EWA Symposium on Sustainable Water Management

New Strategies, Technologies and Innovative Solutions

14-15 September 2010
Munich, Germany

www.EWA-online.eu
Foreword

It is a pleasure for me to welcome you to the International Symposium organised by EWA, supported by the DWA, which will be held over two days during the IFAT ENTSORGA.

In the EWA Symposium we want to highlight the ever-increasing need for technological development in the Wastewater sector in Europe, promoting the sustainable valorisation of water quality management in practice. This symposium will exchange the latest findings and share experiences of engineers and scientists regarding new strategies, techniques and innovative solutions and allow the participants to hold discussions on the applications and practical implementation.

14 presentations covering four actual topics will inform us about the latest in the field of Sustainable Water Management from our partners around Europe.

On the first day of the EWA Symposium, our speakers address “Emerging Issues in Wastewater Technologies”, “Management of Biosolids” and last but not least, “Sewer Rehabilitation and Industrial Wastewater Treatment”. On the second day, selected experts will deal with “Wet Weather Problems and Solutions”.

In the proceedings you will be able to read about the speakers, abstracts of their presentations and a small description of their background. During this Symposium we also offer you a poster session where carefully selected professionals show their results on the Water Management and Technologies. Hence, in the second part of the proceedings we present their results in the poster abstracts.

I am very pleased that we are able to present such high-qualified speakers presenting their expertise on Sustainable Water Management for the 15th International Symposium. I want to thank all the people involved in the realisation of the conference.

Yours sincerely,

Bojan Zmaić
The Chairman of the European Technical and Scientific Committee at the European Water Association.
EWA Symposium on Sustainable Water Management
New Strategies, Technologies and Innovative Solutions

Content

Tuesday, 14 September 2010, 9:30 – 12:00
Emerging Issues in Wastewater Technologies
Chairman: Prof. Dr.-Ing. Jörg Londong, Weimar (DE)

Resource Oriented Sanitation – Potentials, Options and Experience
– Report of a Large German Working Group
Prof. Dr.-Ing. Martin Oldenburg, Höxter (DE) .............................................................. 6

Aeration – Key Issue for Energy Saving
Dipl.-Ing. Peter Jagemann, Essen (DE) ........................................................................ 7

Reduction of Excess Sludge Production in a Conventional Activated Sludge System by
a New Electromagnetic Treatment
Eric Valette, Sierre (CH) ............................................................................................. 8

Long Lasting Experience with Water Reuse in Braunschweig: Prospects and Risks
Dipl.-Ing. Andreas Hartmann, Braunschweig (DE) ........................................................ 9

Tuesday, 14 September 2010, 14:00 – 16:00
Management of Biosolids
Chairman: Dr.-Ing. Fabio Tataano, Urbino (IT)

A Sustainable, Integrated Approach to Sludge Management
K. Richard Tsang, Raleigh (US) .................................................................................... 10

Capacity Evaluation and Optimisation of a Co-Digester Plant
Prof. h.c. Dipl.-Ing. Erhard Hoffmann, Karlsruhe (DE) .................................................. 11

Design of the SHAFDAN Digestion and Cogeneration Facility
David Parry, Bellvue (US) ............................................................................................ 12

New Development of the Highly Efficient Sludge Drying Process INNODRY 2E®
Marcel Büchler, Dübendorf (CH) ................................................................................. 13

Tuesday, 14 September 2010, 16:30 – 17:30
Sewer Rehabilitation and Industrial Wastewater Treatment
Chairman: Prof. Dr.-Ing. habil. Hansjörg Brombach, Bad Mergentheim (DE)

Sewerage Rehabilitation in Munich
Dipl.-Ing. (FH) Christof Samm, München (DE), Dipl.-Ing. (FH) Josef Heuberger, München (DE) .............................................................. 14

Pre-Treatment of Metal Plating Industrial Wastewater with the Use of Ultra-Filtration Membranes
Evina Katsou, Athens (GR) .......................................................................................... 15
**Tuesday, 15 September 2010, 10:00 – 12:00**

**Wet Weather Problems and Solutions**

**Chairman:** Bojan Zmaić, Zagreb (HR)

<table>
<thead>
<tr>
<th>Title</th>
<th>Presenter, Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pluvial and Surface Water Flooding across Europe</td>
<td>Ronnie Falconer, Glasgow (GB)</td>
</tr>
<tr>
<td>Pluvial Flood Risk and Climate Change</td>
<td>Ad De Roo, Ispra (IT)</td>
</tr>
<tr>
<td>The FloodResilienCity Project – Early Progress</td>
<td>Tony Maguire, Dublin (IE)</td>
</tr>
<tr>
<td>Managing Excess Water and Pluvial Flooding in Hungary</td>
<td>Dr. Petér Kováč, Szeged (HU)</td>
</tr>
</tbody>
</table>

**Poster Session**

<table>
<thead>
<tr>
<th>Title</th>
<th>Presenter, Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grit Trap of Sewage Treatment Plants (STP) – Code of Grit-Trap: Cracked!</td>
<td>Bertram Botsch, Karlsruhe (D)</td>
</tr>
<tr>
<td>Sewer and Infrastructure Tunnel in Munich City Center</td>
<td>Jörg Hagen, München (D)</td>
</tr>
<tr>
<td>Efficiency of the Novo Milosevo constructed Wetland in Vojvodina Province</td>
<td>Andelka Belić, Novi Das (SRB)</td>
</tr>
<tr>
<td>Enhancement of Sewerage Systems and their Rehabilitation and Maintenance Improving Quality-Management in Sewer Development</td>
<td>Karoly Kovács, Budapest (HU)</td>
</tr>
<tr>
<td>Evaluation of Landfill Leachate Treatment by Advanced Oxidation Processes using Characterization by Conventional and Collective Parameters</td>
<td>Lineker Max Goulart Coelho, Belo Horizonte (BR)</td>
</tr>
<tr>
<td>On-site Hypoclorite System Delivers Historic Efficiency Levels</td>
<td>Nigel Bradley, Warwickshire (GB)</td>
</tr>
<tr>
<td>Performance Testing and Control of Supplemental Carbon Addition in Denitrification Filter Systems</td>
<td>Paul Miller, Warwickshire (GB)</td>
</tr>
<tr>
<td>Disinfection Using a new Innovative UV System: Kent County – A case study of Kent County, Delaware</td>
<td>Jim Newton, Colmar (USA)</td>
</tr>
<tr>
<td>Energy Efficiency of the Municipal Sewage Treatment</td>
<td>Bence Fazekas, Veszprém (HU)</td>
</tr>
<tr>
<td>Application of Activated Sludge Model No. 3 and the WEST SOFTWARE for Design Simulation of a Two-Stage Biological Nitrogen Removal Process</td>
<td>Mariana Koleva, Sofia (BG)</td>
</tr>
</tbody>
</table>

