

UVODNIK

Tokratna številka Acta hydrotechnica prinaša razširjeni povzetek magistrskega dela mag. Irene Cvitanič, mlade raziskovalke na Inštitutu za zdravstveno hidrotehniko, Fakultete za gradbeništvo in geodezijo Univerze v Ljubljani, zaposlene na Hidrometeorološkem zavodu Republike Slovenije.

Mag. Irena Cvitanič je končala srednjo tehniško šolo na kemijski smeri v Celju. Študij je nadaljevala na Univerzi v Ljubljani, Fakulteti za naravoslovje in tehnologijo, na Oddelku za kemijo in kemijsko tehnologijo, kjer je leta 1992 diplomirala na kemijski tehnologiji, ožja usmeritev polimeri. Po opravljeni diplomi se je zaposlila na Hidrometeorološkem zavodu Republike Slovenije v Ljubljani, kjer je opravljala pripravništvo v sektorju za varstvo okolja, na oddelku za onesnaženost voda in v kemijskem laboratoriju. Leta 1994 se je na Univerzi v Ljubljani vpisala na podiplomski študij gradbeništva – hidrotehnična smer. Decembra 1998 je zagovorjala magistrsko nalogo s področja zdravstvene hidrotehnike. Pri podiplomskem študiju se je ukvarjala s preučevanjem sodobnih metod ekološke inženirike na področju zaščite in rabe voda, predvsem s prognostičnim modeliranjem kakovosti voda, ki spada med aktualna vprašanja ekološke - zdravstvene hidrotehnike. V okviru programa Tempus je bila leta 1995 na krajšem usposabljanju pri prof. Günthertu na Univerzi nemške vojske v Münchnu.

Magistrsko delo mag. Irene Cvitanič je usmerjeno v spoznavanje biokemijskih procesov v naravnih vodnih ekosistemih, ne samo v problematiko napovedovanja kakovostnih sprememb, temveč v določeni meri tudi k vsebinskemu oblikovanju kakovostnega monitoringa voda na način, da se zagotovi kar največja uporabnost zbranih kakovostnih in hidroloških podatkov. Namen naloge je bil, da se spremembe v zajezeni reki Savi kvantitativno opredelijo s pomočjo matematičnega modela v povprečnih in v ekstremnih hidroloških pogojih. Na tej podlagi naj se poda ocena kakovostnih sprememb v zajezeni Savi in njihov pomen za njeno kakovost v ožjem biološkem in v širšem vodnogospodarskem pogledu. V okviru naloge je najprej podana razlaga samega pojma, kakor tudi mehanizma eutrofikacije vodnih teles. Podani so temelji biokemičnih in fizikalnih procesov v rekah in jezerih. Opisane so posledice zaježitve rek, podana je primerjava lastnosti rečnih akumulacijskih jezer z naravnimi jezeri. V nadaljevanju so podani program gradnje hidroelektrarn na Savi, hidrološke lastnosti akumulacijskega jezera HE Vrhovo in kratek pregled kakovosti vode reke Save na obravnavanem območju pred in po zaježitvi reke Save.

Za izvedbo naloge je bil izbran večparametrski matematični model QUAL2E. Za uporabo modela so bile izvedene terenske meritve na vtoku in iztoku iz akumulacijskega jezera HE Vrhovo. Nato so bile izvedene vse faze modeliranja, od analize občutljivosti, umerjanja in preverjanja modela, do njegove potrditve. Tako je bil model uporabljen za napovedi kakovostnih sprememb Save v akumulaciji HE Vrhovo za raztopljeni kisik in BPK₅. V teoretičnem pogledu so izvedene meritve in rezultati modela opozorili na problematiko modeliranja klorofila, fosforja in amonija, to je na procese, pri katerih rezultati modela ne sledijo merskim rezultatom z enako natančnostjo, kot pri kisiku in BPK₅. Zato bo treba pri napovedih eutrofnosti v naslednjih predvidenih energetskih zaježitvah temu vprašanju posvetiti ustrezno pozornost, tako glede na formulacijo v modelu, kot glede na dopolnitve ali spremembe kemijske analitske tehnike. V praktičnem pogledu pa rezultati naloge z veliko stopnjo verjetnosti dokazujejo, da tudi v najbolj kritičnih sušnih obdobjih in pri najvišjih naravnih temperaturah vode ni pričakovati prekomernega padca koncentracije kisika v obravnavani zaježitvi HE Vrhovo, ki bi ogrozila obstoječo biocenozo v zaježitvi.

