A PROPOSED MISA APPROACH
TO SETTING LIMITS AND ASSESSING COMPLIANCE

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(Received February 1989)

Abstract. Ontario's MISA program is intended to reduce all municipal and industrial waste loadings and to virtually eliminate the release of persistent toxic contaminants to surface waters. Based on 12-months of effluent monitoring data, effluent limit guidelines will be issued for 9 industrial and municipal sectors. The effluent limits will be based on the best available technology economically achievable and will involve extensive statistical analyses of the monitoring data. Proposed statistical methods for the derivation of effluent limits and assessing compliance are presented, along with brief information on the criteria for selection of pollutants and sample size requirements for the MISA effluent monitoring program. The proposed methods are not the policies of the Ministry of the Environment and may or may not be used for the development of effluent limits.

Introduction

Ontario's Municipal/Industrial Strategy for Abatement (MISA) is a comprehensive pollution control program to reduce all municipal and industrial waste loadings and to virtually eliminate the release of persistent toxic contaminants from liquid effluent discharged to surface waters (MISA, 1986). Under the Ontario Environmental Protection Act, Section 136, the Ministry of the Environment will issue regulations requiring effluent monitoring of all industrial and municipal discharges for a period of 12 months at pre-specified sampling frequencies under acceptable quality assurance and quality control (QA/QC). This will provide a comprehensive database from which the effluent limits for selected pollutants will be derived. The effluent limits will be based on the statistical variability of the pollutants and on the best available pollution control technology economically achievable (BATEA). The BATEA limits will be promulgated under Effluent Limits Regulations for each sector. All dischargers will be required to comply with these limits by updating, if necessary, their pollution control technology.

The objective of this paper is to provide proposed statistical methodologies for setting BATEA effluent limits, detecting and assessing compliance. Information on other aspects of the MISA program, relevant to limits development, is briefly presented for the sake of completeness.

In addition to the monitoring of chemical concentrations and flows, Effluent Monitoring Regulations (MISA, 1988a) also require two acute lethality toxicity tests for each discharger: a 96-hr Rainbow Trout and a 48-hr Daphnia magna toxicity tests. The toxicity data on the actual numerical median lethal concentration (LC50) will be used to assess the potential impact of complex, whole effluents on the aquatic environment.
environment and may be used to derive whole effluent toxicity limits. It should be noted that methods for deriving whole effluent toxicity limits are not presented in this paper.

The MISA monitoring and limits regulations will first apply, on a sector-by-sector basis, to nine industrial sectors and the municipal sector. The industrial sectors are: Petroleum Refining, Organic Chemical Manufacturing, Pulp & Paper, Industrial Minerals, Mining, Iron & Steel, Electric Power Generation, Inorganic Chemical Manufacturing, and Metal Casting. The Municipal sector will consist of all sewage treatment plants in Ontario. Effluent monitoring regulations for the petroleum refining sector have already been promulgated (MISA, 1988a) and will come into force on December 1, 1988, followed by the organic chemical manufacturing sector, pulp & paper and so on. Effluent Monitoring Regulations for all the nine sectors are expected to be promulgated by the end of 1989, while Effluent Limits Regulations are expected to be promulgated in 1991.

Selection of Pollutants

The selection of pollutants for monitoring purposes was an early task that the Ministry faced. It was done through a screening process to identify potentially hazardous chemicals in Ontario's municipal and industrial effluents. The criteria used for this assessment were based upon a chemical’s: environmental persistence; potential to bioaccumulate; acute and sub-lethal toxicity to biological organisms; carcinogenicity, and potential to exist in effluents discharged to surface waters. From a list of 1500 chemicals, 179 were identified to be of concern and candidates for monitoring, and constitute Ontario's Effluent Monitoring Priority Pollutant List (EMPPL). However, only 133 of these have proven and acceptable analytical procedures at present while developmental work is in progress for the remainder (MISA, 1987).

This basic list of pollutants, EMPPL, is applicable to all the sectors. Each sector, however, may eliminate monitoring requirements on pollutants that will not occur in their effluents. Therefore, monitoring of pollutants will be done on a sector specific subset of EMPPL which may not be changed during the duration of the Effluent Monitoring Regulation phase. The analytical information obtained during the monitoring phase will be utilized to update the EMPPL for the forthcoming Effluent Limits Regulations so that infrequently detected pollutants could be deleted or monitored at a reduced frequency, and newly detected compounds, not previously identified in the effluents, may be incorporated into the EMPPL. The main criteria for this listing and delisting will be based on the toxicology of the compound and frequency of detection, with the condition that a highly toxic yet infrequently detected compound may not be delisted. This may be done by testing the proportion of concentration values above the method detection limit to be significantly different from a small value, such as <5%, by using a binomial test under the assumption of random sampling and uncorrelated observations. If the frequency of detection