*) The Abstract was not available at the editorial deadline.
Interest on Resource orientated Sanitation technologies is increasing and these technologies are discussed worldwide. A systematic analysis of the technology, its application and sharing the experience is necessary for a wider application. For this purpose, a large working group under the umbrella of the German Water Association with six subgroups equipped with approx. 60 experts has been installed. Topics of these subgroups have been:

- Identification of systems of resource orientated sanitation and its experience
- Experience on collection, transport and treatment of the different flows
- Use and application of products of the systems
- Possibilities of integration of resource orientated sanitation into existing infrastructure systems
- Standards and legal aspects

The results of four year work have been published in a report, which is currently available in German language only.

Target group of the report are all experts and stakeholders involved in sanitation systems and spreading the systematic knowledge to them is important to identify possibilities of sustainable sanitation systems.

A brief overview of the results will be given in the presentation. This overview is focussed on the description of the six systems identified as representative for its holistic approach. Today’s handling with sanitation often implements only part of a sanitation system like e.g. sewer system or wastewater treatment plant. The new approach is the description of sanitation systems from the source to collection, transport, treatment and outputs available for reuse.

**Professional Background**

Educated as a civil engineer, Martin Oldenburg worked as a research assistant at Technical University Hamburg-Harburg for more than 5 years. In 1996 he changed his position to a private consultancy. Since then, he is Managing Director of the consultancy OtterWasser GmbH, which is involved on the design and operation of new sanitation systems in Germany as well as in foreign countries.

Since September 2009 he is professor at the University of Applied Science Ostwestfalen Lippe in the Department for Environmental Engineering and is responsible for biological wastewater treatment and reuse.

He is member of the DWA-working group “New Sanitation Systems.”
Aeration – Key Issue for Energy Saving

Co-Authors: Dr.-Ing Burkhard Teichgräber, Dipl.-Ing. Martin Hetschel, Dr.-Ing. Emanuel Grün

Emschergenossenschaft and Lippeverband (EG/LV) are regional service providers obliged to the water cycle in the catchment areas of the rivers Emscher and Lippe. Among other duties, the operation of 58 wastewater treatment plants (WWTPs) is one of the main activities. To cope with the responsibility for the license payers the decrease of running costs poses an ongoing challenge for the operation of the existing WWTPs. In this regard, energy consumption and energy efficiency of WWTPs became more important issues for operators within the last years.

Due to the fact, that the approximately 50 % of the total energy demand of the activated sludge process is related to the aeration and the oxygen supply of the biomass, aeration represents a focal point for activities to reduce energy consumption and operating costs.

To cope with this issue EG/LV applies different tools for monitoring the existing WWTPs related to energy demand (e.g. internal and external benchmarking, energy analysis). Based on this data and the calculation of representative key figures (operating figures) it is possible to relate certain proportions of the specific energy demand to WWTP characteristics like wastewater composition or system configuration, quantitatively. If significant proportions of the specific energy demand remain undefined a more detailed investigation of the total aeration system is recommended. The following influencing factors and system components are of general interest during this detailed analysing procedure:

- Meeting the ongoing oxygen demand (control strategies (fixed level or demand-oriented), control efficiencies)
- Efficiency of the oxygen transfer for the total aeration system (fouling, scaling)
- Pressure loss of the total system with respect to the capacity, operational conditions and longterm effects (membrane, different system components, control strategies, flow rate)
- Efficiency of the compressed air generation system with respect to the capacity (design values and operation strategies)

Within the presentation the benefit of the described multi-stage process for monitoring and evaluating the energy efficiency of aeration system components will be described.

Professional Background

Mr. Jagemann has studied civil engineering at the university of Braunschweig. Since 1990 he has been working for EG/LV in various divisions, among others in the construction and operation of WWTPs. Since 2005 he has been head of the department “Wastewater Technology".
Reduction of Excess Sludge Production in a Conventional Activated Sludge System by a new Electromagnetic Treatment

Co-Authors: Merlin G., Gonze E., and Cottin N.

An innovative electromagnetic treatment developed by Planet Horizons® was applied in the aeration tank of a municipal wastewater treatment plant to reduce excess sludge production. One of the interests and the originality of this study are that experiments were conducted in a full-scale plant rather than in a lab-scale reactor. Another interest consists in the very weak energy consumption by the physical treatment and with a magnetic field lower than 10 μT. Two parallel and identical lines were used, one as a control (REF-line), and the other as an assay with electromagnetic treatment (EM-line). Removal efficiencies of organic substrate and excess sludge production were measured on the two lines. The results show a significant reduction of excess sludge with good pollutants removal efficiencies.

The wastewater treatment plant is located in Penthaz (Switzerland) and has a capacity of 7'100 person equivalent. This plant is composed by two parallel and identical lines including pre-treatment facilities, an aeration tank and a clarifier. The flow rate of influent in each line (Q₀) is about 670 m³·d⁻¹. Electromagnetic treatment was applied directly into the aeration tank of the EM-line.

The overall organic matter removal efficiency measured in the EM-line was similar from that achieved in the REF-line. The average efficiency was about 95 %.

The average amount of sludge production per day was 106 g·d⁻¹ and 48 g·d⁻¹ in the REF-line and the EM-line, respectively. This test, carried out on an industrial plant, showed that sludge production can be reduced by about 55 % with an electromagnetic treatment.

A biomass stress index (BSI) was defined as the ratio ATP extra-cellular over total ATP. This index was similar in the two lines and lower than 0.5 not showing any negative effects on biomass due to electromagnetic treatment.

Conclusion

First results showed that while organic removal efficiency was not deteriorated, excess sludge production was decreased by about 55 % by the electromagnetic treatment. This full-scale experiment will be continued to confirm these results over a long time and with other range of electromagnetic signals.

In parallel, lab-scale experiments will be conducted to understand interactions between electromagnetic waves and effects on the mixed liquor of the aeration tank.

