

ZORANA NAUNOVIĆ

University of Belgrade - Faculty of Civil Engineering
Department of Hydraulic and Environmental Engineering
Bulevar kralja Aleksandra 73, 11000 Belgrade, Serbia
znaunovic@grf.bg.ac.rs

EDUCATION

Doctorate of Philosophy in Engineering, 2006.

Purdue University, School of Civil Engineering, Department of Environmental Engineering, West Lafayette, Indiana, USA.

Dissertation: Modeling and Design of an Ultraviolet Water Disinfection System for Long-term Space Missions
Employing Computational Fluid Dynamics

Funded by: National Aeronautics and Space Administration (NASA)

Master of Science in Engineering, 2002.

Purdue University, School of Civil Engineering, Department of Environmental Engineering, West Lafayette, Indiana, USA.

Bachelor of Science in Environmental Engineering, 2000.

University of Belgrade, Faculty of Technology and Metallurgy, Department of Environmental Engineering, Belgrade, Serbia.

PROFESSIONAL AND ACADEMIC EXPERIENCE

University of Belgrade, Faculty of Civil Engineering, Department of Hydraulic and Environmental Engineering, Belgrade, Serbia, 2009 – current, Associate Professor.

Professor for the following courses:

- *Introduction to Environmental Engineering*, undergraduate course
- *Solid Waste Management*, undergraduate course
- *Ecology, Chemistry and Microbiology*, EDUCATE international postgraduate program in Water Resources and Environmental Management (until 2015)

Author of the textbook “Osnove ekološkog inženjerstva (Introduction to Environmental Engineering)”, first of its kind in Serbian, 2014.

Head of the international postgraduate program in Water Resources and Environmental Management (EDUCATE), 2009–2015.

Project manager, *Monitoring and Modeling of Rivers and Reservoirs (MORE) - Physical, Chemical, Biological and Morphodynamic Parameters*; the project is financed by the Ministry of Education, Science and Technological Development of the Republic of Serbia and involves 6 academic and research institutions and 49 researchers, 2011–2018.

Consulting/Project Work:

Analysis of Heavy Metal Site Contamination using X-ray fluorescence (XRF) spectrometry and specification of possible remediation methods, 2017.

Environmental Impact Assessment for the Construction of 10 Hydroelectric Power Plants on the River Ibar, 2013 (according to national legislation and international standards).

Preliminary Environmental Impact Assessment for the Preparatory Survey on the Sewerage System Improvement for the City of Belgrade, 2013 (according to the guidelines of the Japan International Cooperation Agency who funded the project).

Environmental Impact Assessment for the Pancevo Oil Refinery Modernization Project and the Integration of New Plants and Installations, 2012.

Technical Specialist for Wastewater Treatment - IPA funded Cross-border Cooperation Programme Romania- Serbia: “Protection Measures for the Tamis river”, 2011.

Environmental Impact Assessment for the Construction of the Buk Bijela and Foca Hydroelectric Power Dams on the River Drina, 2011.

Environmental Impact Assessment for the River Pestan Regulation and Floodwater Control, 2011.

CDM Smith, Cambridge, Massachusetts, USA, July 2006 – June 2008, Environmental Engineer:

- Analysis and evaluation of existing wastewater treatment processes for future improvements and planning
- Improvements and upgrades of existing and design of new wastewater treatment plants processes to meet nutrient effluent discharge limits
- Comprehensive wastewater management planning

Project Management and Execution:

- ***Design of an Ultraviolet (UV) Disinfection System for the Marlborough Westerly, Massachusetts, Wastewater Treatment Facility (WWTF)***. A design incorporating the most suitable UV disinfection technology into the existing WWTF was developed in accordance with the new wastewater effluent discharge permit.
- ***Evaluation of Discharge of Landfill Leachate to the Rochester, New Hampshire, Wastewater Treatment Facility (WWTF)***. The evaluation included the analysis of existing operating conditions at the WWTF, the quality and toxicity of the leachate, and the potential combined WWTF influent loads. The goal of the analysis was to assess whether the WWTP has sufficient capacity to accept the leachate loads and if any leachate toxicity might cause inhibition of biological processes at the WWTF.
- ***Evaluation of Causes of Permit Violations and Implementation of Corrective Measures at the Northbridge, Massachusetts, Wastewater Treatment Facility (WWTF)***. A review of facility operations and data was conducted to identify potential causes of wastewater discharge permit violations at the WWTF. The study involved the sampling of various sand filtration beds at different depths and the analysis of the samples for bulk sediment chemistry to determine if they could be a source of effluent contamination, namely metals and phosphorus. Full-scale dual-point chemical precipitation tests were conducted to evaluate the effectiveness of different chemicals for the removal of phosphorus to meet the new permit limit of 0.2 mg/L.
- ***Flows and Loads Assessment for the Town of Webster, Massachusetts***. An evaluation report was prepared and the most suitable treatment technology for achieving a total phosphorus limit of 0.2 mg/L was identified. Design alternatives for different technologies were prepared.
- ***Wastewater Treatment Facility Expansion and Upgrade the H.L. Mooney Water Reclamation Facility in Woodbridge, Virginia***. A Flow Equalization (EQ) Evaluation and a Primary Clarifier (PC) Stress Test Protocol were developed. The EQ analysis investigated the current capacity and future need for flow equalization, as well as anticipated equalization effluent rates for future flows. The PC Stress test was designed to verify if the existing capacity is sufficient for future conditions and to determine removal efficiencies expected under design year conditions.
- ***Comprehensive Wastewater Management Plan for the Town of Attleboro, Massachusetts***. Flows and loads calculations, water balances and interbasin transfer analyses were performed. Sewering layout options were presented.

