EREF TECHNICAL BRIEF

It is the goal of the Environmental Research and Education Foundation (EREF) to fund far reaching, impactful and high quality research that can be used by solid waste industry and the public it serves to achieve greater sustainability, sound environmental stewardship, improved process efficiency and increased knowledge.

Following are briefs on two projects funded by EREF that have recently been completed. The final reports for these projects are available on the EREF website at www.erefdn.org.

Radiological Investigation of Tritium in Landfills

Grantee: Safety Ecology Corporation & Pennsylvania Dept. of Environmental Protection
Award Amount: $72,500

Tritium (3H) is a radioactive material that is sometimes detected in landfill leachate. Since tritium is only produced naturally via cosmic ray interaction in the upper atmosphere and less recently by above ground nuclear testing, its presence in leachate was more puzzling. After some initial detective work, it was found that gaseous tritium light source devices such as EXIT signs used in most buildings were being disposed of in MSW landfills. Tritium is not a treatable constituent in landfill leachate and must be diluted to reduce its concentration in liquid such as leachate or water.

In support of preliminary studies completed by the Pennsylvania Department of Environmental Protection (PADEP), the PADEP in cooperation with the Environmental Research and Education Foundation, initiated a sampling study to evaluate fluctuations and trends in tritium levels in leachate at Pennsylvania landfills.

Results of this study found that approximately 97% of the 3H measurements were above the minimum detectable concentration (MDC) of 100 pCi/L and higher than typical 3H concentrations in rainfall. The study also concluded that the magnitude and range of tritium sampling results from mid-2007 through the 1st quarter of 2009 at 54 Pennsylvania landfills found detectable tritium levels in most of the landfills sampled. However, accounting for dilution to the nearest downstream drinking water intake, the 3H activity concentrations were 100 times less than the U.S. EPA maximum contaminant 20,000 pCi/L and posed a relatively minor risk.

Click here for more information, including the full report.

Modeling of Hydrogen Sulfide Generation from Landfills Beneficially Utilizing Processed Construction and Demolition Materials

Grantee: University of New Hampshire (Dr. Jenna Jambeck)
Award Amount: $147,558

Increasingly over the past decade, construction and demolition (C&D) debris processing residuals and fines have been used as landfill daily cover material and to close and cap old landfills as an alternate daily cover material (ADC). Alternative daily cover materials are advantageous because they can reduce cost and increase the permitted airspace of the landfill. However, one potential issue with use of C&D fines is an increase in landfill gas (LFG) odors due to production of hydrogen sulfide (H2S) and other reduced sulfur compounds which may lead to increased odor abatement costs. Additionally, regulators have become involved in several states, implementing policies for use of C&D fines, management of LFG and control of odors. As a result, many landfills have stopped utilizing C&D fines altogether. The primary issue in the application of C&D fines as an ADC is determining how much can be used while ensuring minimal odor issues.

As a result, the development of a model to predict H2S generation resulting from acceptance of C&D fines in a typical MSW landfill can estimate how much C&D fines can be used, providing valuable information for C&D processors, landfill operators and regulators.

The objectives of this research project were to:

- Compile and evaluate existing landfill gas, hydrogen sulfide and C&D fines data at nine northeastern landfills.
- Where necessary, conduct supplemental testing of H2S gas concentrations and determine the sulfate content of C&D fines, if still being accepted by the site.
- From the empirical data, develop a first order model to predict H2S generation in MSW landfills in the northeast resulting from disposal or use of C&D fines in the landfill.

Results of this study show H2S generation in an MSW landfill resulting from C&D fines is expected to peak and decline much more rapidly than for methane. Additionally, the model results indicate that C&D fines used as ADC material in MSW landfill environments are expected to decay more rapidly (higher k value) and produce more H2S per ton of sulfate deposited in the landfill (higher sulfur value) then C&D fines that are monofilled. Further, based on the model results of one site (Landfill B), which in addition to monofilling the C&D fines also mixed C&D fines with soils to reduce H2S generating potential, there is some preliminary evidence that by mixing or layering C&D fines with the right kind of soil in a monofill environment, the H2S generating potential of the fines can be reduced. Lastly, in the absence of site-specific data, this research shows a decay rate, k-value of 0.34 for monofilled C&D fines and a k value of 0.70 for C&D fines in an MSW landfill setting are appropriate in the Northeast U.S.

The modeling approach from this study can be used as a tool used to determine the amount of C&D fines that can be accepted/utilized as ADC or fill based upon the acceptable generation of H2S. While

H2S contributes to odor, it should be noted that this model is not an odor model. In addition to acceptable fines quantities and H2S generation, this modeling approach could be valuable for landfills to estimate the cost of C&D fines in terms of LFG management and treatment.

Click here for more information, including the full report.

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Lighting a path to sustainable waste management practices

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