Professional Background

Engineer in Environmental Engineering and Doctor in Process Engineering, Eric Valette is specialized in water treatment processes, with experience in university research mainly focused on wastewater. Today he’s responsible for R&D and collaboration with Universities, CTO of the company Planet Horizons Technologies from Switzerland, specialized in electromagnetic treatment of water.
Long Lasting Experience with Water Reuse in Brunswick: Prospects and Risks

Co-Authors: Daniel Klein, Norbert Dichtl, Christophe Sardet, Bernhard Teiser

Waste water reuse in Brunswick has a long tradition: There are more than 100 years of practical experience in agricultural reuse of water and nutrients, and 50 years of experience in reuse of sludge as fertilizer. Using this know-how can on the one hand help to improve waste water technologies and hygienic conditions in poor countries, and on the other hand promote reuse- and recycling technologies, thus saving energy, water and (artificial) fertilizer.

Within this global context, the development and implementation of innovative technologies that enable an economic utilization of water resources and energy will be the challenge of the future. That is why the presentation will also give a short overview on two studies currently performed in Brunswick, which focus e.g. on the thermal disintegration of sludges and the use of grass and other co-substrates in the thermophilic digestion.

Professional Background

Mr Hartmann has a degree in civil engineering and a master in Public Water Management. Currently Mr. Hartmann is Managing Director of Brunswick Waste Water Services which is part of VEOLIA WATER Germany. Prior to this position he was the Head of Waste Water Services after heading the Waste Water and Solid Waste Services at the City of Brunswick. Mr. Hartmann was in the Commission of Experts for Tsunami-Flood-aid in Sri Lanka. He worked as a Construction Supervisor in Sultanate of Oman, and as an Expert for a water pollution management project in Bandung/West-Java (Indonesia)
A Sustainable, Integrated Approach to Sludge Management

Co-Author: Barry B. Edwards, P.E., Catawba County

Thermal drying is a popular alternative being implemented in the U.S. in recent years. With the continuing rise in energy costs, high operating costs for the thermal drying facilities can make this alternative non-competitive, unless a source of low-cost energy is available.

In Catawba County, North Carolina, a regional biosolids processing facility is being planned. The county owns and operates the Blackburn landfill for municipal solid waste disposal. Landfill gas is collected and combusted in three internal combustion engines to generate electricity, which is currently sold to the region’s power provider. The county has been looking for ways to utilize heat generated from the engines. With the available waste heat, an alternative approach to manage biosolids in Catawba County by thermal drying was considered.

Although the triple-pass rotary drum dryer is the most proven for wastewater sludge drying, it is not best for utilizing waste heat, as the process requires hot air at ~500 degree C, which most waste heat sources do not reach. The belt dryer is more suitable for utilizing lower quality waste heat – it is also possible to use paddle/disc conductive dryers. After evaluating these dryers and touring a number of drying facilities, belt drying was selected as the technology to use on this project.

A regional sludge processing facility will need to handle sludge from multiple treatment facilities – a factor considered when developing the unit processes. Other factors such as sludge receiving, temporary storage, dewatering, odour, and side stream management are also considered. An integrated approach with the sanitary landfill and surrounding industries and facilities is taken to leverage the synergism among the elements.

Multiple uses are considered for Catawba County’s dried biosolids, including: fertilization of the onsite biofuel research crops by Appalachian State University; fertilization of turf plots; distribution and marketing to local and regional markets; fuel for biomass boiler onsite; and mix with ash from biomass plant as soil conditioner.

The paper will describe in more details the integrated approach and development of this regional facility.

Professional Background

Dr. Richard Tsang is a vice president with Camp Dresser & McKee, a global environmental consulting firm. He specializes in residuals processing and management and has served on projects across the U.S. and abroad.
The case study to be presented in this paper is the WWTP of Baden-Baden (Federal State of Baden-Württemberg, Germany). The WWTP of Baden-Baden is one of the first co-digestion plants in Germany with an initial biowaste capacity of 5000 t/a which in the meantime has increased to about 30000 t/a.

The today's background will significantly change within the very near future due to the necessity to rehabilitate the digestors after an operational period of more than 30 years. Thus one problem to be solved is how to manage the today's amount of substrates (220.5 m³/d sewage sludge and 91.5 m³/d co-substrates) with only half of the digestor volume. This could be done by splitting up the existing one stage in a two stage digestion with a minimal volume for a thermal hydrolysis step or maybe to even include an ultra sonic pre-treatment prior to the hydrolysis. Or, if necessary at all, to add another existing smaller reactor to the second methanogenic stage.

The second most important question to be answered after the rehabilitation of the digesters is about the maximum capacity of the co-digestion or what is the maximal biogas production which could be achieved. So what has been done to answer these questions and what have been the results of the half-scale investigations.

The first step of the investigations has been the optimization of the boundary conditions of the hydrolysis step. Bench-scale batch reactors have been operated to quantify the maximum hydrolysis rate of the particulate organic matter under the variation of the retention time in the hydrolysis reactor at different hydrolysis temperatures (from 37 °C to 52 °C) with and without ultra sonic pre-treatment. The second step of the investigations focused on the implementation of the hydrolysis step into the existing digestion process. Therefore lab-scale digesters with upstream hydrolysis reactors have been operated to determine the minimum possible retention time in the lab-scale digesters under continuous flow conditions.

The results of the bench-scale batch experiments showed that the hydrolysis rate increases up to a temperature of 42 °C. At higher temperatures the hydrolysis rates decreased. The optimum retention time was about 23 h.

The results of the continuous two stage experiments showed that it is possible to reduce the retention time in the digestor from approximately 20 d today to 15.2 d; as a result of the implementation of the hydrolysis reactor in the existing system.

A positive secondary effect of the implementation of the hydrolysis has been an increase of the biogas yield of about 12.8 % (5772 up to 6511 m³ Biogas/d) respectively the methane yield of about 28 % (3290 up to 4232 m³ Methane/d).

Professional Background
• Civil Engineer and Head of the Process Technology and the Semi- and Decentralized Systems Group
• Co-editor of the Karlsruher Flockungstage Series
Co-editor of the Chemical Water and Wastewater Treatment Series (Gothenburg Symposia)
Design of the Shafdan Digestion and Cogenration Facility

Israel, a leader in water reuse, reclaims more than 75 percent of its wastewater. As a compliment to its water reclamation program, a state of the art solids processing facility is being designed at Israel’s largest wastewater treatment facility – the 80 MGD Dan Region Wastewater Treatment Plant (SHAFDAN), approximately 10 kilometers south of Tel Aviv, which serves two million people and reclaims the water for agricultural purposes.

