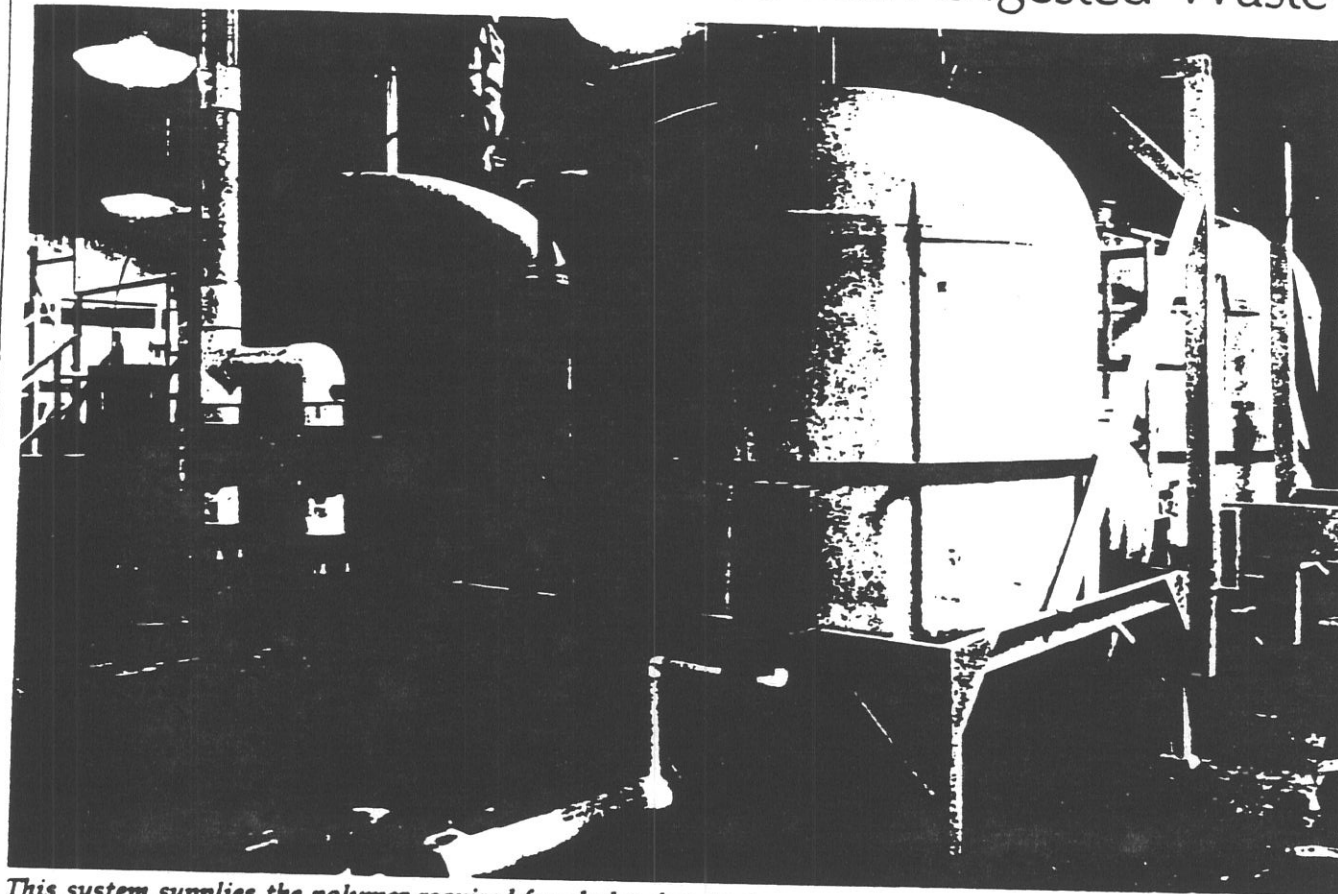


Anaerobic Digestion

Methane-Rich Gas Produced from Digested Waste



This system supplies the polymer required for sludge dewatering.

by Joan Timberlake

If someone on the street heard the words "anaerobic digestion," the reaction might be "What's that—something to do with aerobic exercise or a new disease?"

Both ideas are far from the real meaning. Actually, anaerobic digestion has been a part of wastewater treatment for over 80 years, but only in the last decade has it been looked at for another benefit—as a treatment process capable

of producing significant amounts of usable energy.

Knowing this, the Bacardi Corporation developed their special patented anaerobic filtration process. Although the first use was in Bacardi's rum distillery, it is applicable to many types of wastes: whether from a pharmaceutical company, a paper mill, meat or food packing plant, or winery.

Keeping the skies, waterways, and lands pure is of great concern because of today's environmental awareness. Anything dealing more efficiently with waste is something worth exploring. The Bacardi Corporation Anaerobic Filter System®

utilizes a wastewater stream from a manufacturing facility and introduces anaerobic bacteria to degrade those waste materials in a manner that is particularly energy efficient.

