

Name: James L. Hanson
Affiliation: Lawrence Technological University
E-mail: hanson@ltu.edu
Webpage: www.ltu.edu

Geoenvironmental Research Experience

Thermal analysis of landfills

Project investigating the spatial distribution of temperatures and gas levels within landfills as well as the influence of temperature on the engineering properties of wastes. Investigation includes field monitoring (at landfills in various climatic regions), laboratory tests, and numerical modeling.

Ultrasonic evaluation of stabilized soil mixtures

Project investigated the correlations between pulse velocity and the mechanical behavior of soil stabilized with fly ash.

Alternative processing for paint sludge

Project investigated assessment of current techniques used in handling paint sludge at various automobile assembly plants and analyzed options for reducing costs and environmental impacts of existing and alternative processes.

Geoenvironmental Teaching

Developed one course in Geoenvironmental Engineering that includes coverage of contaminant transport and waste containment facility design. Also, developed i) Designing with Geosynthetics, ii) Infrastructure Problems and Solutions, and iii) Ground Improvement for Foundations, which each contain some geoenvironmental engineering coverage.

Geoenvironmental Consulting Experience

Served as a faculty intern for summer 2003 with DaimlerChrysler Corporation investigating alternative dewatering and disposal methods for paint sludge.

Appraisal of Geoenvironmental Research, Education and Practice

RESEARCH

Research in the area of geoenvironmental engineering has reached a status of providing improved techniques for remediation and waste containment. Significant advances in modeling geoenvironmental systems have occurred. Field-scale verification of containment and remediation techniques has been investigated to a limited degree. Progress in the waste containment area has been further developed than remediation work.

EDUCATION

Teaching of geoenvironmental engineering has reached a stage of maturity that can be characterized by a consistency among university programs. Courses containing common material (such as waste containment facility design or remediation techniques) are being offered at many universities. Generally, geoenvironmental engineering coursework is offered at the graduate level. Some introductory concepts of geoenvironmental engineering are covered in undergraduate geotechnical engineering courses. Few programs exist where a full geoenvironmental specialization can be obtained at the graduate level. The presence of short courses related to geoenvironmental engineering has visibly decreased in the past few years.

PRACTICE

Waste containment methods have advanced considerably due to a combination of regulatory constraints and materials engineering developments (primarily in the areas of geosynthetics and compacted clay). Re-use of industrial byproducts has become established in various materials processing industries (most notably, concrete). A great benefit of reusing industrial byproducts in geotechnical applications is the sheer volume of materials used in this industry. Small percentages of fillers or replacements can accumulate to substantial volumes of re-use.

Perspective on Emerging Geoenvironmental Issues and Technologies

Education in geoenvironmental engineering will continue to expand as new technologies are developed. As geoenvironmental engineering earns its own place as a sub-specialty of civil engineering, opportunity exists for further developing graduate coursework to provide training for this specialization. ASCE Policy 465 allows a timely opportunity for more specialized graduate education and training.

A broader scope of re-use applications needs to be evaluated. To date, geoenvironmental engineers have taken waste products from various industries and effectively used these products as raw materials for mixing with soils, aggregates, or stabilizing agents for geotechnical applications. For optimization of re-use applications, the entire process (from byproduct formation to re-use application) needs to be further evaluated on an individual basis. This includes consideration of the original manufacturing process (that is producing byproducts) as well as appropriate processing of the byproducts to optimize performance in the ultimate geotechnical application. Many industries are still not aware of potential re-use applications for their waste products in geotechnical applications. It is envisioned that optimization of these sustainable practices may be possible by combining byproducts from various sources and various industries.

The practice of geoenvironmental engineering is on the verge of significant advances based on fundamental research findings due to scale and potential combination of technologies. First, research in geoenvironmental engineering has reached an important stage of increasing scale to field verification of basic methods. This scale of research has involved industry to conduct field demonstration projects. An example of technology that has reached the field demonstration stage is the bioreactor landfill. Industry has promoted acceleration of waste decomposition to maximize air space in landfills as well as reduce post-closure liability. Various full-scale bioreactor landfills are in place and operational. Second, the practice of geoenvironmental engineering has reached a stage of optimizing remediation and containment applications. The application of combinations of various technologies for optimization represents great potential for both the research community and industry in geoenvironmental engineering.

Standards development in geoenvironmental engineering has lagged behind the pace of both research and industry. The academic community has a rather limited presence at the ASTM committee meetings for both D-18 (Soils and Rock) and D-35 (Geosynthetics). Potential exists to accelerate standards development by increasing presence of leading edge researchers at these meetings. In general, a closer tie between researchers and practitioners would benefit research by promoting practical investigations, would benefit practice by providing improved technologies and methods, and would benefit education by highlighting the connection between theory and practice.