

WATER LOSS DETECTIVES



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TRIBUTE TO VASILE CIOMOS



As usual it is a pleasure to be asked to contribute a short editorial to the latest edition of the Water Loss Detective Magazine. However this contribution is tinged with sadness due to the untimely death of Vasile Ciomos in a tragic accident in August near his home town of Cluj.

As most of you will know Vasile was President of the Romanian Water Association (ARA) and also a Regional Director of the International Water Association (IWA). Vasile had been actively involved in the water sector in Romania for over 20 years and had been largely responsible for reshaping the water sector in the country to successfully attracting much needed funding into the sector from both National and International Funding Institutions.

Through his position with the IWA he strengthened links throughout the water industry, particularly in countries in the lower Danube Catchment Area. Although an Economist by profession he commanded good technical capabilities and was involved in introducing numerous initiatives to facilitate operational improvement. One such initiative was the launching of the Leakage Challenge Competition several years ago that has grown from strength to strength over the years. The Competition has strengthened the knowledge of water loss reduction techniques and provides a forum for practitioners to gain from common experiences. It was an initiative that he always found time to support and fit into his busy working schedule. An international perspective on this years event is also featured in this issue He was also actively involved in Benchmarking and was responsible for developing a database for international performance comparison. Non-Revenue Water features as one of the key performance indicators.

Vasile will be missed by all who knew him and his influence in the water sector will be difficult to replace but I am sure that we will all rise to this new challenge that we face.

Andy Bowden

Managing Director – A C Bowden Consultancy

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FINDING WATER

Water utilities are starting to discover they are sitting on a goldmine: more than a third of the drinkable water in urban areas leaks out of the distribution system, never reaching customers, and therefore, not being billed. As utilities embark on water loss reduction projects, an integrative approach adopted by some may be the best lead to follow.

When the average resident in one of the world's rapidly growing cities opens the tap for a glass of water, another, hidden tap is opened somewhere underground, leaking precious drinking water into the earth. In most urban environments, according to World Bank estimates, more than 30% of the water pumped through the distribution system is lost, due to leakages, old infrastructure, illegal connections, wrong water pressure, bad metering (or none at all) and a variety of other problems. This situation is neither financially sustainable, nor does it bode well for future generations' water supply and the environment.

Altogether, some 5,000 million cubic meters (1.3 trillion gallons) of potable water are lost each year through urban systems, enough to fill 2 million Olympic-sized swimming pools every year. Experts explain that the main problem with water losses is two-fold: First, drinking water, which is becoming a rare resource in many areas due to population growth and climate change, is being wasted; Second, cash-strapped utilities, that need the income for maintenance and development are losing money around the clock. Globally, the value of lost drinking water, which experts call non-revenue water (NRW), is estimated to be around USD 18 billion annually.

One might assume all that cash would be enough incentive to get utilities going for reducing NRW, but worldwide experience shows that the process is slow and more difficult than previously thought. Only a few governments or private utilities have so far tackled the problem seriously, though the number is steadily rising. In most countries, utilities belong to the public sector, with day-to-day problems often clouding the need for major infrastructure projects. Moreover, the utilities that do embark on expansive projects on their own often fail because they lack the know-how and experience to do them right.

Realizing the problem, experts say, is the first step towards a solution. "Until utility owners will be sufficiently aware that they are 'sitting on a goldmine', they will continually fail to incentivize or oblige their CEO's to take action," says Roland Liemberger, who co-authored an influential World Bank Report on the issue, titled "The Challenge of Reducing NRW in Developing Countries."

Liemberger lives in Manila, one of the few megacities in the developing world in which the water utility, in this case a private concessionaire, realized the financial potential of a NRW reduction project. Like many Asian cities, the capital of the Philippines experienced a rapid rate of urbanization and development over the last

few decades. The western part of the city is one of the most densely populated places in Asia, with nine million inhabitants now and still growing. Sustainable water practices are incredibly important to not only support the increasing demand for clean water; it is also a necessity for the water utility's survival.

