

LAKE ERIE:

Phosphorus Is Culprit

Lake Erie isn't dead; it's suffering from biological overproductivity (eutrophication). But the choking effect of this overabundance of life can be deadly to man's activities in the area of Lake Erie and Lake Ontario and the international section of the St. Lawrence River, concludes the first volume of a report to the International Joint (U.S.-Canada) Commission. And the pollutants guilty of creating this mess come from sources in both the U.S. and Canada.

Phosphorus nutrients are the most important single contributor to the eutrophication process, the report notes. Since the main sources of phosphorus pollution are municipal and industrial waste effluents—detergents supply 50% or more of the waste phosphorus—then the simplest way to control phosphorus nutrients is to eliminate their use in detergents.

The recommended control program would require an immediate reduction in the phosphorus content of detergents and, by 1972, complete replacement of phosphates in detergents by environmentally harmless substitutes. Deadlines in 1972 would also be adopted to control loss of phosphorus from agricultural activities and to remove phosphorus from sewage. Control of phosphorus is the only effective remedial measure against eutrophication that can be feasibly undertaken at present, according to the report.

Other recommendations include adoption of water quality objectives,

acceleration of pollution control programs, and maintenance of adequate surveillance over all possible pollution sources.

The report was prepared by advisory boards which were appointed by IJC, and which comprise federal, state, and provincial officials from the U.S. and Canada. Second and third volumes, yet to be published, promise to reveal technical data, gathered over the 1963-67 period, which support the conclusions presented in the first volume.

Theodore E. Brenner, research director of the Soap and Detergents Association, tells C&EN that efforts to find replacements for phosphates in detergents have been accelerated throughout the industry, but no substitutes can be seen on the research horizons. "There's no conclusive evidence that phosphates control eutrophication, and the approach should be a total rather than a piecemeal attack on the waste problem, which includes human wastes and other sources of phosphorus pollution. If use of phosphates is reduced, there will be a corresponding reduction in cleaning efficiency, and a cleanliness crisis will develop if phosphates are prohibited," Mr. Brenner warns.

THERMAL ANALYSIS: Impressive Advantages

Should you ever need to check the thermal stability of a polymer or to characterize natural and synthetic rubbers, a new flame ionization thermal analysis system could be helpful. At least that's the message that came across from the talk that Arthur C. Stapp, development engineer with Carle Instruments, Inc., Fullerton, Calif., gave to the ACS Western Regional Meeting in Anaheim. Compared to conventional thermogravimetric methods, for instance, Mr. Stapp says, the new system offers some impressive advantages: Sensitivity is 10 to 100 times greater, smaller samples can be used, decomposition rates can be measured directly, and vapor pressure can be measured quantitatively over a range from 0.1 millitorr to 6 torrs.

The instrument will be available later this year. It is based on a novel method of thermal analysis conceived by Dr. Frank T. Eggertsen, E. E. Seibert, and Dr. Fred H. Stross at Shell Development Co., Emeryville, Calif. Carle Instruments is making the unit under license from Shell.

To conduct an analysis, the material—usually a few hundred micrograms are sufficient—is heated in a furnace that has been purged with pure nitrogen. As volatilization or degrada-

tion takes place, the current of nitrogen sweeps organic compounds into a flame ionization chamber as they are evolved. There, a high-temperature hydrogen flame ionizes the compounds and electrical current produced is detected by an electrometer with a sensitivity of 10^{-11} amp. per millivolt output.

The system can detect carbon evolution at a rate as low as 10^{-9} gram per minute, Mr. Stapp claims. Both detector response and furnace temperature, which is measured by a probe thermocouple, are logged on a two-pen strip-chart recorder. Furnace temperature may be programmed for a pre-selected heating rate from ambient temperature to 530° C. Alternatively,



Photo by C&EN's Dermot O'Sullivan

Carle's Arthur Stapp
100 times more sensitive

the temperature can be maintained at a desired constant value.

Describing a typical test, Mr. Stapp cites decomposition rate determinations of a synthetic rubber at 0.1%, 1.0%, and 10% per minute. When decomposition is complete, nitrogen gas flow is replaced by air and the preweighed residue heated for 10 minutes at 575° C. Difference in weight is a measure of the amount of oxidizable and nonoxidizable inorganic fillers used in the rubber.

FOAM PATENT: Goodyear Sues Two

Goodyear Tire & Rubber Co. has filed patent infringement suits against Diamond-Shamrock Corp. and Mobay Chemical Co. The separate, but simultaneous, actions charge infringement of Goodyear's flexible urethane foam process (U.S. Patent 2,827,665), which is in widespread commercial use around the world.

A Goodyear spokesman says the company has offered to license the patent to producers and is now em-

Depolluting the Great Lakes will be costly*

(Millions of U.S. dollars)

	CANADA Total to 1978	U.S. Total to 1978
Municipal		
Backlog	43	368
Upgrading and replace- ment	126	372
Phosphorus control	49	333
Industrial	31	545
SUBTOTALS	249	1618
Combined sewer separation ^b	672	5700
TOTALS	921	7318

*Provision is not made for future industrial development, sewer extensions, land acquisitions, or costs of financing.

^bResearch may lead to economically more feasible methods.

barking on a program of enforcement of its patent rights. Apparently, Diamond-Shamrock and Mobay were picked as initial targets because they are major producers of the material. If the Akron-based rubber maker wins court action, other producers may quickly fall in line.