Purdue University, School of Civil Engineering, Department of Environmental Engineering, West Lafayette, Indiana, USA, January 2003 – June 2006, Research Assistant:

- Developed a numerical method for predicting process performance of various ultraviolet (UV) disinfection reactor designs
- Completed biosimetry experiments on existing UV reactor to verify numerical model results
- Performed dose-response experiments with *Bacillus subtilis* spores and various wavelengths of radiation
- Worked with an excimer lamp manufacturer to obtain an efficient disinfection radiation source
- Designed a UV disinfection reactor for a closed-loop water recycling system for long-term space missions

Indiana Clean Manufacturing Technologies and Safe Materials Institute (CMTI), Purdue University, West Lafayette, Indiana, USA, January 2002 – December 2002, Research Assistant:

- Conducted styrene emission testing according to EPA test methodology procedures for open-mold spray applications of styrene-based gel coats and resin systems
- Devised an infra-red drying technique which improved the performance of a novel wood surface top-coat formulated to reduce process emissions
- Researched new generation foundry core binders which reduce air emissions of polycyclic organic material
- Organized a workshop seminar for engineers and consultants working in the foundry industry to present new sand core binder technologies
- Performed ISO 14001 pre-registration audits for industry clients

SELECTED PUBLICATIONS and PATENTS

Nikolic, A., Mikic, M., & Naunovic, Z. (2017). Broadening the urban sustainable energy diapason through energy recovery from waste: A feasibility study for the capital of Serbia. *Renewable and Sustainable Energy Reviews*, 69, 1-8.

Masod Abdulqader, S., Vakanjac, B., Kovačević, J., Naunovic, Z., & Zdjelarević, N. (2017). Natural Radioactivity of Intrusive-Metamorphic and Sedimentary Rocks of the Balkan Mountain Range (Serbia, Stara Planina). *Minerals*, 8(1), 6.

Djukić, A., Lekić, B., Rajaković-Ognjanović, V., Veljović, D., Vulić, T., Djolić, M., Naunovic, Z., Despotović, J. & Prodanović, D. (2016). Further insight into the mechanism of heavy metals partitioning in stormwater runoff. *Journal of Environmental Management*, 168, 104-110.

Mikic, M., & Naunovic, Z. (2013). A sustainability analysis of an incineration project in Serbia. *Waste Management & Research*, 31(11), 1102-1109.

Milosevic, I., & Naunovic, Z. (2013). The application of a multi-parameter analysis in choosing the location of a new solid waste landfill in Serbia. *Waste Management & Research*, 31(10), 1019-1027.

Blatchley III, E.R., Shen, C., Naunovic, Z., Lin, L.S., Lyn, D.A., Bergstrom, D.E., Fang, S., Guan, Y., Robinson, J.P., Ragheb, K.E. & Gregori, G.J. (2010). Dyed microspheres for characterization of photochemical reactor behavior. *U.S. Patent No. 7,842,512*. Washington, DC: U.S. Patent and Trademark Office.

Naunovic, Z., Lim, S., & Blatchley, E. R. (2008). Investigation of microbial inactivation efficiency of a UV disinfection system employing an excimer lamp. *Water Research*, 42(19), 4838-4846.

Naunovic, Z., Pennell, K. G., & Blatchley III, E. R. (2008). Development and performance of a fluence rate distribution model for a cylindrical excimer lamp. *Environmental Science & Technology*, 42(5), 1605-1614.

Pennell, K. G., Naunovic, Z., & Blatchley III, E. R. (2008). Sequential inactivation of *Bacillus subtilis* spores with ultraviolet radiation and iodine. *Journal of Environmental Engineering*, 134(7), 513-520.

Blatchley III, E.R., Shen, C., Naunovic, Z., Lin, L.S., Lyn, D.A., Robinson, J.P., Ragheb, K., Grégori, G., Bergstrom, D.E., Fang, S. & Guan, Y. (2006). Dyed microspheres for quantification of UV dose distributions: Photochemical reactor characterization by Lagrangian actinometry. *Journal of Environmental Engineering*, 132(11), 1390-1403.

CERTIFICATION

Professional Engineering License No. 371I96610, Serbia, June 2010.

ISO 14001 Environment Management Systems Lead Auditor Training, June 2002.

OSHA 40-hour HAZWOPER certification, 29 CFR 1910.120, March 2004.

OSHA 8-hour HAZWASTE SUPERVISOR, January 2007.

Applied Management Principles Program (Human resource management, Accounting and financial management, Marketing management, Strategic management and Entrepreneurship), Krannert Graduate School of Management, Purdue University, May 2005.

PROFESSIONAL AFFILIATIONS

Editor of *Water Science and Technology* (IWA Publishing)

Editor of *Water Science and Technology: Water Supply* (IWA Publishing)

Water Research and Management Editorial Board (Journal of the Serbian Water Pollution Control Society)

International Waste Working Group (IWWG)

International Solid Waste Association (ISWA)

Serbian Water Pollution Control Society - Steering Committee

Chi Epsilon Civil Engineering Honor Society