The apparent value of this sludge is $15.91, but the writer believes from the information secured from the fertilizer producers, the only real value to the city of Milwaukee will be the available ammonia, upon the basis of which the dried sludge will be sold. This amounts to $13.88, but because of the probable variation in the ammonia content, and in order to be conservative, he has estimated an average value of $12 per dry ton.

Where sludges contain less than 10 per cent. of fat its value hardly pays for the cost of extraction, and such a quantity does not injure the sludge for a fertilizer.

The Milwaukee sewage produces from 3,000 to 5,000 gallons of sludge per million gallons of sewage treated, and when removed from the sedimentation tanks contains from 97 per cent. to 99 per cent. of water. About one-half a ton of dried sludge is produced from this volume of sludge or one-half ton of marketable fertilizer per million gallons of sewage treated. It is, therefore, believed the sludge can be sold for $6 per million gallons of sewage treated.

At the present time we are experimenting with a Berrigan press manufactured by H. R. Worthington, of Harrison, New Jersey, and find no difficulty in dewatering this sludge to 74 per cent. moisture. Mr. Winthrop R. Pratt at Cleveland is also experimenting with a centrifuging machine of the laundry type, and so far appears to be securing promising results. In neither case has it been found necessary to use lime, or other substance, in pressing this sludge to an one-inch thick cake.

While its further dewatering through direct or indirect driers has not been tried out by us, there seems to be no doubt from the daily experience of the Chicago packing houses in the drying of their tankage and liquid manure that this sludge can be quite as easily and economically dewatered to 10 per cent. basis, which is the moisture content allowable in fertilizer. In fact there are several driers in use in many industrial establishments which are satisfactorily operating on a similar material, and the writer has secured from some of the manufacturers of driers guarantees which cover the cost of drying the sludge we are producing from 80 per cent. to 10 per cent. moisture, exclusive of handling.

While we have not completed our dewatering experiments we have secured sufficient information to warrant us in believing that $6 per dry ton will cover the cost of dewatering and shipping the material to Chicago, including overhead charges.

Estimating the average value of the marketable sludge to be $12 per ton, there will be a profit of approximately $3 per million gallons of sewage treated.

I appreciate that these are estimates only, and the public will look upon them as such, and while we in Milwaukee are much concerned in getting all the profit possible from the sludge, we are primarily more concerned in finally disposing of the sludge without nuisance, even though no profit is realized.

That the sludge is valuable as a fertilizer has been physically proven by Dr. Edward Bartow, Director of Illinois State Water Survey, in his laboratory at the State University, where he made several pot cultures of wheat and garden vegetables according to the standard method employed by the United States Agricultural Department.

The writer has gone into the sludge question in considerable detail because of the doubt expressed by so many interested parties that the sludge can be successfully disposed of. There is great reason for this doubt, because in no other artificial process of sewage disposal has it been possible to dispose of the sludge without expense and growing nuisance.

Two of the important features which appeal not only to the engineer, but to the average layman are the low first cost of installing the activated sludge process and the high standard effluent procurable.

So far as the writer knows, the only artificial process which produces an effluent at all comparable with the activated sludge process is sedimentation, followed by percolating filters and final sedimentation with sterilization.

The first cost of the activated sludge process is practically the same as the first cost of sedimentation tanks of the Imhoff type of like capacity. The cost of the percolating filters, final sedimentation and sterilizing equipment must be added. This cost is approximately $14,000 per million gallons of sewage treated. This adds largely to the overhead charges. In addition to this the cost of sterilization must be considered. We have found in Milwaukee that it costs $2.50 per million gallons to sterilize the effluent from an 8-foot deep sprinkling filter to the same standard of bug removal as secured by the activated sludge process.

The activated sludge process requires one acre to treat ten million gallons, whereas the sprinkling filter process requires five times as much. Available lands in or near a city are expensive, and this additional cost must be considered.

ULTRA-VIOLET RAY STERILIZER IN CANADIAN BOTTLING PLANT.

Probably the first non-portable ultra-violet ray water sterilizing outfit installed in Canada was at the York Springs bottling plant, near Toronto.

The water supply is obtained from five springs at York Mills. These springs are within a few hundred feet of each other, and the water flows by gravity to the bottling plant, which is built in a hollow or ravine. They have a capacity of 14,000 gallons per 24 hours. The water flows into a concrete cistern, from which it is pumped to the first upper story of the plant. There it is filtered, under pressure, through three small filters of about 1,000 gallons per hour total capacity. From the filters the water passes to two slate tanks which act as reservoirs. From these tanks it flows by gravity through an E2 type R.U.V. special casting, and is sterilized by a single lamp, which operates on a 230-volt d.c. line, 2.2 amperes.

The sterilizer has a capacity of about 1,000 gallons an hour, but is operated at only 700 gallons per hour. From the sterilizer the water passes by gravity direct to the bottling, aerating and flavoring machines. Daily samples for bacteria count are taken from the pipe line just ahead of and just after the sterilizer, to check its operation, although the management state that this precaution has not proven necessary to date, as the water has shown a low bacteria count with no pathogenic organisms, even before sterilization. The sterilizer was deemed advisable, however, as an extra safeguard.

Mr. P. A. Boeck, in a paper before the Chicago Section of the American Society of Mechanical Engineers, suggested that since heat was a form of energy consisting of molecular vibration of a periodic character, the introduction in a furnace wall of bricks of different density would help to break up or change the wave length. Layers of insulating powder may also be used, or air spaces; but care should be exercised in this application of the last-named, as large voids have the effect of propagating heat by convection and radiation.