U.S. DEPARTMENT OF THE INTERIOR
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION

Selected Summaries of WATER RESEARCH

Research and Development

Robert A. Taft Water Research Center, Cincinnati, Ohio

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CHEMICAL MEASUREMENT (W68-38)

A discussion of selection of suitable parameters for use in water pollution control. Rather than attempt to select parameters which measure pollution per se, a preferable approach is to define a specific water use and establish the quality characteristics necessary to provide an acceptable water resource. The criteria of the National Technical Advisory Committee on Water Quality serves to identify the parameters. A table sets forth the frequency of parameter usage based on the water quality standards of 43 states and the District of Columbia. Quality requirements for public water supply, industrial, agricultural and aquatic life uses are discussed individually.

Ballinger, D. G., "A Review of Chemical Measurements in Water Pollution Control," *Water & Sewage Works*, Reference Number, R38-R42, 1968.

CONTROL OF NITROGEN AND PHOSPHORUS (W68-42)

A modular treatment process consisting of high-rate activated sludge, nitrification, and denitrification is described. Results of continuous flow studies show that conventional biological treatment combined with specific chemical additives can remove efficiently chemical oxygen demand, suspended solids, nitrogen, and phosphorus from wastewater.

This investigation was a logical combination of previously reported processes for biological denitrification and phosphorus control by chemical additives.

Management of sludge systems, pilot plant operation, analytical procedures and results, and economic considerations are discussed.

Barth, E. F., Brenner, R. C., and Lewis, R. F., "Chemical-Biological Control of Nitrogen and Phosphorus in Wastewater Effluent," *Journal Water Pollution Control Federation, 40*, No. 12, 2040-2054, 1968.

IDENTIFYING OIL AND ASPHALT POLLUTANTS (W69-5)

To determine the chemical nature of the heavy petroleum products involved in the 1967 Lake Michigan oil spill, a procedure for the characterization and identification of the oily, tarlike materials was needed. Samples from beach water were analyzed by infrared spectrophotometry. The unknown spectra could not be matched with the known spectra, since autoxidation caused changes in the unknown specimen. By comparative ratios of infrared absorbances, the identity of the critical unknown samples was established. Even though asphalt and heavy residual oil have similar infrared spectra, there is a sharp distinction. Samples from seven petroleum companies were tested, using this new method for rapid characterization.

Kawahara, F. K., "Identification and Differentiation of Heavy Residual Oil and Asphalt Pollutants in Surface Waters by Comparative Ratios of Infrared Absorbances," *Environmental Science & Technology, 3*, No. 2, 150-153, 1969.

WASTEWATER TREATMENT BY RADIATION (W69-7)

The rationale for considering radiation as a wastewater treatment technique is discussed.

This paper defines four principal applications of radiation to water pollution control:

1. Sludge beneficiation (improved sludge handling and water removal).
2. Total destruction of organics.
3. Disinfection (bacterial reduction).
4. Selective removal of refractories or specific compounds.

Ballantine, D. S., Miller, L. A., Bishop, D. F., and Rohrman, F. A., "The Practicality of Using Atomic Radiation for Wastewater Treatment," *Journal Water Pollution Control Federation, 41*, No. 3, Part 1, 445-458, 1969.

ULTIMATE DISPOSAL (W69-11)

Advanced waste treatment processes include methods for removing pollutants such as nutrients, suspended matter, dissolved organics, and salts from waste water and concentrating them in a waste stream. Devising the most economical process for the disposal of the concentrated pollutants is the responsibility of the Ultimate Disposal Research Activities of the Federal Water Pollution Control Administration in Cincinnati. Pollutants that are removed from waste waters must be treated so that they will not interfere with the intended use of the environment. The elements of polluting substances may be placed in the air, either on or under the land, and in the oceans. Preliminary conversion to innocuous or nonextractable forms is necessary. Organic substances may be oxidized to carbon dioxide, water, and nitrogen by dry incineration, wet oxidation at high temperature and pressure, or by soil organisms. Water-soluble salts must be locked up or diluted in the ocean. Other elements should be recovered for chemical values or

converted to insoluble precipitates which can be buried or sunk.

Dean, R. B., "Ultimate Disposal of Advanced Waste Treatment Residues," *TAPPI, 52,* No. 3, 457-461, 1969.

POLLUTION TOLERANCE OF ALGAE (W69-12)

From information on pollution-tolerant algae compiled from reports from 165 authors, the genera and species most often referred to as significant fall into a relatively stable series. Diatoms, pigmented flagellates, green, and blue-green algae are all well represented among the pollution-tolerant genera and species. In some genera, a single species is far more significant than all others as a pollution-tolerant form. In other genera, only a slight difference distinguishes the pollution-tolerance of two or more species. Algal genus and species pollution indices are presented for use in rating water samples with high organic pollution.

Palmer, C. M., "A Composite Rating of Algae Tolerating Organic Pollution," *Journal of Phycology, 5,* No. 1, 78-82, 1969.

ODOR IN RAW WATER (W69-13)

Odorous materials in raw water present problems in meeting requirements for quality water. These problems are now met by scanty subjective odor tests and very empirical jar treatment tests. The objective of the water supply industry must be to apply sound scientific knowledge and methodology to guide its operations the way other manufacturing industries do.

To accomplish these objectives, we need improved odor test methods, both for quality and for intensity. Even more, we need systematic analytical methodology to tell us what compounds cause the odor problem and what chemical properties provide a means for solving the problem. Identification of pollutants will, in many cases, provide the ammunition to prevent recurrence. In other cases, this identification will make it possible to select odor treatment methods more wisely and to discover bases for new treatment methods.

Rosen, A. A., "Influence of Raw Water Characteristics on Meeting Requirements for Quality Water — Odorous Materials," *Proceedings of the 11th Sanitary Engineering Conference,* University of Illinois, Urbana, Illinois, 59-69, 1969.

ZINC AND THE FATHEAD MINNOW (W69-15)

A continuous-flow bioassay was conducted for 10 months to determine the chronic effect of zinc on fathead minnows *(Pimephales promelas* Rafinesque). Fish production, as based on survival, growth, and reproduction, was investigated. Reproduction by the test fish was almost totally inhibited at zinc concentrations that had no effect on survival, growth, or maturation of these same fish. At these same concentrations there was also no effect on survival of control eggs and fry. The number of eggs produced per female in the low zinc concentration (0.18 mg/l) was only 17 percent of the eggs produced in the control (0.03 mg/l of zinc). Application factors based on these data and the 96-hour median tolerance limit (9.2 mg/l) are discussed.

Brungs, W. A., "Chronic Toxicity of Zinc to the Fathead Minnow, *Pimephales promelas* Rafinesque," *Transactions of the American Fisheries Society, 98,* No. 2, 272-279, April 1969.

WATER RESEARCH is issued by the Information Office, Ohio Basin Region, Federal Water Pollution Control Administration, Cincinnati, Ohio. Summaries are based on technical research publications by the staff of the Research and Development Program. Reprints of the complete articles may be obtained by writing Chief, Office of Information, Federal Water Pollution Control Administration, 4676 Columbia Parkway, Cincinnati, Ohio 45226.

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