better data and to consider creative solutions to reduce the impact of PM on human health. The pressure has been intensified by the clash between economic and regulatory interests. Because science and technology work slowly in relation to the speed at which regulations proceed, there is a need for new ideas and approaches."

According to the publisher's literature, "this concise book presents the relevant scientific data, historical developments, unsolved problems, and new research opportunities related to particulate air pollution and human health. Included are chapters on the nature of particulate air pollution, fates and toxicity of inhaled particles, evidence of harmful effects of air pollution, events that led to the current controversy, interpretation of modern epidemiology studies, needed research, challenges to commonly accepted ideas about pollutants and health, and recommendations for scientists, regulators, legislators, the public and industry."

While the book focuses mainly on ambient air, indoor air pollution is not ignored. Most indoor living or working environments have air pollutant sources. These sources include pets, heating, cooking, combustion sources, tobacco emissions, surface abrasion, vapor outgasing, soil gas intrusion, and biological. High concentrations of pollution in indoor settings can, at times, dominate short- and long-term exposures and may even be associated with discomfort, irritation, illness, and even death.

The problem of particulate pollution and control is exceedingly well discussed as well as the topic of both over and under control. Phalen ends his book this way: "today, we are at an important crossroad with respect to the future of air pollutant regulation. One road involves performing the needed research and making decisions on the basis of the science, with full consideration of the many tradeoffs associated with new regulation. The other road involves adopting regulations driven by politics and pressure groups. The first road is obviously the more beneficial one for protecting human health. However, it requires a more patient and reasoned approach that invests in research, allows time for the science to work, and then allows the time needed for technological change. The second approach promises uncontrolled, chaotic, and rapidly changing rules. A great deal is at stake. Will science and reason, or expediency, rear and ignorance be the determinants of public health decisions. To travel the better road, there must be a new era of cooperation and communication among scientists, regulators, legislators, advocacy groups, and the public."

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Solvent Recovery Handbook

Ian M. Smallwood, 2nd edition, Blackwell Publishing Ltd., Osney Mead, Oxford, UK, 2002, £ 125.00 (UK), 432 pp., ISBN 0-632-05647-9

Organic solvents are ubiquitous chemicals used in large amounts by the modern chemical industry. Unfortunately, they end up being destroyed or vaporized where they make up approximately 35% of the VOC compounds that enter the atmosphere. This book addresses those losses by providing practical guidance on technologies available for solvent recovery and recycling.

The first task in solvent recovery/reuse is to separate the solvents from their current environment. To this end, Smallwood has three initial chapters entitled:

- Separation of solvents from the gas phase;
- Separation of solvents from water;
- Separation of solvents for reuse.

In the gas phase chapter, Smallwood discusses scrubbing, adsorption on activated carbon, condensation, and membrane system separation. As he does throughout the book, the author includes excellent process flow diagrams, pictures of actual equipment, and tables of relevant data.

Following the chapter on solvent removal from water is the one entitled "Equipment for separation by fractional distillation" which is the process, Smallwood says, the engineer will most likely choose in order to exploit the difference in volatility between a solvent and water. Distillation, he notes, can be used to separate solvents from heavy residues, polymers, or inorganic solids (Chapter 5). Chapter 6 discusses separation of solvents by batch or continuous fractionation. Drying of solvents is the topic of Chapter 7. The author's expertise (the book jacket says Smallwood has been responsible for building two solvent refineries containing a large number of continuous and batch fractionation units) is shown by such sections (in the separation of solvents chapters) as a "checklist of crucial problems."

Used solvent disposal is the subject of Chapter 8. Methods for disposal of solvents are listed as: (1) combustion in cement kilns, (2) production of steam, (3) thermal or catalytic vapor incineration, (4) biological treatment, and (5) return to supplier.

"Good operating procedures" is the title of Chapter 9. In this chapter, Smallwood discusses the health effects of solvents, laboratory procedures, site design and layout, explosion and ignition sources, toxic risks, storage and handling of solvents, feed stock screening and acceptance, process operations, personnel protection, and first aid.

In Chapter 10, the criteria one might use to choose a solvent are discussed. These criteria are addressed by a series of rhetorical questions:

- Is the solvent effective?
- Is the solvent likely to be environmentally acceptable for the foreseeable future?
- Is the solvent suitable for use on the site?
- Is recovery worth considering?
- Can the solvent be recovered?

The final two chapters are plant-oriented technical chapters that discuss the details of batch and extractive distillation.

The remainder of the book (240 pages) is devoted to chemical properties. This section begins with Chapter 13, entitled "Significance of solvent properties" (such as CAS and UN numbers, Hazchem Code, EPA Code, and physical properties such as boiling point, freezing point, etc. for individual solvents). The next 75 pages contain physical property data for the 58 most commonly used solvents. Also given is detailed information in tabular form on common solvent pairs.

Following the final chapter, entitled "Recovery notes," that highlight several of the most common solvents (e.g. pentane, hexane, ethanol, etc.) is a short bibliography containing

many book references that one can consult for design procedures for recovery processes. Surprisingly, no individual technical papers are cited.

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