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Present Status of the Sewage Disposal Problem

Efforts to Recover Valuable Nitrogenous Contents of Sewage Made Difficult by Colloidal Nature of Activated Sludge--Cities May Have to Dissolve and Oxidize as Much of Organic Material as Possible, Turning out Smaller Quantity of Stable Residue and Making No Attempt at Conservation

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WHEN an interested person with the solution of some sewage disposal problem in mind begins to make a survey of the existing installations, he is soon struck with the fact that there appears to be no perfect sewage disposal plant in existence. Some will show one good feature, some another, but after a thorough investigation the investigator will be convinced that the most notable feature about the majority of sewage disposal plants is the apparent failure to achieve the object aimed at, or some marked nuisance in connection with the operation of the plants.

It seems to me that it has been the lack of appreciation by engineers of the principles involved in sewage disposal that has chiefly been responsible for the large number of offensive sewage disposal plants in this and other countries.

One factor frequently responsible for the improper operating of sewage disposal plants has been the failure of engineers to take into consideration the large amount of silt and detritus brought down in sewage, and to provide detritus chambers of sufficient capacity. As a result silt passes over into the sedimentation tanks proper and settles out in the form of compact deposits which prevent proper sludging of the tanks. The consequence is that decomposition of the sludge sets in, large quantities of offensive gases are given off, both in the tanks and during the sludging process, and a nuisance is created.

In other cases incomplete sewage disposal systems have been installed. These frequently consist of a system of screens, grit chambers and sedimentation tanks, the effluent being allowed to flow into the nearest stream or lake. If this effluent flows into a body of water too small to handle it, all the oxygen is absorbed from the water, the organic matter in the effluent settles out, anærobic action takes place, and again a nuisance is created, to say nothing of the possible danger from contaminated water supplies.

Sludge Treatment a Nuisance

Or again, when sludge is to be treated, a nuisance is almost certain to result, because sewage sludge cannot be rapidly dewatered or dug into ground and can only be kept from undergoing offensive bacterial putrefaction with the greatest difficulty.

In many cases where nuisances have arisen, the fault has not been that of the engineer, who originally designed the plant with a full knowledge of the subject of sewage disposal held at the time of its construction. Sometimes well-designed plants have been allowed to become public nuisances through mismanagement. In other cases the growth of the municipality has resulted in the plant being overloaded, with no attempt to remedy the trouble by properly extending the system.

All of these conditions have come within the experience of anyone who has studied the problem of sewage disposal at all extensively. In England, the writer has seen numerous small installations consisting of sedimentation tanks and bacteria beds which appear to be carried on with a comparatively negligible amount of nuisance. It is only a question of degree, however. If these small installations were increased to ten or twenty times their capacity, the negligible nuisance would become marked.

At Salford I saw the original activated sludge plant operating without the slightest odor upon a most objectionable-looking sewage containing large quantities of dye products and explosive manufacturing wastes. At Devizes I examined a very excellent installation of sedimentation tanks and trickling filters. This system was considered to be one of the very finest examples of its kind in England; there was little odor and the whole process was carried on in the open air.

Operation Is Important Factor

Whether there is a nuisance or not at any disposal works depends on the operation of the plant as well as on the installation, and as plenty of labor can usually be obtained in England, the plants there are, as a rule, well looked after.

In America it has been possible for engineers to install many sewage disposal plants that looked well on paper, because the local authorities did not know enough about the problem to tell whether the plans were suitable or not, and there was no central authority, or referee, with sufficient minute knowledge of the subject to whom the plans of the proposed installation could be submitted. This central, independent expert authority, or referee, has been established in Ontario and other provinces in the person of the sanitary engineer of the Provincial Board of Health, instead of the Board itself, as was the case in Ontario at one time.

The disposal of sewage in its various stages is absolutely dependent upon bacterial action. Bacteria are the agents which are employed to carry on the series of destructive processes which finally convert the organic matter present in sewage into inert inorganic salts and a humus-like residue which can no longer undergo active putrefaction. Two classes of bacteria may be employed, according to the result wished for: Anærobic and ærobic.

The anærobic type are hydrolytic organisms, and as a rule split up complicated organic materials into simpler organic materials, frequently with the production of hydrogen sulphide and other offensive gases.

Aerobic bacteria, on the other hand, tend to directly oxidize or burn up organic compounds, or their split products, into inoffensive, inorganic stable compounds, such as carbon dioxide, nitrates, sulphates and other salts. The final result of anærobic and ærobic action combined, which is presumably the general rule, is a stable organic residue called "humus."