The digestion facility will handle 230 dry tonnes/day of sludge from maximum a month wastewater flows of 110 MGD in 2030. This bioenergy facility is part of a land based biosolids management program that will end the current practice of discharging sludge into the Mediterranean Sea through a long ocean outfall. Class A Biosolids, as defined by the Israel Ministry of Environment, will be produced and beneficially used for agricultural applications. The biogas from anaerobic digesters will fuel a 10 megawatt (MW) cogeneration facility. The facility will include the installation of eight acid-phase digesters and eight gas-phase anaerobic digesters. Screened sludge will be fed to four sets of two stage, up flow, acid digesters (1010 cubic meters each). Along with enhancing sludge hydrolysis and the digestion process, the acid digesters will help curtail foaming. Each gas-phase digester will have a volume of 13,200 cubic meters and operate at thermophilic temperatures. Digested sludge will be pumped to the thickening and dewatering facility for centrifuge dewatering.

Professional Background

Dr. Parry has 30 years of experience in the planning, design, and construction management of wastewater treatment, solids processing, and energy projects. He is actively involved on several wastewater, biosolids, and energy projects throughout the world.

Dr. Parry is a Senior Vice President with CDM and is responsible for its wastewater and energy practice. Dave is a Board Certified Environmental Engineer (BCEE) with the American Academy of Environmental Engineers. He is a registered mechanical and civil engineer in several states and provinces in North America.

He earned his Bachelor and Master’s degrees in mechanical engineering from Brigham Young University. He earned his Ph.D. in mechanical engineering from the University of Illinois at Urbana-Champaign. He has recently been appointed as the Chair of the Bioenergy Technology Subcommittee of the Water Environment Federation Residuals and Biosolids Committee.
New Development of the Highly Efficient Sludge Drying Process INNODRY 2E®

Co-Authors: P. Knoer, B. Paolini, Mr. Knoer is a Consultant R&D, Degrémont Technologies, Mr. Paolini is a Technical Vice President, Degrémont Technologies,

The rapid increase of energy costs is driving to study alternative processes for sewage sludge drying. Therefore a new design of the INNODRY 2E® was performed, focused on the reduction of the energy consumption, achieved by the optimization of the values key-parameters.

The INNODRY 2E® system can be divided in two process steps. During the first step the sludge is distributed on a horizontal thin film evaporator (TFE). The transported sludge undergoes primarily through a heat transfer operation, for which the dewatered sludge is heated up and water is evaporated. At the end of the TFE the sludge paste, containing 45% of dry substance, is pressed through a screen to produce sludge strings.

In the second process step, being primarily a mass transfer operation, the strings are dried with a belt dryer, for which the used air is heated up through the condensation heat arising from the first process step. This drying process guarantees a safe operation, since no explosive dust is produced.

The development of the new INNODRY 2E® with a higher evaporation capacity will be shown, achieved by the optimization of the recovered vapour energy generated during the first process step and by the optimization of the air flow in the belt dryer with Computational Fluid Dynamics (CFD).

Professional Background

Mr Buechler completed his studies in mechanical engineering at the Zürcher Fachhochschule in Winterthur (Switzerland), focused on thermodynamics and biomechanics. The diploma thesis was to calculate and construct a combustion chamber for a micro gas turbine. Since April 2008 he has been working for Degrémont Technologies Ltd., active in the sector R&D Innoplana/Biosolids.
Sewerage Rehabilitation in Munich: Diverse, Economic and Historical Aspects – a Simple and Transparent Conception

The Sewerage Service of the IFAT City of Munich proudly presents its results in rehabilitation of sewers in different diameters, materials and construction dates and offers after the Symposium therefore several coordinated technical visits to the rehabilitated sewers.

Munich has constructed one of biggest Sewer Systems in Germany. And it is one of the oldest. The different sections are in rather diverse conditions depending on its construction and service situations.

The basic data are
a relatively high rainfall of 980 mm/a and a relatively high gradient of 0,4 % on average. This means a quick sewer system and minor problems with anaerobic zones or pumping facilities but a wide range of transported water quantities in the mixed system.

The City's simple remediation strategy
is coordinated with the State Water Authority and mainly comprises of
• a qualified assessment of damage with establishing the cause of damage and the required remediation time,
• the possibly most sustainable selection of the rehabilitation procedure as a result of each individually conducted calculation of Project Cost NPV.

The rehabilitation systems
range from craft activities to improve older masonry joints to an intensive use of inlining systems and to especially Munich experiences in密封ing up old stoneware joints by flexible epoxy resins.

The results
show themselves to be technically and economically comparably favourable:
• the sewer system is in good structural and tightness condition. All projected remediation costs are expected at about 42 Million Euros, this is a total of about 17 € per meter existing sewer;
• some short sections remain actually uninspected because of high waterflow; therefore we are planning a time limited conception of sewage transfer.

Professional Background
Christoph Samm and Josef Heuberger are both civil engineers, 37 and 58 years. They both studied at the Munich University and started their career in the Bavarian State Services for Water and for Motorways. For respectively 4 and 22 years the two colleagues have been working at the Sewerage Service of the City of Munich and are both involved with the planning, financing and monitoring of the new construction and the remediation projects for the entire sewer system.
Pre-treatment of Metal Plating Industrial Wastewater with the Use of Ultrafiltration Membranes

Co-Authors: S. Malamis, T. Kosanovic, S. Tsakalos, E. Akridas, & M. Loizidou

Metal plating industrial wastewater streams contain toxic metals in high concentrations, which must be reduced to accepted levels in order to be safely discharged or to avoid inhibition problems in subsequent biological treatment. This work investigates the use of ultrafiltration (UF) membranes for the pre-treatment of electroplating wastewater. Natural adsorbents (bentonite, vermiculite) were added to enhance the system performance with respect to pollutants removal. The system was assessed for its ability to remove nickel, zinc, organic matter and colour. Nickel and zinc removal was assessed for a wide pH solution range both in aqueous solutions and wastewater. The results showed that UF can significantly reduce nickel and zinc concentration from wastewater with removal efficiencies higher than 89% at pH ≥ 8 for both metals. Mineral addition increased metal removal efficiency to even higher values (> 97% at pH ≥ 8). Mineral contribution to metal removal was higher when more metal ions were available for the adsorption process, which was the case in acidic environment. The presence of organic compounds and cations such as ammonia in wastewater limited the adsorption efficiency of minerals for Ni and Zn uptake. The examination of system kinetics in the binary system showed that zinc and nickel adsorption onto minerals tended to reach equilibrium at approximately 200 min. Diffusion was a multi-stage process where intraparticle diffusion was not the only rate limiting step. UF resulted in significant colour and organics removal, which increased with mineral addition. Wastewater filtration resulted in low membrane permeability and thus fouling was limited. The results showed that the combined adsorption-UF system was able to produce a final effluent with metal concentrations which under certain conditions met the limits for discharge of industrial wastewater into the municipal sewerage system.