"In 2007, before Maynilad [western Manila water provider] implemented the project, a third of the population was still un-served and supplied only by private water tankers or from boreholes; Maynilad's NRW level was very high, at 67%," recalls Liemberger. In the five years since the project began, NRW has been nearly cut in half, saving more than 600 million litres per day [158.5 million gallons], providing 2 million additional people access to running water and quadrupling the company's value, to around USD 2 billion.

"No utility has ever achieved such a massive water loss reduction in only a few years", says Liemberger, who helped Maynilad to design and implement the project on behalf of Miya, a global water efficiency company that partnered with Maynilad for the ongoing NRW project.

But where Manila succeeded, other cities fail.

The complexity of reducing the NRW

"There is no right or wrong formula," says Arjun Thapan, chairman of Waterlinks, Inc. and former Special Advisor on Infrastructure and Water to the Asian Development Bank President. "A solution that fits one metropolis does not fit the other, and the right mix needs to be determined by experts," he says.

Liemberger agrees. "Much of the failure until now is due to underestimating the technical difficulties and complexity of NRW management. NRW is a complex and integrated problem and needs a complex and integrated solution," he adds.

Another key problem is organizational. Both experts believe that one of the necessary steps is to establish a single body – whether public or private – and to entrust it with overall responsibility for solving the problem. "You have to view water as a business," analyzes Thapan. "It doesn't matter whether it is managed privately or publicly, so long as the assets are owned publicly. The water issue needs to be corporatized if it's wished to be resolved."

"Only if you make one party truly accountable for solving the problem you can be sure that you will get your 'bang for the buck,'" says Liemberger. "Too often too many cooks spoil the broth, and at the end nobody is accountable and no results are achieved. This leads

to frustration and utilities give up and don't make anymore efforts."

In fact, some experts see this process happening already: NRW reduction projects starting with high expectations, but ending up abandoned because of an incorrect approach. "Despite abundant efforts by governments, international finance institutions, donors, water operators and research institutions towards NRW reduction, it is striking that in many cases the performance improvements in NRW tend to reverse with time," says Jan Janssens, a former program leader for the World Bank Water and Rural Development Program.

The problem is not confined to the developing world either. In the U.S., where an estimated 23 million cubic meters (6.1 billion gallons) of fresh water are lost annually, most of the infrastructure is more than a hundred years old. Replacing all the pipes, as a crude way to eliminate water loss, would require a staggering investment of more than USD 400 billion. In the current economic situation, such investment is unrealistic and daunting. Thus the question of how to reduce water loss using a variety of methods becomes a global consideration.

Holistic is better

Utilities around the world are learning that a successful long-term NRW reduction program is hard to implement. Even though problems are commonplace, their solution may require a variety of different measures, usually including some mix of water-pipe replacement, active leak detection, water pressure management, new metering devices and methodology, accompanied by public education programs. But the exact recipe changes from one city to the next.

The right approach, as Manila and other recent examples show, may lie in choosing an integrative solution: balancing the technical, financial and

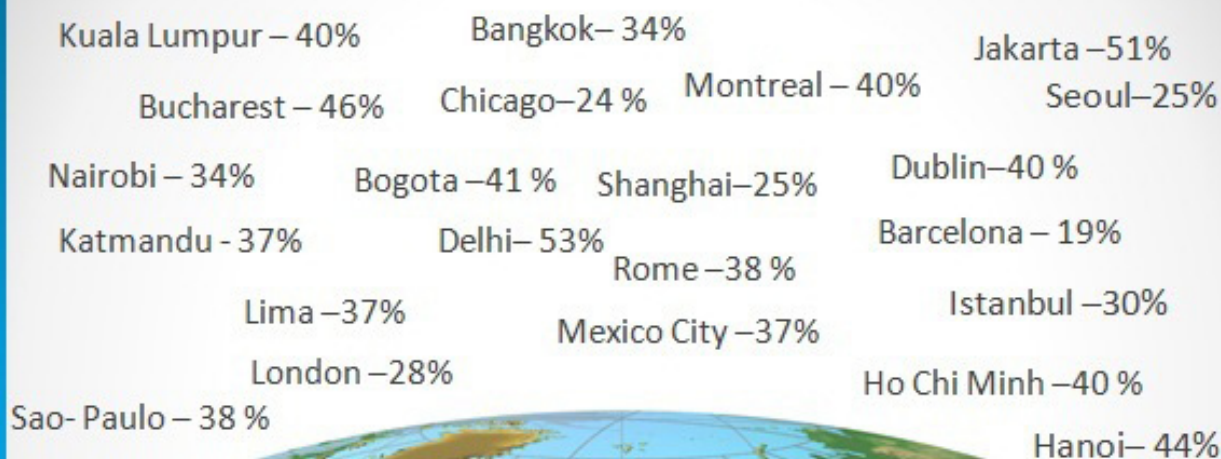
organizational parameters according to their needs in consultation with international advisors and expertise. "Ultimately, what is required is the development of an array of technical, institutional, economic and managerial capacities," declared the United Nations Water Decade Programme on Capacity Development in 2011. This approach has been adopted by more and more governments and utilities in the last few years, replacing single large-scale projects like overall pipe-replacement or building new water-treatment plants, which proved to be highly inefficient.

