10th Young Water Professionals Programme

May 1 – May 6, 2011

WASSER BERLIN INTERNATIONAL

Berlin

Contents

Participants of the Programme:

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- Thomas Pochwyt — German

Sponsored by DBU (Knowledge Transfer Programme and Alumnis):

- Irina Angelova — Bulgarian
- Ágota Atkári — Hungarian
- Luiza Babikyan — Bulgarian
- Sergiu-Leonard Chereches — Romanian
- Claudia Cotoara — Romanian
- Peter Csafordi — Hungarian
- Thomas Dippong — Hungarian, Romanian
- Erika Fábiková — Slovakian
- Eva Fetter — Hungarian
- Nicolae Sebastian Cornel Forir — Romanian
- Ivan Kolev — Bulgarian
- Bernadett Ildikó Kòsa — Hungarian
- Peter Kovacs — Hungarian
- Urszula Mikolajczyk — Hungarian
- Zsofia Mogan — Polish
- Adina Pacala — Romanian
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- Maria Stoica — Romanian
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Sponsored by IPSWaT:

- Frezer Seid Awol — Ethiopian
- Bijendra Man Bajracharya — Nepalese
- Fasika Diro — Ethiopian
- Uchechukwu Ihunweze — Nigerian
- Haoting Li — Chinese
- William Roberto Mulleck Padilha — Brazilian

- Shakun Paudel — Nepalese
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- Mays Al-Sawalha — Jordanian
- Ramon Brentführer — German
- Florian Fischer — German
- Mahmoud Hammad — Palestinian
- Muhammad Khalifa — Sudanese
- Wifag Hassan Mahmoud — Sudanese
- Mirja Michalscheck — German
- Maika Müller — German
- Ghadir Mohammed — Yemeni
- Jordi Nieder — German

Dank an die Messe Berlin, Passavant Geiger und WILO für die großzügige Unterstützung!

Evaluation

Young Water Professionals Programme 2011

1=very good 2=good 3=satisfactory 4=not so good

Average:		**1,53**
Programme in general	1,47	
Applicability/usefulness of the programme	1,63	
"Water Operators Partnership" (02.05.2011)	1,75	
Convention Programme (02.05.2011)	1,85	
Excursion to Waterworks (03.05.2011)	1,25	
Excursion to WWTP (03.05.2011)	1,71	
"The German Water Sector" (03.05.2011)	1,51	
"Information about GWP" (04.05.2011)	1,59	
"International Water Experts" (04.05.2011)	1,60	
"IWA-DWA Career Event" (06.05.2011)	1,59	
Anniversary Celebration (02.05.2011)	1,35	
Sightseeing (02.05.2011)	1,29	
Stand Party (04.05.2011)	1,62	
Communication between group members	1,51	
Communication with guide	1,42	
Group atmosphere	1,33	
Expectations met?	1,54	

REPORT OF GROUP I

TRADE FAIR VISIT

4th MAY

BERLIN

Presented by:

Jafar Alkhatib, Syria

Agota Atkari, Hungary

Florian Fischer, Germany

Ivan Kolev, Bulgaria

Oana Sacuiu, Romania

Zsofia Mogan, Hungary

Bijendra Man Bajracharya, Nepal

Matyas Rajnai, Hungary

Iva Vidaković, Croatia – Guide

Contents:

Introduction

This year the Young Water Professionals' Programme, organized by the German Association for Water, Wastewater and Waste (DWA), celebrated it's 10th year anniversary. The Programme took place from 2. – 6. May at the Messe Berlin during the Wasser Berlin International 2011 trade fair and congress for water and wastewater.

The Wasser Berlin International is Europe's leading trade fair for water supply and wastewater disposal. It is an important event for all water industry decision-makers. The international trade fair provides a comprehnsive overview of the market, new products and technologies and numerous opportunities for international business contacts. This year 696 exhibitors from 34 different countries presented their products and services in six fair halls covering an area of approximately 48,000 m^2 . The trade fair halls were 1.2, 2.2, 3.2, 4.2, 5.2, and 6.2 and in hall 2.1 there was an interactive show for the public entitled WASsERLEBEN. According to statistic from 2009 as the reference year, the total number of visitors to the trade fair was 34,583.

As a business location, Berlin's geographical proximity to the countries of Central and Eastern Europe, and in particular to the new member countries of the EU, makes this event especially interesting in terms of the business opportunities it offers.

A chance to thorougly explore the trade fair and what the exhibiting companies, associations and organizations have to offer was part of the Young Water Professionals Programme scheduled for May 4th 2011.

Fig. 1 Survey of the halls on the fair ground (http://www1.messe-berlin.de 2011)

The history of Berlin as a trade fair venue

Since Berlin holds a significant importance in history as a venue for trade fairs, some key dates and facts should be mentioned in this report. Berlin as as a trade fair venue has a history dating back to the first quarter of the 19th century. In **1822**, the first industrial exhibition took place. With this, an era or organized exhibitions in Berlin began. In **1924**, the first "Große Deutsche Funkausstellung", nowdays known the IFA, was held. Also this year the construction of the Radio Tower and the “Haus der Funkindustrie” hall begins. In **1927** the Berlin Radio Tower is opened and also the first Green Week takes place. In **1927** The International Materials Exhibition was held at the Tehnische Hochschule. This was the largest fair in Berlin with 250,000 visitors. In **1935,** the construction of the Deutschlandhalle begins. During World war II in **1943** the Berlin Exhibition Grounds and the Deutschlandhalle are almost completely destroyed, and the Radio Tower suffers extensive damage. In **1946** reconstruction of the exhibition grounds begins and already the following year the first exhibition “Werte unter Trümmern” takes place. Between **1956** and **1957**, the construction of the Palais am Funkturm begins and the Deutschlandhalle is rebuilt. From **1970** to **1979** six new exhibition halls are built. In **1979**, Europe’s largest and most modern conference venue venue: The Internaional Congress Center ICC Berlin opens. In **1992** the Messe Berlin GmbH gets its todays name and **2006**; AQUA UKRAINE and Water Sofia take place which resulted in the highest turnover to date – 168 million euros.

Picture 1 The Fair grounds with the radio tower (http://www1.messe-berlin.de 2011)

Hall 1.2 International NO DIG, pipeline construction

One of the highlights of the fair was the 29th INTERNATIONAL NO DIG Berlin. NO DIG is the trade fair for trenchless technology which focuses on Europe. Ever since 1982 trenchless

construction methods have represented an environmentally sound, low-cost alternative wherever underground pipelines are modernized or installed. In hall 1.2 166 companies presented themselves.

HOBAS

Picture 2. I.Kolev

HOBAS is a leading supplier of high performance GRP Pipe Systems for applications such as potable water, waste water, hydropower penstocks, cooling water lines, irrigation and drainage. HOBAS GRP Pipe Systems can be used for all installation methods (open cut, jacking and relining, above ground and sea outlets). HOBAS Products include circular and non-circular Pipes, various Coupling Systems, Shafts and Manholes, Tees, Bends and other tailor-made Fittings and Accessories.

NAYLOR DRAINAGE

Picture 2. I.Kolev

Naylor Hathernware is one of the world's leading manufacturers of chemically resistant ceramics, with experience dating back over a century. Naylor has developed a comprehensive range of products to address the problem of discharges too hot and or corrosive for conventional drainage systems.

PiPe Green$_{TM}$


Picture 3. I.Kolev

The product is very special from many angels. It is eco-friendly and the technology used in the manufacture of this product has a track record of 35 years during which it has proved its competence. No cement or water is used in its manufacture.

Superlit

Superlit is a well-known company in production and supply of pipes and fittings. Superlit produces pipes for freshwater, sewage, drainage, cooling water, sea discharge and for hydroelectric plant systems.

Picture 4. I.Kolev

WKT

Picture 5. I.Kolev

WKT produces pipes manufactured for coal and salt mining. The range of products constantly expands due to the development of new raw materials and bling the manufacture of pipes for the drinking water supply using low pressure polyethylene. WKT is one of the first companies to also manufacture PVC pipes with lead-free stabilizers from 1 January 2006.

Hall 2.1 WASsERLEBEN Public Show

Picture 6. Hall 2.1, M. Rajnai

Picture 7. A presentation at WASsERLEBEN, M. Rajnai

Parallel to the congress and the trade fair runs the WASsERLEBEN. It was located this year in Hall 2.1 just after the southern entrance; however it was not easy to find. WASsERLEBEN is an essential part of the fair since 1993, but also separated from it. Trade visitors entered the exhibition for free but it was also open for non-trade visitors for a daily price of 2 Euro. The average numer of 10 000 visitors per year underlines the importance of this exhibition. WASsERLEBEN turned more to the general public, especially to young people and provided extensive information about water as a resource. The show is designed to attract visitors

who are unfamiliar with water-related issues and encourage them to seek further information and become actively involved.

At "WASsERLEBEN" organizations and institutions dealing with water demonstrate what is important and interesting about water in a fun and exciting presentation designed to stimulate visitors to reflect and act. Here, visitors can experiment, and get answers to questions concerning living with and around water. The biggest part of the audience were students, and among the exhibitors the younger generation was also represented: apart from 44 institutions and organizations, 7 schools participated in WASsERLEBEN.

There is not enough space in this report to discuss all of the exhibitors and programs in detail. In the following it will be described some selected highlights of the program. All of the programs were very interactive, because they wanted to make processes and techniques related to water easily understandable. Hence the whole water sector was depicted by experiments so visitors could do hydrological modeling, drive an excavator or even build the world's largest dandelion-pipeline.

Experiments on the hydrological model of Grunewald (Freie Universität Berlin)

The model presented by the Workgroup Hydrology of the Berlin University illustrates the link between climate change and ground water systems regarding urban areas. The model provides an insight into the undersurface water layer from the Havel straight to Grunewald. Different parameters make it possible to simulate climate change and the extraction scenarios of the water work and their impact on the nature.

Historical water supply and ground drainage in Berlin

With the help of the German Historical Association of Water (DWGH) visitors were able to take a trip into the past of the water supply. First of all, there was an emphasis on the ancient world. Then the Oberharzer Wasserregal was presented which dates between the 16-19 centuries. It is the latest UNSECO World Cultural Heritage admitted in Germany. It was demonstrated, how the water supply was covered on the contemporary level of engineering technique. At the same time pictures showed some early water storage and supply techniques. Visitor could try in practice, how difficult is to transport water with an Archimedean screw and own muscles.

Drinking water treatment in developing countries

Both of the non-profit organizations Viva con Agua and 2aid.org deal with the problem of drinking water shortage in developing countries and they represented their work at the same stand. They organized a funny show jumping course to demonstrate the young visitors of the exhibition how extremely strenuous is to get pure water on many places of the earth. In a competition teams of young students have to solve task, for instance carrying heavy water cans around to get pure water from the contaminated one.

Modeling of precipitation, evaporation and water balance

German Meteorological Agency presented the topic of climate change and they illustrated climatologically dates and facts like precipitation, evaporation and water balance. Most of the exhibits aimed at children older than 14 years. The models explained in detail what would happen if a certain amount of precipitation fell to the earth in a certain time. Nevertheless German Meteorological Agency participated the carrier program of the exhibition.

The longest dandelion-pipeline of the world

The Young Environmental Protectors Brandenburg (Naju) wanted to build the world's longest pipeline system. Children had to merge the stems of the dandelion together. This playful approach made it obvious how complex and expensive is to build up an efficient water supply system. Beyond that NAJU illustrated how important is the usage of recycling paper. Visitors had the chance to produce their own paper.

Picture 8. Interactive demonstrations, I.Vidakovic

Picture 9. A quiz for children, I.Vidakovic

Hall 2.2 Water and wastewater treatment, associations

Picture 10. S.Mogan

In one of the largest halls, hall 2.2, a total of 146 exhibitors from Germany, Sweden, Turkey, Switzerland, France, Italy and China were presented. These companies gave us information about water and waste water treatment (for example: Rabtherm AG; Huber SE; Koch Membrane Systems; Hydrotech AB) and there were also some associations (for example: BDEW: German Association of Energy and Water Industries; Berliner Wasserbetriebe; IAWD). We would like to introduce in this report some interesting companies that we visited in hall 2.2.

Berliner Wasserbetriebe


Picture 11. S.Mogan

Berliner Wasserbetriebe is the largest company and core business of the Berlinwasser Group. Berliner Wasserbetriebe has a long tradition. The first waterworks facility in Berlin went into operation in 1856.

Today the highly-developed Berliner Wasserbetriebe provides 3.7 million people in Berlin and Brandenburg with drinking water. Alongside the supply of water, it is also responsible for the ecological disposal and treatment of wastewater. With its know-how, Berliner Wasserbetriebe is one of the most important players in the international water and wastewater business. In order to ensure the high quality of the drinking water supply and wastewater disposal now and in the future, Berliner Wasserbetriebe have established a certified quality and environmental management system in accordance with DIN EN ISO 9001 and 14001 and an occupational health and safety management system in accordance with OHSAS 18001.

Environmental protection is self-evident at Berliner Wasserbetriebe. By observing environmental aspects as well as the economic and social concerns, they ensure the basis for life for future generations.

IAWD


Picture 12. S.Mogan

The International Association of Water Supply Companies in the Danube River Catchment Area (IAWD) is concerned with improving and safeguarding the water quality of the Danube and its tributaries. IAWD encourages all measures and attempts directed towards avoiding and eliminating all contamination of, and hazards to, the raw water quality in order to ensure reliable drinking water supply. To achieve these goals, all efforts are undertaken to unite the water companies of all countries in the Danube catchment area in IAWD to encourage concentration on the following objectives:

- Developing a uniform, internationally agreed monitoring and investigation programme to safeguard water quality as well as evaluating and publishing the results obtained
- Making the results of this work available to national and international institutions
- Public relations
- Maintaining a regular and continuous exchange of experience between members
- Co-operating closely with other organizations pursuing similar objectives

Rabtherm AG – Switzerland

Picture 13. S.Mogan

After the slogan - ecologically, competently and economically, Rabtherm AG is engaged since March 2000 with the marketing of the patented system Rabtherm - heat utilization from waste water for heating and cooling of buildings -, as well as the development of a comprehensive system, which uses and produces renewable energy. Rabtherm AG supplies a unique product solution and an outstanding technical knowledge. The focus lies especially in the economical, process orientated, as well as in the marketing field.

Their services contain: Rough Analysis, Location / Feasibility study with drains and heat burner (The studies contain the local clarifications drains data (inclusive condition) and

burner data, the calculations of production costs and the cost of the investment), Clarifications with the users, Consultation/Support for conveyance request

Additional services:

- Solutions for drying sewage sludge
- Cooling water in industries as energy source
- Cooling of domestic drinking water
- Snow and ice melt systems for roads
- Airconditioning and cooling in protected oldtown zones (cooling with waste water instead of cooling towers on the roof)

In the market for renewable heat energy RABTHERM strives for a leading position. Thanks to the technical know-how of RABTHERM - it's possible to follow the "recycling" principle and to provide an important contribution to the ecology. With this new energy system approx. 20 per cent of the heating market can be covered profitable and economically on a long-term basis.

Hydrotech AB – Sweden

Hydrotech develops, manufactures and sells high performance microscreen filter systems.

Their systems are used in more than 7000 installations around the world. They are the leading company in the development and manufacture of microscreens. Microscreening is used as a technique for removing particles from all types of liquid flows.

Hydrotech have been in water filtration for over 25 years and are now the World leading supplier of microscreens. The factory sites are located in South Sweden, just across the water from Copenhagen. They are part of Veolia water Solutions & technologies, one of the world's leading companies in the area of water purification.

Picture 14. S.Mogan

Together with their parent company Veolia Water Systems and their network of highly specialized representatives world-wide they are able to offer total solutions for all that water filter needs including, problem identification, Design evaluation, On-site testing, Drawing specifications, Installation, Start-up,

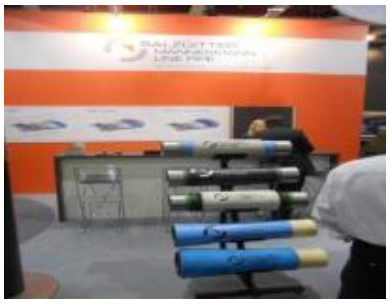
Training, Support, Feasibility, Cost-efficiency tests, Effluent polishing, stormwater, waterworks, process plants, public pools and fish farms are just some of the areas using Hydrotech's water purification filters.

Hall 3.2 Pipeline construction, vitrified clay, cast iron, steel, plastic

Where pipelines are an important element of water distribution infrastructures, many pipelines companies in Wasser Berlin International presented themselves showing their latest's products, especially in the Hall 3.2 .

Good quality pipelines are required in order to maintain the good quality of water after being treated. In addition, percentages of water lost in piping systems due to main line breaks, corrosion and joint leakage should be minimum especially when dealing with water scarce country. Pipelines are subject to natural disasters, such as earthquakes, and such natural hazards could place populations at great risk.

SALZGITTER



Picture 15. J.Alkhatib

This company with its 100 years experience provide Line pipes designed for high operating pressures of a wide range of dimensions and material grades which ensures reliable transportation and distribution of water and other media, in addition, it provides technical advice from the planning desk to the construction site.

NUPIGECO

Is another pipelines company that was in hall 3.2. This company offers pipe and filling systems to convey hot and cold water in various types of installations.

