TechData Sheet

Naval Facilities Engineering Service Center
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Demonstration of a Polymer Coating on Contaminated Soil Piles

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Problem

Stockpiles of contaminated soils at cleanup sites must be protected to reduce dust and sediment from entering stormwater runoff. Many Navy facilities have stockpiles of contaminated soils, awaiting remediation or off-site disposal. These soil piles are traditionally covered with two types of plastic covers: a **clear cover** that quickly deteriorates under ultraviolet light and a **high density polyethylene cover**, which is very expensive. Plastic covers are difficult to install and keep secured during strong winds and rainstorms.

Solution

As a solution to these expensive plastic covers, a commercially available polymer coating can be used as a highly effective cover to control dust and erosion. A coating is a cost-effective method to protect soil from wind and rain, while being unaffected by ultraviolet light. Compared to a plastic cover, a coating is more effective in reducing stormwater contamination caused from erosion and reducing dust or particulate matter in the air.

The coating lasts longer and requires less maintenance than a plastic cover. Since the coating solution is benign, it can be mixed with the soil and put into the ground.

The coating meets National Pollution Discharge Elimination System requirements for erosion control and meets the United States' Environmental Protection Agency requirements for reducing particulate matter in the air.

Demonstration at Naval Shipyard Long Beach

A polymer coating was demonstrated on stockpiles of contaminated soil at Naval Shipyard (NSY) Long Beach (Figure 1). Approximately 11,000 yd^3 of contaminated soil needed covering to contain petroleum vapors and protect against erosion from wind and rain. Due to ultraviolet deterioration and constant winds, a plastic cover lasted about 2 months before a replacement was needed. A polymer coating, under the tradename SOIL-SEMENT®, was proposed to the Regional Water Quality Control Board (RWQCB) as an alternative to the plastic cover. The RWQCB approved the technology as an experiment for the site. The coating has been in place since September 1997 and has endured numerous rainstorms and high winds without having any dust or erosion problems.

Figure 1. Soil pile at Naval Shipyard, Long Beach.

Technical Description

SOIL-SEMENT® is a polymer emulsion. The formulation contains polymers, which are considered non-hazardous by the Occupational Safety and Health Administration definition. It does not contain any hazardous solvents and is non-toxic and non-hazardous.

SOIL-SEMENT® has the unique ability to penetrate, saturate, and bond surface dust and aggregate together and "cement" this to the base to create a hard, dust-free, and water-resistant surface. The effectiveness results from the length and strength of its polymer molecules and their ability to bond with surface materials. It has a unique chemical structure made of molecules attached in relatively straight-linked chains and then cross linked between other chains that may be 1,000,000 molecules long. The molecular structure is much stronger compared to the smaller molecular structure of oil, calcium, petroleum resin, and asphalt emulsion products which range from 100 to 10,000 molecules. As a result, the coating can be made as strong as steel or as resilient as rubber.

SOIL-SEMENT® is environmentally safe; is non-toxic, non-corrosive, and non-flammable; does not pollute groundwater; does not disturb vegetation; and does not change the pH of soil. When drying, it does not contribute any pollutants to stormwater runoff. It will actually reduce pollutants by reducing total suspended solids present in stormwater runoff.

SOIL-SEMENT® is a concentrate that is diluted with water prior to application. Simply sprayed onto the soil, it dries in 2 to 3 hours and cures in 24 to 36 hours (Figure 2). When the soil pile is reclaimed, the coating breaks up and can be handled as normal soil. The number of applications depends on the activity of the soil pile. An inactive soil pile may only need one application and may last a year or longer. The application may last longer by either increasing the concentration and/or increasing the number of applications.

Figure 2. Applying SOIL-SEMENT® to a soil pile.

In addition to contaminated soil piles, a polymer coating can be used for a variety of applications such as: construction sites, dirt roadways, coal piles, dirt helicopter pads, slope stability, and an alternative to the 6-inch daily soil cover in landfills.

Additional information on the other applications of polymer coatings is available from the Naval Facilities Engineering Service Center.

Benefits

SOIL-SEMENT® has the following benefits:

- Is cost effective compared to a plastic cover
- Minimizes particulate matter in air
- Creates a stabilized surface which will not shift or break
- Protects against wind and rain
- Is not affected by ultraviolet light
- Prevents rain water from seeping into the soil
- Dries clear which preserves the natural appearance
- Mixes with the soil and can be put into the ground

Cost Analysis

Soil piles at NSY Long Beach were covered on two occasions with a visqueen cover at a cost of approximately $32,000 each. After the visqueen cover failed a second time, SOIL-SEMENT® was applied at a cost of $25,000. The cost savings of SOIL-SEMENT® versus a third visqueen cover was $7,000. However, if SOIL-SEMENT® had been initially applied, the cost savings would have been $64,000.

SOIL-SEMENT® concentrate is $3.00 to $4.00/gallon. The amount required varies, depending on the surface area of soil, activity of soil (how often the soil is disturbed), and duration of soil control. Therefore, to determine the cost for coating a soil pile, the surface area, activity of the soil, and duration of soil control must first be estimated. Coating an inactive soil pile for a year or longer will cost 4 to 5 cents per ft^2. In contrast, a construction site with a large amount of soil activity will require a stronger concentration and will cost 5 to 12 cents per ft^2. Since cost is a strong function of surface area, the soil pile must be constructed to minimize the surface area to lower the cost. This can be done by forming a taller pile with a circular or square base.

For more information about **polymer coatings**, contact:

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