

COMPARATIVE TESTS OF AIR DIFFUSERS AND DEVICES FOR DEWATERING ACTIVATED SLUDGE*

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FOUR reinforced concrete tanks were remodelled and each fitted with a different air diffuser. The tanks operate on the fill-and-draw system and are 3 ft. 2 ins. square and 8 ft. deep. At each filling 350 gals. of sewage were added.

One tank was fitted with a system of perforated pipes having perforations $\frac{1}{25}$ in. in diameter placed 2 ins. apart and staggered at an angle of 45° from the top of the pipes. There were about 40 holes in the pipes or 4 to each square foot of surface area. The bottom of the tank is sloped from the centre and sides at an angle of 45° , thus forming two V-shaped channels of equal size, 1 ft. in depth, running entirely across the tank.

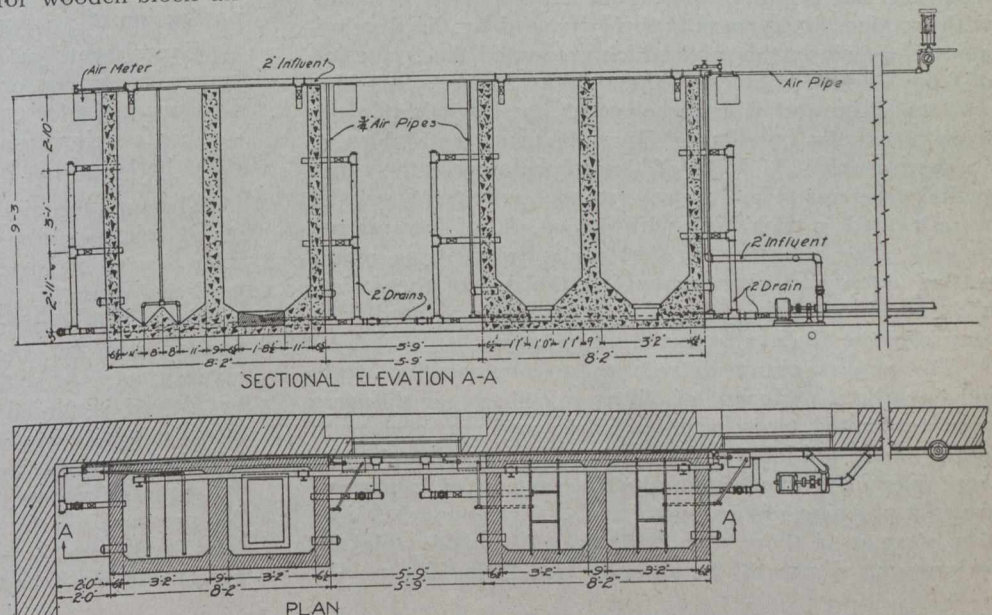
The bottom of the second tank was hopped from all four sides and a concrete container for wooden-block air diffusers was placed in the bottom of the hopper. The container was patterned after one designed by Nordell and used at Milwaukee in the Nordell aerating tank. The container is a 1-piece casting 2 ft. 8 ins. long, 1 ft. 8 $\frac{9}{16}$ ins. broad, and 5 ins. thick with a receptacle for the blocks 1 ft. 3 $\frac{9}{16}$ ins. by 2 ft. 3 ins. in plan, $\frac{3}{4}$ in. deep at the edge, and $1\frac{1}{4}$ ins. deep at the centre. The wooden blocks rest upon a series of 13 ridges, $\frac{1}{2}$ in. wide and $\frac{1}{4}$ in. high that run across the receptacle leaving a $\frac{1}{4}$ -in. space underneath for the air to circulate. The surface of the container was cast on a curve so that the tendency of the wooden blocks on swelling would be to wedge themselves more firmly into position. The basswood blocks used in the experiments were $\frac{1}{2}$ in. thick, 6 ins. long, and $2\frac{1}{8}$ ins. wide. At first, difficulty was experienced in keeping the blocks in position because of the excessive swelling that took place when they were placed under water and also because they became soft and spongy. Many of the blocks became so curved and twisted that they were discarded. It was found necessary to place strips of heavy galvanized iron on edge between each row of blocks for reinforcement and to close up certain joints with oakum.

Filtros plates of different porosity furnished by the General Filtration Co. were placed in two of the tanks. Three plates were used in each tank, covering one-third of the area and forming the bottom of a trough with sides sloping at an angle of 45° . The plates of the third tank were marked "fine" because on the basis of dry rating these plates passed 5.8 cu. ft. of air per minute per square foot under a water pressure of 2 ins. When saturated with water and passing 2 cu. ft. of air per minute they showed a resistance on a water gauge of 11.4 to 11.8 ins. The fourth tank was equipped with plates marked "coarse" which on the same basis passed 12 cu. ft. of

air per minute per square foot. When passing 2 cu. ft. of air per minute these plates registered a resistance of 8.8 to 9.6 ins. of water pressure.

The tanks were operated during three periods of 15, 20 and 35 days, respectively. Each of the tanks was operated in three aeration periods daily of 510, 300 and 270 minutes with a 2-hour allowance between the periods for settling, emptying and filling. The same amount of air as measured by ordinary gas meters was added to each tank. All conditions were maintained as nearly identical as possible. The sewage was pumped from the main sewer just outside the city limits of Champaign and accordingly was fresh. It was a fairly strong domestic sewage with no trade wastes. No activated sludge was added to the tanks at the beginning of any of the series of tests.

Samples of sewage were taken as the sewage was being pumped into the tanks and samples of effluents were collected at the close of each aeration period after the sludge had been allowed to settle for 30 minutes. The methods of analysis were those given in the 1917



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edition of Standard Methods for the Examination of Water and Sewage of the American Public Health Association.

In the first series of tests only the perforated pipes and filtros plates were used. The series continued only 15 days. The average purification, measured in terms of removal of turbidity, removal of oxygen-consuming capacity, and the production of nitrate nitrogen was greatest in the tanks with the coarser filtros plates, next in the tank with finer plates, and least in the tank with perforated pipes. Measured in terms of reduction of ammonia nitrogen and sludge accumulation the order was reversed. About 19,000 gallons were treated with 2.5 cu. ft. of free air per gallon.

All four tanks were in operation in the second series of tests, which continued 20 days. Measured in terms of removal of turbidity, removal of oxygen-consuming capacity, production of nitrate nitrogen, and sludge accumulation, the tanks containing filtros plates gave the best results. The tank with the wooden blocks was next and the tank with perforated pipes the poorest. Measured in terms of reduction of ammonia nitrogen, the tank with

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