Professional Background
Evina Katsou obtained her first degree, a 5-year course in Chemical Engineering and an MSc in Water Resources Management (2008) from the National Technical University of Athens. She is currently a PhD candidate in her final year at the National Technical University of Athens. Her main research areas are: industrial wastewater treatment through biological and physicochemical processes and metals removal from wastewater.
Pluvial and Surface Water Flooding across Europe

This paper will set the scene by firstly summarising outcomes from the European Water Association expert meeting on Pluvial Flooding in Europe held in Brussels last October. A key outcome was the drafting of a questionnaire to assess the extent of the pluvial flooding problem across Europe and obtain further information. Both the expert meeting and the responses to the questionnaire have informed further consideration of key issues at the EC Working Group F Thematic Workshop on Flash Floods and Pluvial Flooding held in Cagliari, Sardinia from 25-18 May 2010. Working Group F advises the Commission on implementation issues associated with the Floods Directive. The paper will review feedback from the questionnaire specifically in relation to pluvial flooding and discuss the significance and characteristics of pluvial flooding for different parts of Europe. This will be set within the context of urban surface water flooding which also includes flooding from sewerage and drainage systems due to extreme rainfall and flooding from groundwater. The paper will also review some of the approaches adopted in dealing with pluvial and surface water flooding.

Professional Background

Education: BSc(Hons) in Civil Engineering; MSc in Public Health Engineering; Chartered Engineer; Chartered Scientist; Chartered Environmentalist.


Experience: As a Senior Consultant with Jacobs, Ronnie has 35 years experience in flood risk management. He is a Member of the Scottish Government Flood Risk Assessment Group and European Water Association (EWA) representative on EC Working Group F on the Implementation of the Floods Directive. He is also a Member of the EWA European Technical and Scientific Committee. He sits on the steering group for the NERC Flood Risk from Extreme Events (FREE) research programme. His project management experience includes major UK and international water and environmental management projects including development of a flood forecasting and flood warning system for the state of Andhra Pradesh in India and the Perth Flood Alleviation Scheme the largest flood mitigation scheme in Scotland at the time of construction.
The Flood Resiliency Project – Early Progress

CO-Author: Tom Leahy, Executive Manager Engineering, Dublin City Council, Ireland.

Dublin City Council is one of eleven organisations from eight European Cities which make up the Interreg IVB Project “FloodResilienCity”. The FloodResilienCity Project is addressing a number of innovative themes concerned with sustainable flood risk management including Room for the River and Pluvial Flooding (flooding from sudden, short duration intense rain storms). The project is using the Scottish Government’s 4A’s model of sustainable FRM comprising Awareness, Alleviation, Avoidance and Assistance.

The paper will describe the emergence of pluvial flooding as a significant risk confronting Dublin City Council, which has recently appointed Jacobs Engineering Ireland to undertake a strategic review of pluvial risk and associated issues and the paper will describe this programme and the early progress.

The study includes:
• Examination of the pluvial risk and the metrics used to describe and quantify this.
• Over view modelling & mapping of the city-wide risk.
• Detailed pilot modelling & mapping of a number of high risk areas.
• Development of new strategies (& Codes of Practice) to manage pluvial risk in existing and new development areas.
• Linkages to National & European strategies.

Professional Background

Tony Maguire is a graduate of Imperial College, London (1970) and a Chartered Member of Engineers Ireland. He has worked in the past with consultants and contractors in both England and Ireland. Since 1984 he has been an employee of Dublin City Council (DCC) concerned with water, drainage and flooding projects.

Between 2003 & 2008 he was DCC project manager on the Interreg IIIB SAFER Project (Strategies and Actions for Flood Emergency Risk management). As part of the SAFER project he helped develop Dublin’s Triton tidal & flood forecasting system which was the first in Ireland and has been responsible for its implementation since. In 2007 he was appointed project manager for the Interreg IVB FloodResilienCity project which will run to 2012.
Managing Excess Water and Pluvial Flooding in Hungary

1. Where do we stand: What is the issue?

Hungary is situated in the region insisted by consequences of water extremities: excess water, water scarcity and drought. The period of water extremities can cause damages on national level. During the last century on average in 3 – 4 years have occurred relevant droughts periods, 5-7 years have excess water time.

It is necessary that the Government and municipalities give adequate support for the mitigation of water extremities. That was clear, that the general assessments of the water balances are indispensable for the prevention and the mitigation of damages.

2. What are the implemented solutions?

The assessment of the water balances was developed, which can give general information about current status and the forecasted status of water balances to the experts both on regional and local level. The method based on the continuous water balance index, which was developed by Dr. Imre Pálfi. The index gives evaluation about forecast of water balances by the hydro-meteorological parameters. The forecasts support determines the anticipatory tendency, which can use by the basis of measurements.

The assessment consist data about the water sharing between different basins, inundated areas by excess water and the evaluation of basic meteorological parameters.

The monitoring network is covered by the Network of Meteorological Service completed by the Network of Water Management Directorates.

The assessment access is free of charge on our web page.

3. What are the lessons-learned: how challenges have been overcome and what is still unsolved.

The assessment is the only one free of charge water balance report in Hungary. The results of the report can be used as the background of the measurements.

The density of the monitoring network –in the present structure- can use only for developing assessment on regional level. The next task is decreasing of the monitoring network’s density in order to develop the forecasts on local or farm level.

Professional Background

Dr. Kozák has a PhD degree in Earth Sciences from the University of Szeged, and has a degree in Civil Engineering (MSc) from the Technical University of Budapest. He holds membership of the following institutions: the Hungarian Chamber of Engineer, the Hungarian Hydrological Society, the Section’s Committee Hydrology and Hydraulic. He also has been the Hungarian Head of the Expert Group for the Identification of the Ground Water Bodies at the Hungarian – Serbian Management Sub-committee.
Poster Session
Grit Trap of Sewage Treatment Plants (STP)

Code of Grit-trap: Cracked!

Grit- and grease traps are widely used in STPs despite the fact that no theory has been published that describes the characteristics and distribution of particles, and the flow and the separation of these particles. The standard design guidelines for grit traps cannot provide the level of grit separation required by DWA 2008 et al.

