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Present Day Tendencies in the Disposal of Sewage

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ONLY in comparatively recent years has sanitary science recognized the relationship of sewage disposal to public health and the fact that the proper disposal of sewage is a necessity. The early nineties saw the first works for treating sewage in this country. Since that time, or in the relatively short period of thirty years, the small septic tank plant has developed, until today we have the large activated sludge plants with modern devices and mechanisms for compressing air, operating gates, conditioning sludge to a marketable state and other details. However, the prime object of sewage disposal remains the same; that is, to so dispose of sewage at a reasonable expense that objectionable conditions will be eliminated.

What Sewage Disposal Means

There are, in general, two parts to a sewage disposal project: first, the collection of the sewage, commonly known as sewerage, and second, its treatment before discharging in such a manner as to prevent nuisances. Too often the term "sewage disposal" is used only in reference to the treatment works, when in reality, the entire network of sewers, as well as the treatment site and the plant itself, should be included. The reason for this lies in the fact that sewers are usually installed without much thought and as a matter of convenience, and it is only when the outlets begin to cause trouble that public opinion crystallizes into a realization that the disposal of sewage means more than simply its collection at one or more outlets.

Stages in Solving Disposal Problems

It is important that the layman understand the various steps which occur in correcting objectionable conditions that necessitate disposal improvements. This is true since health standards and those of cleanliness and convenience change as communities grow and expand. The first step consists in the discharge of sewage through separate and scattered outlets without any provision for treatment. The second step is that of intercepting the sewage at the various outlets and concentrating it at one or more points. These terminal points may at first be only temporary and not the permanent or ultimate outlets. The third and final step is that of treating the sewage before it is discharged into a stream or body of water.

In the past it has been customary to build sewers in those portions of a community where most needed or demanded, with the outlets into the nearest water course. As these outlets have multiplied, nuisances have occurred and it has been found necessary to intercept them and to carry the sewage to some common point where it can be

discharged without causing offense. Today, more than ever before, municipalities contemplating disposal improvements no longer are content to make provision simply for the immediate future. They demand of their engineers a comprehensive plan which will take into account future conditions as well. It is for this reason that in laying out main trunk line sewers, the point of discharge must be decided upon with the end in view that some day there may be located at this point a sewage treatment works. Also this point of concentration must be considered from the standpoint of its adaptability to certain methods of treatment whereby the sewage can be rendered suitable for discharge without causing nuisances.

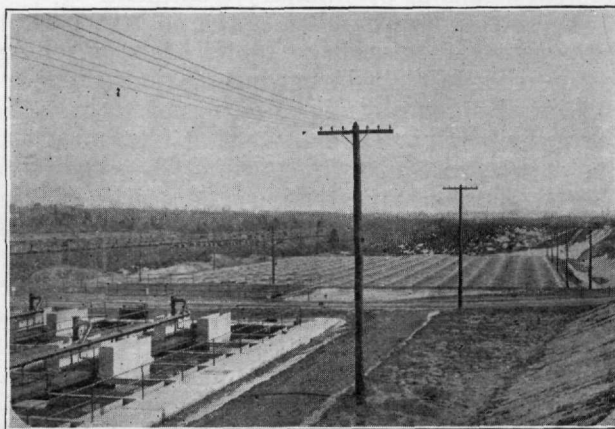
Combined vs. Separate Sewers

Perhaps the most conspicuous development in the field of sewerage is in connection with the type of system to be adopted. Advocates of the combined and separate systems are probably about equally divided, yet it is being realized more and more that various factors besides personal preference affect the decision. In consequence, the selection of the most suitable type is being given more consideration than ever before. The tendency is to enforce by ordinance a strict adherence to the type adopted in view of the misuse to which sewers and drains have been put in the past, particularly where the separate system has been followed.

Sewage Not Purified

It is rarely that conditions warrant the expense of completely purifying sewage; that is, removing all suspended solids, all organic matter and all bacteria or, in other words, making sewage fit to drink. In practice this is never accomplished, and it is erroneous to speak of treated sewage as "purified sewage." For convenience, however, the percentage removal of floating solids and of suspended and organic matters obtained by the treatment processes may be referred to as the "degree of purification".

In applying the principles of sewage treatment to any given problem, various factors influence



A TYPICAL SEWAGE DISPOSAL PLANT

the design of the works, as for example, the quantity and quality of sewage to be treated and the degree of purification required. The treatment of sewage is accomplished by a series of steps and the degree obtained increases with each successive step. If the body of water into which the treated sewage is to be discharged is large and the admission of raw sewage is not considered objectionable, a single process such as passing the sewage through gratings of fine screen may suffice. If conditions require the removal of floating solids, sleek and oily films, and the discoloration of the water, the screening process should be followed by a sedimentation in some type of tank. Furthermore, if sewage treated by the screening or sedimentation process, or both, is to be discharged into a relatively small stream, these processes must be followed by an oxidation process which will remove the finer solids that do not settle and which will mineralize the dissolved organic matter. Having determined the amount and character of the sewage to be treated and having decided upon the degree of purification necessary, the problem resolves itself into selecting a method of treatment by the application of a single process or a combination of processes as indicated above, which will be best adapted to and most economical for the local requirements.