Since the bacteria don't require oxygen, no oxygen transfer equipment is necessary to keep them growing. They "digest the waste" in an environmentally safe way. Moreover, the big bonus is that the process also reduces energy needs since it converts the majority of the organic portions of the wastewater into methane-rich gas that can be burned in boilers.

Dr. Michael Szendrey, Director

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of Bacardi's Environmental Department, notes "Since the process must be operated within a narrow temperature range, insulation is important to prevent heat loss and minimize operating costs, especially in temperate and cold climates."

He mentions the weather aspect since there is an exception. At their Puerto Rico distillery where they treat mosto, a waste product resulting from the production of rum, insulation is *not* required due to the warm climate and the high temperature of the wastewater.

Insulation definitely is a key part of the agenda for the other site where a wastewater plant utilizing the Bacardi system is in operation—Miles Laboratories in Elkhart, Indiana. And there soon may be many other locations where insulation will be needed since Bacardi and Ultrasystems Incorporated of California have an agreement to explore the development of additional facilities.

Much of the Midwest is well-known for its temperature extremes. In Elkhart, Indiana, summer temperatures may match or top Puerto Rican highs (105°F has been recorded), but winter is a far different story when the low can be a -30°F. If the proper insulation wasn't used under such varied conditions, this could present quite a problem, since anaerobic filter operations must be maintained within a tight range. (To have the micro-organisms work properly, this plus-or-minus range is 5°F, according to Dr. Szendrey.) Finding the right insulation for the contrast between those Indiana temperatures and the original Puerto Rican use offered a challenge, but it was one that was worked out with the proper expertise.

Miles Laboratories has been established in Elkhart, Indiana for 100 years, but the separate \$15 million wastewater plant is a much newer

development, having opened just about a year ago, January 1, 1986.

Several years ago when they decided to add such a wastewater treatment facility, they began researching different technologies used throughout the world. The decision was to go with Bacardi's state-of-the art process. This method had been selected as "one of the ten outstanding engineering achievements in the U.S.A." by the National Society of Professional Engineers, and received other awards as well.

Sharing community concern about environmental quality, Miles worked closely with the local city government. Also, to make sure that their new Wastewater Pretreatment Plant would be custom-designed to their special needs, John Cooper, their manager of utilities and operations, made several trips to Puerto Rico to define the process.

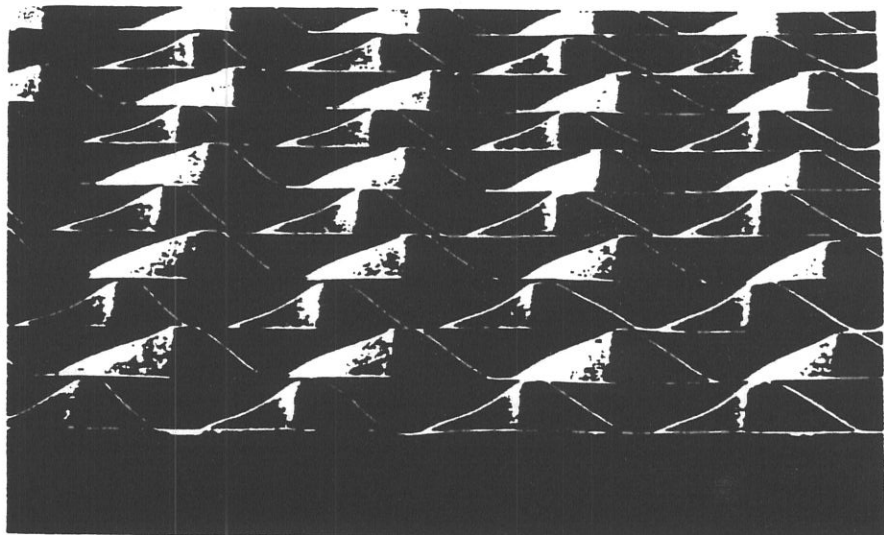
Cooper says, "The selection of the Bacardi process took about three

of the most interesting challenges involved the combination of many different size tanks. "We used panel-type foam insulation which was glued to the aluminum and held in place by spring tension bands which allowed for the expansion and contraction of weather variations.

Cooper speaks highly of how important insulation is to the process. "Because these tanks are as well-insulated as they are, we're able to get by without adding much heat, even during the coldest weather. For the roof that had been coated with a weather barrier, we hand-sprayed foam insulation," he adds.

Insulation of the pipes was handled by the ICMS Co. of Baroda, Michigan. Estimator Robert Verbanac agrees with Jacobi about the maneuvering around structures of differing heights as being one of the aspects which made this insulation job even more interesting.

"There was some existing piping we had to work over and around.