In addition to many other companies like: Schoengen, Egeplast, Eupen and others.

Picture 16. J.Alkhatib

Another important element of any distribution system are manholes. A few companies in hall 3.2 presented manholes in different shapes and qualities.

Reprocovery

Picture 17. J.Alkhatib

A small but interesting company that recycles wastes such as polyester, rubber and other material and offer manholes and other utilities out of these recycled wastes. Some other companies were offering power equipment needed during setting up the distribution system like OERTZEN.

OERTZEN

Picture 18. J.Alkhatib

This company offers power equipment such as: pumps, electrical or combustion engine drives, and other things like valves that regulate water pressure and volume.

Away from pipelines and the electrical equipment needed for their setting, **ACWUA** (Arab Countries Water Utilities Association) was in this hall. This regional association of water supply and sanitation utilities partners with different utilities in the Arab countries to provide good service delivery to their customer.

Picture 19. J.Alkhatib

Hall 4.2 Valves, pumps, geothermic technologies, associations, well sinking

This section offers a wide range of innovative modern technologies in the field of Fittings, Well construction, Pump and Geothermal Associations etc. from different companies from different countries such as Germany, Italy, UK, China and Poland etc.

The items that were shown in these booths can be used from households to big industries working in the water sector. For e.g. companies such as Honeywell GmbH were exhibiting the latest product for the heating circuit, single pipe heating and cooling system, continuous supply of filtered water etc.; whereas companies like BBA pumps offer a wide variety of efficient pumps up to capacity of pumping of water at the rate of 5600 m^3/h. (ref: newsletter by BBA pump, September 2010)

Apart from the innovative technologies, this section also has an interesting way of attracting the viewer.

Picture 20. Small toy crane holding chocolate, B. Bajracharya

Picture 21. Image of animal, B. Bajracharya

To illustrate about the hall, we have randomly chose only few of the companies which participated in this hall among the several others listed below:

Grundfos GmbH

Picture 22. B. Bajracharya

Established in 1945, today Grundfos is represented worldwide by more than 50 companies with regional and local offices worldwide sales and service organization.

Grundfos has consistently ranked among the most innovative companies in a rapidly changing world of technology, opened up new ways while improving the basic materials.

This company provides service and product for ground water extraction, drainage, waste management and cleaning etc.

(Ref: Grundfos homepage)

PRAKLA Bohrtechnik GmbH

Picture 23. B. Bajracharya

PRAKLA Bohrtechnik is widely known for manufacturing universal drilling rigs under the condition of high quality demands. Besides drilling rigs for all well-established drilling method, they also offer a crawler mounted drilling rig for geothermal drilling. Moreover, they also manufacture special drilling rigs as per customer's requirement. All drilling rigs and auxiliary equipment is manufactured at their locations in Germany. (Ref: Wasser Berlin virtual market place website)

Von Roll hydro

It is considered to be the leading Swiss provider of products and services for water and gas supplies.

They supply piping and shut-off systems, fire hydrants, street covers and systems for continuous leak detection and monitoring of water quality and also support engineers and developers in project development and service organizations in the maintenance. (Ref: Von Roll Hydro homepage)


Picture 24. B. Bajracharya

NOVA SIRIA SRL

Picture 25. B. Bajracharya

NOVA SIRIA has 75 years of experience in manufacturing large size and tailor-made fittings in Italy. The company exports in 25 countries all around the world. They offer a wide production range in the fields of construction and maintenance of delivery piping systems for water, gas, oil and pressure pipelines in general and use technologically advanced materials (in particular, anti-corrosion linings). (Ref: NOVA SIRIA SRL homepage)

Hall 5.2 Water treatment, associations, Internationals Forum / Measuring regulating and analysis technology

Picture 26. A.**Atkari**

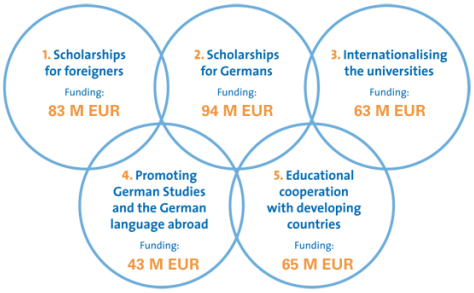
Hall 5.2 had 87 exhibitors from different countries such as Germany, Austria, China, USA, Netherlnds, United Kingdom, Turkey, Poland, Bulgaria and Taiwan. There were companies which provide engineerins services such as RBS wave GmbH and ZWT GmbH. Further more there were some research companies such as ITT-FH Köln, BEW GmbH and associations and institutes, for example the German Association for Water, Wastewater and Waste (DWA) and the German Water Partnership.

DAAD (German Academic Exchange Service)

Picture 27. A.Atkari

The German Academic Exchange Service (DAAD) is the largest funding organisation in the world supporting the international exchange of students and scholars. Since its foundation in 1925, more than 1.5 million scholars in Germany and abroad have received DAAD funding. Its budget is derived mainly from the federal funding for various ministries, primarily the German

Federal Foreign Office, but also from the European Union. It supports:



-The Internationalisation of German universities

-German studies and German language abroad

-Assists developing countries

It maintains contact with and provides advice to its main partner countries on every continent via a network of 14 regional offices and 50 information centers.

The DAAD runs over 250 programmes, through which it funds more than 67,000 German and foreign scholars worldwide per anum.

DWA (German Association for Water, Wastewater and Waste)

Picture 28. A.Atk**ari**

The German Association for Water, Wastewater and Waste is a specialist technical and scientific organsation and counts approximately 14,000 members. The members represent the specialists and managers of municipalities, universities and polytechnics, engineering offices, authorities and industry. It is a politically and economically independent association which promotes research and development. The DWA supports sustainable water-resources management, and has established a discussion forum for ideas and the exchange of opinions and provides expert advice for legislative bodies and policy makers. The DWA develops technical rules and standars, provides training and education programmes and publishes highly specialised publications and materials for public relations work in water-resource management, wastewater, waste and soil conservation.

WILO SE

WILO SE is one of the leading manufacturers of pumps and pump systems for heating, cooling and air-conditioning technology and for water supply and sewage disposal.

Picture 29. A.Atk**ari**

German Water Partnership

Picture 30. A.Atk**ari**

The fundamental aim of the German Water Partnership is to make the outstanding German engineering, know-how and experience in the water sector easily available to partners and clients all over the world.

German Water Partnership

Hall 6.2 Measuring, regulating and analysis technology

Badger Meter Europe GmbH

Is a wholly owned subsidiary of Badger Meter, Inc., USA, based in Milwaukee, Wisconsin in 1905 with sales of more than 350 million Euros and the dedication of more than 1200 employees all around the world, Badger Meter has earned an international reputation as leader in the development and manufacture of flow management solutions. Its products are used to measure and control the flow of liquids, including water, oil and chemicals.

Picture 31. O.Sacuiu

Badger Meter offers a complete line of integrated metering systems and instrumentation technologies:

- Electromagnetic flow meters
- Turbine meters
- Nutating disc meters
- Impeller meters
- Ultrasonic flow meters
- Oval gear meters
- Coriolis mass meters
- Fluid management system
- Small control valves

SebaKMT

Picture 32. O.Sacuiu

Is the world leader in the design and manufacture of portable, fully equipped auto laboratories and advanced technology for diagnosis, fault location and location of power cables and communication routes as well as of intelligent systems for monitoring and locating leaks in water pipe networks. At the moment the company has subsidiaries and offices in over 120 countries.

Their products allow the quick and accurate fault and losses location and give a clear and accurate diagnosis for the utility networks. In order to be able to make best use of leak detection technology, one needs precise information about the pipe network and its components: division of the pipe network into defined zones, hydraulic pipe network calculations, definition of flow measurement points and dimensioning of measurement equipment, the use of data loggers with optional remote transmission technology for quick access to the data, identification of the zones with the largest water losses, the use of pre-location technology in the identified problem zones, location and repair of the leaks.

With SebaKMT's leak detection products, everyone has a complete system for reliable location and thus for efficient repairs.

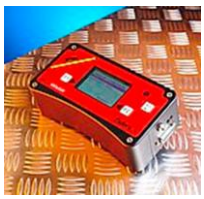
ESDERS

Headquartered in Haselünne/Germany, Esders GmbH has served the gas, water and wastewater industries since 1989, developing and supplying outstanding measuring equipment, software and system solutions.

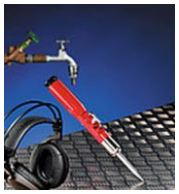
Products: Software, Gas technology – pipe network, installation, pressure-measurement, water technology, pressure measurement and leak detection.

High-pressure pumps for the fast and automatic configuration

Electronic pressure measurement box for pressure tests to gas and water pipes



H2 - Waldi for easily locating even small leaks in water and heating systems



Acoustical leak detection system

DIEHL Metering

The company has shaped the history of metering through the development and production of water and heat meters. Highly accurate meters of excellent quality still form the basis of the comprehensive spectrum of products and services provided today by the company.

The meters for water, thermal energy, gas and electricity cover the whole of today's energy spectrum – and include integrated communication. The focus has been put on developing communication capability of meters for many years and innovative ultrasonic technology and electronic components for automatic meter reading over radio or M-Bus have always been produced in-house.

The complete Smart Metering infrastructure can also be supplied from one source. Individual system solutions tailored to the needs of customers and backed by many years of project management experience are offered. Even software for reading, visualization and management of energy data is developed solely by the Group.

The extensive spectrum of products and services helps water and energy suppliers all over the world to offer their consumers much more service and convenience and at the same

time make their own internal processes considerably more efficient, specifically reduce power peaks and distinctly cut time, work and costs.

Some of the other companies that also provide measuring, regulating and analysis technology and were, this year, at the Water and Wastewater Trade Fair are:

TROTEC – provides technological innovations for leak detection in drinking water system

JUMO – provides all-in-one solutions – from product development to production, services & customer support of instruments for measuring, regulating, analyzing.

ARAD Group – specializes in innovative water measurement technologies. Today the ARAD Group of Companies offers the most advanced and fully integrated water management system in the world.

RITTMEYER – develops and delivers state-of-the-art measuring and process control technologies as well as precise measuring systems that successfully operate worldwide

WTW - ready-to use systems for monitoring the quality parameters in drinking water

NZR a company in charge of development and design, production, maintenance and repair as well as calibration of measurement instruments for electricity, water, heat and gas.

Note: the products and exhibitors mentioned in this report were chosen randomly with no intention of advertisement, due to the impossibility to write about all 696 exhibitors.

DWA - Young Water Professionals

2011

Report of Group II

Laurel ThomasArrigo

Hani Al-Koli

Urszula Mikolajczyk

Claudia Cotoara

Shakun Paudel

Muhammad Khalifa

Eva Fetter

Thomas Pochwyt

Report

Challenges of Waterworks

1. Introduction

The Public german water supply sector is organized into regional or local monopolies operated under a concession from the local authorities and cities which are responsible under the German constitutions for ensuring water supply to their citizens (Hirner 2001). Among the 1,266 larger water service providers about 15 percent are municipal utilities under public law (Eigenbetriebe); 16 percent are inter-municipal utilities (Zweckverbände); 63 percent are utilities under private or mixed law either under private, public or mixed ownership.; and 6 percent are water and land associations (Wasser- und Bodenverbände). Only 3.5 percent of service providers were entirely privately owned.

The Berliner Wasserbetriebe, a subsidiary of the holding company Berlinwasser, is an example of a public-private partnership providing water and sanitation services in Germany's capital Berlin. In the year 2009 Berlinwasser had 5.234 employees. The shareholders of the Berlinwasser Holding are the state of Berlin with a controlling share of 50.1% and the companies RWE and Veolia Environment, each with 24.95%. Berlinwasser serves 3.4 million people in Berlin and 300.000 inhabitants in the surrounding region with water and 3.9 million people with sanitation services (www.bwb.de). Berlinwasser also provides surface water treatment services for the Tegeler Lake and bank filtration to refill the Grunewald lakes.

Drinking water is produced in nine water works which are located throughout Berlin.

Fig 1. Waterworks in Berlin (www.daniel-buchholz.de 2011)

Drinking Water Production in Berlin

1. Deep Wells: Drinking water in Berlin is produced from groundwater. Approx. 700 deep wells are in operation. The wells are between 30 m and 170 m deep and supply between 40 m^3 and 400 m^3 raw water per hour (Fig 2).

2. Aeration System: Through nozzles oxygen is sprayed in the aeration chambers or passed over weir overfalls so that it can absorb the oxygen in the air and replenish itself.

3. Reaction System: Dissolved iron and manganese in the raw water reacts with the water and forms flocs, which then settle to bottom of the reaction tanks.

4. Rapid Filter system: The remaining iron and manganese flocs are removed in the rapid filter system (sandfilter).

5. Clean Water Tank: The clean water tank is a water storage tank and serves to meet fluctuating supply needs and balance demands.

6. Pumping station: The clean water pumps (diesel or electric pumps) pump drinking water to the consumers.

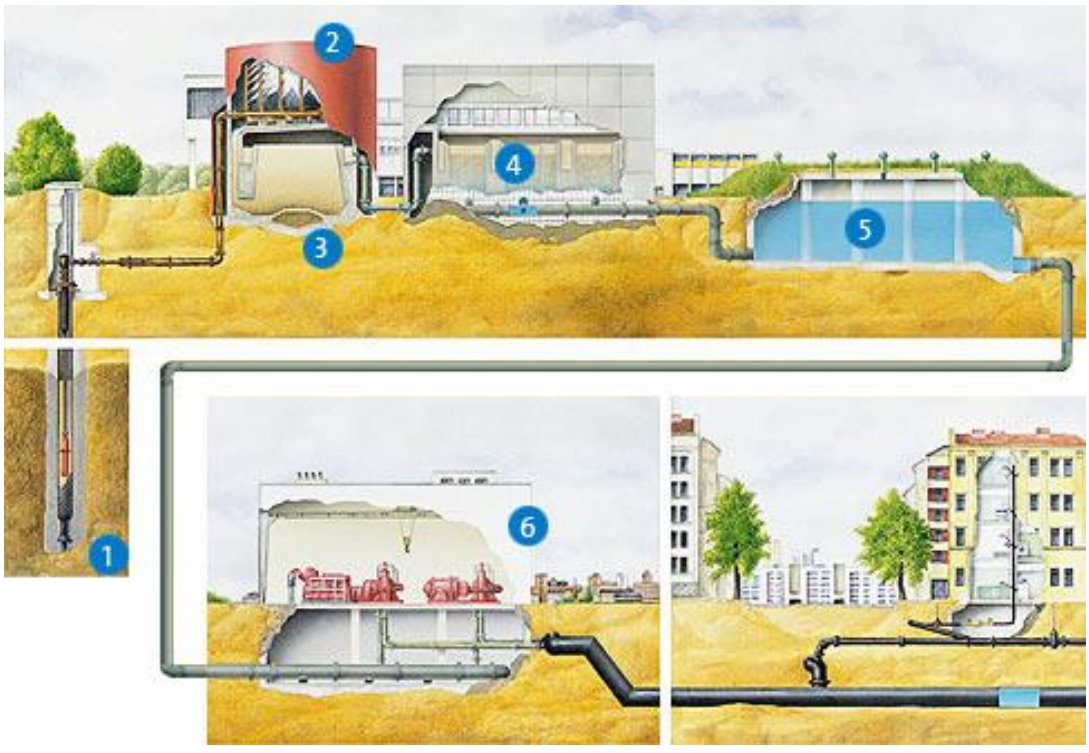


Fig. 2: Drinking water prdoduction Berliner Wasserbetriebe (www.bwb.de)

2. Necessity for water disinfection

Clean water is one of the most important needs of our bodies. Today, the World Health Organisation (WHO) estimates that more than a billion people lack reliable access to clean drinking water. Untreated or inadequately treated drinking water supplies remain the greatest threat to public health, especially in developing countries, where nearly half the population drinks contaminated water (Dufour et al., 2003). In these countries, diseases such as cholera, typhoid and chronic dysentery are endemic and kill young and old alike (SANDEC, 2002).

Disinfection is an important step in ensuring that water is safe to drink. It eliminates microbiological substances such as bacteria, viruses, and cysts to protect human health and the environment. Bacteria and viruses can exist in both surface water and groundwater, whereas parasitic protozoa can be found mainly in surface water (Deere et al., 2001).

Some methods are more effective than others when targeting specific species and some methods have adverse side-effects such as creating disinfection byproducts and halo acetic acids whose health effects are unknown. It is generally understood that no single disinfection technology can meet all the treatment objectives.

Primary methods of disinfection are chlorination, chloramines, ozone, and ultraviolet light. Other disinfection methods include chlorine dioxide, potassium permanganate, and nanofiltration. The treatment choice depends on a number of factors that are site specific and for which adjustments must be made depending on raw water quality. Source water quality and turbidity levels, water temperature and pH level, and incidence of pathogenic contaminants must be taken into account for treatment decision making (WHO, 2009).

Water disinfection by chlorination, massively introduced worldwide in the early twentieth century, set off a technological revolution in water treatment. Its success are its easy accessibility in almost all of the world's countries, reasonable cost, capacity for oxidation, and residual effect (WCC, 2008). All of this allows it in a fairly simple way to ensure the harmlessness of drinking water from the moment of its production to its use, thereby benefiting not only small systems, but also large cities with extensive distribution networks.

