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RECENT PHOSTRIP® PROCESS RESULTS IN U.S.A. AND EUROPE

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The patented PhoStrip® process provides a reliable means for meeting stringent wastewater phosphorus effluent standards at very low cost and in a manner compatible with any type of activated sludge treatment. The process is based upon the ability of wastewater microorganisms to take up phosphorus under aerobic conditions and to release it, in more concentrated form, in a small anaerobic sidestream. Approximately two-thirds of the phosphorus is removed by precipitating it from the sidestream and the remaining third is removed in the normal wasting of the sludge.

A fraction of the return sludge is detained in a "phosphate stripper tank", similar to a clarifier-thickener. The sludge becomes anaerobic and releases large quantities of phosphate. The supernatant is rich, therefore, in phosphate. The settled sludge is returned to the aeration basin where it picks up the phosphorus from the incoming sewage. Because of the high concentration (up to 100 mg/l PO_4-P) of phosphorus in the small sidestream, only a low chemical dose (generally lime) is needed compared to the chemical requirements of fullstream precipitation processes. PhoStrip can be built into existing plants or new installations. Available tankage can be adapted with appropriate mechanisms to serve as strippers. The process is about 50% cheaper than fullstream chemical treatment. No other biological process can meet PhoStrip's low effluent P level, 1.0 mg/l P or less. Other PhoStrip advantages include low chemical sludge production, improved activated sludge settling and protection of the activated sludge process against toxic shock and hydraulic overloading.

Demonstrated fullscale in 1973, PhoStrip is now installed in 15 cities in all regions of the USA. Approximtely 490,000 m^3 /d (130 mgd) are now being treated. As of 1983, when data were last compiled, effluent TP from all operating plants averaged less than 1.0 mg/l. The largest plant, Reno-Sparks, Nevada treats 113,000 m^3/d (30 mgd) with savings of $500,000 per year in capital and operating costs. The most recent plant, Rochester, Minnesota was accepted by the City on July 17, 1984 after a formal month-long performance test produced daily composited sample cumulative averages of 0.17 mg/l O-PO_4-P and 0.88 mg/l TP against a standard of 1.0 mg/l. This is a new 72,000 m^3/d (19.1 mgd) two-stage, high purity oxygen, activated sludge plant. PhoStrip is applied to the first stage where the oxidation period is only one hour, the shortest P-uptake period yet tried. PhoStrip proved to be completely compatible with the second stage nitrification process. The plant met all other effluent requirements during the test.

The US Environmental Protection Agency recently sponsored a study (report (1) in publication) of phosphorus removal processes. For typical size municipal plants and typical wastewater, PhoStrip was found to be cheaper than chemical precipitation or other biological methods. The report found no other biological method able to meet the consistently reliable 1.0 mg/l TP effluent of PhoStrip. It is the only sidestream phosphorus removal process and this is the source of its economy and P removal effectiveness.

Under license to HYCON (NL), a PhoStrip system demonstration is under preparation at the Bayerische Landesanstalt für Wasserforschung (Bavarian Institute for Water research) in Munich, W-Germany. This will mark the first demonstration of the process in Europe. Such a demonstration is deemed desirable because European wastewater and practices may differ from those in the US with respect to PhoStrip appplicability. Effluent P-standards may also be more severe, down to 0.2 mg/l TP or less. It is desired to determine whether the addition of filters following the PhoStrip process can achieve these low levels. Laboratory experiments at Munich have already shown that the sludge organisms perform the P-uptake and release functions as actively as in any of the US installations. The demonstration at Munich is in a 3 m^3/h (800 gph) pilot plant with a primary stage, an aeration basin and final clarification. A sludge collecting tank has been modified to serve as the stripper. The influent is raw wastewater from the City of Munich main interceptor flowing nearby.

Other interesting developments in PhoStrip include pilotscale demonstrations of 50 to 70% removal of total plant nitrogen through denitrification. The findings indicate that the denitrification taking place in the anaerobic stripper continues for a while after the anaerobic sludge returns to the aeration basin. Test runs at Biospherics late in 1983 showed that the use of primary effluent to help elute released phosphate from the stripper greatly increased the P-release rate. "Enhanced release" PhoStrip promises to allow the size of the stripper tank to be reduced significantly.

Over the past years, research in eutrophication has shown that phosphorus is the key. Its removal is essential to preventing the spread of this serious condition which is being increasingly recognized as a threat to waterbodies throughout the world. The PhoStrip process offers a fully demonstrated, highly economic and ecological method for cities faced with this problem.

(1) EPA Report: "Emerging Technology Assessment of Biological Phosphorus Removal". Prepared by Weston Designers Consultants.

Key Words: PhoStrip, Phosphorus Removal, Phosphate Removal, Stripper Tank, Wastewater Phosphorus, Eutrophication, Biological Phosphorus Removal, Hycon, Phosphorus removal in Europe.