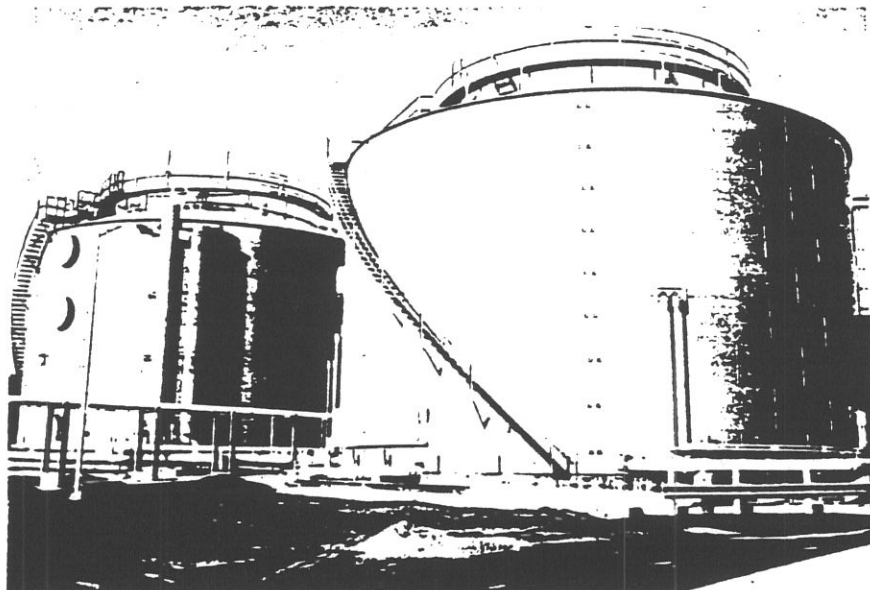
Shown above are honeycombed plastic panels called "media." These are used in removing organic compounds from wastewater.

years, then the plant took about a year and a half to build."

Chicago Bridge & Iron (CBI) Services of Chicago was the firm which insulated the tanks and Ken Jacobi, Painting Supervisor, recalls that one

Also certain tanks might be 50 feet high and have piping on the outside, while other pipes might be at the 9-12 foot level, so there were a lot of different situations. We used Knauf fiberglass and jacketed the

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Miles' Anaerobic Reactors

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pipes with PVC jackets. For the steam and condensates, it was calcium silicate with metal jackets. Our main suppliers were Manville and Owens-Corning. When we finished, we were pleased with the work because it was the kind of good looking job in which pride can be taken."

Miles' plant is a self-contained operation. In addition to the treatment system, it has its own analytical laboratory, specialized safety systems, and a complete computer control system that also constantly records plant process data. The four microprocessors that are monitored by a supervisory computer allow the utilization of a much smaller staff (six operating people are involved)—than one would expect for a round-the-clock, seven-days-a-week operation.

In addition to the six-person operating team, they employ two full-time maintenance workers, a laboratory supervisor, and an analyst.

How does it all work? The way the process operates is that wastewater from the manufacturing fa-

cilities is fed into the equalization tanks. Here the fluctuations of flow are evened out before it is sent into the anaerobic filter. The filter is filled with Goodrich-manufactured honeycombed plastic panels called "media." The anaerobic microorganisms attach themselves to the media and form a film which then begins digesting organic compounds from the wastewater that passes by.

"Since the anaerobic organisms in this process grow without oxygen, the system has low energy requirements and does not generate a great deal of sludge. From the tanks where the sludge is held for processing, it is fed forward into belt filter presses where its solids concentration is increased from 6 percent to 40 percent. Sludge then is conveyed to sludge hoppers which are hauled to a local landfill."

After going through compression and drying to a -40°C dew-point, the biogas is piped to Miles boilers where it is used to produce process steam. At the Elkhart site,

this means cutting natural gas consumption costs by 5 to 10 percent per year.

This process also has been an award winner for Miles...receiving recognition from the Indiana Water Pollution Federation in the form of an Industrial Award for the positive attitude it exemplifies toward water pollution control. ☉

Even More Pluses

From Bacardi's own experiences additional advantages for use of their process may be seen in the recently published *Biomass Energy Development* report by Bacardi Vice President, Dr. George H. Dorion, and Dr. Michael Szendrey on their operation.

Since its January 1982 startup, not only has the Anaerobic Treatment Plant in Puerto Rico met or exceeded all design performance criteria and the biogas generated been substituting for a significant portion of the fuel consumed by the distillery steam boilers, but there is something else. Even if there were need for an extended shutdown (the Bacardi Corporation distillery operation requires this for routine maintenance at least once, and sometimes twice each year), the process has been shown to cope successfully with an extended interruption of the wastewater feed.

Not only that, but Drs. Dorion and Szendrey are quoted in *Biomass Energy Development* about its performance record: "This novel fixed film anaerobic filter has been in continuous operation for five full years without a single process upset."

As more and more of these wastewater filtration plants are built in the years ahead, it's not just this anaerobic digestion process that the users are likely to appreciate but the insulation that's used to increase the energy efficiency as well.