One example reflecting this holistic view began recently in the Bahamas. Because of high NRW levels, the Caribbean state loses around 20 million liters (5.3 million gallons) of water each day. The losses alone cost the utility almost USD 16 million a year. With the support of the government and the Inter-American Development Bank, the Bahamas Water & Sewerage Corporation began a 10-year comprehensive NRW reduction program.

"Several solutions were tried over the years using internal and external resources," said Glen Laville, General Manager of the Corporation. "Nothing made our network more efficient, because every action had its benefits and consequences. We finally determined that only an integrated, comprehensive approach that encompasses all aspects of network efficiency could solve the problems."

Along with technical complexities, another key challenge is to understand the public dynamics of water issues. "NRW reduction projects are usually not so attractive for local governments," says Thapan. "They are smaller in nature and more difficult to undertake, because it means going into the network and fixing leaks. Some politicians will always prefer building a brand new treatment plant instead". Yet it is inefficient if almost 50% of the water produced go down the drain.

Global Water Losses





Financially, NRW reduction programs lead to the highest return on investment in terms of both water and money. Castalia Consultants, a group that deals with infrastructure projects, recently compared the return on investment from NRW projects to water treatment plants. Their conclusion was that a liter of fresh water coming from a new treatment plant, “is 2.5 times more expensive than a liter of fresh water coming from water-loss reduction programs.” This is yet another example of why improving existing systems and conserving resources is the sustainable solution.

A recent NRW project conducted by the São Paulo’s water utility (SABESP) proved the financial potential of well-managed NRW reduction programs. Aimed to deal with NRW figures of more than 60% in the suburb town of Itapevi, the project covered the initial investment in only 17 months, and increased water supply to the entire population by cutting NRW by more than half.

SABESP understood the financial potential of comprehensive NRW reform. Their current level of NRW is 26%; they have undertaken an ambitious 10-year program to reduce NRW even further to 13%. “We have learned

through a number of successful NRW projects that this is the most sustainable and cost-effective way to optimize the existing network. The financial aspect has already proven itself,” said Gesner Oliveira, former President of SABESP and currently a board member of Miya Brazil.

Mary Ann Dickinson, chair of the IWA Efficient Urban Water Management Specialist Group, says these kinds of projects have proven their value all over the globe. “Utilities often fail when they cut corners on data collection and rely on their own inaccurate estimates, and when they don’t budget the financial resources to get the job done in managing their leakage. It is all cost-effective management: the positive return on the investment can be easily documented.” Dickinson also believes NRW management projects send the right message to the public, especially in urban areas that suffer from water scarcity. “Any water utility short on water supply must demonstrate to their consumers that they are, themselves, practicing what they are preaching,” she says. “While the average customer has little understanding of the mechanics of water loss management, they certainly understand the inequity of being asked to sacrifice their own water use when water is seen leaking from the network.”

The “New Oil”

As water is becoming a scarcer valuable resource, some analysts are calling it the “new oil”. The water issue is even more pressing than oil because, unlike oil, it is not replaceable. Thus saving potable water is expected to move higher and higher up on the governments’ agendas worldwide. Utilities will be under pressure to stop losing half of the water produced, repair hidden underground leakages and ensure the level of efficiency that is the norm for other resources.