The WHO drinking water standards state that 2-3 mg/L chlorine should be added to water in order to gain a satisfactory disinfection and residual concentration. The maximum amount of chlorine one can use is 5 mg/L. For a more effective disinfection the residual amount of free chlorine should exceed 0,5 mg/L after at least 30 minutes of contact time at a pH value of 8 or less (WHO,2010).

UV devices are also effective against bacteria, viruses and protozoa, add nothing to water and produce no taste or odour; in addition, only a few seconds' exposure to UV light is required if the water is clear. They do not, however, ensure the safety of the water beyond the point of application (EPA, 2006).

Disinfectants to remove contaminants can also be harmful to humans in and of themselves. Use of disinfectants has led to the development of two additional water safety standards: maximum residual disinfectant level (MRDL) and maximum residual disinfectant level goal (MRDLG). In the chlorination process for example, chlorine reacts mainly with natural water constituents to produce a complex mixture of by-products, including a wide variety of halogenated compounds, which may have carcinogenic effects to humans (Thompson et al., 2007).

Just as with contaminant level standards, it is not always realistic to reach the residual disinfectant goal. In response, the MRDL offers a balance between human safety and available purification resources.

3. Arsenic in groundwater – A world problem

In the last decades, the awareness of the problem of arsenic contamination of groundwater and its health and social impacts has increased. This problem is well-known in many countries around the world. Hundreds of millions of people, mostly in the developing countries, use drinking water with high arsenic concentrations exceed the recommendation of the World Health Organization (WHO). Current part of our report includes a brief summary of the arsenic contamination of groundwater.

Arsenic (As) is a semi-metal element occurred naturally in rocks, soil, water, air, plants and animals. It can be further released into the environment through natural activities such as volcanic activities, erosion of rocks and forest fires, or through human activities (U.S Environmental Protection Authority 'EPA', 2010).

Along with the increasing in groundwater extraction, to cover the increasing demand for water for drinking, the concern of healthy water has increased due to the chemical contamination with pollutants and their adverse impacts on the human health. One of the greatest concerns in the groundwater contamination is the presence of arsenic. Arsenic and its health impacts have been recognized and detected in 23 regions in different regions of the world (Rahman et al., 2005). It's a global problem, occurs in almost every region in the world (Fig. 1): Asia (Bangladesh, India, Vietnam, Cambodia, China, Taiwan, Thailand and Korea); North America (USA); South America (Chile, Argentina); Europe (Netherland, Russia); and Australia (Naidu et al., 2006, Smedley, 2003).

According to the United States Environmental Protection Agency (EPA), drinking water with 10 parts per billion (ppb) arsenic may cause 1-6 additional cancer deaths over the lifetime exposure of a group of 10,000 people. While other organizations estimates that risks to be about 10 times higher (MDE, 2007). The arsenic contamination of groundwater is now a world problem. There are over 137 million people in more than 70 countries are probably affected by arsenic poisoning of drinking water (Gupta et al., 2008). The worst place on the Earth is Bangladesh, where 30 million people are suffering from the negative impacts of this problem.

Long-term exposure to arsenic contaminated drinking water increase the risk of cancers of the skin, bladder, kidney, liver and lung. In addition it may cause thickening and discoloration of the skin, nausea and diarrhea, decreased production of blood cells, abnormal hearth rhythem, blood-vessel damage and numbness in the hands and feet. Recently, arsenic exposure has been associated with the development of diabetes mellitus (Knobeloch et. al., 2006).

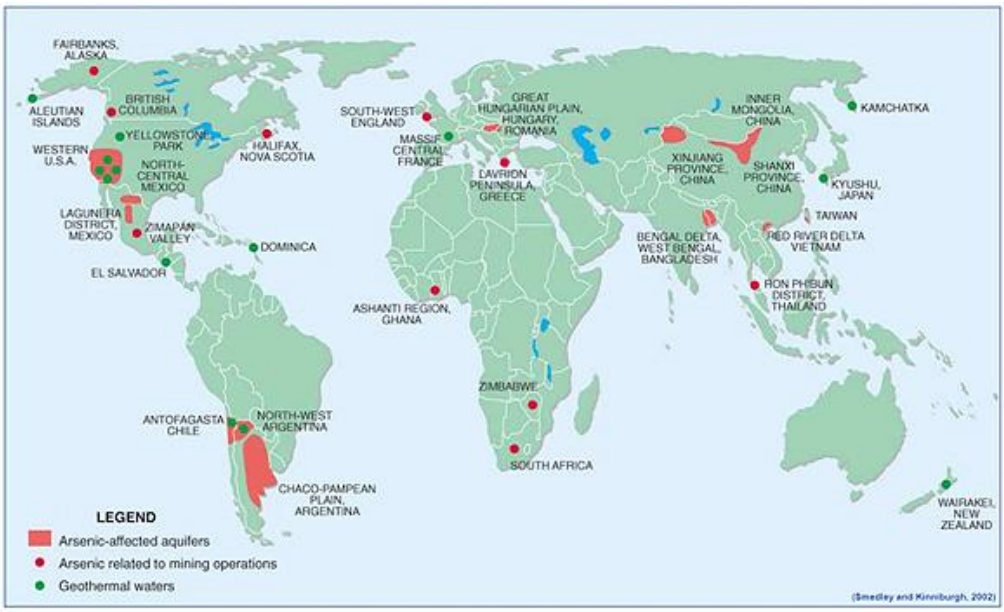


Fig. (3): A map showing the locations of arsenic contamination in the groundwater around the world (Source: www.1.bp.blogspot.com)

There are many sources for arsenic in groundwater. Arsenic can be derived by a wide range of activities: by oxidation of arsenic bearing minerals (e.g. arsenopyrite), industrial activities, mining and power generating from geothermal resources.

Human exposure to arsenic can cause both short and long term health effects. Short or acute effects can occur within hours or days of exposure. Long or chronic effects occur over many years. Short term exposure to high doses of arsenic can cause adverse health effects such as stomach pain, nausea, vomiting, diarrhea and numbness in the hands and feet and hyperkeratosis. While a long term exposure to arsenic has been linked to cancer of the bladder, lungs, skin, kidneys, nasal passages, liver and prostate (EPA, 2010).

4. Assessment of Technologies for the Removal of Pharmaceuticals and Personal Care Products in Drinking Water Facilities

A quite recently and important discovered issue regarding drinking water is consistence of pharmaceutical substances in it. The limited quantity of unpolluted water available for

future use as a resource for drinking water production is one of the major challenges faced around the world, including Europe. Currently, many communities in Europe and world-wide use water resources for drinking water production that contain a significant portion of wastewater.

Until recently the focus of wastewater treatment has been on the elimination of organic trace pollutants, although drinking water has been indirectly affected by prescription and non-prescription pharmaceuticals and care products (PPCs). A study made in 2004i shows that approximately 3000 different pharmaceutical ingredients are used in the EU today, including painkillers, antibiotics, antidiabetics, beta-blockers, contraceptives, lipid regulators, antidepressants, antineoplastics, tranquilizers, impotence drugs and cytostatic agents. These are all substances that are frequently transformed in the body and enter the raw sewage via urine and feces and by improper disposal. Other type of substances that indirectly reach the drinking water are the ones contained in the personal care products such as soaps, shampoos, liquid bath admixtures, skin care products, dental care products, sun screen agents, hair styling products etc., which are used in enormous quantities throughout the world. In the early 1990s their annual production exceeded 550,000 t for Germany alone.

Taking into consideration the fact that PPCPs, frequently polar and persistent organic compounds that possess extremely high biological potency, such as estrogens, end up into the indirect potable water the future focus should be on an efficient removal of all potential harmful constituents from water. The issue of PPCPs presence in water should be approached as well. However, these chemicals (estrogens, parabens, isothiasolin derivatives, methylbenzyliden camphor, etc.), recently detected in surface and drinking, water are not considered in the Drinking Water Directive 98/83/ EC. Also at the 'Kick-Off' meeting for revising the Drinking Water Directive on 23rd October 2007 in Brussels these matters weren't stated on the list of problematic matters or as chemical parameters for water quality tests.

The removal efficiency of existing wastewater treatment must be optimized and new technologies need to be developed.

5. Biofilm development in the drinking water supply system

The value of the developed drinking water supply facilities and of their networks is significant and therefore an asset management is needed to handle with them. At the same time, the present state of the water supply networks is deteriorated and neglected owing to the omission of the reconstruction works in some of the eastern-European countries. The consequence is not only a loss in the common wealth but also could cause operational problems. The lack of reconstruction significantly enhances the maintenance and troubleshooting costs, in extreme cases could endanger the service (e.g. operational malfunction, environmental damage). Further problems could be the shortcoming (in the course of the design, implementation and operation) in the field of the protection against the corrosion.

This problem is heightened by the fact that the basic conditions (incomplete or total lack of the networks' inventory, errors in their state assessment, lack of the GIS (Geographic Information System) based solutions appropriate for the economical calculations like diagnostics, assessment of losses, evaluation of the efficacy) of the design of the reconstruction are not ensured.

Common problem in Hungary (as in other large cities in the world) that the water coming out from the drinking water treatment plant undergoes quality changes until reaches the consumers [1]. One of the reason for it that in the treatment plants (post)disinfection technologies are not applied (or in small amount), therefore the added disinfectant is consumed in short time so in a part of the network there's no disinfection. The other reason is that a bulk of the drinking water supply networks has got excess capacity comparing to the real consumption (due to the oversize of networks for ensuring the firewater supply and the decline of the consumption owing to the increasing service fee), so the residence time in the network could be more than 24 hours. Due to the long residence time and the insufficient disinfectant, significant amount of biofilm could be formed onto the inner wall of the pipes.

Microorganisms in biofilms can include bacteria (including coccoid round, rod-shaped, filamentous, and appendaged bacteria), fungi, and higher organisms like nematodes, larvae, and Crustacea. Recently, researchers have shown that viruses and parasites like Cryptosporidium can be trapped in biofilms. Although viruses and Cryptosporidium do not grow in a biofilm, they can attach to biofilms after a contamination event [2].

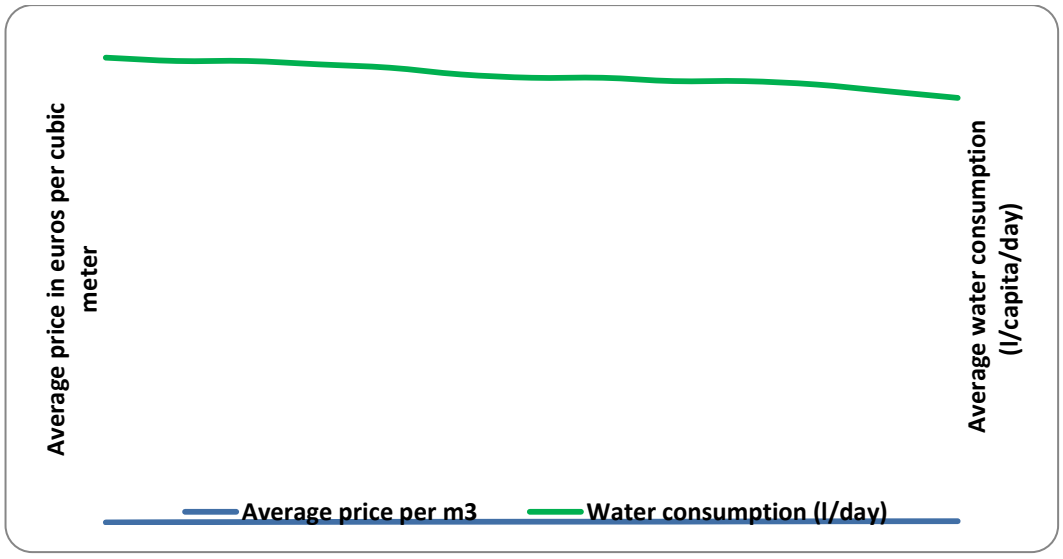
Some microorganism can adhere directly to the pipe surface via appendages that extend from the cell membrane; other bacteria form a capsular material of extracellular polysaccharides (EPS), sometimes called a glyocalyx, that anchors the bacteria to the pipe surface. The organism take advantage of the macromolecules attached to the pipe surface for protection and nourishment. The water flowing past carries nutrients that are essential for the organism' survival and growth. Biofilms are dynamic microenvironments, encompassing processes such as metabolism, growth, and product formation, and finally detachment. The rate of biofilm depends on the physiochemical properties of the interface, the physical roughness of the surface, and physiological factors of the attached microoranisms. Sheer forces generated by fluid velocity and possible effects of disinfectants on EPS may be important in the release of biofilms from surfaces. The pieces of biofilm released into the water may continue to provide protection for the organisms until they can colonize a new section of the distribution system [3].

The peeled off biofilm not only means esthetical and odour/taste problems but also presents risk to human health (pathogen microorganisms at the consumer). Moreover, the presence of the biofilm could decrease toward the concentration of the disinfectant in the network. Therefore, it is important to thoroughly flush the distribution system to remove these organisms following a contamination event. Another preventive solution could be an appropriate asset management, which could help to carry out the needed reconstruction works. A well maintained drinkingwater supply system could decrease the risk of biofilm formation throughout minimizing the possibility of groundwater infiltration trough leaks and enhanced biofilm adherence to an eventually corroded surface.

6. Price and Quantity Issues in water supply

Water pricing strategy is an economic tool, which might influence the water use pattern of consumers. Price increase tends to reduce the water consumption and vice versa reflecting inversely proportional relationship of price and consumption. Charging system of water supply in Germany is legally bound by a cost coverage principle through the Municipal Charges Acts. This act enforces water supply utilities to follow equivalence and cost coverage principles to fix the charge to its customers. As such, charges must not be significantly above the value of the service for the citizens irrespective of the cost of the service they provide and all costs occurred in water supply must be covered by the charges (ATT, BGW, DWA, VKU (2005)).

Water tariff statistics of Germany reflects that the price of water is constantly increasing every year, as a result water consumption per capita per day has been significantly reduced (see fig 1). Average price of water per cubic meter and per capita consumption per day in 2002 was € 1.7 and 134 l/s respectively; this figure in 2007 increased to € 1.85 and 128 l/s in 2007. This exemplifies water pricing as a successful strategic tool to practice sustainable water use.



Data source: BDEW water tariff statistics, 2007 (cited in Wackerbauer, 2009) & Schleich and Hillenbrand, 2007.

Reduced water consumption on the other hand has implications to the business of water companies. However, the balanced charging system is believed to meet the costs of the service while encouraging customers to the efficient water utilization to achieve the goals of the principle of cost coverage and equivalence.

7. Network Management

As technological advances in efficient urban waterworks system techniques leads to the widespread availability of drinking water in urban and rural settings, it simultaneously becomes apparent that attention is often lacking in maintaining and improving methods of water transportation. Aging and decaying pipe systems often lead to monetary losses from non-revenue water and outdated network maps make locating and fixing pipe leaks a time consuming effort. Moreover, proper billing of water usage is essential to effective network management. Berliner Wasserbetriebe, Berlin's primary drinking water source, manages a successful water transportation network, resulting in low non-revenue water losses.

Varying vastly from one country to another, non-revenue water loss rates range from 4% to upwards of 40%. Non-revenue water losses in the Berlin area water transportation network are less than 5%, a relatively low percentage considering the vast network of pipes connecting the 9 Berliner Wasserbetriebe plants to the consumer extends 7,800 kilometers. Aided by computer network monitoring systems surveying water flow, waterworks staff members are notified of unusual flow changes and are able to locate leaks quickly. Yearly, 20,000 repairs are made on servicing existing pipes, including fixing burst pipes. Moreover, continual improvements to existing pipes occur year-round. With the average age of water mains in the Berlin area at 52 years, careful examination of the oldest pipes, as well as cleaning and reinforcing them with cement, is a year-round necessity.

While maintenance of the physical network of pipes and water mains is essential, proper metering of water usage is equally important. Connecting the main water line to an

individual consumer, house connection pipes and meters monitor the amount of water used per individual household, establishing the monthly water usage and thus the monthly bill, per household, for water use. Additionally, monitoring of individual water meters prevents water theft and can also detect leaks in the house pipes. In Berlin, meters are checked and serviced by Berliner Wasserbetriebe, with nearly

50,000 water meters replaced yearly.

Necessary to maintaining efficient functionality of the Berliner Wasserbetriebe is the extensively mapped and monitored network system. Continual surveillance of flow rates, combined with easily accessible network maps, enables staff workers to quickly resolve problems, thus speeding the repair time and, in turn, lowering the total water lost due to pipe network leaks. This, combined with successful metering of individual water usage enables Berlin to enjoy some of the lowest non-revenue water loss rates.

8. Ground Water depletion

The importance of groundwater for the existence of human society cannot be overemphasized. Groundwater is the major source of drinking water in both urban and rural in many countries. Being an important and integral part of the hydrological cycle, its availability depends on the rainfall and recharge conditions. Till recently it had been considered a dependable source of uncontaminated water.

Groundwater is the major source of drinking water in Yemen.

Many problem faces Yemen in water sector specially the rapidly depletion of ground water table.

