Wednesday, 3/15/2017

8–9:30 a.m.

Geomembranes

Chairs: Don Hullings, Cornerstone Environmental Group; Eric Blond, SAGEOS / CTT Group

Determining Long-Term Transmissivity of Selected Drainage Geocomposites to Landfill Leachate

Stephan Fourmont, Afitex-Texel; George Koerner, Geosynthetic Institute

In the design and construction of landfill leachate collection and detection systems, it is important to maintain adequate drainage in order to minimize the hydraulic head on both primary or secondary liner systems. This is reflected in minimizing the leakage through the liner system. The situation is heightened when wet (also called bioreactor) landfilling is practiced in order to have rapid degradation of the organics as opposed to traditional dry landfilling. Concern has been expressed over such aggressive liquid management practices in bioreactor landfilling in regard to the long term clogging of geocomposites in either the leachate collection or leak detection systems of double lined municipal solid waste (MSW) landfills . In order to evaluate different geocomposite drainage systems we tested several per the GRI-GC1 Standard, "Test Method for Soil-Filter Core Combined Flow Test". These experiments were conducted for three years in a field laboratory at a major MSW landfill in the U.S.A. The investigation was conducted until system permeability reached equilibrium. It was found that the tubular geocomposite performed well over time. Good performance was predicated on proper geotextile filter selection with this particular leachate and set of environmental conditions. Conclusions and recommendations as to various possible drainage geocomposites and their behavior are presented.

Case History of Six 25-Year-Old Geomembrane Lined Ponds

Dan Rohe and Mark Wolschon, EPI

Six adjacent research ponds were constructed in 1990 using different formulations and thicknesses of PVC geomembranes liners. The ponds were 1.8 m deep with slopes of three horizontal to one vertical. The ponds were located in Mancelona, MI, USA and fully exposed to the envionment. They contained water but were exposed above the waterline. The site is situated in northwest lower Michigan, approximately on the 45th parallel. Ambient temperatures range from +30 to -30°C. An assessment of the six different PVC geomembranes after 25 years of service is provided herein. Results are based on physical, mechanical and endurance test results.

Geomembrane Water Proofing of 16.3-1km Hydroelectric Structural Wood Flume

Brian Fraser, Mike Neal, and Ross Hartsock, Layfield Group

In 2015 the authors undertook to refurbish a 16.3 km (10.1 mile) elevated wood and metal flume that was owned by a private hydroelectric company near Mount Rainier, Washington. The hydroelectric facility was originally built in the early 1900's. Water is diverted from the Puyallup River at an intake diversion and carried by a wood flume structure downstream to the hydroelectric generating plant. The flume is supported by approximately 6,200 beams of which approximately 1,200 are wooden. In many areas of the flume, the wood floors and walls were badly decayed and leaking. The plant had an operating capacity of 26 megawatts (MW) however as a result of the structural decay the flume was experiencing significant water leakage resulting in the plant only operating at 8 MW. The project started with 165,000 m2 of a high strength geotextile that was installed below the geomembrane to help structurally reinforce the deteriorating wood flume walls and flooring. The water proofing of the flume

required a total of 140,000 m2 of 2.5 mm and 2.0 mm HDPE liner material to be installed. The project faced many challenges as a result of poor access and tight space constraints. There was no roadway or vehicle access other than three staging areas. All project related materials and equipment needed to be deployed using a small rail car and track built into the top of the flume structure. Crews had to deploy, weld and mechanically attach geomembrane while working in a very confined working space.

The Benefits of Exposed Geomembrane Covers for Intermediate Applications at Landfills

Donald Hullings, Cornerstone Environmental Group; Tom Hasek, Seneca Meadows Inc.

Exposed geomembrane covers (EGCs) have been used on landfills in place of more traditional soil-covered geomembranes. The design details and economic benefits of not using a soil cover have been well documented (Hullings 2007; Hullings 2009). This presentation focuses on the benefits of installing an EGC instead of intermediate soil cover. While an EGC for this application adds additional cost, it provides improved landfill gas capture, reduces the amount of storm water that infiltrates the landfill to create leachate, and reduces potential erosion. The capture of more gas can reduce odor and greenhouse gas emissions, while at the same time provide more methane for use in renewable fuel projects. The reduction in leachate has a direct impact on leachate treatment and disposal cost, which is becoming more expensive as options are becoming more limited. The enhanced soil erosion protection saves valuable soil from washing away while also protecting surface water. A case study details the benefits that operators may achieve.

Effect of White and Black Color on Heat Generation in Polyethylene Geomembranes Exposed to Solar Radiation

Patricia Dolez, SAGEOS/CTT Group; David Beaumier, SAGEOS/CTT Group; and Eric Blond, SAGEOS/CTT Group; Ata Taghizadeh, Solmax

Carbon black is often added to polyethylene geomembranes to improve their ultraviolet resistance. The black color, on the other hand, absorbs most of the solar energy reaching the surface of the geomembrane. The resulting temperature rise induced in the geomembrane is the source of numerous problems in the field. A fine white layer may be added on the exposed surface of the geomembrane to reflect the solar radiation and reduce the geomembrane temperature. This study is aimed at quantifying the difference in heat generation under solar irradiation associated to the presence of this white surface layer. Black and white-surfaced geomembrane specimens were exposed to various laboratory-controlled solar irradiances, using a Xenon-arc chamber modified for the purpose of this project. Temperature was found to be significantly lower in the white-surfaced geomembranes, compared to the black ones, with differences in the range of 10 to 20°C depending on the laboratory controlled solar irradiance.

Performance Evaluation of a Bioreactor Landfill Operation

Md. Zahangir Alam and Md. Sahadat Hossain, University of Texas at Arlington; Sonia Samir, Solid Waste Institute for Sustainability

The optimum performance of a bioreactor landfill operation will minimize the operational cost and maximize the benefit to a landfill owner. Performance of bioreactor landfill operation can be evaluated through monitoring several indicators such as moisture distribution, leachate generation, gas production, and landfill settlement. The current study is focused to investigate the performance of a bioreactor landfill operation by assessing performance indicators. The study was conducted at the City of Denton Landfill, Texas, USA. Electrical Resistivity Imaging (ERI) technique was utilized as a tool to

monitor moisture distribution within the landfill. The ERI results indicated that the moisture content rebounds back to its pre-existing state after 2 weeks (14 days) of leachate recirculation. The variation from base line to 14 days is due to moisture movement (horizontal and vertical), leachate generation, and waste decomposition with time. In addition, the water balance simulation model visual HELP is conducted which indicated that the actual leachate generation in the field was approximately 55% lower than the HELP model results. The added water/leachate being used in gas production and may resulted the lower leachate return from the landfill. Hence, an increase in gas generation was observed and it increased from 543.6 m3/h (320 scfm) in 2010-2011 to 1087.3 m3/h (640 scfm) in 2014-2015. Moreover, landfill settlement was determined through surveying and a total of 1.524 m (5 ft.) maximum settlement was observed in some locations of the landfill cell between in year 2014-2015 of bioreactor operation which leads to additional space gain in the landfill. Therefore, based on the preliminary results, it can be summarized that the bioreactor landfill operation is performing effectively with time.