Experience is expected to play the key role. “Manila worked because NRW reduction became the flagship activity of the local utility,” says Liemberger. “It worked because of adopting a holistic view on NRW management and because the department dealing with it, which was established in the beginning of 2008, started with only five staff but grew to around 450 local engineers. It worked because there was sufficient funding; and last but not least – because there was willingness to partner and learn from international companies and experts.”

Asaf Unie

The writer is an environmental journalist invited by Miya to conduct an in-depth independent analysis of the water efficiency industry.

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LEAKAGE CONTEST FROM THE PERSPECTIVE OF A DUTCH JURY MEMBER

On Saturday June 8th, 21 well-equipped teams went into the 'field' to detect leaks in the water distribution network of Bucharest. The 6th contest in the Romanian history was held in the capital city because last year it was the team of the Bucharest company Apa Nova that won the contest.

This time the contest got somehow an international character because a team of Bulgaria and Serbia participated and a team of Moldova observed. The three traces in the centre of the town were well safeguarded by the employees of Apa Nova. This was crucial because this year Safety Procedures were taken into account. Note that in my Dutch company the slogan is: "we only do the job, if we can carry it out in a safe way".

Rainfall caused a small delay of 1 hour to give the teams equal changes. In the evening the results were compared by the jury in a nice environment alongside a lake, where all the participants were invited for dinner. It was decided to dig holes on three locations the next day for reasons of verification.

It turned out on Sunday that on the first trace no leaks were found. Only two brave teams dare to declare that. On the other traces leaks were detected. The fabulous team of the company of Alba was closest

to the real locations of the leaks. Almost the best were the teams from Galati and Sibiu.

I want to express my utmost appreciation for the professional organization and I'd especially like to mention Silviu Lacatusu from ARA, professor Anton Anton, and the people from Apa Nova. Perhaps it is an idea to think about an international contest of the teams who were the best in their home country. For making house connections on distribution mains, such a contest already exist; for fighting leaks not yet.

The last item I'd like to mention is the interesting seminar on Sunday. The fact that these meetings are organized will contribute to the involvement of all the participants to the contest and more over to the technical departments of all the Romanian water companies.

It was an honor for me as a Dutch asset engineer from PWN Water Supply to be member of the jury. Next year the participants will meet again in the city of Alba; they may host the contest.

Peter Horst

PWN Water Supply, The Netherlands



ECOIMPULS – AN IMPULSE FOR SUSTAINABLE DEVELOPMENT

Ever since the beginnings of its development, human society has remodeled its natural environment out of the desire to improve its quality of life. However, the creation of this "artificial" environment, intended to serve the current needs of the human population, has led to significant destruction of our terrestrial habitat, to such an extent that we are now faced with a true "ecological crisis". If we want our civilization to have any chances of survival, we must act as quickly as possible to protect the quality of the surrounding environment. How? Through limitation of the negative impact our activities have on it. Through the development of sustainable solutions which will contribute to stopping the on-going degradation of nature and to improving the current situation.

The International Conference on Environmental Research and Technology – ECO IMPULS 2013,

scheduled to be held in Timișoara, Romania on the 7th and 8th of November 2013, represents a small contribution to the efforts being made worldwide in this matter. Reducing the impact of civilization on the environment is one of the main priorities of experts in this field - through the development of clean technologies, by increasing the efficiency and reliability of systems, as well as by using renewable energy sources. The proposed topics address a range of current issues including: "Water in a changing world", "ZERO waste cities", "Energy – beyond the conventional". In the hope these are subjects of interest to you, we look forward to welcoming you at this year's conference!

