

A Toledo, Ohio-developed sludge conditioning system with a long official name, "Advanced Alkaline Stabilization with Subsequent Accelerated Drying," has been recognized by the EPA as a "Process to Further Reduce Pathogens."

Sludge, Kiln Dust Make Fertilizer

by Thomas L. Kovacic

The Clean Water Act requires that every reasonable effort be made to utilize the natural resources generated by wastewater treatment and disposal practices. These include both the effluent and sludge resources. The Resource Conservation and Recovery Act contains even stronger mandates for federal support and encouragement of resource recovery as a cornerstone of America's waste management policy.

The effective utilization of sludge resources has generally been hampered by five critical concerns: Is the process dependable? Is the process cost effective? Is the process and the product community-acceptable (odor)? Is the product environmentally safe (in terms of disease, and toxic elements and organic compounds)? Is there a reliable market for the product?

Toledo has established a national reputation as a leader in the effective land application of wastewater treatment sludges. This Northern Ohio city has successfully land applied all of its sludge for over ten years using a combination of anaerobic digestion and lime stabilization to treat the material prior to application.

In the spring of 1985, Toledo began reviewing the potential use of cement kiln dust (CKD) in lieu of lime to disinfect and deodorize sludge more effectively. The initial testing, both with digested and raw sludge, produced encouraging results. The kiln dust concept was being developed at the Medical College of Ohio in Toledo (MCOT) and was funded initially by N-Viro Energy Systems, Ltd. of Toledo, a firm which specializes in the utilization of industrial, utility, and municipal by-products. Dr. Burnham (MCOT) and the author recognized

the immense value of an admixture that could improve sludge dewatering, disinfect, substantially reduce odors and add value to the sludge-based by-product (cement kiln dust contains calcium, potassium, sulphur, magnesium, and other valuable trace minerals). We believed that pasteurization of sludge through extended alkaline processing was a distinct possibility.

In early 1986, Toledo agreed to sponsor a research project at MCOT to evaluate the theory that a combination of extended alkaline treatment with concurrent accelerated drying might achieve U.S. EPA criteria for the highest classification of sludge treatment, a *Process to Further Reduce Pathogens* (PFRP). In the spring of 1986, Dr. Burnham began extensive testing of seeded Toledo sludge to determine the killing capability of the combined treatment process. The results were successful and created significant regional interest. Later that year MCOT received a \$522,000 grant

using raw Monroe, Michigan sludge and dewatered Toledo sludge. Careful monitoring of disinfection levels and odor stabilization levels was exercised. The results of both evaluations were beyond expectations.

The initial process took over thirty days of combined alkaline stress and drying stress to achieve pasteurization (on PFRP) levels of disinfection. In late summer Dr. Burnham recognized the possibility of drastically reducing treatment times. He predicted that by using the exothermic heat generated by the anhydrous admixtures, lime and/or cement kiln dust, pasteurization and permanent odor stabilization could be achieved in less than seven days. Full-scale tests were run in Toledo, Des Moines, Iowa, and DuPage County, Illinois.

The results impressed all participants. Pasteurization levels of disinfection were achieved in less than three days, and the time required to produce a nearly odorless, granular product was less than seven days. A key feature, of this technology is its ability to achieve pasteurization without sterilization. The presence of non-pathogenic micro flora, normal soil bacteria, is a major contributing factor to significant and permanent odor stabilization. Some of the original product from the demonstration project has been stored in conical piles for over 400 days without odor or recontamination.

As part of the Ohio Development Department's Edison Grant Project, a University of Toledo group under the direction of Dr. Gary Bennett, has conducted extensive testing on the ability of the process to immobilize

"Some of the original product from the demonstration project has been stored in conical piles for over 400 days without any odor or recontamination problems."

from Ohio's Department of Development and N-Viro Energy Systems. Moreover, the Toledo staff recognized the significant value of a PFRP system and product, and committed to participate in a full-scale development and demonstration project. Toledo also committed to use the technology if the EPA approved the process as achieving PFRP criteria.

