But then good news is found in the following: "Life expectancy in the United States is going up, and toxic environmental chemicals have been a very small constraint on that expectancy."

Given this background, INFORM goes on to examine chemical production and use, chemical waste production and reduction and chemical release/reduction in general. A great deal of data are given, analyzed, and re-analyzed (almost to exhaustion, I believe). The 16 contributors to this volume have examined data from the USEPA's Toxic Reduction Inventory, RCRA, and other sources in an attempt to determine trends in the use of chemicals in commerce, their presence in industrial waste and their release to the environment.

As I read the book, I very much liked INFORM's question and answer approach to its investigations/findings. However, I did not find their reports (data reproduction) of amounts of waste/chemical by country/state/county useful. Nor were the 3-dimensional plot easy to utilize.

But I believe they attain their goal as expressed below:

"In *Toxic Watch 1995*, the first in a series of reports, INFORM has explored a broad range of U.S. data on the use and presence of toxic substances in our environment, looking for answers to important questions. Just how prevalent are toxic substances in the environment? What are the major sources of toxic contaminants? What industries contribute the greatest share of toxic substances and waste? What has been the impact of government and industry programs designed to reduce toxic exposure? Are we managing toxic materials in the most environmentally sound way possible? Perhaps of greatest importance, is the United States meeting its national goal of reducing toxic waste at the source by preventing its creation in the first place?"

Given that INFORM's mission is to examine business and municipal practices that threaten the environment and public health, and their current research focusses on strategies to reduce industrial and municipal wastes to preserve air and water quality, they have done a good job. And I believe a fairly balanced job without the abnormally inflammatory rhetoric of a radical environmental group. Although, as I have said before, INFORM writers seem to present the same data three or four different ways.

My only major quarrel with the book is with the length of the Chapter 9 on environmental justice. I even question its inclusion. This topic, although important in a social context, was totally out of place in this book.

G.F. Bennett

PII S0304-3894(96)01860-2

Concentration Fluctuations and Averaging Time In Vapor Clouds, a CCPS Concept, by D.J. Wilson, Publisher Center for Chemical Process Safety (CCPS), American Institute of Chemical Engineers, New York, 181 pps. ISBN: 0-8169-0679-3, $90 for U.S. and Canada; $125 elsewhere.

Sampling vapor cloud releases during the first few seconds to a few hours is more difficult than hour-by-hour variations. The preface of the volume attempts to bring to

focus the knowledge needed to be more exact in the short times, where the concentrations and variations may be far more significant, especially if flammability or toxics are involved.

To develop clear, unambiguous definitions of statistical terms such as "plume sampling time", "concentration averaging time", "receptor exposure time", "peak concentration during an event" and other variables, the volume explores terms including "threshold crossing probability", "source size", "source density", "jet momentum", "terrain roughness and atmospheric stability", "buildings and obstacles", "vertical wind shear", and "compatibility with mean concentration models". Such examples detail and identify areas where further information is required to define concentration variability statistics.

Averaging time, and its results, have been shown by considering the crosswind plume spread and using this crosswind spread to calculate the reduced centerline mean concentration. The widely accepted 0.2 power law for averaging time fails to account for this and should be replaced, according to the author.

Changes in the method of predicting the mean and standard deviation of concentration for fluctuating plumes. A simple empirical model for intermittency that can be used with the log-normal pdf is recommended.

All real plumes produce significant periods of near zero concentration interspersed with non-zero fluctuating concentration. For hazard assessments of toxic and flammable releases it is essential to predict the fraction of time that zero concentrations will occur; this observation is called intermittency.

Chapter 2 follows with Sampling and Averaging Time Definitions, all of which relate to time:

"Travel time t is the ensemble averaged time required for fluid initially released from a source to be carried downwind to a plume centerline receptor." "Release time t release", "event time t event", "exposure time t", "averaging time t", "measurement time t", "instrument response time t", and "mass-weighted sample time t".

"Mass-weighted sample time t" is discussed in detail for both very short and longer time exposures. "Effective sampling time t for Block Time Averages" may be calculated by the time-averaged statistics from the equation given in the text.

Chapter 3, Effect of Averaging Time on Mean Concentrations, discusses in detail the concentration fluctations and averaging time in vapor clouds, with graphs and other visual aids.

Chapter 4 considers Concentration Fluctuation Modeling. Wind tunnel simulation versus field testing for model validation are compared and the data reduced to graphs.

Chapter 5, Probability Distributions, requires a closed-form analytical function to permit rapid calculations. Four of the existing pdf functions are Table 5.1 and the comparisons are made with clipped-normal probability distribution, log-normal probability distribution, and gamma probability distribution. Recommended probability distribution and conditional intensity functions are discussed and analyzed.

Chapter 6, Release Height and Source Size Effects on Fluctuation Intensity, develops a meandering plume model that predicts the along-wind plume centerline total fluctuation intensity, and the shape of vertical and crosswind fluctation intensity profiles as a function of source size, release height and wind shear.

Chapter 7, Source Density Effects on Fluctuations notes with illustrations and graphs this area of interest.

Chapter 8, Buildings and Obstacles, notes that the influence of nearby buildings on dispersion is dependent on small changes in wind direction and source location, and illustrates the problems with graphs.

Chapter 9, Threshold Crossing and Peak Levels, examines the probability of surviving an event without having crossed a specified flammability, toxicity, or regulatory threshold. This chapter presents the required working equations for adjusting mean concentrations for varying averaging time.

In addition to the text cited, it should be noted that three appendices, five pages of nomenclature, and an index complete the volume. Hardly a bed-time reading book, the information and background make it a real addition to our understanding of the complex issues in vapor or gas clouds.

Howard H. Fawcett, P.E.