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Giorgio Mannina  
Editor

# Frontiers in Wastewater Treatment and Modelling

FICWTM 2017

 Springer

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To Sergio, Eleonora, Marcella and Carlo.  
Thank you God for this achievement bless  
all of us.

# Preface

Today, multidisciplinary is a key to solving issues in the water field. The works in several International Water Association (IWA) Specialist Groups have demonstrated the importance of both innovative technologies and mathematical modelling, and that the exchange of scientific and technical information among researchers and practitioners involved in these fields is crucial for effectively advancing knowledge.

Mathematical modelling has the advantage of allowing scenario analysis before designing the real plant in order to ensure an optimized system.

To foster the multidisciplinary collaboration among different water specialists, the dialogue is a must in order to better share specific knowledge.

With this final aim with the support of the International Water Association (IWA) and the University of Palermo, Italy it was organized the FICWTM 2017, Frontiers International Conference on Wastewater Treatment from 21 to 24 of May 2017.

The FICWTM final aim was to create a forum for promoting the discussion among scientists, professionals, and academia in different areas of the broader theme of environmental engineering and sciences. To facilitate discussion, no parallel sessions were organized and the number of participants was limited to highly motivated professionals.

The conference was organized in nine sessions, and for each of them, a keynote by a referral researcher was presented. Specifically, the keynotes were held by the following professors, whose contributions were highly inspiring: Damien Batstone, George A. Ekama, B. Jefferson, Ulf Jeppsson, Piet Lens, Ingmar Nopens, Hallvard Ødegaard, Gustaf Olsson, and Mark C.M van Loosdrecht.

The wealth of information exchanged during FICWTM was of great benefit to all involved in challenging environmental issues caused by the increase of pollutants loads discharged into natural environment ecosystems. Those challenges require the building of a regulatory framework as well as control strategies. This framework needs to be based on scientific evidence associated with exposure and health risk for pollution prevention and remediation strategies. The application of innovative remedial techniques and new scientific methods is a key in order to reach sustainable development. It is therefore crucial to address the existing pollution

problems, and protect public health as well as preserve the welfare of the environment.

The application of cost-effective technologies for waste treatment and controls is much needed in order to make possible the implementation of appropriate regulatory measures that insure success of broader policy in pollution prevention.

Engineers and scientists working in water sector area need to be familiar with a wide range of issues including the physical processes of mixing and dispersion, biological developments, and mathematical modelling. Hence, a continuous exchange of information between water professionals in different parts of the world is essential.

Protection of the environment, one of the pillars of sustainable development, is an absolute priority for the international community. In this context, the FICWTM conference aimed to focus on relevant experiences, up-to-date scientific research, and findings carried out all over the world to protect and preserve the environment.

FICWTM 2017 is also a part of the three-year research project PRIN-GHG which was about the reduction of greenhouse gas from wastewater treatment plants. The financial support by the Italian Ministry of Education, University and Research is acknowledged. The research project had also an educational goal which aim was to train through seminars and advanced course young researchers involved in the project. In particular, three editions of the advanced course on wastewater treatment and mathematical modelling were organized at Palermo University, Italy, and four international seminars on the binomial between water and energy.

During the project, both experimental and mathematical activities were carried out on pilot plant and real wastewater treatment plants with the final aim to wide and strengthen the knowledge on energy optimization and emission reduction from wastewater treatment plants. This book contains also several contributions of the project researches.

This book contains contributions presented at Frontiers International Conference on Wastewater Treatment which was held at the University of Palermo, Italy, from 21 to 24 of May.

Overall, this book is organized into nine parts. Each part deals with a specific topic of the frontier in wastewater treatment and modelling. Specifically, the following parts are present: Part A—Carbon nutrient removal and recovery, Part B—Instrumentation and control and automation (ICA) & benchmarking, Part C—Membrane bioreactors, Part D—Anaerobic digestion, Part E—New frontiers in wastewater treatment, Part F—Greenhouse gases from wastewater treatment plants, Part G—Moving bed biofilm reactors and hybrid systems, Part H—Anaerobic digestion and modelling, and Part I—Computational fluid dynamic (CFD) in wastewater treatment.

Each contribution of the conference has been peer-reviewed by at least three members of the scientific committee\*. Their efforts have contributed to the high quality of the final book contributions, and therefore, their reviewing activity is acknowledged and appreciated.

This book and the conference would have never been organized without the support and great input of professors and friends: George A Ekama (University of Cape Town, South Africa), Hallvard Ødegaard (Norwegian Institute of Technology, Norway), Gustaf Olsson (Lund University, Sweden), Peter Vanrolleghem (Laval University, Canada) and Gaspare Viviani (Palermo University, Italy).

Finally, I express my thanks to Mr. Pierpaolo Riva, publishing editor at Springer, for his support during the preparation of the final book.

I do hope that the reader will find the book a source of inspiration for both research and professional life.

Giorgio Mannina

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