It is necessary to distinguish three types of flow in the grit trap: -- 1. conventionally aerated ones, -- 2. stepwise aerated ones, -- 3. unaerated ones Hydro-Grit-Trap.

The flow within an unaerated grit-trap is approximately a one phase type and easier to describe than the two-phase-flow of an aerated grit trap. However in both cases physical parameters and shape of particles influence the path of a particle across the flow. This path in longer in great grit-traps. Therefore the separation depends also on the size of the grit trap due to the scale effect.

Overall design parameters do not exist. It is necessary to standardize the efficiency requirements and to standardize the shape of the grit trap. Computer simulation can be used to explore flow and separation effects by solving the implicit equations; this requires a lot of processing power.

Only such results have been considered that meet the standard separation efficiency, e.g. 95 % of 0,2mm grit size.

As a result of this analysis I recommend the introduction of 4 principles

-- 1. Avoid the black box design, -- 2. (Optional) discard aeration, -- 3. (Optional) determine the surface load allowed dependent on the width of the grit-trap (see fig.1) -- 4. (Optional) determine the width of the grit-trap from the maximum flow (see fig.2).

The flow pattern (1.) should exclude bypass-, recirculation- and shortcut flow.

Herewith I present a solution for the design-parameters for the Hydro-Grit-Trap for a standardized separation efficiency of 95 % of 0,2 mm grit, for a standardized shape of the grit trap B=T and L=x * B (x= 10 or 12) and for the preferred flow pattern and for the range of flow up to appr. 0,3 m³/s. The only relevant parameter is the width B of the grit-trap; the detention time is proportional to this width.

Lit DWA Fachausschuß KA-5 Absetzverfahren …, Arbeitsbericht, KA 55 (2008)

Professional Background

1955-1964 Study at Technical University Karlsruhe, Mech. and Civil Engineering with field studies of STP, power plant, sugar mill, factories, etc. 1964-1990 senior and head designer with mechanical equipment manufacturers as well as manager for turnkey projects in constr. companies, since 1994 STP consultant engineer, since 1995 sworn expert for STP certified for chamber of commerce, 1968-2003 member/vice chairman of DIN-NAW and ATV-DVWK committees, 1995-2000 provisional professor at University GHK Kassel; many publications, lectures and patents
Sewer and Infrastructure Tunnel in Munich City Center

The Münchner Stadtentwässerung is a municipal company who runs the wastewater treatment plants, maintains the sewer system and develops the sewer system and the wastewater treatment plants.

In Munich, both wastewater treatment plants are located on the west bank of the River Isar. This means, that the whole wastewater, which is accumulated eastward to the River Isar, has to cross the river to reach the wastewater treatment plants.

In 2006, a project was started to build an additional crossing of the River Isar in the city centre of Munich. Due to the altitude of the existing sewers on both sides of the river, the new sewer had to be just underneath the riverbed surface, so that a mechanical tunnelling (Pipe-Jack) was considered to be not practicable.

We decided to create the new sewer in a “cut and cover” method and accepted the challenge that the building site was situated in a river with alpine flow characteristics. This means that we had to solve many problems such as creating temporary islands in the river in order to drill the piles for the tunnel. We had to ensure that the open building pit would not be flooded by the River Isar.

An emergency plan had to be developed to be able to clear the whole building site (incl. giant equipment) in less than 6 hours and to develop a concept to prevent the city centre to be flooded by the River Isar in the case of flood water. Above all, we had to enforce the riverbed with stone filling to prevent erosion in case of flood water. For this stone filling, about 8.000 tons of stone had to be brought into the city centre of Munich and were embedded in the riverbed within 10 days.

Professional Background

Since 2002, Mr. Hagen has been working for Münchner Stadtentwässerung at the department MSE-12, dealing with the new construction of sewers. He is project manager for special underground engineering and tunnelling. From 2001 to 2002, he worked for the consulting engineers Miller in Nuremberg as a designer of sewer systems. From 1997 to 2001, Mr. Hagen did his civil engineering studies at the Georg-Simon-Ohm University of Applied Sciences in Nuremberg, majoring in Water and Waste Management.
Efficiency of the Novo Milosevo constructed Wetland in Vojvodina Province

Co-Authors: Jasmina Josimov-Dunderski, Milica Rajic

Wastewater is treatable in a number of different types of constructed wetlands. This technology is now entering a phase in its development where it can provide wastewater treatment in a wide range of circumstances. Unfortunately, this popular method still is not applied in our country. The first attempts are just going on in Vojvodina Province. This part of country is with good conditions for municipal wastewater treatment by constructed wetland. There are 85.9% of communities with number of people between 1000 and 5000.

This paper deals with details of the constructed wetlands in Novo Milosevo, which is working from last year. Novo Milosevo is a village with 8450 people, and sewage system, without any industry inflow. On the Novo Milosevo location a plant has been constructed for sewage treatment of the hybrid type, involving a combination of horizontal, vertical and lateral flow, according to the proposition of Cooper and Clark. The wetland construction is planned in the Tisa inundation plane at the eastern side of the settlement. Total area of the wetland system of 15600 m² is divided into three ponds: settling pond, purification pond and the pond improvement of treatment effects.

Monitoring of efficiency was carried out three times till now, by measuring chosen parameters in influent, in purified water after every pond, and in effluent. Investigation is concerned with the effects of wetlands in the process of purification of wastewater of the Novo Milosevo settlement as assessed on the basis of biological oxygen demand (BOD₅), suspended matter (SM), total phosphorus, ammonium, chloride, and some of the microbiological organisms.

Professional Background
Dr. Andelka Belic is full professor for Water pollution control and Water use. She has more than 30 years experiences in water pollution control, water use, environmental protection and nature conservation. She has elaborated about 200 different papers, professional and scientific, in the mentioned fields. She has participated in more than 10 research projects financed by the National Ministry of Science.
Enhancement of Sewerage Systems and their Rehabilitation and Maintenance
Improving Quality-Management in Sewer Development

The development of sewerage systems in Hungary (and in the new EU countries) is getting re-launched. In the EU programming period 2007-2013 Billions of €-s are going to be spent to improve the level of sanitation, and the environmental protection.

Hungary is facing an extremely fast development from 65 % to 87 % with a total length of about 20.000 km new sewer within 5 years. The past national program on this 1995-2005 has brought 10.000 km. A large study-including 600 projects with 8.550 km new sewers- focusing on the quality has shown a large scale of quality problems, and a poor construction level, and low life time expectancy.