Sana'a basin considered one of the basin which is going to be dry during the coming years.

water crisis in Sana'a basin

According the studies, the number of water wells drilled in Sana'a basin until 2002 are 13,425 including 7,963 productive water wells and the basin stretches over a total area of 3,200 km2.

Jihaf on of the specialist who made reports speaking about the depletion of Sana'a basin are inauthentic, at least, during the set dates including 2008, 2010 and 2022 which were respectively put by the Russian team, the Yemeni government and the Japanese team respectively.

Qat is responsible

Sana'a, with a population of 1,747,627, is growing at an even higher rate as people move from the rural areas to the city. The population increase raises demand for water for drinking and growing food. Yemen is one of the world's poorest countries. 60% of the people work as farmers.

There is no question that Yemen is running out of water and that qat crops are consuming most of the dwindling supply. The direst estimates predict that underground aquifers will dry up in as little as ten years

Agriculture in the Sana'a basin area accounts for 80% of water demand. Cultivation of qat (a tree that has leaves that are chewed as a stimulant in Yemen) and grapes (a cash crop) consume the majority of the water.

Besides population growth, another reason for the increase in water use is the change from traditional farming and water management methods suitable for the region to modern

farming techniques such as powerful water pumps which allow people to withdraw much more water.

Sana'a's aquifers are dropping at a rate of about 20 feet per year. If this rate continues they will be depleted by the end of decade. The groundwater is used in irrigated agriculture, industry, and households. Due to low rainfall, the groundwater does not recharge at a rate that can keep up with current demand and is therefore a (mostly) nonrenewable resource. In the Sana'a region farmers and the city are competing for water.

Depletion reasons

the reasons for overuse of groundwater are:

• Unclear water rights and thus unregulated extraction;

• Fuel subsidies and low import duties on agricultural equipment;

• High returns on cash crops;

• Inefficient irrigation practices.

Suggested solutions

In order to address water supply issues, the Yemeni government has prohibited the drilling of new wells without a permit and prohibited the establishment of new industries that consume large amounts of water. However, this has not been enough to stop depletion of the city's aquifers. Some other suggested solutions are to bring water from somewhere else, such as coastal desalination plants, or to relocate the capital. Some solutions suggested by UNEP/WHO report were to reuse wastewater in the city and to conserve agricultural water.

References

- ATT, BGW, DWA, VKU, 2005, “Profile of the German Water Industry 2005”, Bonn.

- Wackerbauer, J., 2009, “The Water sector in Germany”. Working paper CIRIEC No. 11.

- Schleich, J. and Hillenbach, T., 2007, “Determinants of Residential Water Demand in Germany”. Working paper on sustainability and innovation, No. S 3, Fraunhofer Institute systems and Innovation Research.

- Innovation policy and present state of the public works of urban water management in Hungary. (2011) Fülöp R., Fetter E. Pollack Periodica Vo. 6. No. 1. Pages 117-129

- Identifying Future Drinking Water Contaminants. (1999) 1998 Workshop on Emerging Drinking Water Contaminants, National Research Council, Page 207
- http://www.nap.edu/openbook.php?record_id=9595&page=207

- Control of biofilm growth in drinking water distribution system. (1992) EPA, Seminar Workshop Publication, Pages 3-4
- http://www.p2pays.org/ref/15/14291.pdf

- Deere, D., Stevens, M., Davison, A., Helman, G., Dufour, A., 2001. Management Strategies. In: Water Quality: Guidelines, Standards, and Health. Assesment of risk and risk management for water- related infectious disease. IWA Publishing, London. pp.257-288.

- Project Poseidon, Contract No. EVK1-CT-2000-00047, coordinator: Dr. Thomas Ternes.

- Dufour, A., Snozzi, M., Koster,W., Bartram, J., Ronchi E., Fewtrell L., 2003. Assessing microbial safety of drinking water: Improving approaches and methods. Available on line at : http://www.who.int/water_sanitation_health/dwq/9241546301full.pdf

- Daughton Ch.G., Ternes Th. A. (1999) Pharmaceuticals and Personal Care Products in the Environment: Agents of Subtle Change? Environ. Health Perspect. 107, 907-938.

- EPA, 2006. Ultra Violet disinfection guidance manual for the final long term to enhanced surface water treatment rule. Available on line at : http://www.epa.gov/ogwdw000/disinfection/lt2/pdfs/guide_lt2_uvguidance.pdf

- SANDEC, 2002. Solar Water Disinfection. A guide for the application of SODIS.
- Available on line at : http://www.sodis.ch/methode/anwendung/ausbildungsmaterial/dokumente_material/manual_e.pdf

- Thompson, T.,Fawell, J., Kunikane, S., Jackson, D., Appleyard S., Callan, P., 2007. Chemical safety of drinking-water: Assessing priorities for risk management.
- Available on line at : http://whqlibdoc.who.int/publications/2007/9789241546768_eng.pdf

- WCC, 2008. Drinking water chlorination. World Chlorine Council.
- Available on line at : http://www.worldchlorine.org/publications/pdf/WCC_Policy_Paper_Water_Chlorination.pdf

- WHO, 2009. Guidelines for drinking-water quality. Policies and Procedures used in updating the WHO Guidelines for Drinking-water Quality.
- Available on line at : http://whqlibdoc.who.int/hq/2009/WHO_HSE_WSH_09.05_eng.pdf

- WHO, 2010. Guidelines for drinking water quality.

- Available on line at : http://www.who.int/water_sanitation_health/WHS_WWD2010_guidelines_2010_6_en.pdf

- EPA (2010). "Basic Information about the Arsenic Rule. United states Environmental Protection Agency." Available online at: www.water.epa.gov/ lawsregs/rulesregs/sdwa/arsenic/basic-information.cfm (07.05.2011).

- Rahman, M., Sengupta, M., Ahamed, S., Chowdhury, U., Hossain, A., Das, B., Lodh, D., Saha, K., Pati., S., Kaies, I., Barua, A., and Chakraborti, D. (2005). "The magnitude of arsenic contamination in groundwater and its health effects to the inhabitants of the Jalangi – one of the 85 arsenic affected blocks in West Bengal, India." Science of the Total Environment 338: 189 – 200.

- Naidu, R., Smith, E., Owens, G., Bhaattacharya, P., (2006). "managing arsenic in the environment: from soil to human health.", CISRO Publishing, Australia.

- Smedley, P., (2003). "Arsenic in groundwater – south and east Asia". In: Alan, H., Kenneth, G., Welch, Stollenwerk, (ed). "Arsenic in groundwater." Kluwer Academic Publishers, USA, 179-209.

- MDE (2007). "Health information about arsenic in drinking water". Available online at: www.mde.state.md.us (08.05.2011)

- Gupta, B., Bandopadhyay, A., and Mukhopadhyay, S., (2008). "Subterranean Arsenic Removal (SAR) Technology for Groundwater Remediation." Available online at: www.insiturarsenic.org (07.05.2011)

- Knobeloch, L., Zierold, K., and Anderson, H., (2006). "Association of arsenic-contaminated drinking-water with prevalence of skin cancer in Wisconsin's Fox River Valley". J. Health Popul. Nutr., 24 (2): 506-213

- Berliner Wasserbetriebe. “Water for Berlin: clear – clear information,” www.bwb.de (May 8, 2011).

- Bill Kingdom, Roland Liemberger, Philippe Marin, “The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries.” Water Supply and Sanitation Sector Board Discussion Paper Series. Paper No. 8, December 2006.

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DWA - YOUNG WATER PROFESSIONALS'PROGRAMME 2011 -

Report of Group III

Water Operators Partnerships – National and International Experiences – Working Together

Group 3 : AL-Marji, Ronza; Awol, Frezer S.; Kovacs, Peter; Mulleck Padilha, William R.; Müller, Maika; Pacala, Adina; Tsegu Fesehaye, Kidane; Xiao, Lu; Zankov, Anton. Report Developed during the DWA-YWP 2011 program, under the coordination of Ms. Laura Langel and Ms. Gabriele Martens.

14 of May, 2011

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Introduction

This year the 10th Young Water Professionals Program (YWPP), organized by the DWA, German Association for Water, Wastewater, and Wastes , took place from 1st – 6th of May in Berlin, and gave the opportunity to 54 young professionals to have access to many events, among them the Wasser Berlin International, the International Forum and the Blue Planet Berlin Water Dialogues 2011.

Figure 1: 2011 DWA- Young Water Professionals

During this week, the YWP attended a variety of events, including several symposiums, workshops and presentations by companies and organizations. The first official event of the week was the Water Operators Partnerships (W.O.P.) – National and International Experiences – Working Together, a discussion forum consisting of numerous presentations, where tomorrow's challenges in water sector were seen in the light of national and international cooperation partnerships, and case studies of development opportunities were presented and discussed. This will be the focus of this report.

In order to review and summarise the event, a group of 9 participants from the YWP was formed (group 3). Interesting enough, the fact that all members of the group were from

different countries and different backgrounds gave the group such diversity of opinions and ideas that the debate resulted in a very well balanced understanding of the topic discussed.

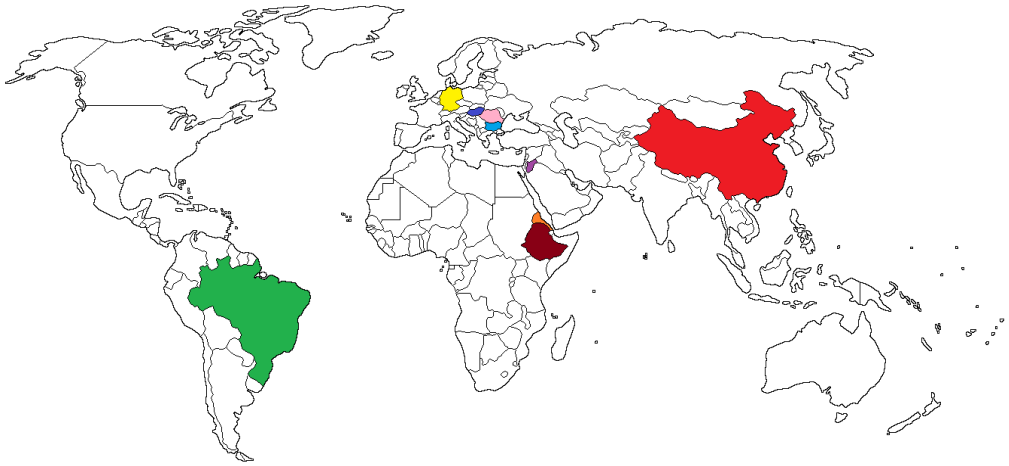


Figure 2: Group 3 – Origin Countries.

As it was said, this report aims to summarize the understanding gained as a result of presentation of W.O.P.s. In the context of the report, general information about W.O.P.s will be given, followed by summaries of projects presented and finalized by focusing on a specific case study, "The Munich experience: Know-How-Transfer to Romania ", that was chosen to be further studied. At the end of the report a brief general conclusion is included.

Assignment

1. W.O.P.s : Concepts, processes and goals

1.1 Concepts

The Water Operators Partnership (W.O.P.s) is a program that seeks to promote not-for-profit partnerships and good practices between water operators, and between operators and any other interested party related to the water and sanitation sector.

WOPs provide water operators that require mentorship on specific technical topics with the guidance of experienced and high-performing peers. All partnerships are results-oriented, aiming for the adoption of best practices and increased capacities to improve or expand access to water supply and sanitation services.

Water Operators Partnerships (WOPs) are arrangements in which water companies cooperate and share their experience and knowledge on a not-for-profit basis. WOPs are promoted by the UN Secretary-General's Advisory Board on Water and Sanitation (UNSGAB). The thought behind WOPs is that water utilities can learn from more experienced colleagues. By setting up a partnership, two water companies can team up and learn, without having to wait for external organizations to establish contacts and develop projects.

In the national and international experiences WOP works together as collaboration with GWOPA, UN-HABITAT and DWA. Following the "Hashimoto Action Plan" that it launched in Mexico in March 2006, the UN Secretary General's Advisory Board on Water and Sanitation (UNSGAB) initiated a global mechanism to promote Water Operators Partnerships (WOPs). Former UN Secretary General Kofi Annan requested UN-HABITAT to lead the development, and host the secretariat, of the global WOPs mechanism.

His Royal Highness, Prince Willem-Alexander of Orange, launched GWOPA as a global mechanism to scale up WOPs. GWOPA's mandate is to build on ongoing efforts and provide financial, technical, and advocacy support for WOPs at the global level.

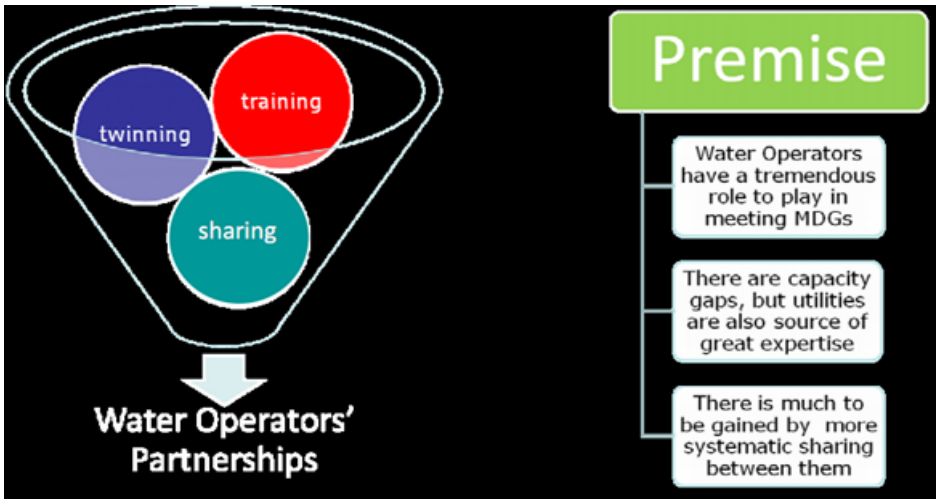


Figure 3: Water Operators' Partnerships Concepts.

1.2 Goals

By using suitable exchange and transfer mechanisms, the partnership will exchange and distribute know-how, skills and software resources amongst WSS operators to enhance the global capacity to improve performance for the benefit of the poor. Some of the goals of Global Water Operators Partnership Alliance (GWOPA) are to:

- Position the Global Water Operators' Partnerships Alliance as an efficient, effective and functional global mechanism for regional, sub-regional and national Water Operators' Partnerships supported by a coalition of agencies.
- Engage in advocacy for Water Operators' Partnerships in appropriate national, regional and international forums.
- Facilitate and support regional, sub-regional and national Water Operators' Partnerships mechanisms, for improving the performance of public water utilities.
- Provide web-based and other platforms to facilitate information collection, analysis and dissemination.
- Host, promote and support a range of events directed at meeting the demands and needs of public utility members of the Alliance.
- Promote technical cooperation between water operators;
- Promote good practices through the training of water operators and other sector entities.

1.3 Strategies

Formation of Water Utilities Network

Water Utilities Networks promote alliances, knowledge exchange, and capacity development among member water utilities. They also anchor all WOPs activities designed to improve the operational and financial efficiency of members. These networks' organizational structure has three tiers:

- A steering committee or governing board, comprising elected representatives from utilities of each of the participating countries, that is responsible for setting the network's policies, plans, and monitoring results
- A secretariat, headed by an Executive Director and based in a host utility, that oversees for the daily operations of the network
- Member utilities, comprising public or private water and/or wastewater utilities, national water and wastewater associations, and small scale service providers.

Each network serves as a platform for the major initiatives of WOPs: continuous improvement and benchmarking, twinning with expert utilities, and training workshops for capacity development. They also implement their respective business plans and mobilize resources for their specific needs.

Continuous Improvement and Benchmarking

Continuous Improvement and Benchmarking (CIB) involves collecting, analyzing, and comparing key performance data of water and sanitation utilities and, on the basis of analysis, developing a strategy and work program to improve specific aspects of a utility's performance.

This program seeks to help utilities establish internal processes and build skilled teams to collect, analyze, and measure their services and then compare their performance and service practices against those of other utilities. This yields sufficient insights to enable the utility teams to identify improvement opportunities, craft change proposals, and then drive their implementation to achieve better results.

Training Workshops

Know more about the WOPs Program's training workshops on technical aspects of water utility operations. To improve the technical capacity of water utilities, WOPs will design and implement training programs focused on specific aspects of utility operations. Among the possible topics are:

- NRW management
- Tariff setting and regulation

- Asset management
- Cost recovery
- Improved metering, billing, and collection

2. Shared Experiences: Presentations

As an insight, we would like to emphasize that some key words were present in all presentations: assisting, support, knowledge institute, technology partners, development, national education, exchange experience, cooperation, neighborhood, benchmarking etc. They all express and involve communication and/or partnership in different levels, a concept that is, understandably, very necessary when dealing with water related issues.

2.1 Presentation: Water Operators partnerships - Concept and Process

Farj, El Awar, PhD, Nairobi , Kenya

This presentation brings an idea about the backbone of W.O.P.s , explaining main concepts , processes, goals and advantages of such enterprises. Due to its contents explanation about this presentation was incorporated in to the first part of this assignment: W.O.P.s: Concepts, processes and goals.

