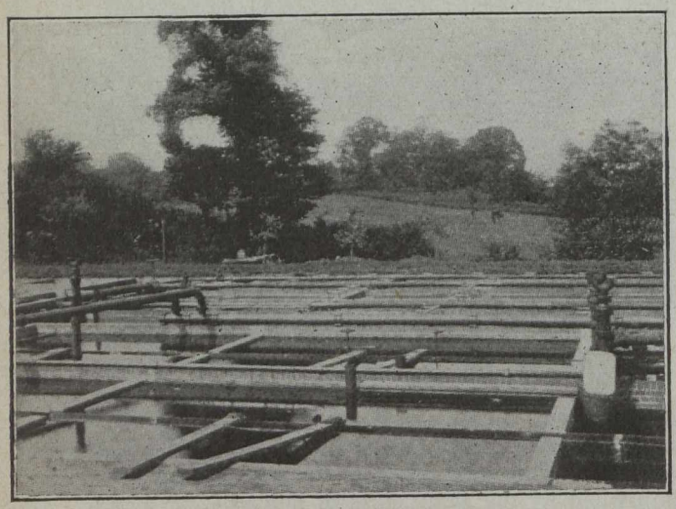
ACTIVATED SLUDGE PLANT AT WORCESTER, ENGLAND.

THE results of the experimental work which has been carried out at Worcester, England, for some time past demonstrate that another important advance in the treatment of sewage by the activated sludge system has been made.

In 1915 the city engineer of Worcester, Mr. Thomas Caink, recognizing the merit of the activated sludge system, on behalf of that city offered to Messrs. Jones and Attwood the use of a set of the sewage tanks for the carrying out of an experimental installation.

In making this offer, the city imposed a condition that Messrs. Jones and Attwood bear all the cost of the necessary engineering work, and only if they succeeded in treating 750,000 gallons of sewage each 24 hours which should give a non-putrescible effluent containing not more than four parts per 100,000 of suspended solids for twelve consecutive months, would the corporation take over and purchase the plant and works at an agreed price. In case of failure, all new work had to be removed at the expense of the engineers and the tanks restored to their original condition. So sure were the engineers that success would be attained that the offer was accepted and the alterations to the tanks commenced November 9th, 1915.



Looking Across Sludge Tank from Settling Tank.

The tank placed at their disposal was 80 ft. long by 72 ft. wide, made up in nine longitudinal bays each 8 ft. wide with 9-in. parting walls; these are again sub-divided into compartments with 9-in. transverse walls. Of the nine bays, five are used for aeration and agitation and four were adapted for settlement.

Aeration Tanks.

The five aeration bays are arranged as follows: The first bay, though 8 ft. broad at top, is only 5 ft. at bottom, due to batter of outside wall. The bottom of this first bay is arranged with ridges and furrows 5 ft. centre to centre, five aid diffusers each 12 ins. square were placed at the bottom of each furrow. The lower part of each transverse wall is cut away, making an opening 3 ft. deep right across tank above top of ridges, a ridge being arranged under each of these walls.

The other four aeration bays are aranged in pairs, each pair making a circulating tank. The bottoms of these circulating tanks are formed with ridges and furrows saw-tooth form at 10-ft. pitch with eight diffusers in each furrow. Advantage is taken of the transverse walls, which are used as baffles, and these together with intermediate baffles of wood give a baffle alongside each line of diffusers, which check the back flow and allow the rising current of sewage to flow forwards, thus giving a horizontal circulation of 100 ft. per minute velocity, a circulation much more rapid than would be obtained by the natural flow of the sewage through the tank. The objects of this intensive circulation are to prevent the deposition of sludge and to secure equality of its diffusion.

Settlement Tanks.

To make the best use of the four bays for settling the sludge and drawing off a clear effluent, the aeration tank effluent was brought over a weir into a channel leading it to the end of the four bays, into which it flowed underneath a timber baffle about 8 ft. below the surface, the liquid having a horizontal flow for a length of 80 ft. over a floor area having slopes of 20 to 80 degrees from the horizontal, and finally flowing over the edges of, and into a concrete channel. Eight sumps were formed and fitted with 3-in. diameter air lifts to lift the settled sludge into the inlet channel.

Air Compressing Plant.

The air compressor, belt-driven by electric motor capable of developing 40 b.h.p., is of the Ingersoll-Rand horizontal type, which when running at 235 r.p.m. has a piston displacement of 615 cubic feet, and an actual delivery of 562 cubic feet, or a volumetric efficiency of 91.5 per cent. at a pressure of 10 lbs. per square inch, according to makers' test.

Considerable discussion has occurred in reference to the use of porous tiles for diffusing the air.

Before adopting the porous tile we tried some experiments with small orifices, but found they choked whereas porous tiles were apparently not affected to nearly the same extent.

Having decided on the use of porous material we spent many months during 1913 and 1914 testing every porous material obtainable without securing anything suitable, and finally decided to make our own, and since we found a satisfactory composition early in 1915 we have had no trouble in obtaining the required porosity, whilst the sludge is not easily drawn into the pores of the tiles, although often subject to the full hydraulic head of sewage in tank, the tile acting as a filter.

Trouble was found during some of the earlier experiments at Davyhulme in oil choking the underside of diffusers, due chiefly to the fact that air was drawn from high pressure sources, and the oil used had become carbonized, but if air is compressed to not more than about 10 lbs. per square inch, the temperature of compression is not sufficient to alter the nature of the oil and thus the liability to choke is small, provided the air compressed is clean. A little oil probably prevents growths as we have found none.

The following advantages of the porous tile diffusers for circulation over mechanical agitation fully justify their adoption:—

(1) There are no moving parts in the sewage.

(2) Compressed air is used for aeration, agitation, circulation and sludge lifting, one large power unit is more economical than several smaller ones.

(3) The air used for aeration provides also for agitation and circulation.

(4) The vertical and lateral circulation by numerous diffusers in a ridge and furrow tank is more effective than

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