

Groundwater leakage stopped by bacteria

John W. Lambert^{*}, Victoria Whiffin (GeoDelft, Stieltjesweg 2, 2628CK Delft, The Netherlands

2.2.

Recently, the Dutch National Institute on Geotechnical Engineering, GeoDelft developed a new concept, called SmartSoils®. SmartSoils®, or soil on demand means that we aim to be able to change properties of the soil (e.g. permeability, stiffness, strength), in such a way that they fulfill pre-specified requirements for construction activities. These new techniques open a wide range for applications in geo-engineering. In this range of techniques BioSealing is the first one which has been successfully applied in field conditions, representing a low-priced alternative for traditional leak repair in underground constructions.

BioSealing was developed in co-operation between GeoDelft, Visser en Smit Bouw and Delft University of Technology in the Netherlands. It is a technique based on the stimulation of bacteria-growth in the soil, to seal off undesired leakages both in underground constructions, and in geological formations. The formation of stable precipitates in the leaking area is induced by the simple injection of nutrients to natural subsoil bacteria. Due to the groundwater flow towards a leak, nutrition and bacteria will automatically reach the leak and seal it off. Therefore it is not necessary to know the exact location of the leak and can the nutrition be injected at several meters distance of the location of the leak. BioSealing is environmental friendly ("only adding sugar") and durable, although more research has to be done to know the real durability. It is expected that future developments of BioSealing, and in general SmartSoils®, will play a major role in decreasing failure costs.

BioSealing was developed to prevent excessive drainage of building pits due to leaks, for example in sheet piles. After several laboratory tests and a field test (where 3 20ft see-container were buried on vertical position with known leaks in the bottom of the containers) a first commercial application was conducted to seal leaks which were caused by the construction of an aqueduct under the 'Ringvaart Haarlemmermeer' in 2005. Brackish seepage water flows through a gravel layer along the aqueduct from the Pleistocene sand layer to the surface. BioSealing sealed the gravel layer successful off. It should be mentioned that the tests are related with unconsolidated materials as sand and gravel. However, Canadian experts have developed, independently from this Dutch research, BioSealing as a method to prevent groundwater flow through microfissures and microcracks in fractured rock materials.

Author's address for correspondence

Author's Name: John W.M. Lambert
Company: GeoDelft
Street: Stieltjesweg N°: 2
City: Delft Zip code: 2628 CK
Country: The Netherlands
Tel: +31 (0) 15 – 2693842 Fax: +31 (0) 15 – 2610821
Email: J.W.M.Lambert@geodelft.nl