



“Gheorghe Asachi” Technical University of Iasi, Romania



RESEARCH ON AQUATIC POLLUTION LEVEL OF MALEIA RIVER BY SIMULATION IN COMPUTATIONAL FLUID DYNAMICS

Lorand Toth*, Angelica Călămar, Alin Irimia, Sorin Simion, Alexandru Simion

*National Institute for Research and Development in Mine Safety and Protection to Explosion – INSEMEX Petroșani,
32-34 G-ral Vasile Milea Street, 332047 Petroșani, Romania*

Abstract

Watercourses that transit rural / urban areas are susceptible to the phenomenon of aquatic pollution due to various types of polluting species. The important issues of river pollution and of polluting species dispersion, require an approach with predictive tools (models for transport of polluting species) which can evaluate the performance of depollution measures/actions to reduce pollution and to take optimal management decisions. Thus, from January 2017 to May 2017, a monitoring investigation was carried out on the Maleia watercourse, polluting species concentrations measured by different physical-chemical methods being considered as input data for the Surface Water Modelling Systems (SMS) software in order to establish the dispersion of pollutants in the aquatic environment. The hydrodynamics of the river sector has been simulated through a module of the Surface Water Modelling Systems using the Reynolds form of Navier-Stokes equation system, along with the continuity equation for incompressible fluids in turbulent motion with free surface. The numerical simulation of advection-diffusion processes at an average depth of the studied river sector, was used for analyzing the space-time evolution of aquatic pollutants.

The originality of this paper starts from the desideratum that rivers crossing inhabited areas are subjected to discharge of pollutants which implies the analysis of the quality of the studied water course (Maleia), as well as the illustration of the dispersion of certain pollutant species by estimating the dilution times as well as the determination of the iso-concentration field.

Numerical models have been obtained for a sector of the Maleia River, providing the possibility of simulating both common and accidental pollution (related to space-time evolution of transport and dispersion of pollutants). The models obtained allowed the estimation of water quality in each finite element of the studied sector, and not just in one sampling point, as it is usually measured.

Key words: aquatic pollution, water body, dispersion, mathematical model

Received: September, 2018; Revised final: January, 2019; Accepted: April, 2019; Published in final edited form: April, 2019

* Author to whom all correspondence should be addressed: e-mail: lorand.toth@insemex.ro; Phone: + 40 254541621; Fax: +40 254546277