According to the evaluation of the collected data, some 20 % of the total sewer put into operation did not meet the standard requirements.

The general statistics, and observation shows, that behind the most specific problems is the deformation (ovality of the cross section) of pipes which aquers due to not sufficient compaction of embedment. In many cases the sewers built less than 10 years ago have to be repaired or even reconstructed.

The EU infrastructure development founds are financing sustainable and affordable environmental solutions in line with the WFD. A basic guidance for the preparation of decisions is the Guidance for Cost Benefit Analyses taking the long term operational, and replacement costs also into consideration.

The paradigm change in the decision-making has to be supported by improving the quality management in sewer development.

A new quality control measurement technology is getting more and more acceptance in Europe (GB, DE) the “laser profiler” and have to be presented and implemented in the new EU countries to improve the quality of the water infrastructure.

The presentation would give an overview on the status of the sewer development in Hungary, and a non producer specific presentation of the “new” measurement technology

Professional Background
• Membership in Professional Bodies: Hungarian Chamber of Engineers (member), Hungarian Wastewater Association (Vice-president-elected since 1998), MC member of EWA, Member of the WWater Working Group of the Hung. Academy of Science 2001,
• Key qualifications: Wastewater treatment, Water/Wastewater-Asset evaluation, Business development
• Publications and Seminars: several publications in Hungarian and German professional papers,
• Presentations at different international congresses in different Countries (Germany, Belgium, Japan, Austria, Russia, Poland, Romania, Slovakia, Bulgaria, Montenegro)
• Technical and Project References:

Development of different enviromental technologies and products (partly patented) sold EU wide, design and building of WWTP’s and sewers as mein contractor for more than 100 Municipalities in Hungary and neighboring countries, evaluation of water assets of more than 1000 km of networks in more than 25 municipalities
Evaluation of Landfill Leachate Treatment by Advanced Oxidation Processes using Characterization by Conventional and Collective Parameters

Co-authors: Wagner G. Moravia, Miriam C. S. Amaral, Liséte C. Langue

Leachate from stabilized landfills presents a high concentration of compounds poorly biodegradable. Thus the physical-chemical treatments could be more appropriated than the biological ones. The advanced oxidation processes by Fenton (AOP/Fenton) is a technique that promotes the formation of hydroxyl radicals (•OH) using iron salts to catalyst the reaction. The AOP has an elevated oxidation power. Conventional parameters are usually employed in the characterization of effluents and their methodologies are standardized in the literature, such as: alkalinity, BOD, COD, total nitrogen, ammonia nitrogen, pH and total solids. Collective parameters (inert COD, aerobic biodegradation, humic substances) are characterization methods found in the literature, not yet standardized, but providing targeted information to a particular property of the effluent. So, this research seeks to evaluate the efficiency of the leachate treatment by AOP/Fenton using a characterization by conventional and collective parameters. The tests were conducted at bench scale using a jar test apparatus. The humic substances were evaluated according to the modified Lowry method (Frolund et al., 1995). The biodegradability was determined by the Zahn-Wellens method (OECD, 1995). The inert DCO was carried out according Germili et al. (1991). The characterization was evaluated by conventional and collective parameters already mentioned. The conventional parameters analysis was performed according to the Standard Methods for the Examination of Water and Wastewater (APHA, 2005). About DCO, it were obtained removals averaged 75 %. It noted an increase of the ratio BOD/COD which went from 0.03 to 0.2 and the aerobic biodegradability increased by 40 %. The inert COD decreased from 1200 to 300 mg/l. The humic substances analysis shows the predominance of fulvic acids that has a lower molecular weight (< 5 kDa). The global result indicates that the AOP acts reducing the recalcitrance of the effluent by the oxidation of hard degradation compounds. Therefore, the AOP are a promising alternative to remove organic matter and to increase the biodegradability of the leachate.

Professional Background

Mr. Goulart Coelho is an undergraduate in Environmental Engineering at École des Ponts Paristech (ENPC), France and in Civil Engineering at Federal University of Minas Gerais (UFMG), Brazil. He carried out studies of effluents treatment at UFMG waste laboratory.
On-site Hypochlorite System Delivers Historic Efficiency Levels

Forest Park Water, owned and operated by the North Penn and North Wales Water Authorities (USA), began work to expand the Forest Park Water Treatment Plant in Chalfont, Pennsylvania to accommodate the needs of a growing customer base in neighbouring counties. For its chlorination needs, Forest Park chose an on-site sodium hypochlorite generating system, which has proven to be noteworthy for delivering record, never-before-validated efficiency levels.

Typically, an on-site sodium hypochlorite generating system consumes 2.5 kWh/lb. of chlorine and 3.5 lbs. of salt/lb. of chlorine. Severn Trent Services has significantly advanced on-site hypochlorite generation technology through an enhanced proprietary electrode coating. The coating, which the company has researched and developed since 2004, provides greater operational efficiency, significantly reducing the consumption of salt and electricity. To meet its efficiency guarantee at the Forest Park facility, Severn Trent Services provided enhancements that:

• reduced salt consumption from 3.5 to 2.34 lbs/lb of chlorine, representing an operational cost reduction of more than 25% in salt consumption;
• reduced energy consumption from 5.5 kWh to 4.2 kWh/kg of chlorine – an operational cost reduction of more than 20% in power.

The new Forest Park Water Treatment Plant began operation in November 2006 and operates at an average flow rate of 56,000 m³/day, with seasonal fluctuations ranging to more than 87,000 m³/day. The on-site hypochlorite generation system has produced more than 180,000 kg of chlorine since it was commissioned. With more than two years of operational data, the enhanced efficiency at the Forest Park installation represents the first time such performance has been validated.

Professional Background

Mr Nigel Bradley serves as Engineering Manager for Severn Trent Services. He is head of engineering for the company’s water treatment products in the U.K and Europe including responsibility for site commissioning, process design, and support to product development and operations on a global basis.

He is also a member of the Institute of Civil Engineers; the Chartered Institution of Water and Environmental Management; and is a Chartered Engineer. A graduate in Civil Engineering, Bradley has more than 35 years experience in the water sector.