2.2 Presentation: Amsterdam and its WOPA experiences in Africa

Gerard Rundberg, Amsterdam, Netherlands

It is not easy to reach the Millennium Development Goals (MDGs) specially related to water and sanitation but the public water utilities can play a big role in achieving the MDGs in a big part of the world; they use their know-how in order to exchange the information with the other countries. Netherland is one of the countries where know-how was used for a long period in order to solve their water problems by this international cooperation ,this

type of cooperation between water utilities was later on called the water operators' partnership (WOP).

The cooperation between countries depends on the principles of water::

- Water is the first principle of the life
- Access to drinking water and sanitation is a human right
- Water is related to climate, thirst, hunger, poverty, health, social and environmental growth.
- Water problems are integral problems needing an integral vision.
- Safe water is the carrier of all other MDGs
- Safe water for the poor is just a matter of good governance.

According to the presenter, the main principles of WOPs are the Exchange of knowledge based on solidarity and the focus on capacity development. That means creating an environment in which water operators can develop into well performing Water Operator.

The main objective of these partnerships was, as it was said, the transfer of know-how between countries especially on the north-south and west-east axis. In 2010 WOPs developments were specially focused on viewing the integrated water cycle, with solid waste and energy, cooperation with the Green Cross International and achieving the MDG's on the African continent.

As so, some achieved benefits of the cooperation between the Netherlands and Africa were presented:

- The African water operators and Amsterdam WOPA working together to fight poverty
- Reaching out to new partners and Stakeholders.
- To get a world water fund.
- Better service to the public

As part of it, a specific contribution of World Waternet to WOP's Sharing know-how on:

- Daily routine on operation and maintenance
- Appropriate and low cost technologies ,
- Research and development
- Engineering
- Legal water frameworks
- Institutional settings
- Training
- Community participation

In the west-east initiative, the case of Egypt (Drinking water in Alexandria) was presented and the results of the partnership were:

- Preventive maintenance
- Optimization operation
- Leakage Reduction
- Investment program
- Communication and public campaigns
- Dissemination in Egypt (upstream Nile state)

2.3 Presentation: The German Neighborhood System - 45 Years Regional Cooperation.

Matthias Barjenbruch, Berlin , Germany

In this presentation the audience was acquainted with the structure of "The German Neighborhood System" which essence is transfer of knowledge, competence and professional skills among everybody: the ones engaged in the service of the water sector and the customers alike. The past experience had shown that cooperation and better understanding of the problems faced by the sector was required to be able to effectively respond to the challenges of the modern society. This was achieved by the following means:

- Cooperation between the public and the private sector ("combining commercial enterprises, government and non-government organisations, scientific institutions and water-related associations"
- Communication between the separate Water Operators
- Transferring ideas and know-how on every level of the organizational structure both horizontally and vertically – managing, scientific and executive
- Preparing qualified water professionals starting from the schools
- Expanding the knowledge of the population directly effected by the waterworks and the water related issues for better understanding and participation in solving those problems

2.4 Presentation: The Munich Experience – Know-how-Transfer to Romania

Peter Köstner, Munich , Germany

This presentation is about applying west-European standards in cities in Romania, and the exchanging knowledge and ideas for mutual benefit. A more detailed explanation on this presentation will be given in the next chapter, no further information will be given here.

3. Detailed Example: The Munich Experience – Know-how-Transfer to Romania

The following chapter gives an overview about the Water Operators Partnership between the Waste Water Collection Department of the Municipality of Munich and Aquatim Timisoara, Romania. It aims to describe the cooperation in the field of know-how-transfer between these two cities.

Romania is located at the crossroad of Central and Southeastern Europe. The country consists of an area of 238.391 km² with a population of approximately 22 Million habitants. Approximately 45% of the population lives in rural areas and 32% of the population has no adequate access to water supply and waste water networks.

Figure 4: Location of Romania.

http://upload.wikimedia.org/wikipedia/commons/6/63/Location_Romania_EU_Europe.PNG

Romania has to comply with the provisions of the Council Directive 98/83/EC on the quality of water intended for human consumption by the end of 2015 and of the Council Directive 91/271/EEC concerning urban waste water treatment by the end of 2018.

In urban areas there is an urgent need for rehabilitation of water supply and waste water networks as well as the construction of waste water treatment plants (Romania is on

the second place, after Poland in UE countries with great investments needs in the water sector). Rural areas are characterized by a water supply service under 15% from population and sewerage system under 10%.

Since 2001, the Romanian authorities developed programs to access international financing for the rehabilitation and upgrade of the local water infrastructure in medium and small towns.

The Aquatim Company is the water and sewerage operator in the Timis County with 670,000 inhabitants, where 69 % of the population is connected to the water supply system and 54.7 % is connected to the wastewater collection system.

In 2006 Waste Water Department of the Municipality of Munich, Germany and the Aquatim Timisoara, Romania established know-how transfer cooperation in the water and environmental sector. This cooperation concentrate basically on the fields of sewerage system, waste water treatment plants, capital and tariff rate management, project and quality management, research projects, human resources management as well as organizational development.

From this cooperation in 2009 the German-Romania water foundation Aquademica (is a Non Governmental Organization - NGO) has been established.

The foundation will be involved in training and research programs at a national level, by organizing courses and seminars, providing consultancy, initiating and developing partnerships, organizing conferences and meetings. These will mainly address to the water operators throughout the country, but also to other utility providers and public or private companies interested in capacity building. Last but not least, training will be provided to Aquatim's employees as well.

The Aquademica Foundation has two main advantages. One relies in the good practices, already validated by the experience of our German partners. The second strong point is given by the pilot plants, on which the existing processes may be modeled to be optimized and new technologies, may be tested before implementation.

There are three pilot plants scaled with the treatment facilities for modeling waste water treatment, donated by Municipality of Munich (2) and Frauenhofer Institute for

Interfacial Engineering and Biotechnology from Stuttgart (1). All pilot plants can serve as support for the future courses and seminars developed by the foundation.

Figure 5: Various parts of the pilot plants in Romania.

The good practices and the pilot plants are the successful combination used in the future to tackle the demand for building competencies in the water field, an environmental sector that has become more and more sensitive and therefore is in need for professionals.

Basis for research and practice is knowledge transfer which is also supported by the network. The transfer also includes the cooperation of universities and research institutes with Aquademica.

A sustainable cooperation, the establishment of strong and viable networks as well as the connection of German technology, which is one of the world's most advanced in this field, and its implementation in Romania are also the target of numerous educational programs.

Mainly, the know-how transfer is made by the German specialists or by the multipliers, who are specialists trained in Germany. The Munich Wastewater Department together with the DWA create knowledge multipliers (up to now they are 6 Romanian specialists), multiplying knowledge itself, which transfer the know-how to the Romanian specialist by courses, seminars, etc. organized at Aquademica.

In the following are some of the advantages of this partnership:

To the German partner:

- Contribute to the achievement of the networking and professional development objectives, both strategic and economic;

- The communication process, in this case know-how transfer by seminars, workshops etc., have a double influence; due to the differences between countries, culture and organizations, the actors involved make contact with this differences (for example problems) what contribute to the future development in research and human resources; increase the problem solving capacity for participants;
- Increase the network for future projects and programs;
- Once "water is everybody's business", this partnership can be seen as a transparency and social responsibility action.

To the Romanian partner:

- At organizational level, increase the knowledge capital, the human resources flexibility and effectiveness and the good practices exchange; also increase the problem solving capacity and the identification and elaboration of the best solution for technology, strategic human resources and management ;
- At individual level increase the professional level and satisfaction;
- At societal level increase the quality of the services, the safety level of water and waste water system and the reducing of losses; due to this, it is possible a good development of the water infrastructure that have a good impact at the economic development in the area.

Conclusion

This event was very instructive, and it enlightened, if not completely changed, our concepts about water related partnership .As so, it was clear that Water Operators Partnership (W.O.P.s) are indeed an amazing tool for exchange of knowledge and know-how. Furthermore, by stimulating good practices, it also enhances connections between nations in all axes (N-S, W-E, S-N, E-W) .

Also, it is our understanding that water must be seen as a human right, not simply as a commodity. It should be potable, accessible and cost efficient. That's why W.O.P.s are essential instruments, a mean for making the Millennium Development Goals reality for the whole world.

At last, we would like to congratulate DWA for the "Young Water Professional Program" initiative, it is indeed a unique opportunity to meet other young professionals who share similar interests, exchange experience and, most of all, to have the chance to be for a week placed among the "major league" of water professionals, to get proper career guidance and to enhance our chances to be inserted in the job market.

"Nobody can exist in today's economy without partnership."

Bibliography

- www.adb.org
- www.ara.ro
- www.primariatm.ro
- www.aquatim.ro
- www.aquademica.ro
- www.potabilizare.ro
- http://www.wsscc.org/resources/resource-networks/global-water-operators-partnership-alliance-gwopa
- http://www.vitensevidesinternational.com/water-operators-partnerships.html
- http://seawun.org/uploads/SEAWUN%20Convention%202010/S6-Promoting%20Replication%20and%20Scale%20up%20of%20WOPs/1-WOP%20a%20Global%20Initiative.pdf
- http://www.unhabitat.org/downloads/docs/5377_74541_frame.pdf
- http://www.iwahq.org/Mainwebsite/Resources/Document/WOPs.pdf
- http://www.adb.org/water/wop/wop-water-utilities.asp
- http://www.waterlinks.org/water-operator-partnerships
- http://www.gwopa.org/
- http://www.iwrm-karlsruhe.com/

Report of Group IV

Technical Excursion to Waßmannsdorf wastewater treatment plant

Content

Introduction

During “Wasser Berlin”, technical excursions were offered to the participants of the Young Water Professionals Programme. One of these excursions was the visit of the Waßmannsdorf Wastewater Treatment Plant (WWTP). This was very interesting and educating. It offered the participants the opportunity to get a basic knowledge of the different technical processes and stages in a modern wastewater treatment plant.

The group arrived at the plant at about 10.00 am and was welcomed by a representative of “Berliner Wasserbetriebe”. After a presentation on the history, and a process overview of the wastewater treatment plant, the group was guided to the various sections and departments of the plant.

History

The history of the Waßmannsdorf Wastewater Treatment Plant goes back to 1890 when Neukölln bought the Waßmannsdorf manor and created irrigation fields for the treatment of the local district’s wastewater.

In 1927, the first primary sedimentation tank was commissioned with a daily capacity of 100,000 m^3. During the following decades, the wastewater treatment was expanded. Until 1989 the treatment plant was modernized with the provision of a new inlet structure as well as chemical and biological phosphate elimination. The old structures of 1927 were shut down.

Following the unification of Germany in 1990, the wastewater plant was replanned.This was in order to serve more areas, and to meet the new quality standards of Germany and the European Union.

Overview

The Waßmannsdorf wastewater treatment plant is located in the south of Berlin. It is one of six WWTPs treating the wastewater of Berlin. The plant has a capacity of 230.000 m³/d. The process steps are shown in Figure 3.

FIGURE 1: MAP OF WASTEWATER TREATMENT PLANTS BERLIN*

FIGURE 2: WASTEWATER TREATMENT AREA**

* All drawings in this report are taken from information material provided Berliner Wasserbetriebe, www.bwb.de

** All the photographs in this report were taken by members of group 4

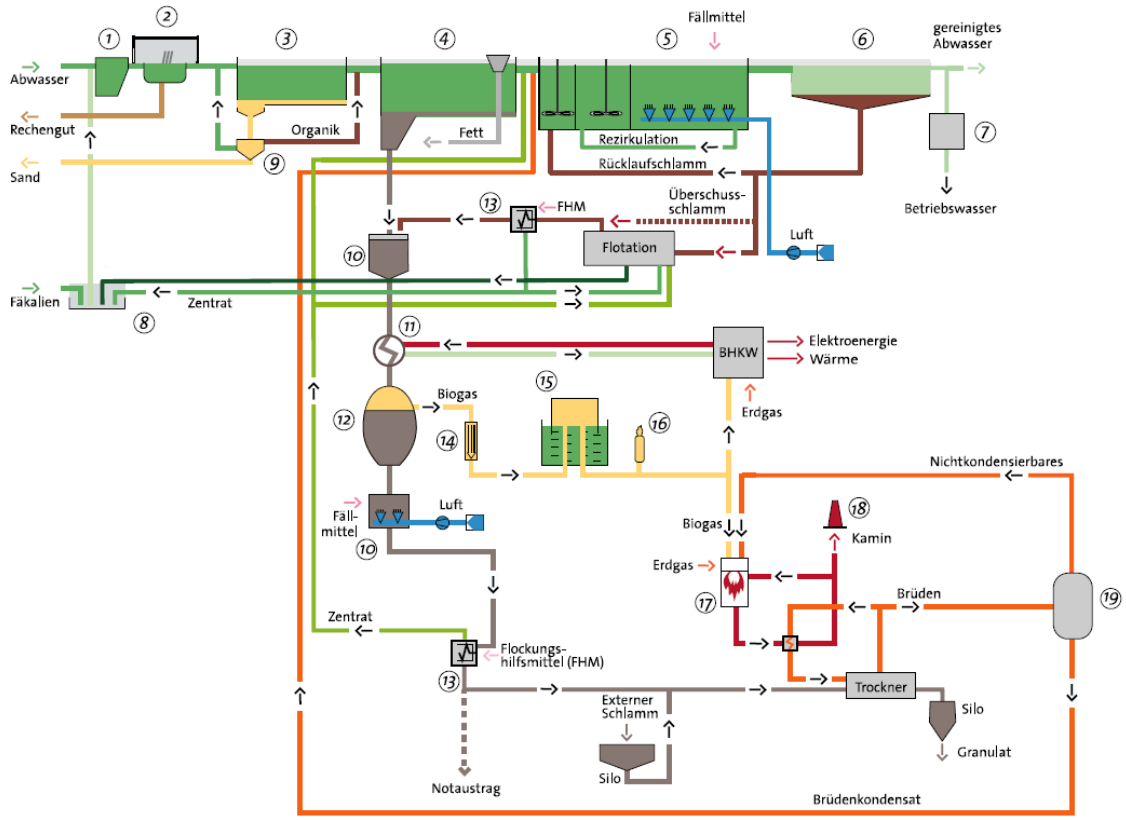


FIGURE 3: WASTEWATER TREATMENT PLANT WAßMANNSDORF PROCESS OVERVIEW

1. INLET
2. SCREENS
3. GRIT CHAMBER
4. PRIMARY TREATMENT AERATION
5. SECONDARY SEDIMENTATION
6. INDUSTRIAL WATER PREPARATION
7. INDUSTRIAL WATER PREPARATION
8. WASTEWATER COLLECTING PUMPING STATION
9. SAND WASHER
10. SLUDGE STORAGE
11. SLUDGE HEATING
12. DIGESTION TANKS
13. CENTRIFUGE
14. GAS TREATMENT
15. GAS SILO
16. GAS TORCH
17. HEATING GAS GENERATOR
18. FUNNEL
19. VAPORS CONDENSER

The treatment processes of the WWTP are described in the following passages.

Inlet Structure

Inlet structures are built to control the amount of wastewater flowing into a wastewater treatment. The wastewater which comes from the pumping stations in Berlin passes through two DN 1800 pressure pipes to a combined stretch. The wastewater in the inlet structure is distributed between four inlet channels.

FIGURE 4: INLET STRUCTURE, COLUMNS ARE HOLLOW AND TRANSPORT THE WASTEWATER

Screens

The screens, which are responsible for the removal of coarse particles, consist of four channels equipped with circulating screens. The hole diameter of each screen is eight millimeters. The screens are regularly cleaned by rotating brushes. Each screen is connected to a screening press. The dewatered coarse material is filled into four screenings containers and recycled.

FIGURE 5: SCREENS

Grit Chamber

In the grit chamber, sand is removed from the wastewater by sedimentation. The wastewater flows through unventilated channels. A proportional weir ensures that the flow velocity of 0.3 m/s is load-independent.

FIGURE 6: GRIT CHAMBER, COVERED

The settled sand is transported to hoppers by scrapers. The, the sand is cleansed in two sand washers.

The grit chamber is, as well as the inlet structure and the screens, covered. Thus, the waste air can be collected and treated.

Primary Sedimentation

In the primary sedimentation stage, sewage flows through 10 large, rectangular tanks, which have a total volume of 22,500 m^3.

The average retention time of the wastwater in the tanks is about two hours (during dry weather). The amont of sludge produced by sedimentation is approx. 1500 m^3/day.

FIGURE 7: PRIMARY SEDIMENTATION TANK

The primary sedimentation tanks are equipped with scrapers that continually drive the collected sludge towards a hopper in the base of the tank where it is pumped to sludge treatment facilities. In addition, floating sludge is also removed in the primary sedimentation tank. Srapers on the surface of the wastewater collect floating substances and drive them to the end of the tanks.

Biological Treatment

After the removal of settled and floating substances, organic compounds (COD – Chemical Oxygen Demand), Nitrogen, and Phosphorus have to be removed from the wastewater to fulfill the requirements of the German legislation.

In the waste water treatment plant in Waßmannsdorf, COD, Nitrogen , and Phosphorus are removed biologically. To achieve the needed effluent quality regarding COD, Phosphorus, and Nitrogen, two factors have to be combined: microorganisms, known as activated sludge, and Oxygen availability. Thus, the biological treatment is divided into three zones, characterized by different degrees of Oxygen availability.