For further information please contact us on aquademica@aquademica.ro

VODACOM - FOR BETTER WATER SUPPLY IN THE COASTAL AREA OF MONTENEGRO

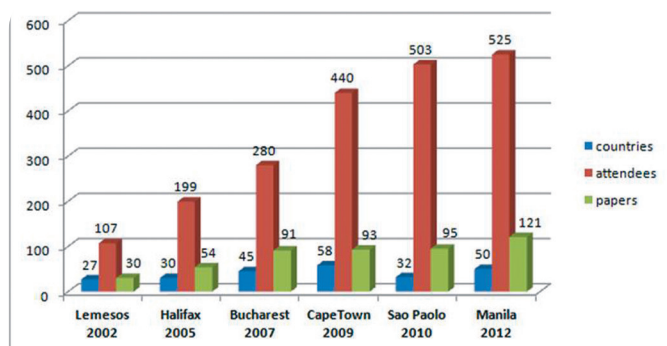
Vodacom is a joint service and coordination company for water and wastewater services for the Montenegrin Coast. It was established on 29 March 2005 after the Government of Montenegro (GoM) recognized the need for active work on upgrading water and sewage infrastructure on the Montenegrin coast. Vodacom was then established by the GoM, and Bar, Kotor, Tivat, Budva and Herceg Novi Municipalities, as a Project Executing Agency (PEA), for the *Water Supply and Sanitation Adriatic Coast Project*.

The total value of this Project being implemented by Vodacom in cooperation with the GoM, coastal Municipalities, and public water utilities, international consultants and contractors is of 150 million Euros. Funds are secured through loans and grants from the German Development Bank (KfW), funds from budgets of the relevant coastal Municipalities, and the financial contribution of the GoM. In parallel with this investment project Vodacom is implementing another project aimed at water utilities capacity development, whereby it becomes partner to the consultancies MACS and Sachsen Wasser in this field. Over the course of implementation of these projects Vodacom serves as a bond for cooperation and coordination of activities among the GoM, ministries, municipalities, water utilities, consultants, designers, contractors, donors, and creditors.

Vodacom's work is based on the following fundamental values: knowledge and skills of employees, cooperation, accountability, innovation, initiative, and ethics.

Vodacom's activities

- Management of investment projects in the field of water supply and sanitation aimed at economic development and environmental protection of the Montenegrin coast,
- Management of water utilities capacity development project in order to raise their performance



efficiency, and transform them into modern utility service providers,

- Marketing activities aimed to raise public awareness on the value of water resources, the need to preserve water, and efforts being taken at both local and regional level to upgrade community infrastructure.

Water utilities capacity development measures

Since 2004, Vodacom (in cooperation with the consultancy MASC from Frankfurt, and then from 2009 up to the late June 2012 with the company Sachsen Wasser from Leipzig) has implemented in two stages, a project aimed at developing local public water utilities capacities. Vodacom has prepared the terms of reference for the consultants based on its own assessment of the condition of the local water utilities. This project was aimed at reaching desirable and possible levels of water utilities operation through increased performance efficiency. This project resulted in reduced losses in the water distribution system, secured round-the-clock supply, reduced operating costs, improved collection efficiency, financial viability parameters, and customer service provision. First real losses reduction project in water supply systems, Budva, Herceg Novi and Bar (Vodacom members) in accordance with international competition results, successfully performed by HEIS Company from Sarajevo (Bosnia and Herzegovina).

Continuous implementation of the project enabled Vodacom to master knowledge and develop capacities in all project areas being the subject of a joint work with consultants, and continue providing independent consulting services to its members and other shareholders, as well as to be a local partner to international consulting companies.

Leak detection, GIS and hydraulic modelling

The most influential component of enhancing technical and commercial performance of water utilities is a more efficient use of existing resources and reduction of losses and the amount of NRW. This component contributes to increasing supply efficiency, better water management, and financially sustainable performance, as well as to better conservation of natural resources of Montenegro.



