ZERO WATER DISCHARGE SYSTEM FOR THE BABYLON RESOURCE RECOVERY FACILITY

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Discussion by

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This is an excellent and a very worthwhile paper. I would like to commend the authors for presenting their data in sufficient detail that it is a contribution to the literature in an area of difficulty, the discharge of water from a solid waste processing plant.

The Resource Recovery Plant is a fairly standard Mass Burn type plant, and this opportunity to look into the zero water discharge system is excellent. The idea of taking some of the plant's makeup water from the underground leachate plume of the adjacent landfill and processing it is worthy of particular note. The removal of the contaminate water in such a manner that it decrease the potential for contamination of the local water courses is an excellent idea. This source coupled with the clean up system is a good method of obtaining acceptable water for the plant's operation.

These shallow water wells satisfy some of the plant's water requirements while containing the leachate pool, but there is also municipal water usage. I would like to know the percentage of water taken from the municipal supply.

I know their systems, so I know what they mean when they say the flue gases leave the economizer section of the boiler, and is release for absorption to the atmosphere. This statement could confuse the reader. I know the flue gases leave the economizer and go through a dry scrubbing process, a filter and then to the chimney for dispersion in the atmosphere. This is an integral part of their system, but it takes a little understanding to get that from the last paragraph on page 257.

I have a question about the cooling towers. Evaporative towers are a means of handling water containing some impurities and getting the needed cooling. But, what about the impurities in the water? A certain amount of chemical treatment is used to keep the algae, etc. under control. In addition, as the authors point out, a good percentage of the treated water winds up in the cooling tower and is evaporated. My question is, since the evaporative plume and drift from the tower contain these impurities, is there any estimate of the quantity and types of impurities in this atmospheric plume? This is a question that is bound to arise, and we should most certainly be prepared to answer it.

I note that the design allows for 2 hr of water makeup storage for the tower quencher and other usages. Is this sufficient? On what basis was the decision made? Was it because of an adequate municipal supply? I would like your comments on this.

Another question is, was reverse osmosis considered in place of electrodialysis? If it was, I would appreciate comments on why electrodialysis was chosen over re-

verse osmosis. I think that I might have made the same decision, but I am curious.

Again, this is an excellent paper, one that I feel is a contribution to our technology and in keeping with the technology transfer goal that is a part of our divisional charter. It indicates we are making progress toward this goal.

Discussion by

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ABSTRACT

This paper describes the design and planning of a zero water discharge system which utilizes a shallow underground leachate plume from an adjacent municipal landfill as a source of makeup process water for a 750 tons per day waste-to-energy facility for the Town of Babylon, Long Island, New York.

This paper covers the selection of the make-up water source, describes the facilities' water treatment system, provides the chemical composition of the water stream, and the major water treatment facilities design data.

CONCLUSIONS AND RECOMMENDATION

This is a good paper in that it provides the bases for the selection of a nonpotable process water source, describes the processing stages for the purification of the various wastewater streams, and provides the composition of major wastewater streams. Also included are major facilities design data, facility layout, a simplified process flow diagram, a water system flow chart, wastewater treatment system and a blowdown treating system.

The simplified Water System Flow Chart, Fig. 3, is somewhat misleading in that it is not a water balance. It appears to specify the design capacity of each of the stages. From the reviewer's perspective, a water balance is more desirable.

COMMENTS ON SUBJECT PAPER

The paper describes the process used in the selection of the make-up process water. The selection of a shallow underground aquifer which is contaminated with leachate from an adjacent municipal landfill serves two major functions. It provides a reliable source of make-up water which will slow if not halt, the spread of the leachate plume. It will also have a positive impact upon the migration of the contaminated upper aquifer into the lower potable water aquifer. The only other potential source of make-up water would be from deep wells. Long Island, which is very densely populated, is beginning to face serious potable water supply problems.

A simplified water system flow chart for the normal facility operation is presented. This chart, unfortunately, is not a water material balance. It apparently indicates the design capacities of the various systems within the water treating system.

