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Rust Inhibitor and Water Pollution*

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RUST INHIBITOR AND WATER POLLUTION

A polyphosphate rust inhibitor has been added to the salt spread on snowy Rochester streets nearly every winter beginning in 1948-49. This year the city management questioned the advisability of using the rust inhibitor. One of the questions raised was the contribution of the rust inhibitor to the pollution of Lake Ontario. The R.C.S.I. Water Pollution Subcommittee has examined the available scientific evidence and summarizes it in this report.

(1) Does polyphosphate pollute the lake? Yes. It does so by acting as a fertilizer that increases the growth of algae. It is not a pollutant in any other way. Polyphosphate dissolves in water in the streets and passes with the water through the primary treatment of the sewage treatment plant. It then enters the lake. During treatment and later in the lake, the polyphosphate is gradually broken down to ordinary phosphate, which is a fertilizer for algae. Thus polyphosphate provides for a gradual release of fertilizer, in a way that will best promote algal growth in lake water.

(2) There is phosphate in city sewage. Does the use of rust inhibitor cause a significant increase in the amount of phosphate that Rochester releases into the lake? Yes. From the known annual volume of sewage released by the city's Durand-Eastman plant, and from the estimated phosphate content of this outflow (8 to 9 parts per million), calculate an annual discharge of approximately 1200 tons of phosphate into Lake Ontario. Rochester uses 30,000 tons of rock salt in a typical winter, calling for 300 tons of rust inhibitor (at the 100:1 ratio recommended by the manufacturer). The polyphosphate inhibitor is converted to phosphate (PO_4) with a yield close to 90% by weight, which means an added 270 tons of phosphate, and an estimated increase in pollution by 20% to 25%. Even if the estimate is too high by a factor of two, we are left with a minimum 10% annual increase in pollution, which is significant.

(3) Rust inhibitor is used in winter. Do algae grow in winter? Yes. Algal blooms, i.e. growths so dense that they resemble pea soup, are found in American lakes under ice. Winter blooms of the algae, *Annabaena*, *Oscillatoria*, and diatoms have been reported in lakes from Wisconsin to Pennsylvania.

(4) When inhibitor is discharged into the lake in winter, is it spent and gone by spring? No. Phosphate becomes a part of the ecological cycle of growth and decay in lake water. Some of it can cycle locally in the Rochester Embayment, where it will keep up the fertility of inshore waters for algae. Some will gradually drift along the shore past Webster. Eventually, some will be deposited on the bottom of the lake. The bulk of the phosphate will be discharged from Lake Ontario to the St. Lawrence River, but the outflow is slow in proportion to the volume of the lake, so the "flushing" of Lake Ontario water down the river takes several years.

(5) Are there non-polluting commercial rust inhibitors that could be used in place of polyphosphate? No. While chromates can protect from corrosion as well as polyphosphates, they are poisonous and cannot be employed on city streets. As far as we know, rust inhibitors available for city use contain polyphosphate.

(6) Is the use of polyphosphate rust inhibitor a bad practice from the standpoint of water pollution? This depends on the type of drainage basin, on the design of the sewage disposal plant and on the sewer system. We see no harm in releasing some phosphate in winter into a river that drains into the ocean. In lake drainage basins, the best practice would be not to release phosphate into the lake. This can be done by proper sewage processing. New techniques of treatment such as lime precipitation are now under development, and remove phosphate from sewage. As Rochester has combined storm and sanitary sewers, such treatment would keep most of the rust inhibitor out of the lake, even though the inhibitor was used in the streets. Under present conditions, however, the lake is overfertilized, as indicated by the wash-in of algae on beaches, and any fertilizer added to the lake makes a bad situation worse.

(7) Is the rust inhibitor effective in protecting cars from salt corrosion? The R.C.S.I. is studying this question and will release a separate bulletin on its findings.

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