In 1987, full scale seeded testing was conducted on Port of Toledo property and at a pilot site in Lucas County

heavy metals. To date, the data shows the quality of the leachate from the planted fields with respect to heavy metals to be excellent, even approaching EPA drinking water standards. The large quantities of precipitated calcium carbonate provide both short term and long term insurance against soil acidification without significantly raising the pH in alkaline soils. Agronomic evaluations are being conducted by Dr. Terry Logan of Ohio State University Department of Agronomy.

Resource Recovery and the 'NIMBY' Syndrome

by Sally Robinson

Both the Clean Water and the Resource Conservation and Recovery Act clearly and courageously established beneficial utilization as the cornerstone of this country's waste management policy. Today, these laws and their resource recovery mandate are particularly relevant. There is significant national concern over the short and long term environmental problems caused by waste disposal practices such as ocean dumping, incineration, and land-filling. These questionable practices, with no redeeming recovery benefits, are now receiving widespread public attention and justifiable criticism.

Many cities have instituted industrial pre-treatment policies and regulations which dramatically improve the quality of municipal wastewater sludge. Thus continued use of the above disposal practices for what is a valuable national resource just doesn't make sense. Here, the NIMBY (Not In My Back Yard) syndrome becomes a critical component of professional planning for public health, safety and responsible public service costs.

Concerned citizens do not want disposal facilities like landfills or incinerators located in their communities. Concerned citizens do not want sludge spread on neighboring farms. Concerned citizens do not want sludge treatment facilities located in their neighborhoods. Thus, the NIMBY syndrome is creating a real policy dilemma for public wastewater managers and elected community leaders. How, then, do communities provide for both public health and public interest?

Toledo, Ohio was a classic 'NIMBY' case. For over ten years Toledo had successfully applied digested sludge to land in surrounding farm communities. A combination of circumstances (political, operational and technical) created a situation in which the land application of all dewatered sludge was rejected by these communities, a development which has occurred time and again throughout the US. Secondary biological sludges have dramatically affected the acceptability of dewatered sludges. Odor objections led to fear of other possible environmental concerns. Community acceptability has become a top priority in determining sludge management alternatives, and why not? Quality of life is important and there are acceptable sludge disposal alternatives. The community must be involved in determining what is acceptable! Moreover the public must be assured that both sludge processes and products

meet stringent public health and safety standards.

Officials in Toledo were involved from the start with the N-Viro Soil technology, as it was developed and demonstrated by the Medical College of Ohio in the city. A week-long open house at a pilot process site, including live television coverage and three consecutive public seminars, were provided by the municipality, Medical College, and N-Viro Energy Systems. The willingness of all involved parties, particularly the environmental and agricultural consultants, to share openly their understanding and experience was critical. The farm community recognized the environmental and agricultural value of organic vs. chemical fertilizer, and readily accepted this product when their odor and public health concerns ceased to be a problem. Rural community acceptability is not easily achieved. It must be earned, and these are four key criteria:

- The product should be pasteurized to prevent pathogen or odor regrowth and to eliminate public health concerns.
- Heavy metals should be immobilized by aggressive pre-treatment programs, proper management and monitoring of soil-product pH. Today's pH controls are usually not adequate.
- The product must be capable of extended storage to allow for seasonal utilization. Year around daily application significantly damages agricultural value, creates an image of a waste material, adversely affects farmland, and raises realistic concerns about surface water run-offs.

The second step in overcoming the NIMBY Syndrome in Toledo was to properly site the sludge-to-fertilizer facility. The obvious location was at the wastewater treatment plant in Bayview Park. However, that is located immediately adjacent to three private marinas, two public golf courses, and an active neighborhood community. Initially, over three-hundred signatures were obtained on an opposing petition. Again, private and joint meetings (including plant tours and inspections of the finished product) were held to evaluate public concerns. A key consideration was the ability of N-Viro's kiln dust technology to immediately, significantly and permanently reduce odors, and to immobilize toxic elements. City officials and their consultants explained that the

process would also significantly reduce existing odors from the Toledo plant.

"I am convinced that what they are going to do out there is environmentally acceptable. A year from now, we will be a lot better off than we are now," said Mrs. Jeanine Perry, leader of the neighborhood (heretofore) opposition, in addressing City Council. With strong public support, the sludge-to-fertilizer plant was approved unanimously. Site acceptability called for four important conditions:

- New sludge treatment processes should decrease, not increase existing plant odors.



