RELEVANCE OF PROBABILITY DISTRIBUTION OF EFFLUENT QUALITY PARAMETERS FOR THE TREATMENT PLANTS DESIGN

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Abstract:

The basic legislative requirements for the wastewater treatment plants (WWTPs) are that the quality of selected parameters in effluent should be below the stipulated values, and that this is considered to be fulfilled if no more than certain percent of samples during one year do not conform to limits. In the Serbian legislation, for WWTPs with capacity larger than 50,000 PE minimal number of samples (24h composite) per year is 24, of which 3 can be non-conforming (12.5%), providing that the BOD_5 and TSS value are not more than 100% and 150% above the limit, respectively. The starting point for setting the inlet quality used in the design is the probability distribution of legislatively relevant wastewater quality parameters. For sewage outlet "Sajam", largest in Belgrade, Gumbel distribution of BOD_5 concentrations provided the best match with the laboratory determined values, with mode (most frequent value) 250 mgO_2/l and scale parameter 60 mgO_2/l. In order not to overstep the limit value in more than 12.5% of samples, wastewater with the BOD_5 concentration of 390 mgO_2/l, which is 90th percentile, should be used in the design. The designed WWTP based on this value should be tested (using software modeling tool or calculation spreadsheet used for developing the design) on 99.9th percentile of BOD_5 concentration i.e. 640 mgO_2/l, present in the influent approximately ones in 1000 sampling, or once in 40 years (which is more than the normal lifespan of the plants) for 24 samples a year. If the calculated effluent BOD_5 concentration is less or equal to 200% of 25 mgO_2/l limit value (50 mgO_2/l) for this BOD_5 concentration then all the conditions stipulated in the legislations will be met. The same methodology should be used for COD and TSS.

Keywords: *WWTP; Legislation; Probability distribution.*

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PREFACE

Welcome to the Abstract Book for DISC2024 – a forward-thinking collection that captures the synergy of robust academic research and innovative project work. Over the course of this transformative conference, we have witnessed 112 scholarly research contributions alongside 19 inspiring project presentations, each delving into topics critical to shaping our sustainable future. This year's themes include:

- **Environmental Protection and Sustainable Development**
- **Occupational Safety and Health**
- **Strategic Human Resource and Business Management**
- **Sustainable Project Management**
- **Civil Engineering**
- **Education 3.0**

In addition to the main sessions, we were honored to host a special session featuring our distinguished guest, Arijana Filipić from National Institute of Biology, Slovenia. Her captivating presentation, "Mission Possible: Successful Scientific Presentation," provided invaluable insights into delivering impactful and persuasive scientific discourse, setting a high benchmark for academic excellence.

Hosted in the vibrant city of Novi Sad this December, DISC2024 has provided a dynamic forum where experts, practitioners, and emerging scholars converged to exchange ideas, challenge conventional boundaries, and chart new paths in research and practice.

We extend our sincere gratitude to every author, presenter, and mentor whose contributions have enriched this publication. I also wish to recognize our entire organizing team for their remarkable efforts in bringing this event to life. In particular, my heartfelt thanks go to Dr. Nevena Živančev, Dr. Jovana Topalić, MSc. Dunja Istrat and MSc. Tijana Adamov for their visionary leadership and steadfast commitment. Your invaluable contributions have been the cornerstone of this event's success.

As you explore the abstracts and project summaries contained within these pages, we hope you find the insights and innovations presented here as inspiring as they are thought-provoking – fueling future collaborations and breakthroughs in your respective fields.

Looking ahead, we eagerly anticipate welcoming you once again in December 2025 as we continue to build on the success and collaborative spirit of DISC. May your journey of discovery and innovation continue unabated in the coming years.

With warm regards,

Dr. Maja Petrović

Associate Professor and Editor

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