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EVALUATION OF TREATMENT SCHEMES APPROPRIATE FOR WASTEWATER REUSE IN GREECE

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EXTENDED ABSTRACT

The sustainable management of water resources often requires the identification of wastewater as a valued source of water. Although the benefits of wastewater reuse and reclamation have increased significantly in Europe because of the advances in effectiveness of wastewater treatment and disinfection technologies there is currently no legislation nor guidelines regarding reuse. The scope of this paper is the proposal of wastewater reuse quality criteria and treatment specifications, appropriate to Greek conditions. The parameters that affect wastewater reuse criteria were taken into consideration, concerning among others reuse priorities, available treatment plants and effluent characteristics. In order to accurately reflect the effectiveness of the treatment and disinfection technologies currently available in Greece the proposed wastewater reclamation criteria were verified by a series of experiments conducted at the Sanitary Engineering Laboratory of NTUA. The experiments were designed to study the feasibility and effectiveness of the following treatment schemes to produce treated wastewater suitable for reuse: a) disinfection of secondary effluent with UV radiation and chlorination and b) tertiary treatment and disinfection of wastewater with UV radiation and chlorination.

The efficiency of each method to disinfect secondary and tertiary effluent was evaluated by determining the percent reduction of both total and fecal coliforms. The experimental data were analyzed using a stochastic statistical model that employs Monte Carlo simulation. The main scope of the stochastic approach was the regeneration of a greater set of data, based on the defined by the experimental information mathematical distribution of each parameter involved and the determination of relative probability distributions. The stochastic approach applied fulfils the statistical aspect of most guidelines that have been developed for wastewater reuse, enabling the estimation of the removal efficiency of each treatment scheme at a certain level of certainty.

The paper presents the results of the evaluation of the alternative wastewater treatment schemes and it summarizes the revised proposal on wastewater reused guidelines and treatment specifications. Following this approach the standards proposed are realistic and feasible and in the case of restricted reuse can be readily achieved by the existing wastewater treatment plants in Greece. Even in the case of unrestricted reuse the additional treatment required can be achieved at a moderate cost, through upgrading of the existing plants with tertiary treatment.

Key words: Wastewater reuse, criteria, treatment specifications, wastewater treatment, ultraviolet disinfection, chlorination, Monte Carlo simulation