Municipal well-water is used for boiler water makeup and potable water services. All other water users utilize treated upper aquifer well-water. All wastewater streams in the plant, such as cooling tower blowdown and boiler blowdown, are reprocessed and reused within the system. There will be no discharge of any wastewater streams from the plant.

There are three main wastewater treatment systems that are described in detail and illustrated. These consist of: the upper aquifer well-water and blowdown streams; the cooling tower blowdown treatment; and the boiler feedwater treatment system. The type of system and capacities of each stage within the process have been defined.

Of prime interest are the chemical compositions of the five water streams which show the dissolved solids in each stream. The composition of the upper aquifer well-water does not indicate the presence of organic type liquids or solids which one would expect in leachate from a municipal disposal site. Currently there are several deep aquifers on Long Island that have been contaminated with nonbiodegradable organics from domestic septic tanks which have led to the ban of phosphates and other domestic type chemicals on Long Island.

Overall, this appears to be a standard design refuse-to-energy type facility. The only apparent deviation from the norm is the use of water from a shallow aquifer that is contaminated with leachate from a municipal refuse dump.

Refuse-to-energy facilities are prime candidates for zero water discharge design due to the need for low grade water for the dry scrubber and bottom ash quench systems.

AUTHORS' REPLY

To Mr. Fernandes

Mr. Fernandes' discussion includes several requests for additional information. These requests are ad-

dressed below in the order that they appear in his commentary:

(a) Percentage of Municipal Water. What is the percentage of water taken from the municipal supply?

The average daily requirement for water from the municipal water supply will be about 33,000 gal/day or approximately 7% of the total water usage at the facility.

(b) Cooling Tower Water Treatment. Is there a chemical treatment system for cooling tower water?

The cooling tower is provided with a separate chemical treatment system. Bromine in the liquid form will be used to control bacterial and algae growth. Bromine treatment was selected over chlorination for this application due to the presence of ammonia in the makeup water.

(c) Cooling Tower Plume and Drift. What is the quantity of cooling tower plume and drift and what does it contain?

The maximum evaporation from the cooling tower is estimated to be 425,000 gal/day in the form of essentially pure water vapor.

Drift will average about 3000 gal/day. It contains the same solubles which are in the cooling tower basin water, i.e., chlorides, sodium, calcium, and potassium.

(d) Storage Capacity. Is 2 hr storage capacity for make-up water sufficient? On what basis was the decision made? Was it because of an adequate municipal supply?

Two hours of treated make-up water storage is sufficient and is provided to account for minor equipment maintenance outages and upsets in the treatment system.

The system is provided with multiple trains and sufficient redundancy to assure high availability. All pumps are provided with 100% spares. Standby pumps are started automatically. The gravity and pressure filters have spare capacity. The well water treatment system clarifier/thickener has three days of sludge holding capacity to facilitate planned or emergency belt press filter maintenance. The two half capacity electrodialysis units operate independently.

In the unlikely event of a major system outage, the facility will continue to operate with 100% municipal water makeup until system operation is restored.

(e) Was reverse osmosis considered in place of electrodialysis? Why was electrodialysis chosen over reverse osmosis?

Both reverse osmosis and electrodialysis were evaluated for use in the system. The primary reason for selection of electrodialysis is the fact that it yields a low volume of highly concentrated waste water which can be utilized in the ash discharger as make-up. The waste water quantity produced by reverse osmosis is relatively higher and would not have fit as well into the water balance of this plant.

To Mr. Winsor and Mr. Alibutod

The discussion paper presented by Mr. Winsor and Mr. Alibutod contains two comments to which we offer a reply.

First, they state that "the Simplified Water Flow Chart, Fig. 3, is misleading in that it is not a water balance". This observation is incorrect. While the chart has been simplified for use in the paper, it does depict average facility water balance data and not system design capacity data, as suggested in this discussion paper.

Second, they point out that the leachate stream should be expected to contain some organic material. This is correct. The water samples collected at the site show trace amounts of organics which will either be removed by settling in the well water treatment system or handled in the cooling tower system with bromide injection.