Additional Information on Hydrogen Sulfide and Activated Sludge Treatment Issues

By Steve Schliesser, DAQ

March 6, 2003

During the February 12, 2003, Air Quality Committee Meeting, a number of concerns were raised on hydrogen sulfide and activated sludge treatment issues. Committee members requested that Division of Air Quality staff further investigate these concerns and report back in the March AQC meeting. Following is additional information largely compiled by interviews with wastewater consultants and other state agency staff, and found in the literature.

1. Costs for wastewater treatment

DAQ confirmed the reasonableness of the industry-provided aggregated costs to control H_2S from the fertilizer and paper industries. Published cost data for pulp / paper mills demonstrated close agreement (within 10%) to industry cost estimates. In addition, a leading wastewater treatment consultant also substantiated the basis of industry cost estimates.

2. Relative cost and performance.

For a given treatment efficiency, the current method utilized at most of the NC paper mills, aerated stabilization basin (aerated basins), is more economical than activated sludge treatment (AST). Given its cost-effective advantage and available space, 2 out of 3 mills in the US have aerated basins; the balance has activated sludge.

However, activated sludge provides higher quality sludge treatment, as it generally produces 90% reduction in biochemical oxygen demand (BOD). In comparison, aerated basins produce 75% BOD reduction and closer to 50% BOD reduction in cold weather. Consequently, there is a trend of a higher distribution of aerated basins located in the warmer climate of the south with a higher distribution of activated sludge units in the colder climates of the far north and Midwest. For instance, most of the mills in southeastern US have aerated basins, while 2 out of 3 paper mills in Canada (50 out of 75 mills) have activated sludge.

Another pattern appears to be developing. Wastewater discharge limits for BOD, total suspended solids, nitrates, and phosphates are becoming more strigent for the paper industry and other industries, including animal farming. Because of its superior treatment performance, several paper mills with aerated basins releasing wastewater into sensitive waterways with strict discharge permit limits already have or are switching over to activated sludge. This is true at least in certain areas in Florida, Michigan, Minnesota, Washington, Wisconsin, Canada, as well as for Blue Ridge Paper on the Pigeon River here in NC.

3. Cost impacts of new activated sludge installations in other states.

There is evidence that the paper industry in many instances was able to bear the costs of installing new activated sludge units when necessary to meet environmental standards. State regulators typically set standards, but do not dictate how standards are met. Industry has the choice and responsibility of deciding how to meet the standards.

4. "Phasing in" new activated sludge installations.

Certain paper mills are attempting to phase-in activated sludge units to work in combination with aerated basins. So far this has not been very successful for some mills, due largely to the complexity and integrated nature of the multi-step wastewater treatment process. However, at least in Washington, three new activated sludge units have been installed only on the most concentrated wastewater streams in paper

mills, such as blow tanks, digesters, and bleach tanks. The other less concentrated streams are treated by other means. This approach significantly reduces the amount and cost of wastewater treatment and has been successfully implemented.

5. Reporting and controlling air emissions from wastewater treatment at paper mills.

Only one of the five NC paper mills reported any air emissions, including hydrogen sulfide, from wastewater treatment. However, based on discussions with other state agency staff, this appears to be the common practice in the paper industry as well as in other industries. In discussions with paper industry researchers, there is a limited database from measurements of air emissions from wastewater treatment systems. In fact, the database is so lacking that researchers recognize any generalizations of trends or relationships would be considered unreliable and indefensible. Consequently, researchers have developed a computer model to predict emissions of specific organic compounds during wastewater treatment. Given the relative absence of air emission measurements and regulatory oversight, there is no mechanism or incentive for mills to even report, yet alone control their toxic emissions. In turn, there is little experience and expertise in developing process changes to minimize emissions or in developing cost-effective emission control technologies.

These points help to explain why it may be expensive for an industry to control its wastewater treatment soon after discovery and, understandably, so reluctant to do so. It also speaks to the difficulties that an air quality committee faces in trying to reconcile the balancing act between protecting public health and protecting the state economy.

Literature References

M. Fels, J. Pinter, "Optimized Design of Wastewater Treatment Systems: Application to the Mechanical Pulp and Paper Industry: Design and Cost Relationships," Canadian J. of Chem. Engg, Vol. 75, April 1997, pp. 437-451.

U.S. EPA, "Technical Support Literature for the Voluntary Advanced Technology Incentives Program," DCN 14488, November 1997.

U.S. EPA, "National Census of Pulp, Paper, and Paperboard Manufacturing Facilities Questionnaire Database," 1990.

Telephone Communications

Derric Brown, Environmental Manager, Blue Ridge Paper, Canton, NC, phone: 286-646-2318, browndb@BlueRidgePaper.com.

Arun Someshwar, Ph.D., Principal Research Engineer, National Council for Air and Stream Improvement (NCASI; paper industry environmental research organization), phone: 352-377-4708.

Steve Stratton, Research Engineer, NCASI, phone: 541-752-8801 ext. 232.

Michael H. Foster, CET, President of Environmental Business Specialists, phone: 985-674-0660, www.ebsbiowizard.com.

Michael Paice, Biotreatment Research Specialist, Pulp and Paper research Institute of Canada, phone: 514-630-4100 ext. 2452, www.paprican.ca/pdf/07-Effluent%20Biotreatment-Exp-E.pdf.

Merlen McCall, Supervisor, Washington Dept. of Ecology, phone: 360-407-6929.

Randal Telesz, Engineer, Michigan Dept of Environmental Quality, phone: 517-373-7089, TELESZR@michigan.gov.