Hydrocarbon Removal

Using Bioremediation with Porous Paving and Bio-swales

Hydrocarbon Problem
Asphalt paving and emissions from vehicles generate an ongoing source of light hydrocarbon emissions, which can include numerous "anes" and "enes" along with aromatic hydrocarbons (the bulk of which evaporate into the atmosphere when spilled). Most of these materials can be toxic, and are regulated by concentration amounts contained within our public waterways and/or water tables, in order to protect our water supply.

Elimination of the source is not a valid option in our economy or culture, so we must find means to minimize the generation, or occurrence, of sources and volumes, and find ways to mitigate their impact when sources are found. Invisible Structures, Inc. promotes the use of porous paving, and bio-swales as a method of bioremediation to combat hydrocarbon pollutants at, or close to, the source.

Bioremediation Solutions
Natural biological activity can reduce and eliminate low concentrations of hydrocarbon emissions, such as those found adjacent to our streets, highways, and parking areas –including those surfaced with asphalt. Primary activities from natural systems include **oxidation** (enhancing the presence and continuous source of oxygen), and **microorganisms** (found in all upper soil layers, including porous paving).

Oxidation works by the exchange of electrons (positive or negative) between petroleum-based hydrocarbons and other elements found in soils, usually in the presence of adequate amounts of oxygen. Elements, such as iron, magnesium, sulfur, carbon, and phosphorous, plus hydrogen and nitrogen are all required as "food" by microorganisms for growth.

Turf root zones (as found in grass porous paving and bio-swales) contain all of these elements in natural grasslands, and especially in cultivated turf areas. As the elements are consumed, new, simple and safer compounds, that are harmless to our environment, are released.

The porosity of our Grasspave2 and Gravelpave2 pavement cross-sections ensures that copious amounts of oxygen are available for microbial feeding. There is also a high amount of surface contact area on sand and gravel particles in the cross-section to attract and hold the pollutants for sufficient time to allow consumption by microbes.

Bioremediation has also been found successful in treating heavy petroleum spills (coal tar, wood treating chemicals, and refinery wastes), but the rate of reduction is much lower and contact time must be maximized.

While various petroleum spills sites have experimented with multiple methods of bioremediation, (with mixed results) the typical pavement runoff scenario involves drastically lower concentrations of pollutants. These concentrations are well within the capabilities of naturally occurring colonies of microbes that can be enhanced with greater oxygen capacity of our porous pavements and bio-swale technology.

Please call or contact Invisible Structures, Inc. technical support staff if you should have any questions or issues with this paper.

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