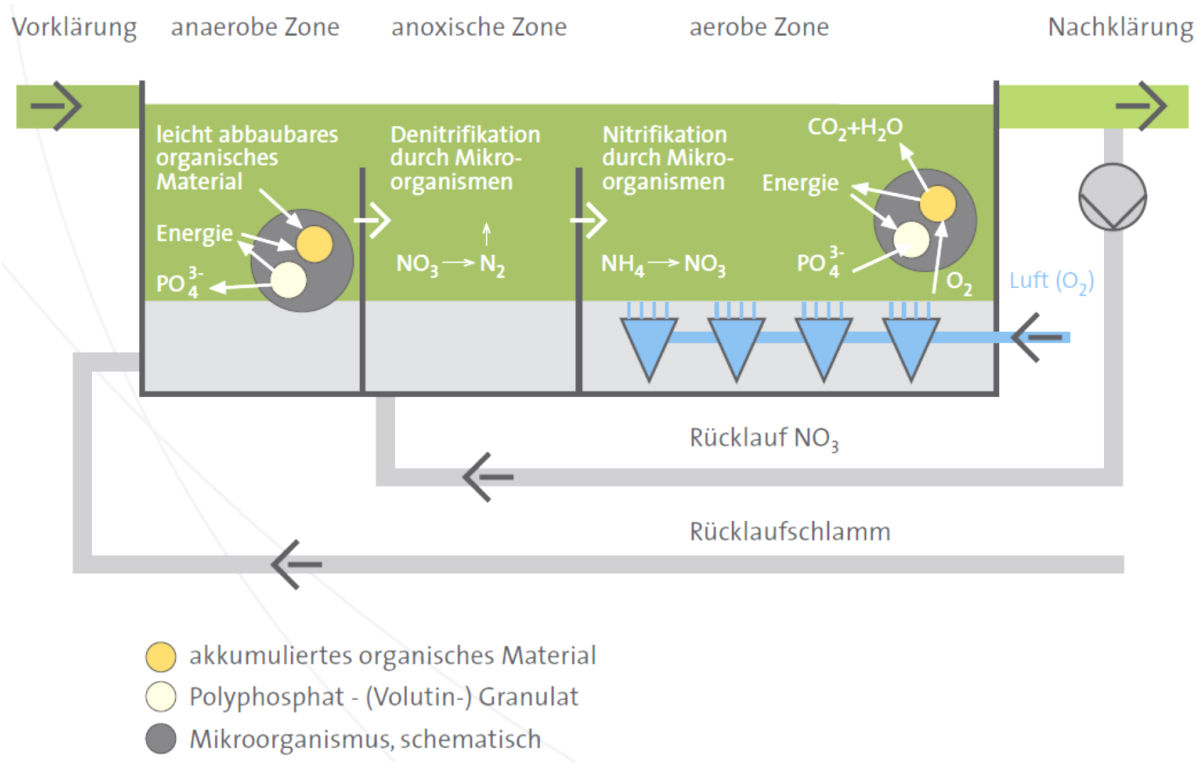


FIGURE 8: BIOLOGICAL TREATMENT SCHEME

Anoxic zone

The first zone of the biological tank is characterized by anoxic conditions. No Oxygen is available for the microorganisms, which are enriched by adding returned activated sludge from the secondary sedimentation tank to the inflow from the primary treatment. The anoxic conditions stimulate the microorganisms to increase their latter Phosphorus uptake.

Anaerobic zone

Nitrate rich wastewater from the effluent of the tank is added to the waste water leaving the anoxic zone. Thus, Nitrate (NO_3^-) serves as a source for Oxygen. The microorganisms use this Oxygen to degrade organic compounds (COD). By removing Oxygen, Nitrate (NO_3^-) is turned into Nitrogen (N_2). Since Nitrogen is a natural gas, it is let into the atmosphere without posing any risk.

Aerobic zone

In the aerobic zone, aerators are installed on the ground of the tank. Six turbo compressors pump air from the atmosphere into the waste water. Thus, the Oxygen concentration in the tank rises. Autotrophic microorganisms use this Oxygen to transform Ammonia (NH_4^+) into Nitrate (NO_3^-), which is turned into Nitrogen in the anaerobic zone. The heterotrophic

microorganisms use the oxygen to degrade COD, which serves as a source of energy and lets them grow. During this process, COD is degraded into water (H_2O) and Carbon dioxide (CO_2). Furthermore, the microorganisms absorb a lot of Phosphorus.

FIGURE 9: AEROBIC ZONE OF BIOLOGICAL TREATMENT

At the end of the aerobic zone, there are two components left in the waste water that yet have to be removed: Nitrate and sludge. To remove the Nitrate, a big part of the wastewater is circulated back into the anaerobic zone, where Nitrite is turned into Nitrogen as described above.

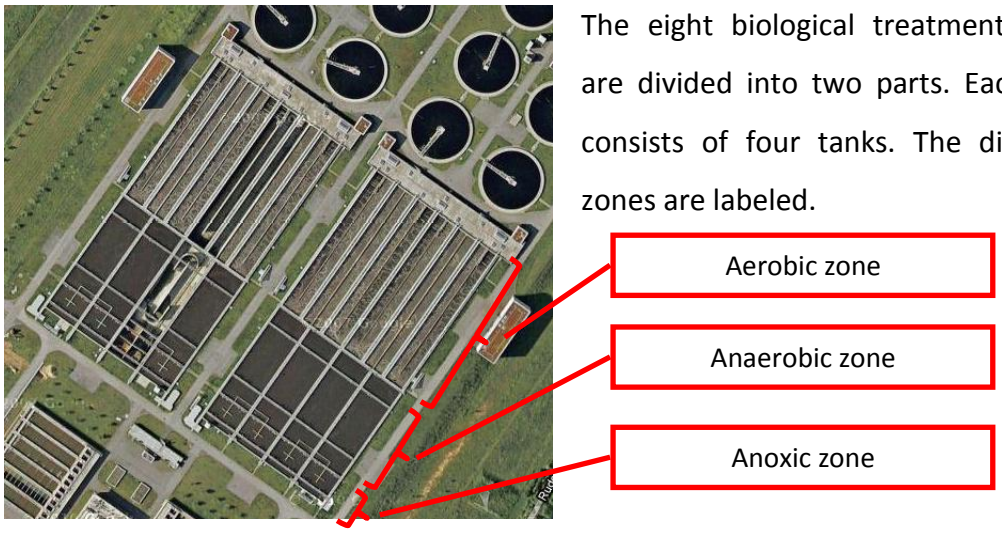
The rest of the effluent, which still contains the activated sludge, goes into the secondary sedimentation.

The biological treatment is the core of the wastewater treatment plant to meet the requirements concerning COD, Phosphorus, and Nitrogen compounds. The overall cleaning efficiency of the waste water treatment plant is shown in table X.

TABLE 1: INFLUENT AND EFFLUENT CONCENTRATION – IMPORTANT PARAMETERS [MG/L] (SOURCE: LEAFLET OF BERLINER WASSERBETRIEBE, WAßMANNSDORF WASTEWATER TREATMENT WORKS

	COD	**Phosphorus**	**Ammonia**	**Nitrate**
Influent	1087	13.7	65.7	-
Effluent	54	0.4	0.2	11.6

The biological treatment consists of eight tanks with a total useful volume of 208,080 m³. About 1/8 of this volume is anaerobic, and 1/3 is anoxic. The major part (> 50%) is aerobic.



The eight biological treatment tanks are divided into two parts. Each part consists of four tanks. The different zones are labeled.

FIGURE 10: PICTURE (SOURCE: GOOGLE MAPS, 12.05.2011) OF BIOLOGICAL STAGE IN WAßMANNSDORF

Secondary Sedimentation

In Waßmannsdorf wastewater treatment works 16 horizontally flowed-through round tanks are operated for the secondary sedimentation. In these tanks, the sludge formed by microorganism during the biological treatment is removed. The total volume of the tanks is 81,300 m^3.

FIGURE 11: SECONDARY SEDIMENTATION TANK

The round tanks provide calm areas necessary for the suspended particles to settle. The tanks have a diameter of 40 m. Depending on the weather, the throughput time is 4-8 h, and the surface load is 0.47 m/h to 1.1 m/h. The settled sludge is pushed into the center of each tank by scrapers. From there a part of the sludge is pumped back to the biological treatment to maintain a constant sludge concentration, the rest of the sludge, called excess or surplus sludge, is treated in the sludge treatment.

The clean water is drawn off through perforated pipes, which are located horizontally, 0.7 m below the surface of the water. A part of the clean water is used on the wastewater treatment plant as service water for flushing, firefighting and cooling purposes. The major part of the clean water goes into the Teltow Canal.

Sludge Treatment

Sludge treatment in Waßmanndorf wastewater treatment takes place in 4 process steps: the thickening, the digestion, the mechanical dewatering and the drying of the sludge.

Sludge Thickening

The surplus from the secondary sedimentation has a solids content of 1%. The solids content is increased to 8% by flotation, flocculation and centrifuges. The thickened surplus sludge then is mixed with the primary sludge.

Sludge Digestion

There are 6 digestion tanks which each with a volume of 8000 m^3. The mixed sludge is heated to 33° C and digested under anaerobic conditions for 20-25 days. During the digestion organic compounds are degraded and biogas is produced.

Sludge Dewatering and Sludge Drying

For further handling, the sludge has to be dewatered. Thus, five centrifuges withdraw water from the sludge until a dry solids content of 28% is reached.

To increase the dry solids content to 93%, the sludge is enriched with granulate that supports the following drying process in the rotary dryer.

FIGURE 12: SLUDGE SAMPLES OF DIFFERENT TREATMENT STAGES

Biogas Recycling

During the sludge digestion, biogas is produced. To increase the quality of the biogas, hydrogen sulfide is removed by biological treatment. The biogas then is used in a block heating work (BHW) to produce electrical power. Thus, 60% of the electricity used on the wastewater treatment plant can be covered. The heat that is also produced in the BHW is used to control the temperature of the sludge and to heat buildings on the site.

Summary

The report presents the technical processes and stages of the wastewater treatment plant in Waßmannsdorf, the second largest WWTP of Berlin, Germany. It enables a degree of cleaning which meets the high requirements of the European Union. Furthermore, the onsite management of energy and the high quality of the system technology and control are exemplary.

Outlook

To accomplish a higher effluent quality, the implementation of a UV disinfection stage is planned. Since the water bodies in Berlin are used for swimming in the summer, the effluent of the wastewater treatment plant will be disinfected to improve the water quality of the receiving bodies according to the bathing water directive of the European Union.

Appreciations

To truly appreciate the process of wastewater treatment and the magnitude of the job, one must visit a wastewater treatment plant in person. Thanks to “Berliner Wasserbetriebe” for offering us such an opportunity and for giving us a great tour on Waßmannsdorf wastewater treatment plant!

We also would like to thank Laura Langel and Gabriele Martens from DWA for organizing the young water professionals program.

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Report of Group V

3rd IWA/DWA Young Water Professionals Workshop, Wasser Berlin International 2011, Berlin.

[Career Event Report]

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06.05.2011

Table of Contents

INTRODUCTION:

The International Water Association (IWA) has organized for the third time jointly with the German Association for Water, Wastewater and Waste (DWA) a one day workshop exclusively for Young Water Professionals (YWPs) during the Wasser Berlin International 2011 event. The workshop was organized to achieve the following objectives: to connect YWPs with each others to create professional and personal relationships that will last through out their career; to provide an opportunity for YWPs to create a dialogue with established professionals in the water sector about the challenges that are needed to face in the future; to enable the YWPs meet other professionals in water sector industry and learn about the career possibilities; and to provide information about the different initiatives that can help YWPs obtaining support on how to develop their career.

The workshop was divided into three sessions. At the end of each session the participant broke up into groups, where they were able to raise questions and discuss more with the presenters.

As YWPs, who got the chance to take part in this event, a special thanks extend to the sponsors of this workshop (CH2MHILL and ITT company), to the workshop organizers (IWA and DWA), and to the postgraduate studies scholarship funding organizations (DBU, IPSWaT, and DAAD). Being part of the education community in Germany and as scholarship holders, we as YWPs, were able to be participants and to get in depth knowledge about the different opportunities available in the water sector in Germany and internationally.

I. CAREER COMPASS

1. Finding more about ITT, Dr Johan Groen

Amongst others the ITT Water and Wastewater Company was represented in this workshop. The presentation was started by defining water as a critical row material that is needed everywhere. The challenge is the availability of the needed water quality and quantity. It is a high-tech engineering and manufacturing company who has 40.000 employees. First and foremost it delivers extraordinary solutions for most essential needs of life such as more livable environments, enabling communications, and providing better protection and safety. It operates in more than 130 countries all over the world. Nowadays the necessity of water treatment is more important than ever: this company try to meet the world's need for clean water.

How to deal with the water and how to treat it in a properly way? These latter questions determine the task of this market leader water company. They deal with water intake and treatment, usage, transport and disinfection as well. To compare with other international companies in this area they are global leader in wastewater solutions. ITT products and systems form heart of water and wastewater transport, treatment and reuse systems. It was emphasized that analytics is absolutely important for the future water. It is also a leading manufacturer of premium laboratory, filed, portable and online analytical instruments and systems. ITT´s low flow positive displacement pumps control the flow of water and delicate or viscous liquids in everything from beverage systems to leisure boats.

What are the future goals and visions for this company? The world is getting more complicated. Thus, they have to define the way how they do act and behave with costumers, co-workers and communities. Change is here: an international company must appreciate different cultures and different engineering capabilities.

The YWPs were advised to be flexible, adaptable, and having interest in learning new things for a changing world that is getting complicated. It was also mentioned that YWPs are in a great position. They should use their possibilities and should be interested in burning new skills, like working in team, work with people from different counties with different time

zones. Here language skills are always valuable. YWPs build their career. The way becoming successful is life-long learning and working together with a market leader company, like ITT.

2. Finding more about Berlinwasser, Mr. Andre Beck

The presentation of Berlinwasser began with a story about the founders of Berlinwasser dating back about 150 years ago. In 1852, a contract was drawn up for the supply of running water to Berlin. The first waterworks facility in Berlin went into operation in 1856. It is not imaginable that during the industrial revolution in 19th century, people in Germany and some other western European countries had already started to supply running water and dispose waste water in a modern way. Lots of current facilities and water/wastewater treatment techniques are either followed or inspired from the old days. History is always important to be known since we can learn the experiences from the past.

Coming back to today, Berlinwasser is still one of the largest companies in international water and wastewater business. For instance, its one subsidiary company Berlinwasser is now supplying 3.5 million people in Berlin and surrounding areas with drinking water. It is also treating the sewage of 3.9 million people. For our YWPs, the primary interest cannot be more than the career in Berlinwasser. Is it a company which can provide excellent working environment for young water professionals? Do they provide training or internship opportunities? How can we get a change to work for Berlinwasser?

Mr. Andre Beck then started talking about Berlin as a city. According to him, it is a great place for studying and working in the field of water. One can always find a lot of study opportunities in water science and technology at the universities of Berlin. Besides working in large water companies like Berlinwasser, one can also develop his/her career in doing research in water science at the diverse universities and research institutes in Berlin and its surrounding area.

Although there are many opportunities for YWPs, one cannot neglect the fact that Berlinwasser is regarded as one of the best employers. Doing Master thesis or internship is a way to enter the company; even direct access for graduates is possible. Being a member of the company, gives the chance to receive further training and education in potential development programs. The company also pays attention to its employees' work-life balance. It offers telecommuting; flexible working time, part-time work and one can have

his/her personal working-rate. It also provides services like family service, re-entry into the company after parental leave, health care support and so on.

Shifting to the subsidiary company, Berlinwasser International; it is a company that deals with operation, management and consulting for international communities and institutions. It has won great success in international cooperation during the past years. In water markets in Central and South-Eastern Europe, Asia, Latin America and Africa, Berlinwasser is always being found actively involved. For example, Berlinwasser International has entered Chinese water market in 1997. Since then, China has been the most important base for developing the water and wastewater activities in the countries of the Asian Pacific Region. Up to now, more than 10 projects have been launched in that region It is believed that there will be even larger markets in Asian Pacific because of Asia's economic boom in recent years: rivers and groundwater have been heavily polluted as a result of industrialization and urbanization. Poor water quality causes serious risks for human health and therefore the demand for clean water will increase much more in the future.

For both Berlinwasser International and YWPs, who are mainly from outside Germany, international cooperation is a great opportunity. The company can make profits by doing projects abroad, the local people can benefit from the advanced water treatment technique, and YWPs not only can get a job opportunity, but also learn the experiences from one of the world's largest water companies, which is good for their future career. Mr. Andre Beck also emphasized that water is more than a natural resource. As an international company, Berlinwasser International is seeking people with mission in mind, not being with narrowed qualifications but to be broad in water issues and how to deal with complicated issues; people who can speak many languages and are able to work in an international and creative working environment. The professional has to give the impression of ability to help solving the company problems. The company has to be attractive to the professionals by solving the complex of the business environment. It provides different levels of training targeting different group of people. If someone wants to be a member of it, the easiest way is to do a Master thesis or an internship there. If they find out this person to be really the right one for them and be very helpful in solving the company's problem, he/she might get a job opportunity. Is anyone still hesitating? Do not think twice and just contact them!