The foam is used for a wide range of products, including cushioning material for furniture and bedding, insulation for thermal garments, gaskets, as a sound damping material, and for carpet underlay.

The importance of the suit is reflected by the growth of the urethane foam market. According to the Society of the Plastics Industry, domestic production of the flexible foam was 80 million pounds in 1960, 280 million pounds in 1965, and 420 million pounds last year. SPI estimates that U.S. production of flexible urethane foam will be more than 500 million pounds this year.

One irony of the suit is that Mobay Chemical is owned by West Germany's Farbenfabriken Bayer. Prof. Otto Bayer is considered the pioneer in the discovery, exploration, and development of polyurethanes.

Mobay's comment on the suit is "no comment." Diamond-Shamrock will say a little more. "The matter is currently being reviewed by our legal counsel. We believe that this case is without merit and we are unable at this time to comment further."

The Goodyear suits are filed in the U.S. District Court in Cleveland, Ohio, against Diamond-Shamrock and in the U.S. District Court in Los Angeles, Calif., against Mobay—its Califoam division in Compton produces the foam. The suits charge that the two companies are infringing on Goodyear's patent, which covers manufacture of urethane foam in bulk form. Goodyear is seeking an injunction against the companies, an accounting to establish the amount of damages "adequate to compensate" Goodyear, and an assessment of costs and reasonable legal fees. Goodyear says it had previously offered to license the process to both companies.

The process in question covers production of flexible urethane foam by the bulk process. In this method, the urethane condensation reaction of an isocyanate with a polyol—a hydroxyl-terminated resin—is done on an inclined plane to form a continuously produced sheet or slab of foam. The 40-inch-high slab is then sawed into pieces that can be handled easily.

Other types of urethane foams, for auto crash pads, for example, are foamed in a mold. About half of the urethane foam produced in the U.S. is made by the slab method.

DU PONT: Moving Ahead in Drugs

Du Pont is acquiring a pharmaceutical firm. Du Pont and Endo Laboratories, Inc., have reached a tentative agreement under which the Wilmington, Del., firm will acquire the Garden City, N.Y.-based ethical drug company.

Within 30 days, Du Pont president C. B. McCoy says, "We will deliver 650,000 shares of common stock—valued in excess of \$73.2 million—for Endo's drug business. And at some future time specified in the agreement, an additional number of shares, up to 75,000, may be paid at the then current market price." Du Pont declines to be specific on what is meant by "at some future time." However, the company admits that its earnings will not improve much in 1969 over last year. By the mid 1970's, though Du Pont feels that its earnings will pick up substantially.

Endo was founded in 1920. It is an ethical drug company with an excellent business and medical reputation and experience in the cardiovascular, analgesic, gastrointestinal, and respiratory fields, Mr. McCoy points out. Among its top products are anticoagulant Coumadin, analgesic Percodan, and an antispasmodic drug called Valpin. Manufacturing facilities are in Garden City, N.Y., Puerto Rico, and Mexico. Marketing operations include Latin America, Europe, and the Far East. Currently, Endo's annual sales are running about \$22 million.

Du Pont has had aspirations to establish itself in the drug industry for several years. Its first and only entry into the market place, in 1967, was Symmetrel—amantadine hydrochloride. Symmetrel is used to prevent A₂ (Hong Kong) flu virus. To date, about all that can be said about the product is that it has been only modestly successful commercially.

Perhaps after Endo is in the fold, Du Pont's drug market activities will go up significantly. As Mr. McCoy points out, "We believe chances for directing Du Pont's continuing pharmaceutical research program toward useful new products in the human health field will be improved through the particular marketing capability of Endo."

Du Pont plans to operate Endo as a wholly owned subsidiary and will continue to use the Endo name. R&D activities will continue both in Garden City and in Wilmington.

In seeking ways to overcome its lackluster earnings record of the past few years, Du Pont is looking to diversification as a possible solution.

The question is, how much weight will Endo add? Endo's annual sales of \$22 million have to be viewed as a small operation in the drug field. However, Du Pont tells C&EN that it has several new drug leads which look very attractive—and perhaps the same is true of Endo.

ECONOMIC OUTLOOK: Weaknesses Developing

The incipient slowdown in economic growth that has been detectable for some months now finally seems to be developing into a real downturn in industrial activity. And it is becoming increasingly clear that many chemical companies are being affected where it hurts the most—lower earnings.

Last week Monsanto reported a disappointing third quarter, with earnings 12% below those of the third quarter of 1968. The company expects another year-to-year decline in the fourth quarter. Du Pont also reports a 12% drop in third-quarter earnings for the full year to fall shy of 1968 earnings.

Even Allied Chemical, although it is continuing to stage a strong resurgence this year over the miseries it suffered last year, sees some weaknesses developing in the economy for 1970. However, American Cyanamid boosted its earnings 10% and its sales 7% in the third quarter over year-earlier levels.

The drop in both Monsanto's and Du Pont's fortunes has been sharp. For instance, at the half of this year Monsanto's sales were running 8% ahead of the pace of the first half of 1968. But third-quarter sales of \$462 million exceed third-quarter 1968



Monsanto's Bock
Fiber sales off 5%