Laboratory Study of Acrylic Polymer Effect on Fine-grained Soil Stabilization for Reducing Hazes in Arid and Semi-arid Areas

Gholamreza Tadayonfar
Assistant Professor, University of Hakim Sabzevari

Narjes Shahmiri
Expert of Environmental Protection Organization (Comprehensive Monitoring Office) M. D. Student of Environmental Management at Azad University, Science and Research Branch of Tehran.

Extended Abstract

Abstract

Iran, due to being a large part of it (21% of total area) on the arid and semi-arid zone among the countries is prone to dust storms. Existing of dust and haze in these area is the main problem that has plagued residents and bystanders and it has occasionally disrupted their lives. Identifying area for producing dust may be determined by using satellite data. However many dust storms can be seen clearly near these area.

Monsoon wind causes the mass of clay and silt as dust and haze and sometimes in the form of smoke spreads in the atmosphere and the range of horizontal visibility is limited to 1 and 2 Km. In addition to the environmental problems, this phenomenon has many disadvantages for patients with cardiovascular and respiratory and is also very harmful for children. In this regard, the subject of fine soil partial stabilization using polymer as a way to reduce the production of dust from prone area is defined.

The area where silt is rich is responsible for the occurrence of dust storm that due to the low adhesion between the particles of silt easily moved by wind or water on each other and transmitted from place to place. To prevent the movement of silt soil, friction and interaction between soil particles should be increased. Many other factors including soil type, topography, and climate of a region can create dust. Among these, changing the soil properties by additives considered as a factor for controlling haze.

In this paper, the effect results of acrylic polymer on a pile of fine-grained have been showed the soil has been simulated for different sizes of fine grains. The samples in this study were made of soil particles in addition to different percentage of polymer (0, 5, 10, 15, 20, 25, and 30 by weight of dry soil) were completely mixed together. These samples under laboratory conditions were maintained for 7 days so after ensuring complete dryness, the characteristics of environmental sustainability are examined against the wind. With the addition of polymers to soil, although the soil dry density of the soil conditions without polymer reduced, but adding polymers to soil, significant increases in soil stability against wind blowing at a speed of 72K/h showed. This stability is due to positive reaction of the polymer with the soil particles not only its effect on the duration of storage of samples in the laboratory remained constant, but under test conditions have maintained their characteristics. The result showed an increase of 4% polymer into soil, has about 15 times more stable than the soil without polymer (such as arid and semi-arid soil) increased respectively.

Keywords: Haze, acrylic polymer, arid and semi-arid area, stability against wind.