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Development of strategies to evaluate methods of controlling eutrophication in water bodies

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Abstract

Population growth and productive activities cause deterioration of water quality in water bodies around the World, where lakes and reservoirs are increasingly vulnerable because of acceleration in the eutrophication processes of lakes and reservoirs. Eutrophication is mainly caused by external nutrient loads from wastewater and runoff due to productive activities such as agriculture, livestock and fish farming, stimulating the growth of phytoplankton in surface waters. As phytoplankton dies off and organic matter sinks to the bottom of lakes and reservoirs, where bacteria require oxygen for its degradation, the oxygen demand increases, causing anaerobic conditions that promote the internal loads of phosphate and ammonium from sediments to water columns. Temperature differences as well as wind-driven mixing of water in lakes and reservoirs, promote the distribution of these nutrients, stimulating phytoplankton growth, and reinforcing anaerobic conditions and further release of nutrients. It is therefore necessary to develop and apply methods for eutrophication control.

In this paper, we evaluate and compare different eutrophication control technologies: (1) application of the adsorbent Phoslock and (2) hypolimnetic oxygenation. Although these technologies have been successfully applied in several lakes and reservoirs around the World, design parameters must be obtained for each case due to the variable climatic and biogeographic characteristics. Mass-balance models were developed to describe the internal load remediation performances under different control scenarios. Design parameters were obtained, remediation scenarios were compared, and a sequential extraction method was applied for a better understanding and expectation of the performances of the different remediation technologies.

Biography

Dr. Anne M. Hansen concluded her studies at the National University of Mexico, UNAM. Since 1990. Dr. Hansen is researcher at the Mexican Institute of Water Technology, actually as principal researcher and project leader, and since 1984, she belongs to the Mexican system of researchers (SNI), currently as level 2. Her research interests include the deposition and dynamics of chemical pollutants in water, sediments and soil. She is author of 33 publications in indexed journals, 56 publications in national and international conferences, 25 book chapters and two books. He has participated in 49 projects, 10 technological developments, and has given more than 40 courses on environmental chemistry, hydrogeochemical modeling and environmental engineering. He has instructed 28 theses at the PhD, MSc, and BSc levels. Dr. Hansen has received the Gabino Barreda silver medal at the UNAM, the 2011 State of Morelos merit in recognition of her research, and she is Friend of Water-Rock Interaction by the International Association of Geochemistry. He has taught more than 36 conferences by invitation and is founding partner of the National Institute of Geochemistry (INAGEQ), participating as President from 1992 to 1994. During 2000-2012, she was member of the North American Regional Action Plan on Environmental Monitoring and Assessment and took part in the National Implementation Plan for the Stockholm Convention. She is on the editorial board of the journal Water Science and Technology and associate editor of the International Journal of Environmental Pollution; she reviews articles for other national and international journals and has participated on the boards for basic research of the Mexican Council of Science and Technology (Conacyt). She has also participated in the Organization of 14 conferences in Mexico and abroad. Under her direction, the Hydrogeochemistry Laboratory at the Mexican Institute of Water Technology was created to conduct research and provide protective and corrective measures for water protection and conservation.



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