Clay Liners for Waste Management Facilities—Design, Construction, and Evaluation


Since the inception of the Resource, Conservation, and Recovery Act of 1976 and its subsequent amendments, the land disposal industry has undergone dramatic changes. No longer are hazardous wastes buried in unlined pits. Instead, they are placed in engineered facilities that are designed to mitigate contamination of the surrounding environment. As a result of this change in disposal practice, an abundance of research has evolved with regard to the ability of the clay liner to prevent migration of contaminated liquids contained within landfills. The book, Clay Liners for Waste Management Facilities—Design, Construction, and Evaluation, is a summary of the literature relevant to the behavior of clay liners, and also includes the results of interviews with professionals involved in the design, construction, and evaluation of clay liners. Case histories are included that describe the performance of a number of landfills in which clay liners were employed. The book is a hardcover version of a report submitted to the USEPA in 1988.

Chapter 1 introduces the various topics covered in the book. Chapters 2 through 4 summarize the engineering properties of compacted clay that are relevant to the design and construction of clay liners. Clay mineralogy and chemistry are described in Chapter 2. Chapter 3 presents testing methods and the fundamentals of compaction theory; the discussion of in situ hydraulic conductivity testing is the most interesting part of the chapter. This discussion is comprehensive and understandable. The compatibility of waste liquids and clay soils is discussed in Chapter 4. Numerous compatibility studies are summarized in this chapter, some of which are difficult to obtain, but the chapter does not adequately address the importance of the selection of permeameters to be used in waste compatibility testing.

Chapters 5 through 7 discuss the practical aspects of design, construction, and performance of clay liners. Chapter 5 discusses current methods used in the design and construction of clay liners. Design considerations are thoroughly described and construction quality control/assurance is addressed. At the end of Chapter 5, the designs of ten liners that have been constructed in North America are described. Failure mechanisms are described and discussed in Chapter 6 and the performances of 17 clay liners are described in Chapter 7. Some of the liners have performed well and others have failed. In each case, the authors attempt to explain the performance of the clay liner. Chapter 7 is probably the most interesting part of the book, but all chapters will be useful to the consulting engineer involved in the design and construction of a new landfill.

Chapter 8 is the final chapter and it describes several methods to evaluate the performance of clay liners. The methods are based on “transit time” analyses. This type of analysis is losing favor as a performance measure because recent evidence suggests that transit times can be very short. Hence, the practical significance of Chapter 8 is limited.

Clay Liners for Waste Management Facilities—Design, Construction, and Evaluation is a useful book for professors, consulting engineers, and regulators involved in the waste disposal industry. Because of the rapid pace of research on clay liners, the book cannot be used as a sole source of information. It must be supplemented by current reading of the literature. However, the book can be used as a text for a course in environmental geotechnics or as a reference manual during the design of a new landfill. It is a valuable resource for anyone involved in the design, construction, or analysis of clay liners.

Quality Assurance of Chemical Measurements


Because of the issues related to health, industrial products, and environmental quality, chemical analysis of a variety of materials has increased markedly in recent years. Results of chemical measurements are often the basis for critical decisions on vital issues, ranging from health of individuals, to the protection of the environment, to the production of safe, reliable and useful products and services. Therefore, the data used for such purpose must be reliable, and there must be unequivocal evidence to prove it. The philosophy and procedure by which this is achieved and demonstrated are called quality assurance.

This book discusses the basic concept of quality assurance. It is based on the premise that a good understanding of the basic principles of chemical measurement is a necessary prerequisite to achieving accurate data and to designing and implementing a credible quality assurance program. The book is written by a well-known analytical chemist with many years of experience. All of his professional life has been spent at the National Bureau of Standards, from which he retired after 57 years of service. As the author states, the book is written to provide guidance for the development of a credible quality assurance programs and also for its implementation. Not only the philosophy, but also practical approaches to quality assurance are discussed, and statistical techniques vital to its various aspects are reviewed.

The book is divided into 26 chapters and five appendixes. The chapters are presented in logical progression starting with the concept of quality assurance; precision, bias, and accuracy; statistical control and techniques; chemical analysis as a system; the model; planning; principals of sampling, measurement, calibration, quality assurance, quality control, and quality assessment; blank correction and control charts; evaluation samples; reference materials; traceability; quality audits and quality circles; validation and reporting analytical data; improved approach to performance; correction or errors and/or improving; and laboratory evaluation and the quality assurance program. Each chapter has a degree of independence so that it may be consulted in isolation from the others. The tables and figures are well prepared and easy to understand. The book also contains appendixes of terminology used in quality assurance, quality assurance program documentation, statistical tables, and study aids. A valuable appendix of annotated bibliography of selected publications on quality assurance measurements is also included.

While this book focuses principally on chemical measurement, and it should be useful to those involved in analytical chemistry, the material presented is widely applicable to the physical and biological sciences as well. The book should be useful to those involved in research and routine analysis, especially those who collect analytical data with complex analytical procedures and instruments. It should be an excellent reference to those involved in, or learning the methods of, soil, water, and plant analysis.

M.A. TABATABAI, Department of Agronomy, Iowa State University, Ames, IA 50011.