Mayor Donna Owens and Author Tom Kocacik take a whiff of Toledo's treated sludge.

- Dusting from treatment and storage should be prevented.
- The process should not result in increased trucking activity at the site.
- Run-off must be controlled and recycled.

Mayor Donna Owens of Toledo, noting that the process uses two waste materials, described its benefits in a statement. "This technology uses a community-acceptable process to convert sewage sludge from an offensive waste to a safe, community-acceptable product of value. Resource conservation and recovery is the cornerstone of responsible waste management. We believe this process will revolutionize wastewater sludge management."

The cornerstone of any effort to overcome the NIMBY dilemma is early and open community involvement in, and education about, sludge management. Public health and odors are real concerns, but there are cost-effective, safe solutions. With dedicated open communications, resource recovery can overcome the "NIMBY" syndrome. □

About the Author:

Sally Robinson is Executive Director of National Kiln Dust Management Association.

On January 25, 1988, the EPA officially recognized *Advanced Alkaline Stabilization with Subsequent Accelerated Drying* (AASSAD) as PFRP. This was the first such national acceptance of a new PFRP process since the regulations were published on September 13, 1979.

For over three years, Dr. Burnham and his associates have dealt with all forms of municipal sludge. To understand odor control requires constant exposure to levels of odor and qualities of sludge. During this same period the author has maintained the strong position that resource conservation and recovery is right and that utilization can be achieved within the twin constraints of cost and community acceptability. Toledo, Des Moines, Bristol (Tennessee), Greenville (South Carolina), and Oklahoma City (Oklahoma) are now in various stages of building AASSAD facilities. Dozens of other cities, including some of the largest, throughout the US have requested demonstration or privatization proposals.

The question is always asked, How

did Toledo become interested in advanced alkaline technology? The main reason, we believe, is that Toledo has developed one of the best environmental programs in Ohio. We have been conducting and pioneering air and water programs for 25 years. Also, since Toledo is the home of N-Viro, we wanted to be sure this new technology was given a fair review. Its cost-effectiveness was somewhat mitigated by our ongoing digestion rehabilitation investment. However, we see major advantages in adding this process system to in-place digesters.

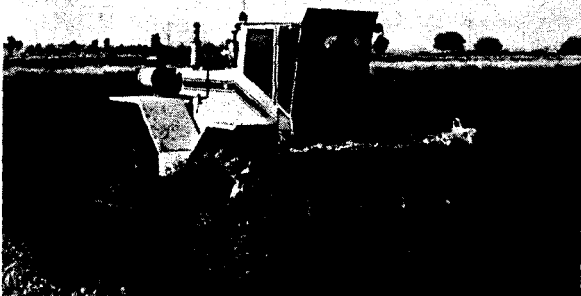
First, we do not now expect to digest the waste activated sludge. In this way, the BOD recycling cost, a major hidden expense of anaerobic digestion, will be drastically reduced. The sludge will dewater better and at lower costs. The digesters, handling primary sludge only, are expected to operate more effectively and efficiently. Finally, by by-passing the digesters with the waste activated sludge, we will retain valuable nitrogen, much of which is lost in anaerobic digestion with subsequent dewatering. The process is simple. It

mixes digested primary sludge with undigested, thickened waste activated sludge, dewatered in polymer conditioned belt presses. Lime and CKD are added in post-press operations, and the combined mixture is aerated for at least seven days.

In deciding on this new process for Toledo, we carefully reviewed all management options. We do not accept landfilling as a viable option for a product as valuable as sludge. Toledo committed significant resources to establish and develop a good pretreatment program, consequently we have a clean sludge. To waste that sludge in a landfill is inconsistent with our national interests. Why waste energy? Why waste resources? With the current trade deficit drastically affecting our national economic security, why should we import nitrogen while we are burying nitrogen-containing compounds in landfills?