He is also a member of the Institute of Civil Engineers; the Chartered Institution of Water and Environmental Management; and is a Chartered Engineer. A graduate in Civil Engineering, Bradley has more than 35 years experience in the water sector.
Performance Testing and Control of Supplemental Carbon Addition in Denitrification Filter Systems

Requirements for improved effluent quality from wastewater treatment works have led to the development of tertiary treatment processes for the removal of nitrate and suspended solids. At the Lower Reedy Wastewater Treatment Plant in Simpsonville, SC, DeepBed™ Denite® filters were installed to reduce the effluent total suspended solids before UV disinfection and to provide the capability for future denitrification should more stringent future total nitrogen discharge limits be imposed. As part of the commissioning requirements, a stringent performance test was conducted to test the capability of the filters to meet the required effluent nitrate-nitrogen + nitrite-nitrogen (NO₂-N + NO₃-N, or NOx-N) concentrations without using and excess of methanol. To meet the limitation on methanol usage, it was necessary to use a control system that included Severn Trent Water Purification’s TetraPace® programming for chemical feed control.

A stringent limitation on backwash frequency also was incorporated into the performance testing. This paper presents the detailed results of this testing as well as discussing impacts of the filter operation on the overall plant performance.

Professional Background

Mr Paul Miller serves as Process Engineer and Field Service Manager for Severn Trent Services. He has more than 20 years experience with Severn Trent Services and is responsible for the sizing and final design of all processes for the TETRA range of filtration solutions. His experience includes overseeing customer performance trials, writing performance guarantees and customer service activities. Miller has a Bachelor of Science (B.S) degree in Chemical Engineering.
Disinfection Using a new Innovative UV System: Kent County
A case study of Kent County, Delaware

Co-Author: Nadia Abboud

The Kent County Regional Wastewater Treatment Facility is an award winning 16 million gallons per day (MGD) wastewater treatment plant located in Kent County, Delaware. It recently accepted one of the inaugural US EPA’s Environmental Achievement Awards for its Environmental Health and Safety Management System (EHSMS). An objective of the EHSMS was to remove chlorine gas as its disinfection process and replace with ultraviolet (UV) technology, to deliver multiple operational advantages over other disinfection technologies.

An innovative UV solution, the Severn Trent Services MicroDynamics® microwave UV disinfection system, was selected to disinfect the water in the plant. This UV system offered a number of advantages over traditional UV systems.

A 1 MGD pilot plant was tested during May 2008 and found to meet the permit limits of 33 colonies/100 ml of Enterococcus. The unit was able to produce an effluent with a geometric mean of 3.5 colonies per 100 ml versus a permit limit of 33 colonies per ml. The full scale UV system will be capable of handling a normal flow of 12 MGD and peak of 18 MGD.

Professional Background

Mr. Newton has over 28 years experience as an environmental engineer. He holds a Bachelors Degree in Engineering Science, a Masters Degree in Engineering Science and a Masters Degree in Civil Engineering. He has worked for the US EPA, local county governments, and as a consultant to government and industry. Mr. Newton has authored over eight technical books, over 30 feature articles on various environmental and regulatory topics, conducted seminars across the country and participated in many national conferences.

Ms. Nadia Abboud serves as Marketing Manager for Severn Trent Services. She is a member of the Water and Wastewater Equipment Manufacturers Association (WWEMA) Board of Directors. A graduate of Villanova University, she received her BS in Management with concentrations in International Business and Arab and Islamic Studies.
Energy Efficiency of the Municipal Sewage Treatment

Some Hungarian wastewater treatment plants having operational capacities >6000 m³/d municipal wastewater purification and anaerobic sludge digestion provided the data for the energy efficiency evaluation. The specific electric energy consumption of these plants was less than 0.75 kWh/m³ treated wastewater. More than half of that (60% – 65%) was used for the oxygen supply (fine bubble aeration). That is why saving on the aeration can result in the highest decrease of the electricity demand. Pumping and mixing requires nearly the same amount of energy (0.045 – 0.14 kWh/m³, 0.04-0.08 kWh/m³) depending on the type of mixers used.

Anaerobic excess sludge digestion and biogas utilization for electricity generation can improve the energy balance of the plants. In average approximately 40% – 50% of the total energy consumed can be covered by the energy of the biogas. Increase of the biogas yield (generated electricity and heat) and the decrease of the electric energy demand can improve the energy balance of the plants.

Minimization of the energy input can consequently be achieved in two ways: mainly with digesting more sludge (or other biodegradable waste), or improving the efficiency of the devices of fluid and air mixing and transport. More efficient aeration/mixing systems can be used for this purpose like hyperboloid mixers/aerators. Separate N removal from sludge liqueur can also decrease oxygen demand and increase the methane yield. The amount of sludge for digestion can be increased either inside the plant or with the transportation of external raw material to the plant.

Professional Background

• PhD student 2007-
  Major: Wastewater treatment technologies, Examination of removal of COD and nitrogen forms, energy efficiency in wastewater treatment plant
  • MEng in Research & Development Engineering, University of Pannonia, Department of Hydrocarbon and Coal Processing, Hungary,

Thesis: Effects of different types of crumb rubbers in asphalt rubbers. 2006

Publications:
3 know-hows, 2 scientific papers, 10 conference presentations, 40 research reports
Application of Activated Sludge Model No3 and the WEST Software for Design and Simulation of Two-Stage Biological Nitrogen Removal Process

Modelling of activated sludge processes has become a common part of the design and operation of wastewater treatment plants. In our research the Activated Sludge Model No 3 (ASM3) and the WEST advanced dynamic simulation model of “Most for Water”, a Belgium company, was used for design and simulation of two-stage biological nitrogen removal process. The results were compared with those achieved by using the German design model ATV A-131/2000. Parameters estimation of the well known pre-denitrification process was conducted with the ASM3 and ATV A-131 design models and comparative analysis between the two models were carried out. The data derived from the both models was used as an input data to start dynamic simulation with the WEST software.

Professional Background

Mrs. Mariana Koleva is Chief Assistant Professor, M. Sc. at the University of Architecture in Sofia. From 2003 to 2006 she did her PhD research in Wastewater Treatment Technologies; Thesis: “New Technologies for High Ammonium Removal from WWTPs Sludge Liquor. In 2005 she did a FEMS fellowship in Nijmegen, the Netherlands, on innovative wastewater treatment technologies for nitrogen removal. From 2006 to 2009 Mrs. Koleva too part in a research project “New Technologies for High Ammonium Removal from Sludge Liquor”, by the Ministry of Education and Science. In 2007 she participated in a one-year research project “Comparative Investigations and Assessment of the Results, Obtained by Means of the HACH LANGE and Bulgarian State Standard Analytical Methods for Water and Wastewater Analysis”. In 2008 she held a training course on WEST software for WWTPs design and simulation at the University.