8ICEG Invited Lecture

Prof. Stephan Jefferis

Director, Environment Geotechnics Ltd and Visiting Professor, University of Oxford

Invited Lecture Title

Low permeability vertical barriers: the state of the art and the research needs for the future

【17:00 - 17:30 , Monday 29th Oct. 2018】

Biography

Professor Stephan Jefferis is a director of Environmental Geotechnics Ltd and a Visiting Professor in the Department of Engineering Science at the University of Oxford.

He is the immediate past Chairman of the British Geotechnical Association.

He has worked on major projects across the World and has over 45 years' experience in the investigation and resolution of unusual materials and environmental problems often associated with natural chemical and microbiological processes in the ground.

He has worked on cutoff walls and excavation support fluids for decades and is co-author of the book 'Polymer support fluids in civil engineering'.

Abstract

This paper will provide a 50-year perspective on vertical barriers formed by slurry trench techniques for applications such as dams and levees and the control of groundwater migration from landfills and contaminated sites.

The paper will consider the behaviour of the basic materials used in cut-off construction focusing on issues that are often overlooked. It will then consider laboratory and field testing for the assessment of barrier performance at the time of construction as well as in the longer term. Interaction with contaminants in the ground is always a concern for barriers and it is recognised that there is a plethora of papers on the effect of chemical contaminants on landfill liner materials and to a lesser extent on vertical barrier materials. However, a missing element from many laboratory reports is an attempt to scale-up the results from the laboratory to predict long-term performance in the field. A basic approach to scale-up and the use of laboratory data will be presented.

Another much-researched area of barrier performance is sorption of contaminants on barrier materials and hence retardation of contaminant migration fronts. However, it

has to be recognised that unless there is biodegradation of sorbed contaminants in the barrier their storage in the barrier is temporary. If the source chemistry changes/evolves, one contaminant can be displaced by another if of higher concentration and/or if it is more strongly bound. The displaced contaminant can then be ejected from the barrier at higher concentration than originally input.

As vertical barriers technologies are well-established, research needs might be thought to be limited. However, applications continue to develop, ever deeper walls in yet more challenging environments. It is time for more full-scale testing of barriers with monitoring over timescales of decades not days to explore the often overlooked effects of long-term permeation by natural waters and volume change of barrier materials in service.