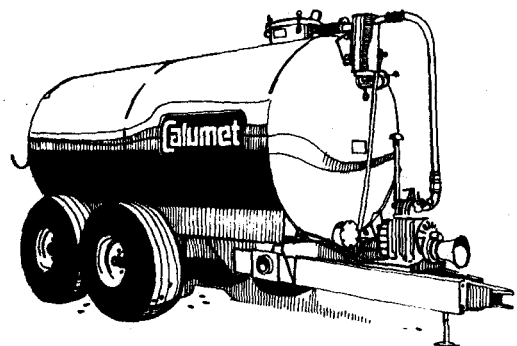
The arguments for incineration are even more difficult to comprehend. Using that approach we destroy natural resources, waste energy and unnecessarily spend billions of dollars an-

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nually to achieve these undesirable results. And an incinerator could cost \$50 million. So we looked long and hard at a compost system. A visit to an Akron, Ohio facility left us impressed. However, the capital cost of compost was at least ten times that of the home grown, Toledo process, the operating costs were higher, and we have more confidence in the long term, large scale marketability of the N-Viro product.

The Toledo sludge-to-fertilizer facility, now in design and expected on-line in April 1989, is being built on a 3-acre plot bordering two public golf courses and three marinas. It is expected to handle about 60,000 wet tons annually. Total capital cost will be about \$2.6 million including all equipment. The strategy of the project is to convert digested primary and undigested secondary dewatered sludge to a state-registered, soil conditioning and liming product to be marketed by one or more fertilizer firms. Fortification of nutrients to achieve guaranteed

About the Author:

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N-P-K (nitrogen-phosphorus-potassium) is being professionally evaluated. Pelletization of the product for use as a fertilizer filler is also being carefully analyzed. Review of these aspects of the program is under the direction of Robert Anderson, a private consultant in addition to being a general partner of the Andersons of Maumee, Ohio, a large commercial fertilizer firm.

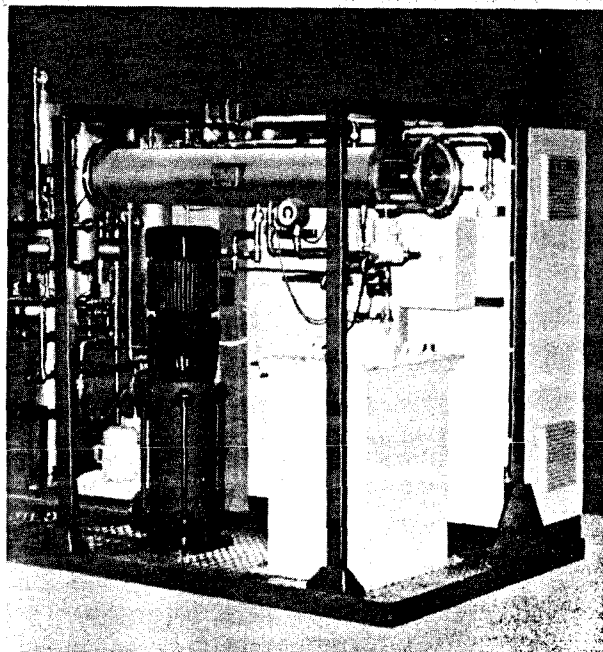
Beneficial utilization of sludge to replace imported and energy intensive materials is a key element in the national commitment to achieve effective resource conservation and recovery.

In summary, we see a process that requires about seven days for total treatment. We see a process with limited capital requirements. We see a process with operating costs at or below traditional PFRP processes and less than other alternatives. We see a community-acceptable, storable, odorless, granular, pasteurized PFRP product that provides built-in protection against pathogen regrowth, odors, and the migration of toxic compounds. Most important, we see an end-product that has multiple market options.

It optimizes the nutrient values of sludge, provides potassium, sulphur, and even trace minerals from the kiln dust additive, and provides sufficient calcium carbonate to provide both liming and long term soil calcium requirements. This combination is attractive to agricultural interests, for reclamation projects or landfill cover, and in the role of landscape fertilizer as demonstrated at two local private country clubs and by the Toledo Division of Parks. Like compost, the storability of N-Viro Soil is a key asset. However, unlike compost, it can be put to work after just seven days of treatment. We see the product offering great flexibility, both in processing and in utilization. □

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