3. Perspectives for the young engineers in WILO Group, Mr. Jan Talkenberger

WILO is a global pump producer company for hot/cold water circuits. It reflects the German background. It has more than 70 companies and representations worldwide in Europe, Asia, America and Africa with headquarter in Dortmund, with strategy to increase the number. The history of the company extends to the year 1872. But the WILO LG Pumps Ltd is founded in the year 2000. Worldwide the name WILO is synonymous with the tradition of first class German engineering. The company has approximately 6000 employers. Last year, 2010, the sales amounted to more than 1.020 Mill Euro, which means more revenues that necessitate hiring more people. In the field of innovation management, the company is the second best employer. It is awarded the Top Employer for this year, 2011, for the fourth time in a row.

WILO produces pumps for all market segments. The pumps and pumps systems for heating, air-conditioning, cooling, water supply and sewage disposal allow manifold use in all kind of installations. The sophisticated technology is used in commercial buildings, municipal installations, industrial purposes, and also in private homes. In close cooperation with the customers, over the decades the company has further developed its know-how from pumps to system competences. This allows offering solutions in line with the most ambitious customer demands.

In municipal water management processing, the company has wide range of products of high efficiency pumps. It has nine factories or production sites in Europe, in Germany, France, and Great Britain/Ireland; and six in Asia, in China, India, and Korea. It produces water pumps for all buildings to waste water at municipal to industries.

WILO is well structured; its business is straight and direct allowing straightforward communication and decision. Besides being benchmarked in payment and benefits; training and development; career opportunities; company culture; and innovation management, the company offers its employees the opportunity to gain international experience.

The company has a company-wide talent management program, where it tries to develop the next generation and managers. Here comes the opportunity for the YWPs. The company looks worldwide for new employees to ensure its market leading position. In addition, the company wants to grow in municipal water management and permanently looks for young

talents to join the WILO family. Therefore, talented people are encouraged to apply at their earlier stage with clear future planning, ability to work in multi cultural environment, languages skills, and ability to work in a team. Recent job opportunities are for marketing in South America and the Middle East. The company also offers internship for engineers at the company headquarter or any other international production site or sales subsidiary for students.

II. DEVELOPING YOUR CAREER

1. Getting involved with arche noVa, Mrs. Andrea Bindel

Arche noVa - initiative for people in need is a non-profit, non-governmental and non-religious international relief organization that was founded in 1992, in Dresden after privately organized relief transport to Iraq. The organization aims to assist people who are suffering from wars, natural disasters or discrimination regardless of the victims' ethnicity and ideology. The organization follows the principle of humanity, impartiality, neutrality, independence and partnership.

The initiative focuses in Water, Sanitation, Hygiene; WASH is their competence. Also in emergency relief, rehabilitation and disaster risk reduction in the affected areas. It works on education and awareness raising in Europe by offering training for teachers and students.

The strategy of WASH program includes water supply, sanitation, hygiene awareness raising, capacity building for authorities and beneficiaries. It works on setting up of water communities by the development and implementation of locally adoptable techniques. It looks also for long-term cooperation with international and local institutions, NGO`s and communities. The initiative had contributed in this year, 2011, to achieve the MDG 7 by providing 1,000,000 people with safe drinking water.

Currently the program is involved in the following projects areas: Haiti, Mexico, Sri Lanka, Indonesia, Myanmar, and Pakistan. As a project example: Pakistan food relief 2010-2011. In this project the program helped in the emergency water supply by the reverse of osmosis water treatment plant and the distribution of household filters as well as developing

households filters from local materials. In the hygiene promotion program the work was on the distribution of hygiene kits, WASH NFI and water coolers as well as conducting hygiene promotion workshops for villagers and schools. There was also repairing work of flood damaged schools and school latrines. The repair and construction of water systems included the rehabilitation of water sources, hand pumps, shallow wells, tube wells, infiltration tanks, construction of washing and bathing places, and construction of public latrines. In this project 16,000 inhabitants got benefits from 12 villages.

Since there are different solutions for different situation, the program is dependent on short term engineering work. Not only the technical background is required, but also ideas that help in achieving the noble initiative goals. It is rewarding to work with nova.

2. Getting involved with GIZ, Mr. Axel Ulmer

The GIZ is a company for development cooperation which is owned by the German government. Its main tasks are consulting, financing, development services and capacity building. The most important contractors are the Federal Ministry of Economic Cooperation and Development (BMZ), the Federal Ministry of Foreign Affairs (AA), the Federal Ministry for Environment, Nature Conservation and Nuclear Safety (BMU) and the Federal Ministry of Kommission, the United Nations and the World Bank. The GIZ employs 17.000 people; 60% of the employees are German citizens. The major work of GIZ is concentrated abroad, which means good opportunity for the YWPs.

The annual budget for the water and sanitation program is 400 Mill Euros, mainly for bilateral cooperation with the government partners. The contractor is mainly the german government but also private companies.The main share of the projects is Africa, which is the most important target region for the water and sanitation program, with an annual budget of 140 Mill Euros. It is followed then by Latin America, Asia and at last Pakistan and Afghanistan.

There are different key focuses. But there are recently two interesting areas. One is the transboundary water management program with projects at Lake Popo, the Nile and the

Niger, designed following the example of the Danube River Commission. The second key focus is the water sector reform program to improve the water delivery.

There are also some emergency relief projects, e.g. in Zimbabwe, where no cooperation is offered in the political situation at the moment.

GIZ is interested the young professionals in all fields either with direct contracts with the GIZ in Germany or with the regional offices in the respected countries. The alumni working with GIZ in their countries will break the language and cultural barriers and help in facilitating the work to achieve the projects goals. GIZ is not about making money and bettering its employee's lifestyle, rather being an organization for helping people having access to basic life standards by the projects in the concerned countries. Here YWPs fit to achieve the personal and the GIZ goals.

3. Perspectives in the water sector for YWPs, Mr. Ruediger Heidebrecht

Mr. Ruediger Heidebrecht gave the audience at the beginning some idea about what DWA is doing and what it has to offer for the participants. The participants took a quick look at what is DWA doing and what they work for the future. Germany spends about 60 to 80 million Euros each year on water research. The German minister was asking" DWA and all your experts, what do you think is the challenge for tomorrow, and not for tomorrow but in 20 years, in 15 years. In which way should we go? Should we go in the separation toilets as EcoSan and GTZ is doing or should we go in high-tech solution with membrane technology where you need a lot of energy to run this membrane technology? What are the challenges of the future?" BMBF spent already 4 – 5 millions and it is going to spend another 8 – 9 million to change some of the old standards; for example, designing treatment plants for the different climatic zones. The drinking water association defines the standards with DWA experts, which has more than 320 standards and 140 of them are translated into English and Chinese and polish and so forth.

The Department of Training at International Corporation of the DWA trains every year about 35.000 people in Germany. Training is a business in Germany so they make a turnover of about 4 – 6 million Euros each year only on training. They train all levels because only 17%

of the staff in the water utilities in Germany is academics; the remaining 83% are workers. So a lot of training is for workers and technicians. Education is a big job at all levels being, academic, non-academic, and technical. After training the staffs comes the certification question. The company or utility will be visited to verify the application of rules and standards. In Germany, a system is created for electricity, gas lines, water supplies, and river protection. Certification is done internally and internationally. For example in Egypt 5 water supply and waste treatment utilities were given certificates. In addition, DWA provides a lot of materials for schools like posters and CD-ROMs and so forth.

Networking targets not only the German water utilities, but it also the German speaking neighbouring countries. They meet once a year and shear the information and the experiences and to introduce partners. There is the network of the waste treatment plants in Germany, where there is a group for big utilities and another group for smaller utilities. In the waste water treatment plant there is a system called neighbourhood, where the workers are connected together once or twice a year. Therefore, the performance of the workers as well as the company will be well known to everyone.

Regarding the membership, DWA has 40.000 members, 800 members are in 55 countries outside Germany. Being International is quite new at DWA. In 1982 the DWA did not have a single paper in English, because it is thought to be a pure national association the thing that has changed a lot recently. The associations of the water sector are non-governmental ones. The water sectors are responsible of the organization of their work and the government does the framework. Here appears the importance of the associations. Hence, membership is open for everyone even if being outside Germany.

So what are the opportunities for the YWPs? Being alumni, everyone who studied at least 3 months in Germany, has the chance to join the alumni portal provided by the German academic exchange service. Besides the website there is also what is called Alumni Water Network, where after registration all information are attainable including the dates of next programs. The next event will take place in May next year. There will be 2 programs and 50 people will be invited. Costs will be covered for 2 weeks stay in Germany. One week will be in the universities and another one to meet the people. Other opportunities for YWPs are postgraduate studies for master or PhD programs that are supported by the BMBF. thing is

that if we are a bachelor and we want to study in Germany for master they have a program for that and all students receive money from BMBF, the Ministry of Technology and Research. They have now around 50 to 70 people in these programs. This program is already 10 years old. There is also the German - Arab studies from Cologne, which is a scholarship for master studies. It is already 4 years old and it will continue for another 3 years. A third opportunity is offered by GIZ, which is called a carrier program. It targets the people who finish their studies at the universities and have no experience yet. YWPs have the opportunity to get a scholarship and to join one of GIZ projects in the water sector. This is a very successful program that is more than 7 or 8 years old. One third of the people, who have started this program for one year, continue their work there.

On 15th of June this year, GIZ is organizing a seminar in Bonn. YWPs have the possibility to join, free of charge, to see the offices and talk to the people at GIZ to get in depth sight about the projects and work system there. Another offer for the YWPs, who are in Germany, is to attend the annual conference of DWA in Berlin.

III. INITIATIVES FOR YWPs

1. Finding out more about AKUT Berlin, Mr. Thilo Burkard

AKUT Environmental Protection Engineers Burkard and Partner was founded in 1988 and started to work in foreign countries in 1998. The number of employees is 15 in Germany and 60 in the foreign countries. The company aims to improve the economical and financial situation of public service providers. It works in deferent fields such as: consulting and planning, research and development, capacity building and training, and construction on a turn-key basis. The topics of interests include waste water treatment, biogas plants, water reclamation, house and building technology, and international development cooperation.

Regarding the International Transfer of Know-How and Technology, AKUT has been active in developing countries since 1998 in the areas of:

- Building up of water and waste water infrastructure, technical planning, supervision, demonstration projects, assistance for implementation of a continuous training system for operators in sanitation enterprises;

- Institutional strengthening for sanitation enterprises and organizations (subjects: economics, technology, assistance, organization structure, human resource development, customer services;

- Capacity building and training, workshops and courses, subjects: waste water, wastes, biogas, air pollution, renewable energies;

- Projects in / with: Peru, Brazil, Bolivia, Dominican Republic, China, Costa Rica, Thailand, Syria, Kenya and Afghanistan;

- Waste Water Treatment with specialization in rural areas, where AKUT places emphases on low cost and innovative processes as: Sequenced Batch Reactor (SBR), Pond SBR, Anaerobic technology, Constructed wetlands for surface and subsurface flow, and Sludge dewatering.

The company has some projects in and outside Germany including Africa, Europe, and Asia. Inlands projects are concentrated in Berlin and Brandenburg. The interest of the company does not stop in the technical projects but extend to the research and development to enable them to implement new aspects of waste water treatment in AKUT drafting process. Therefore the research projects include many partners like UBA, DBU, DWA, IWA, BWB, BMBF, European Commission, and other governmental and private institutions.

AKUT team includes engineers specializing in environment protection technology, energy and process technology, civil engineering, agricultural engineering, management consultants, technical drawer, technical assistants for construction, supervision and management of facilities, and staff members for administration and secretariat, as well as student assistants.

As examples for the AKUT projects abroad is the PMRI project in Peru the work focused, among others, in the reduction of water losses, operation of plants, and socio-political environmental management. The PSDA, Promotion of Private Sector Development in

Agriculture, project in Kenya focused on construction and quality supervision through awareness creation for farmers, capacity building for 20 local construction firms and 200 masons, capacity building for engineers, and the construction of 480 Biogas plants. The biogas plants for lightning and cooking cost about 1000 Euro for construction and labour for a farmer having 4 cows.

The biogas production facilities drafted and designed by AKUT include fully mixed digester, multi batch digesters, fixed dome digesters, plants for renewable substrates and/or organic waste, production of electricity, and local heat supply systems.

AKUT is a member of, German Association for Wastes and Waste Water (DWA), International Water Association (IWA), Association for use of Recycling and Rain water (fbr), German Association of ecological engineering (IOEV), German Biogas Association, WaterPN and German Water Partnership.

2. Getting involved in WWMD, Miss. Frances Lucraft

World Water Monitoring Day (WWMD) is an annual international education and outreach programme. It works on building on public awareness and involvement in protecting water resources around the world, the engagement of citizens to conduct basic monitoring of their local water bodies, creating awareness of the different water realities in different countries, and raising questions and issues about the quality of local water bodies.

The goals of the program are to rekindle public interest in clean water; encourage innovation and technology exchange, promote personal stewardship of water resources, teach participants about some of the most common indicators of water health and encourage further participation in more formal citizen monitoring efforts, and teach participants about how their personal behaviours impact upon the quality of their water resources. The number of participating countries is 85 with 212,000 participants.

The concept behind the program is to sample the local lakes, streams, rivers, ponds, estuaries and other water bodies by the participants. Four parameters have to be measured, which are Temperature, Dissolved Oxygen (DO), Turbidity (Clarity), and the pH. The targeted areas could be agricultural, commercial, residential or industrial. The measurements are

taken by using kits that are available free of charge for lower income countries; normally they cost US $13. The results are submitted annually on the online database in the period from March 22nd – December 31st. They will be shared with participating communities around the globe through the World Water Monitoring Day website.

WWMD is not only about measuring the local water bodies and checking the quality of it. It is also about raising questions about local awareness: Is the water suitable for the biological life? How does the weather matter? What is the land use? Why is water temperature important? So what should we do to protect it? It is about thinking about global awareness with an emphasis on **"think local, act global".**

YWPs can get involved in WWMD by oorganizing an event in their local area; getting their university or organization involved; making school or university visits; distributing WWMD information packages or help translating materials; or become a judge for the WWMD Award program. YWPs can be part of some big by help improving global awareness of water quality issues.

3. Getting involved in Water Wiki, By Miss. Ana Bachurova

The IWA Water Wiki is an information resource and hub for the global water community. It is a freely accessible website for the global water community to share the knowledge and communicate with other water professionals. It provides an opportunity to networking and to reach, add and read several articles. The Water Wiki is an information resource and hub for the water community. It contributes to share the experiences between several subjects related to water.

To get involved in water wiki, one should start by registering and creating a personal profile with affiliations, CV, research interest and contact details. After that it will be possible to communicate and interact with the water professionals in several different research areas.

There are currently over 400 reference articles. Everything is visible and comments can be added to the articles. Even more articles can be created including links to the person online web pages. Everything can be downloaded in the water topics, whatever is wanted, because the Water Wiki trusts in their participants and the authenticity of the articles.

Water Wiki provides also technical support, where the community manager is always available to help with technical difficulties. Editorial Committee is also available to make easier to moderate content, source new articles and review existing material.

The Discussion Forum is presented also to ensure advice on research project or disseminate information. The Discussion Tab is also another possibility to add comments to articles. The blog provides information about the coming events and the newsletter informs about the Wiki developments.

Group Spaces are offered to set up own group to facilitate the communication between the group members. The groups have complete control over who can access in the group space.

Events Extra provides a permanent host for conference materials: poster presentations, materials from workshops, reports, etc. that are not being considered for publication in a journal.

Water Wiki gives also a chance to support organizations by the registration and the creation of a profile for the organization. It could be a good chance for the organization to getting more known and to getting involved to international atmosphere by creating links to the web pages and online publications.

The Water Wiki offers an opportunity for YWPs to being part in an international environment and to share their experiences with other experts in the field of water.

For more information please visit the following websites:

1. ITT: www.itt.com
2. Berlinwasser: www.berlinwasser.de
3. WILO group: www.wilo.com
4. Arche noVa: www.arche-nova.org
5. GIZ: www.giz.de
6. DWA: www.dwa.de
7. AKUT: www.akut-umwelt.de
8. WWMD: www.wwmd.org
9. Water Wiki: www.iwawaterwiki.org

Report of Group VI

The German Water Sector

Group Members (from left to right): Péter Csáfordi (Hungary), Anna Pakuluk (Poland), Syed Abu Shoaib (Bangladesh), Fasika Diro (Ethiopia), Mirja Michalscheck (Germany), Louisa Babikyan (Bulgaria), Irina Angelova (Bulgaria), Maria Stoica (Romania), Nicolae Sebastian Forir (Romania)

Group Guide: Anna Pakuluk

Thanks a lot for giving us the opportunity to participate in the Young Water Professionals' Programme!

On the 2nd day of the Young Water Professionals' Programme on the International Trade Fair and Congress "Wasser Berlin 2011" our working group took part in a workshop "German Water Sector". The speakers gave us insights into the water situation in Germany, Bulgaria, China and Jordan and presented the activities of the Water Works Berliner Wasserbetriebe. We would like to give a brief summary of the workshops' presentations dealing with this topic.

