

and he thought that the Authors would be well advised to put more emphasis on the advantages of multi-span construction of the range mentioned above.

The Authors, in reply, stated that Captain Foster's proposal to use spans of 25 or 30 feet would apply to cases where a low total cube was desired. In other cases such small spans were thought to involve unnecessary complications. The use of prestressed valley beams was thoroughly practicable but the possibility and economy of their being spaced at quite large centres should be kept in mind.

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**“ Controlling Factors in the Choice of Sewage-Treatment Processes
for Sewage Disposal ” †**

by

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Mr G. W. Wilkinson observed, in connexion with the Author's remarks on p.242 concerning dilution ratios, that a further factor which had to be taken into consideration was the regime of the receiving water. Conditions could arise where the suspended solids content of the effluent, adopted on a dilution ratio basis only, might prove to be unsatisfactory because there were impounded reaches downstream, such as mill-dams, weirs, and ornamental-lakes, where the solids could settle and putrify. He considered that where such conditions occurred they should be given very serious consideration in the design of the final stages of a purification plant.

On the question of humus tanks to meet higher effluent standards, Mr Wilkinson fully agreed with the Author that continuous removal of humus by means of tanks of improved design would be essential. It was all too evident that satisfactory effluents from biological filters were often spoiled during their passage through flat-bottomed humus tanks, because the intermittent hand cleaning of the latter was inadequate.

The continuous withdrawal of return and surplus activated sludge from the final separating tanks of the activated-sludge process resulted in that process, in general, consistently producing effluents of lower solids content than passed from the humus tanks of biological filter plants, from which the sludge was only intermittently removed. In that connexion it

† Proc. Instn Civ. Engrs, Part III, vol. 2, p. 236 (Aug. 1953).

was interesting to note that the effluent from the final separating tanks of the Mogden plant averaged 7 parts per million of suspended solids, which figure might be compared with 16 parts per million in the effluent from flat-bottomed humus tanks following biological filters of another plant, and 5 parts per million after that effluent had subsequently been passed through rapid sand filters and micro-strainers.

Mr Wilkinson further observed that, outside the United States, there were approximately 156 diffused-air activated-sludge plants treating a total dry-weather flow of 310 million gallons per day; 121 of those plants treated an average of 0.45 million gallons per day each, which corresponded to an average population of 15,000 for each plant (based on 30 gallons per head per day).

The remaining 35 plants treated a total of 256 million gallons per day; 14 of them were for partial purification for a total flow of 177 million gallons per day. In addition, there was a large number of mechanical plants, the majority of which dealt with populations of less than 50,000.

In the United States the total number of plants was about 330, of which 140 were diffused-air and 190 mechanical. All the mechanical plants and 56 of the diffused-air plants were for populations of less than 50,000.

It would appear, therefore, that the Author's opinion, which set the lower limit of population for activated-sludge plants at 50,000, was by no means generally shared.

Thus, the fact that the majority of activated-sludge plants were for populations of less than 50,000, and that many plants had been running satisfactorily for periods of up to 25 years, was proof that they had not failed "through lack of skilled labour and adequate resources for maintenance" (p. 252).

Provided an activated-sludge plant was properly designed with sufficient tank capacity and aeration potential, it did not demand "constant attention . . . also the application of a wide variety of skill, knowledge, and experience" (p. 247), to any greater extent than, say, a biological filter plant for the same conditions. Indeed, the operation of the latter type of plant, particularly where recirculation or alternating double filtration were practised, might demand a great deal of attention in order to secure the desired results.

Mr Wilkinson agreed with the Author that mechanical dewatering and heat drying or incineration of sludge should be reserved for the larger undertakings, but felt that such processes had yet to be proved efficient and economical, even for large plants in Great Britain.

In that connexion, the results obtained from the plant at present operating under the Author's direction would be awaited with interest.

The Author, in reply, stated that he agreed with Mr Wilkinson that, under the conditions cited, special consideration should be given to the suspended-solids content of the effluent, and consequently to the design of the final stages of purification. In many such cases, the Royal Commission

standard would not be high enough to prevent trouble from settlement of humus and subsequent putrefaction and pollution of the stream, though it should be borne in mind that the solid matter associated with well-oxidized effluents was itself reasonably stable, and would give rise to much less pollution than the solid matter associated with insufficiently oxidized effluents.

The Author was aware that there were many activated sludge plants in existence serving populations less than 50,000, but he was still of the opinion that, in general, percolating filters were more economical for plants serving populations below that figure. He did not agree with Mr Wilkinson that no more attention or skill was required in the operation and maintenance of activated-sludge plants than was required for filter installations, especially if the mechanical equipment associated with each type was included. In the Author's opinion, the greater degree of mechanization involved in the activated-sludge system led inevitably to more frequent attention by more highly skilled operatives than would be needed for filter installations, and furthermore, the activated sludge process itself required a greater degree of skilled control by trained chemists having laboratory equipment at their disposal for the purpose. For small individual works, such skilled control could never be provided economically, though it could be made so under regional control of a number of such works.

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