Status of Treatment Processes

Without doubt, the most outstanding development in the field of sewage treatment has been in the so-called activated sludge process. This process, which ten years ago was confined to laboratory experiments, has today been developed to the point where large installations are being made in England and in the United States. The most noteworthy installations in this country are at Chicago, Milwaukee and Indianapolis, while in several other projects, this process is now under consideration for adoption.

The Imhoff tank cannot be said to have undergone any fundamental changes although its design has been perfected materially during the past ten years. Due largely to improper design and especially to poor operation, there has been a tendency in certain instances to discount the value of this particular device for sewage treatment. However, it would appear from my observations and experiences that, with proper design and operation, an Imhoff tank provides an efficient and economical means of preliminary treatment.

The settling tank, when operated either upon the plain sedimentation or septic basis, is seldom recommended for the larger installations. The reduction of sludge by digestion is not so great as was anticipated and the disposal of fresh or green sludge is a procedure which ordinarily is not to be desired. Furthermore, the large quantities of finely divided suspended matter carried by in the effluent from these tanks affects adversely the functioning of secondary treatment devices. For certain small installations the septic tank may still be worthy of some consideration. However, undue emphasis in the past has produced in the mind of the average layman the idea that the septic tank is suitable under all conditions when, as a matter of fact, its efficiency is relatively low.

Contact filters are being replaced by the more efficient and higher capacity trickling filters. Contact filters were installed in Ohio largely on account of topography, when for this reason, it would have been necessary to resort to pumping, had trickling filters been used. Contact filters are free from the fly nuisance which has militated against the trickling filter. The force of both of these arguments has been somewhat lessened, due to the fact that flies can now be controlled and that pumping can be satisfactorily and economically used to raise the settled sewage to trickling filters when the head is not sufficient to permit a gravity flow. For these reasons, combined with the fact that trickling filters are less expensive per unit volume of sewage treated, there is a tendency where contact filters are in use today to convert them into trickling filters even though this means resorting to pumping.

Maintenance and Operation Neglected

Sewers are usually constructed as a matter of convenience, while treatment works are built ordinarily to prevent damage suits or to guard against the pollution of water used as a water supply. It would seem that since treatment works are usually built under compulsion, there has been a tendency on the part of municipal officials to forget the works once they are built. As a result, sewage treatment works have, with few exceptions, been operated in a hap-hazard manner and with little regard as to whether or not they were functioning in the manner intended. There are, however, sewage treatment works which have operated satisfactorily, day in and day out, over a substantial period of years.

In the State of Ohio there are approximately seventy-five municipal sewage treatment works of which only about one-third receive any operating attention. Regardless of all claims to the contrary, no sewage treatment works can operate successfully without attention. Consequently it seems useless to expend large sums of money for such installations unless some effort is made to realize on the investment by giving the plant a chance to do the work intended.

Realizing this condition, there is now pending in the Ohio legislature, a bill which provides for municipalities obtaining funds for maintenance of sewers and sewage treatment works outside the usual city revenues. The method to be employed in raising the funds will be, in a measure, subject to local control. Possibly it may involve a consideration of increasing the water rates, since there is some justification in the idea that the cost of bringing a water supply into a house should cover the cost of disposing of this same water after it has served its purpose.

It is also necessary to maintain properly the sewers and their appurtenances which are installed as a great net work beneath the streets of our municipalities. Probably of as much importance in this respect as any other, is the feature of keeping permanent and accurate records of sewers and their appurtenances. The mis-use which occurs in making cross connections in our sewers and drains is probably the most deplorable waste we have today in connection with sewerage proj-

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ects. To correct this condition will require a strict enforcement of rigid rules and the provision of sufficient funds for the proper inspection of old and new work.

Funds for Disposal Improvements

The first step in municipal sanitation is that of providing a pure and wholesome water supply, while the second step consists in providing adequate sewerage facilities. Most officials appreciate these facts, and today, more than ever, feel that the health of their community is of paramount importance. Also, in these times, when apparently there are so many requirements for existing revenues and when on account of high taxes, the tax-payer is unusually interested in the persons elected, officials are more careful to distribute expenditures for health, education, transportation and safety to the best advantage. Not as much thought is given to properly distributing funds when they are plentiful, a condition which is closely related to a ready market for bonds. When, however, a ready market for municipal bonds does not exist, greater efforts will be made to expend public funds where they count most in the benefits to be derived. Sanitation or health improvements should not be greatly affected by such a consideration since tangible and easily recognizable benefits are usually obtained for relatively small expenditures.

Summary

The situation in the field of sewage disposal developments shows that no radical change has taken place in the basic features, either as regards sewers or treatment works. There has been a gradual elimination of the older types of treatment works and a more elaborate and intensive application of some of the later methods. In practically all methods of sewage treatment now in use, the basic principles are the same and a satisfactory solution of the sludge problem is still hoped for.

The attitude of the public, however, is changing somewhat in that officials are demanding more and more a thorough understanding of the work to be done and are beginning to realize that sewage disposal in all its phases is a public asset and benefit. Also that such improvements must be properly financed both from the construction and operation standpoints.

In the installation of sewerage improvements, it has happened too frequently that they have been built piece-meal in conformity with funds then available or the views of some particular person in charge at the time, and without reference to either past or future programs of correct procedure. Well conceived plans which provide for substantial benefits and which readily lend themselves to progressive construction for meeting requirements many years in the future, should be followed. In this manner improvements needed immediately may be adjusted to the ultimate program. Such a procedure is essential and well worth the cost.