EDITORIAL

This issue of *Acta hydrotechnica* is publishing an extended summary of a Master's Thesis by Irena Cvitanič, a junior researcher at the Institute of Sanitary Engineering, Faculty of Civil and Geodetic Engineering, University of Ljubljana, currently employed at the Hydrometeorological Institute of Slovenia.

Irena Cvitanič completed the Secondary Technical School in Celje in the field of Chemical Science. She continued her studies at the Faculty of Natural Science and Technology, Department of Chemistry and Chemical Technology where she graduated in 1992 from Chemical Technology in the field of polymers. After her graduation she obtained employment with the Hydrometeorological Institute of Slovenia where she has gained practical experience in the field of the determination of the physical, chemical and biological parameters of water quality and in the field of regulations for estimating the quality of surface waters. In 1994, she matriculated in the Master's Program of Civil Engineering. In December, 1998 she completed her study with a Master's Thesis in the field of Sanitary Engineering. During her postgraduate study, she dedicated her work to the research of contemporary methods of ecological engineering in the field of water resources protection and use. She concentrated her work in particular to the prognostic modelling of water quality, which is one of the topical questions of sanitary engineering. Within the framework of the Tempus Program, she took a short postgraduate course at the University of Federal Arms in Munich in 1995.

Irena Cvitanič focuses her Master's Thesis on the understanding of the biochemical processes in natural water ecosystems. River impoundments change the natural water circulation in the stream regarding discharges and water quality. The goal of the Thesis was to develop a quantitative determination of these changes in the existing Vrhovo impoundment for average and extreme hydrological conditions using a mathematical model. Based on this, the Thesis was set to estimate the water quality changes in the impounded Sava River, as well as their influence on the water quality in the narrow biological sense and in the more extensive water management sense. The Thesis starts with the explanation of the concept and mechanisms of the eutrophication processes in bodies of water. It continues with the basis of the biochemical and physical processes in rivers and lakes and the consequences of river impoundments. Further on, the properties of river impoundments and natural lakes are compared. The Thesis also presents the program of constructing a chain of HEPP's on the Sava River, the hydrological properties of the Vrhovo impoundment and a short review of water quality in the Sava River both before and after the construction of the impoundment. The US EPA QUAL2E Water Quality model, which is a typical multiparametric mathematical model for river ecosystems, was chosen. For its application, field measurements at the inflow into and the outflow from the Vrhovo impoundment were performed, as well as a sensitivity analysis, calibration, verification and validation of the model. The model was used for quantitative water quality predictions of the Sava River in the Vrhovo impoundment for dissolved oxygen and biochemical oxygen demand. In a theoretical respect, the performed measurements and the modelled results warned of the problems of modelling chlorophyll, phosphorus and ammonium, i.e.: of the processes where the modelled results did not coincide with the measured results with the same precision as for O₂ and BOD₅. For the prediction of eutrophication for the future planned impoundments, adequate attention will have to be paid to this question, regarding the formulations in the model, as well as regarding the completion of the chemical analytical technique. In a practical respect, the results also prove with a strong likelihood that in the most critical dry period and when water temperatures are the highest, an excessive decrease in the concentrations of dissolved oxygen, which could have a negative influence on biocenosis in the impoundment, is not to be expected.