protect the Nation's waters. For more information see the [National Water Quality Report](#).

One quart of oil can **contaminate up to 250,000 gallons** of drinking water; 4 quarts of oil can form an oil slick approximately 8 acres in size. That's an oil sheen about the size of 8 football fields. At least **50% of water quality problems** in the United States result from non-point source pollution. NPS pollution occurs when water runs over the land, picks up pollutants from dispersed sources - lawns, streets, construction sites, farms - and transports them to surface waters.

Impervious surfaces, such as roads, rooftops, and parking lots generate **nine times more runoff** than a wooded area of the same size. The porous and varied terrain of natural landscapes, like forests, wetlands, and grasslands, trap rainwater and allow it to slowly filter into the ground. In contrast, urban landscapes coat the land with nonporous surfaces - which act like impenetrable barriers to rainfall. Water remains above the surface, accumulates, and runs off in large amounts collecting contaminants on along its path to the nearest storm drain.

Runoff from a typical U.S. city during the first hour of a storm can carry **more pollutants** than the city's untreated sewage flow during the same period of time.

(Source: Urban Runoff and Stormwater Management Handbook, EPA, 1990)