

Preface

Risk, which deals with the consequences of failures along with its likelihood, plays an important role in sectors such as chemical and process plants, power plants, nuclear facilities, and aerospace which can impose potential hazards. Risk analysis is essential for a plant from the safety point of view as well as from the public acceptance point of view. In this book the basic concepts required for carrying out the risk analysis of plants and the methods/techniques/tools required for carrying out the same is provided with case studies. Hence, the book is organized into the following chapters.

Chapter 1 introduces different sources of energy and their limitations, power plants, evolution of the nuclear industry, hazards, history of major accidents, and the need for risk analysis of plants.

Chapter 2 provides a detailed review of probability and statistics essential for understanding the risk and reliability analysis concepts and methods that are discussed in the remaining chapters.

Chapter 3 discusses the risk analysis of nuclear power plants, risk analysis methodology, level 1, level 2, level 3 probabilistic safety assessment (PSA), event tree analysis, fault tree methods, treatment of common cause failures, different failure probability models, and parameter estimation using Bayesian methods.

Seismic probabilistic assessment of nuclear power plants is discussed in detail in Chap. 4. This chapter provides various aspects of seismic PSA, probabilistic seismic hazard analysis, fragility analysis of structures, components and systems, accident sequence progression during seismic events, and contribution of seismic events to risk of a plant.

Currently, most advanced reactors use passive systems to improve safety in the plant and to eliminate human interactions, especially during abnormal situations in plants. The basic concepts of passive systems are discussed in Chap. 5. This chapter discusses the need for passive systems reliability, limitations of conventional reliability estimation methods, different methods that exist for reliability estimation of passive systems, and need for mechanistic modeling approach.

Chapter 6 provides details of time-dependent reliability analysis, types of loading, degradation mechanisms that cause reduction of strength of material,

techniques available for implementing time-dependent reliability, extreme value theory, stochastic fatigue loading, the concept of out-crossing approach and its limitations, principles of stress corrosion cracking, and its effect on reliability of components with time.

Risk management in nuclear and thermal power plants is discussed in Chap. 7, which includes different tools available for risk management and how it helps in decision making. The basics of response surface methodology, fuzzy set theory, simulation techniques, and stochastic process theory are discussed in the Appendix.

This book is useful for advanced undergraduate and postgraduate students in nuclear engineering, aerospace engineering, power engineering, industrial engineering, reliability and safety engineering, systems engineering, applied probability and statistics, operations research, and earthquake engineering. This book is also suitable for one-semester graduate courses on *Risk Management of Nonrenewable Energy Systems* in all conventional engineering branches like civil, mechanical, chemical, electrical and electronics, as well as computer science. It will also be a valuable reference for practicing engineers, managers, and researchers involved in reliability and safety activities of complex engineering systems.

March 2015

Ajit Kumar Verma
Srividya Ajit
Hari Prasad Muruva



<http://www.springer.com/978-3-319-16061-0>

Risk Management of Non-Renewable Energy Systems

Verma, A.K.; Ajit, S.; Muruva, H.P.

2015, XVII, 424 p. 248 illus., Hardcover

ISBN: 978-3-319-16061-0