

REVIEWS

Physical and Engineering Aspects of Thermal Pollution. By F. L. PARKER and P. A. KRENKEL. Butterworths, 1970. 100 pp. £5.00.

Global Effects of Environmental Pollution. Edited by S. F. SINGER. D. Reidel, 1970. 218 pp. Dfl. 40 or \$11.20.

Professors Parker and Krenkel of Vanderbilt University have compiled a review of the literature on heat-disposal methods from electricity-generating stations. They give an average of about 100 words to each of 423 references and are scarcely discriminating. They deal mainly with US experience, much of which is out of date now because the circulation of river water and forced-draft cooling towers which have been widely used can no longer cope with the enormous load that is added each year. The heating of lakes and the use of natural draught cooling towers – the latter being familiar in the landscape anywhere in industrial Britain – are therefore becoming much more important.

The differences of usage in different countries in the past has been the result of climate and available resources. The use of tidal seas for heat disposal is not considered here, although it is very important in Britain, and, away from the coast, big power stations begin nowadays to look very much the same everywhere.

In lakes the added heat produces a stable stratification which can have a bad biological effect by speeding chemical changes and by reducing the oxygen uptake by decreasing the mixing and the oxygen content by heating. The heat has to be transferred to the atmosphere, and this mechanism is given the usual description, including every kind of heat flux, symbolically in equation form, leading to empirical formulae which include friction, eddy transfer and other fudge factors.

Natural-draft wet cooling towers seem to have advantages over all other methods when the amount of heat released is large because they create convection within the atmosphere and the wind quickly spreads it over a large area. Dry ones look attractive, especially if water is short, until the effects of corrosion on the conducting parts of the heat exchangers are experienced.

There are many applications of fluid mechanics only hinted at by the authors' rather crude and cursory treatment, and it is recommended as a source book only to those who know enough to be able to make their own evaluation of the references and quotations from them.

By contrast, Dr Singer has drawn together 18 papers from a symposium held in Dallas in 1968. They are authoritative, although in some cases speculative or tentative because of the state of the subject. The global balance and cycles of various elements and compounds and the probable changes effected by man are considered in some detail. The overall impression is that the effects of waste products in lakes and the sea are by far the most serious, and one comes away feeling that any reduction in air pollution achieved by putting the pollution into

a water mass only makes things worse because the air distributes and dilutes so much more quickly than even the oceans.

At present, eutrophication is the most serious menace, and looks like getting much worse before it gets better because so many waters are near catastrophe level and the way of life of industrial-revolution man depends on such large emissions of wastes. One paper holds out hope for Lake Erie through the removal of phosphorous compounds from the wastes before they are loosed into the waters, but on further reading it looks more like the kind of magical simple solution of science fiction that the populace is being led to believe exists and is waiting to be found by sufficient research effort. But the problems have already got beyond the subtleties of chemistry and engineering design, for many large lakes and seas are being destroyed as human amenities. No amount of diffusion studies can actually increase natural diffusion rates in the air or sea, nor can they speed up the biological processes which digest the waste.

It is no use talking about raising the standard of life of the underdeveloped nations until the developed ones have invented a mode of living that produces less waste than at present, for if the whole world's population operated like the richest nations pollution would soon end it all. Meanwhile the advanced nations urge more development and growth upon themselves than on the rest on the sole ground that the economic trends must be pursued, otherwise someone else will get 'ahead'.

In this situation the global view must soon lead the nations to reject the nineteenth-century philosophy of industrial expansion. I suppose we can individually keep away from Erie, the Belgian rivers and Bridport beach, but so long as we do not find ways to reduce the tonnage of waste output and merely spread it over a greater area of coastal and inland water we become more committed to the galloping destruction of them. Even now many large cities send trainloads and shiploads of rubbish many tens of miles beyond their boundaries because no nearer dumping ground exists, and the problem is seen as a mechanical one of getting the stuff out of sight. Engineers ignore the ultimate global problem and facilitate progress on present lines, helping thereby to magnify the catastrophe which will deny to an ever increasing proportion of humanity the benefits of our technology.

The appreciation of our predicament appears most in the papers of those who have seen and understand how material progress is expanding geographically at a rate which makes pollution a more imminent menace than the population explosion, having social consequences worse than mere starvation.

Among the hopes founded on the enlightened action taken in a few places there is expressed an exasperation at the slowness with which the rapidly approaching political crisis is being perceived by intelligent people such as the readers of this *Journal*. At the present time governments are more influenced by immediate economic, military, and political pressures; indeed, so great are these pressures that one can scarcely detect any act, designed to change anything, that is motivated by any other influence. Yet the environment, i.e. the world, is generally made worse by the changes because they advance the mechanisms of material exploitation or contemporary sectional privilege and do not take account of the physical limitations of the world for the whole of humanity.

In these circumstances the proceedings of the Dallas symposium can be strongly recommended as a first briefing for readers of this *Journal* on problems of global pollution. It is a pity the index is so bad, otherwise the best way into the book would be through random topics of interest to the reader, but it often fails to direct attention to the most appropriate places, steers it into wrong ones, omits important topics and has some quite silly entries.

The subject seems simple in the newspapers; it begins to take shape in this symposium, but as knowledge grows so the intricacies become apparent. That it is a political matter is obvious to anyone who looks at the forces which make people do what soon appears to be dangerous and stupid, and still go on doing it as much as possible when they know it is dangerous. Clearly the laws and system of rewards which drive our civilization are in urgent need of change; and to hasten this change is more important than facilitating an increase in the tonnage of things consumed.

We participate whatever we do: we can be apolitical no longer. Humanity reacts easily after disaster, but only so long as it is not global, which it never has been in the past. The room for manoeuvre decreases ever more rapidly.

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