1. Berliner Wasserbetriebe

Presented by Dipl.-Ing. Hubertus Soppert

Berliner Wasserbetriebe (BWB) is the largest water supply and waste water disposal company in Germany. About 3.4 million inhabitants are supplied by this company which employs about 5000 specialists and has turnover of around 1.1 billion €. BWB started its history in 1856 with first master plan of sewerage system for 12 drainage districts. The construction of waste water treatment plant began in 1873. The operation of the first biological treatment plant was carried out in 1931, the operation of waste water treatment plant with activated sludge process in 1963 and in the eighties the technology was enriched with the processes of nitrification, denitrification and phosphate elimination in the nineties. After the reunification of East and West Berlin in 1989 Berliner Wasserbetriebe had to cope with a big challenge of rising the technical standards in East Berlin in the sewerage and drinking water supply systems. The waste water treatment plant was extended with investment of 2.5 billion € within 5 years. Another challenge was to replace surface water by ground water and to reduce water consumption and water losses in East Berlin. Nowadays, the largest water supply in Germany draws water from 700 wells and after preparation in 9 waterworks supplies the capital with water using 7 900 km pipe network. Wastewater of Berlin is treated in 6 waste water treatment plants with 9 400 km pipe network.

The *p2mberlin Ltd.* is one company of the Berlinwasser group which is responsible for the engineering and project management. The company makes hard efforts to fulfill the safe, economical and environmental-friendly operation. These requirements can be achieved by

the following investments and knowledge. Know-how, innovative services and technologies are being applied in the design and operation. The project management is cost efficient and punctual. The company has got broad experiences and references received from the long history and international projects, while skilled employees, experts and team work ensure the reliability of p2mberlin.

There are many core business function of the company group held together by the engineering and project management. Drinking water supply, wastewater disposal and storm water management represent one big group of the operation, while construction, infrastructure and landscape planning are also solved by the company group. As we can see Berlinwasser takes part in all works from the planning through construction till controlling, furthermore one company group is gathering the problem of drinking water and wastewater. After Mr. Soppert storm water management is one of the most important tasks because of the 500 mm annual storm water in the region of Berlin. (For instance in Wassmannsdorf wastewater treatment plant large capacity of the sand trap sedimentating sand fraction deriving from rainfall events also proves this fact.) Berlinwasser does not need any governmental support, because the company group is maintaining itself from the collected prizes of its water services.

Drinking water is extracted from groundwater by bank filtration. Water treatment is simple and free of chemical treatment, disinfection. Drinking water goes through the wells into the aeration and filtration plants, afterwards into the storages. 148 pumping station serve to let the water in the households and factories. Total daily capacity of waterworks handled by Berlinwasser has an amount of 1140000 m^3. The operating waterworks are shown in the *Table 1*. Groundwater quality is more and more worse, however drinking water loss through the pipe system has reduced after the reunion. (As far East Berlin it had 25% water loss while West Berlin had only 6-7% water loss.) Simultaneously drinking water consumption has also decreased approximately with 60%, nowadays the average value is 117 l/person.

Table 1. *Daily capacity of waterworks and wastewater treatment plants in Berlin*

Waterworks	Capacity (m^3/day)	Wastewater treatment plants	Capacity (m^3/day)
Tegel	260000	Ruhleben	247000
Friedrichshagen	220000	Waßmannsdorf	218000
Spandau	160000	Schönerlinde	105000
Beelitzhof	180000	Münchehofe	42000
Stolpe	120000	Stahnsdorf	47000
Tiefwerder	100000	Wansdorf	40000
Wühlheide	40000		
Kaulsdorf	30000		
Kladow	30000		

Berlin's wastewater sewer system includes 4300 km of wastewater sewers, 3200 km storm water sewers and 1900 km combined sewers resulted 9400 km total length of sewers. As *Table 1* presents the capital of Germany has a total 699000 m³/day capacity wastewater treatment plant systems. If one of the plants has technical problems, wastewater can be redirected to another plant. The general way of wastewater on a treatment plant is the following: pumping stations – inlet structure with screening plant and grid chamber (sand trapping) – primary cleaning (primary sedimentation, mechanical process) with settling tanks, sludge treatment with digesters (drying through centrifugation then incineration) – activated sludge tanks (biological process) – final clarifiers – inlet into water bodies. It is good to know that the German rights do not ordain to apply chemical treatment and disinfection of wastewater except for those cases when the recipient water body is considered for especially sensitive surface water.

P2mberlin offers different and comprehensive services also in international markets. They prepare feasibility studies, Environmental Impact Assessment and investigate economy efficiency. EIA is based on own laboratories with skilled assistants. Services also include R&D projects and master planning, design (FIDIC), tendering (FIDIC), site supervision (FIDIC), commissioning, optimization, ensuring of health and safety, coordination, organization, administration, financial management, time management, quality management. There are some example-technologies like decentralized systems, membrane filtration which are disseminated and retailed in order to promote non-revenue water production, sewage effluent treatments and integrated water management projects. IWRM-projects have 60% contribution of the company's international operation.

The international project activities cover a huge part of Europe, Asia and p2mberlin has also project partnership in Africa. P2mberlin has contributed such projects like:

- Micro tunnelling – Wastewater Pressure Main BieWa Berlin, Germany,
- Control and Information System for Wastewater – LISA, Berlin, Germany
- Wastewater Treatment Plant, Bremen-Seehausen, Germany
- Wastewater Treatment Plant – WWTP I Gut Großlappen und WWTP II Gut Marienhof, Munich, Germany
- Central Waste Water Treatment Plant Zagreb, Croatia
- Upgrading of the Water Supply, Imisli, Azerbaijan
- Water Supply and Waste Water Disposal, Elbasan, Albania
- Automation of Waste Water Pumping Stations, Istanbul, Turkey
- Rehabilitation of Water and Wastewater Facilities, Volzhsky, Russia
- Main Waste Water Treatment Plant Darkhan, Mongolia.

During these projects Berlinwasser and p2mberlin had a great role e.g. in project planning and structural design, project management, arrangement of tendering procedure, health and safety coordination, delegated client tasks, design and site supervision for the rehabilitation of the building structure, restoration of the complete mechanical equipment, time schedule controlling and cost controlling in connection of the upgrading, rehabilitation/reconstruction of a wastewater treatment plant, mechanical sludge dewatering, preparing contract and negotiation of contract, support in preparation of environmental, health and safety reports, etc. These tasks depict a reliable and high qualified company, reflecting back to the mentioned efforts as to be a safe, economical and environmental-friendly operation.

2. Water Sector in Bulgaria

Presented by Louisa Babikyan and Irina Angelova

Water Supply Sector – general Information

99% of the Bulgarian population is connected to the national water supply network. The quality of the supplied water is in accordance with the EU standards for potable water. Both ground water and surface water is distributed to the population and 42% are treated in water treatment plants. The raw water quality depends on its origin and is summarized in the Table 2.

Table 2. *Raw water quality*

Water Quality	*Unit*	*River water*	*Und. water*
pH	-	7.0-7.8	7.0-7.5
Turbidity	NTU	0,0÷12,0~330 d 10÷300~40 d	0,0÷0,01
Colour (Pt. Co.)	°	5,0÷30,0	-
Alkalinity	mg/l	0,2÷1,0	-
Oxidizability	mg.O2 /l	1,0÷6,0	-
Temperature	ºC	0,2÷16,0	6,0÷12,0
Fe	mg/l	0,0÷1,0	0,0÷0,12
Mn	mg/l	0,0	0,0÷0,5
NH3	mg/l	0,0÷1,2	-
NO3	mg/l	0,0÷10,0	0,0÷12,0
NO2	mg/l	0,0÷0,1	-
Microb. Indices		above the norm	above the norm

The total length of the water supply network in 2009 is 73 785 km, 361 km were reconstructed in this year and 97 km are newly built. The existing water distribution network is in poor structural condition with more than 70% of the pipes made out of asbestos cement. Information about the pipe material is given in the following plot.

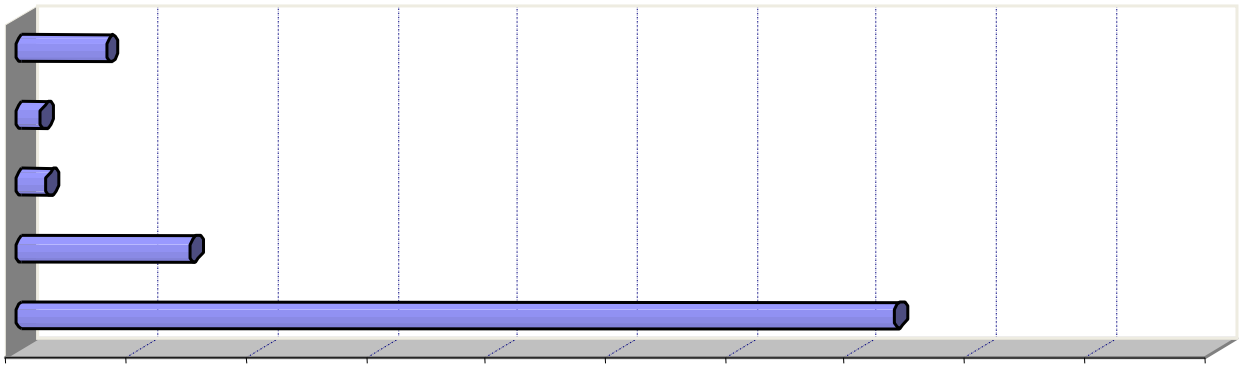

Figure 1. *Pipe's material in water supply network*

Main problems of the water supply sector

The main problems of the water supply sector in Bulgaria are:

- great water losses – up to 60% and high rates of unaccounted water,
- water shortage during the summer months and during droughty conditions, due to lack of water reservoirs,
- the equipment in the WTPs is physically and technically out dated,
- necessity of re-evaluation of the treatment technologies due to deterioration of the raw water quality,
- the treatment of technical water is poorly developed,
- sanitary protection zones are not well secured.

Waste water sector – general information

Statistic for 2009 year shows that 74.8% of the population in Bulgaria is connected to the sewerage system and 45.2% of the population is connected to WWPTs. According to statistic for 2009 the total number of constructed WWTPs is 73 and 42% of the supplied water is treated in the existing WWTPs. The total length of the sewerage system in the country is about 10 196 km.

Figure 2. *Aeration Tank*

Figure 3. *Aerobic sludge stabilization*

Main problems of the waste water sector

The main problems of the waste water sector in Bulgaria are:

- one third of the population is not connected to the sewerage system,
- the high level of infiltration into the sewerage system causes serious problems for the network and especially in the process of the WWTP,
- the existing sewerage system is of combined type and full capacity of the pipes is difficult to achieve under storm water conditions,
- lack of investments in water supply and wastewater infrastructure of assets. The mixed ownership between central and local authorities has affected the entry of the private sector,
- absence of an independent regulatory body.

3. Topic: Challenges in Water Supply in Arid and Semi-Arid Countries

Originally Presented by: Mays Al Sawalha and Ronza Al Marji

The Jordanian M.Sc. students Mays Al Sawalha and Ronza Al Marji (Cologne University of Applied Sciences) reported on challenges concerning the water supply in arid and semi-arid countries. According to them, almost one third of the total area of the world is characterized by aridity and water scarcity. In these regions, irrigation is crucial for agricultural activities,

since rainfall patters vary from season to season and might be highly irregular. Climate change is likely to intensify these trends and overall the Arab Region will be one of the most affected regions in the world. Jordan, their home country, is the 3rd water scarcest country in the world already today. Central challenges with regards to water supply are to secure the water quality, to mitigate the impacts of climate change, to supply the growing population with sufficient quantity and to find peaceful and effective means for the management of the many transboundary water bodies (e.g. the Nile, The Jordan River, Euphrates and Tigres...). Moreover it is important to combat so called non-revenue water, to raise the awareness within the population in this region and to combine new technologies with old wisdom in order to find the best practice for the regional water resources management. The variety of problems require an integrative and interdisciplinary approach. In fact, the two presenters are two of currently 14 students of a bicultural Master Programme in 'Integrated Water Ressource Management', where young water professionals from the Arab region (Jordan, Syria, Yemen, Palestine and Sudan) and Germany are working together in an interdisciplinary way towards sustainable solutions and a wise management of the local water resources. The Young Water Professionals Forum broadens the cultural horizon and exchange and further diversifies the know-how contributed by the different professionals from the many participating countries. It seems that such forums may significantly contribute to successfully handle the challenge of water supply in arid and semi-arid regions.

4. Waste Water Treatment in China – Status and future trend

Presented by Lu Xiao and Haoting Li

In the past, in China, in 1996, 532 from 666 cities had no wastewater treatment plant and 77,4 % of sewage was discharged directly into the rivers. In 2010, the amount of waste water reached 60 billion ton and the pollution load exceeded due to high population transfer to cities. That's why it is needed the control of urban sewerage pollution.

At this moment, in China, the average operating rate of urban wastewater treatment plants is 82,8% and up to 1623 plants have been constructed, but are still 61 cities without wastewater treatment plant.

In the usage of urban wastewater treatment technologies was registries that during the 70's was used activated sludge aeration condition to remove BOD and SS and during the 80' s was applied adsorption Biodegradation Process for PH change and toxic substance

In the present are applied Oxidation Ditches- Orbal and Carousell processes and is also used Sequencing Batch Reactor Activated Sludge Process.

Rural wastewater treatment characteristics

In the rural zones in China are at present 600.000 villages with a population of 0.8 billions people. 80% of rural areas don't have collection and treatment of sewage, they use oxidation ponds, constructed wetlands and surface infiltration beds with low investment costs and also low administration costs.

It is considered that the major Investment Zones are the key river valleys, the central and western regions, the township areas and Sichuan Earthquake Zones.

The **Accompanied Regulations Reformation is represented by the following: improve** market entry certification system, make qualification certificates detailed, improve the bidding system, invite related companies to take part in the environmental and technique standard making, encourage the development of consulting companies. Also has to be implemented water environmental protection municipal bond.

The 2008 newly revised Water Pollution Control Act says that water environmental protection should be political performance criteria of the officials and should be increased the punishment and penalty and no maximum penalty any more.

Also should be increased pollution discharge fees and change from fee to tax, changed from multi-department regulation to single department regulation so that the out of discharge limits could not break the law.

5. German Water Sector

Presented by Dipl.-Ing. Hubertus Soppert

Water situation in Germany

As far as the renewable water reserve of Germany is concerned, it is estimated that it is about 188 billion m³. Out of which only 19 % are actually utilised.

The diagram below shows the percentage of usage by the different sectors. One can see that public water supply uses only 2.9 % which is quite insignificant.

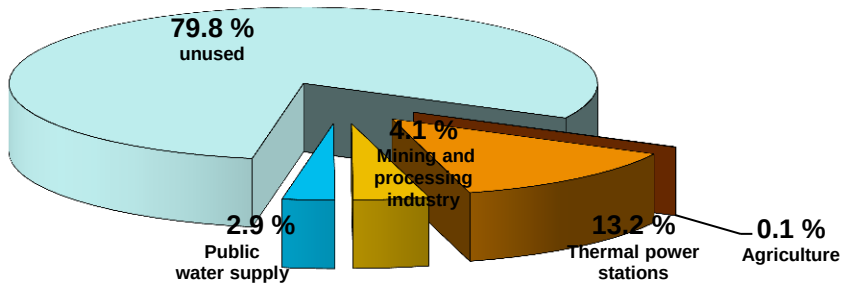

Figure 5. *Percentage usage of water in Germany by the different sectors*

German Water Policy

Generally the German water policy has more or less 6 objectives as depicted below:

- Securing the quality of surface and groundwater
- Waste water treatment facilities with best technology
- Drinking water security
- Flood prevention and protection, retention
- Cooperation and coordination in river basins
- Public Involvement

German Water Partnership

There are about 300 members from all relevant areas of water management which are playing an active role in the partnership frame work. The different members are listed below:

- Operating companies / Water authorities
- Construction companies
- Plant / System manufacturers
- Industry and manufacturers of components
- Consultants / Engineering companies
- Universities/ Research
- Federations / Public institutions
- Organisations for development cooperation

Berliner Wasserbetriebe

Berliner Wasserbetriebe is the largest water supply and waste water Disposal Company in Germany. Currently the company serves about 3.4 million customers in Berlin and gives a job opportunity for 5000 employees.

The water supply system consists of 700 wells and 9 water works which in all consist of 7900 km pipe network. As far as the sewage disposal is concerned, 6 WWTP and 148 pumping stations are used which in all covers 9400 km of sewage network.

Drinking Water Treatment in Berlin

Figure 6. *Schematic representation of the water treatment in Berlin*

As mentioned above, the raw water is abstracted from ground water via bank infiltration by making use of 891 wells. The capacity of the water works is estimated to be 1140000 m^3/d and no disinfection is used.

Assessment of the German Water Sector

Strength:

- Unique System with high Technology
- Minimum Loss (less than 7%)
- High Quality
- Efficient Maintenance
- Successful management after reunification in Water sector

Opportunities:

- Technology Transfer
- High Global Acceptance
- Employment generation for German‘s Abroad
- Employment in Germany for foreign technical skilled Personnel in the water sector

Weaknesses:

- Its rarely visible but to mention for basic understanding are the following:
- Smelling / Odour near Waste water treatment plant
- Suggestion : Plant X-mas trees or other trees
- Burning of the Sludge
- Suggestions: Agricultural Use

Threats:

Climate Change could be a big threat for German Water sector. Pollution control with industrial development is also a big challenge.