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Publisher *Taylor & Francis*

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Chemistry and Ecology

Publication details, including instructions for authors and subscription information:

<http://www.informaworld.com/smpp/title~content=t713455114>

A review of: "Waste Treatment and Disposal"

G. Howells

To cite this Article Howells, G.(1995) 'A review of: "Waste Treatment and Disposal"', *Chemistry and Ecology*, 11: 4, 271 – 273

To link to this Article: DOI: 10.1080/02757549508039076

URL: <http://dx.doi.org/10.1080/02757549508039076>

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BOOK REVIEW

WASTE TREATMENT AND DISPOSAL: ed. R. E. Hester and R. M. Harrison, publ. Royal Society of Chemistry, Cambridge, 1995, ISBN 0-85404-210-5, 158pp. Price £15.00.

This book is the third of a series published by the UK Royal Society of Chemistry on “Issues in Environmental Science and Technology”, edited by Drs. Hester and Harriman. Earlier titles are “Mining and its Environmental Impact” and “Waste Incineration and the Environment”. Later titles will cover atmospheric VOCs, agricultural chemicals and chlorine chemistry. In this volume, contributing authors deal with seven topics: integrated pollution control and waste minimization, sewage and industrial effluents, landfill, emissions to atmosphere, recycling of wastes, disposal of nuclear fuel waste, and the economics of waste management.

Inevitably, the various chapters are uneven – their authors are well experienced but what they have to say depends on the topic, the state of current knowledge, its recent development, and prognosis for control. They are essentially reviews – this has led to a rather theoretical approach, although the some chapters try to provide some model cases. I would have preferred seeing how current strategy matches up to real problems of waste handling by reference to selected case studies.

The opening chapter spells out the currently accepted definitions of BATNEEC and BPEO, but does make the point that since 1991 the regulations have been modified six times (to 1994), with the aim of becoming ever more stringent. The concept of Integrated Pollution Control (IPC), promoted by the Royal Commission on Environment since 1976, is now the accepted strategy of UK Government, and although implicit, is scarcely spelled out or exemplified here.

The chapter on sewage and industrial effluents opens with an historical account. It is salutary to note that the effluent standards applied in UK in 1912 are scarcely bettered today. What has changed over nearly a century is the greater scale of sewage discharge and the growing problem of added industrial discharges. The various forms of sewage treatment are summarised, including sludge treatment and disposal which accounts for half of treatment costs. In UK more than 96% of the population is served by sewerage and non-compliance of works with consent conditions is now only a few percent. None the less there is constant pressure to improve the situation for sensitive waters and coastal discharges. Justification of more stringent standards for public health effects still awaits sufficient statistical significance from epidemiological evidence. The EC requirement for additional treatment leads to a greater production of sludge for disposal. Disposal to agriculture, landfill, forestry as well as to the sea are practised, but municipal waste combustion for energy, and anaerobic digestion to yield methane are likely to become favoured new disposal options. Industrial effluents are more complex, refractory and variable; they

are highly regulated. Some new technologies may help to improve their treatment as well as that for domestic sewage in highly developed countries. For the developing world the most pressing need is for low technology, low-cost techniques to achieve acceptable disposal, especially in overcrowded cities.

Landfill has always been a primary option for waste disposal (for 90% of MSW and 70% of industrial wastes in UK), but recent increases in the volume and toxic nature of waste materials highlights the need for management and control at registered sites. The major principles of design are to “dilute and attenuate”, “contain” and “entomb” the disposed materials. The former applies to unconfined sites with natural drainage to the surrounding environment. In “contained” sites, the waste products should not be allowed to migrate beyond the site boundary, or at least only at acceptable concentrations. Entombment implies that the waste will be stored in dry form, and hence that infiltration of liquids will be prevented; this implies storage rather than waste treatment. The options of mono-disposal and co-disposal are discussed.

Atmosphere is the most effective carrier of pollutants and because visible effects (even steam, scarcely hazardous) and fugitive local emissions (dust, litter) are evident; most attention of environmental groups focuses on this problem. This chapter deals with current regulatory framework to control emissions from waste management in UK. It considers the release of metals, PCDD/PCDFs, greenhouse gases (CO_2 , CH_4), odours and MSW landfill vs incineration options, and their local and global impacts. UK control is far-reaching – 16 processes are currently controlled by HMIP and 11 by local authorities. The EU has also introduced a number of directives and more stringent and comprehensive control seems certain. Biodegradable wastes characteristically generate about 6 m^3 gas/tonne of waste. These gases (SO_2 , NO_x , CO_2 , CH_4) could add potentially to global problems of acid rain, global warming etc., but in fact, waste disposals make an insignificant contribution. Dusts, odours, litter and microbial agents can be more important components. Fugitive releases can be substantial – for instance in the disposal of ash residues, 75% of metals emitted are dispersed by wind during landfill spreading and compaction. For metals, cadmium and mercury emissions from waste incineration were, until recently, 50% of their total in Sweden, and 15 and 60% respectively in UK. While waste treatment and disposal can cause local loss of amenity, claims of serious or irreversible health effects remain unsubstantiated.

Recycling and reuse of materials was a major EU objective in the 1980s, but to date only one Directive (batteries and accumulators) has been adopted. A packaging Directive has had difficulties and has yet to be implemented. Recycled materials have to compete with virgin raw materials on cost, availability and quality, but the cost of preparing wastes economically to a suitably uncontaminated state for reprocessing remains a major technological problem.

Nuclear fuel waste recycling is likely to become a more pressing problem in the future. In 1991, 17% of world electricity supplies were generated by nuclear reactors and by 1992 IAEA estimated that 135 000 Mg of used fuel had been produced. This “waste” contains valuable plutonium and uranium and can be reprocessed. The situation immediately sets a different scenario by comparison with other wastes discussed in this book. In contrast to others reviewed, technology in this field is

relatively highly developed and reasonably available to developed countries but costs are high. The chapter gives primary attention to the Canadian “disposal concept” although this country at present has no reprocessing (or plans). Current practice favours geological storage as a safe interim measure for nuclear waste, but there will eventually have to be an effective and acceptable disposal strategy. The longer we delay decision by further and more refined “paper exercises” the more critical will be the problem of both planned waste disposal and that arising from adventitious events.

Economics and waste management strategies are closely argued in the final chapter where economic analysis is presented as a coherent and logical analysis. It is stated, truthfully, that “Much is made of integrated waste management (IWM = IPC in this context) but rational approaches are few”. *The objective of IWM is clearly to minimize the social cost of waste disposal – failure means that you throw money at a problem without benefit. The point is made that the popular (and EU) view that more recycling is best is challenged – the goal is to define the optimum level of recycling consistent with social costs. A naive approach is to set targets, but these can be inefficient. The case of various landfill and incineration options is clearly illustrated.*

While the book captures the current situation in Europe, I found it disappointing, perhaps lacking in critical questioning and focus on present concerns; for the most part it doesn't break any new ground. Format and style are of good standard. It might be considered good value at £15 if you find the tabulated data and lists of legislated regulations useful to have on hand.

G. Howells