In this sense, even since 2006, Vodacom has been working on developing and strengthening capacities of water utilities technical sectors in order to reach acceptable level of water losses in the water system and

to develop all supporting tools for effective supply system management. Over the course of this period Vodacom has been continuously and successfully working on:

- organizing specialist expert trainings at all levels of technical sector operation (leak detection, flow and pressure measurement by portable on-site devices, training in systematic – planning approach to leak detection and loss reduction by using results of on-site measurements), organizing trainings and workshops related to the use of supporting software tools such as GIS, and hydraulic models. Considering all this Vodacom has been organizing leak detection campaigns in all coastal water utilities through several different methods and approaches: balance method, night measurement, pilot zoning, day inspection of the water supply system and water audit (performed by Djevald Koldžo NRW expert from HEIS). Also leak detection includes water meters inspection on the site (“test in the place”) as well as water meters data base inspection at the office.
- developing hydraulic models used to identify problem areas with detected losses, as well as bottlenecks in the system,
- developing geo-information system (GIS) in the water utilities, members of Vodacom, that now ranks among the best developed geo-information systems of the supply network in Montenegro, and training of engineering staff having received expert training to independently work on GIS system maintenance and development,
- provision of lacking pieces of measuring and safety equipment.

Ageing infrastructure and declining water resources are major concerns with a growing global population. Controlling water loss has therefore become a priority for water utilities around the world. In order to improve efficiencies, water utilities need to apply good practices in leak detection.

Leak Detection: Technology and Implementation assists water utilities with the development and implementation of leak detection programs. Leak detection and repair is one of the components of controlling water loss. In addition, techniques are discussed within this book and relevant case studies are presented. The book provides useful and practical information on leakage issues.

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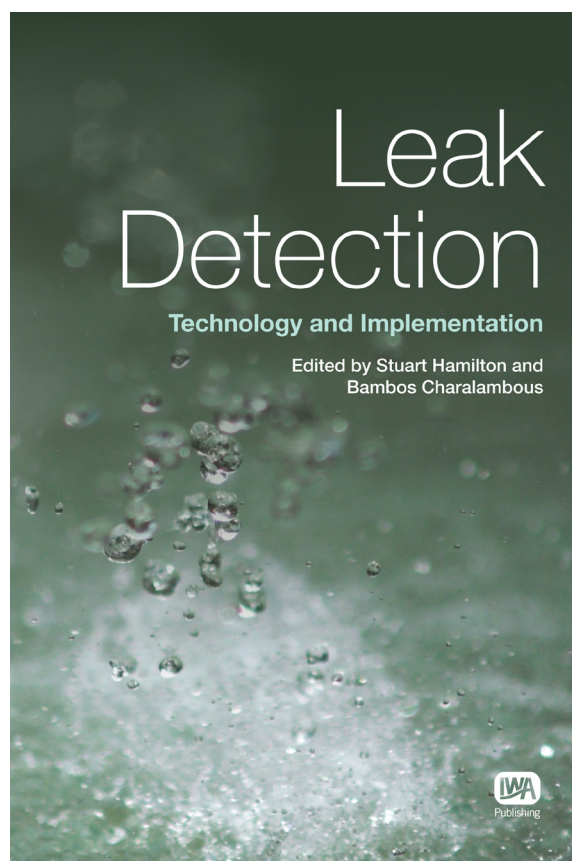
Introduction; The Technology Matrices; Acoustic Principles; History of Acoustics; Leak Detection Technologies; Other Techniques; Optimization tools for leak location; Optimization Principle; System Evaluation; Field Data Process; Optimization Analysis; Post-optimization Analysis; Case Studies; Useful and practical information on leakage issues.

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Leak Detection. Technology and Implementation

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COACHING: AN EMERGING NEED IN WATER LOSS MANAGEMENT

Dealing with water losses requires a holistic approach in all aspects. So far the focus was mainly directed towards technical issues dealing with methodologies and techniques for resolving the water loss issues without substantial emphasis being given to the important changes required to be made in the utility with regard to capacity building in order to accomplish the desired goals. In this article **Jurica Kovac** and **Bambos Charalambous** outline some of the additional aspects of water loss management with specific focus on coaching as a discipline in this field; what it is, how it works and who can provide it.

Introduction

Water Loss Management is defined through goals setting to efficiently, economically and systematically control and reduce water losses in distribution networks. Today it is recognized that this activity has become extremely essential since we are faced with serious changes in our environment (climate changes, pollution, rising demand for more potable water) and with a tremendous downturn in the world financial situation (increase in costs, less funding opportunities).

It is recognised that water loss management is a multi disciplinary activity that practically involves all operational and functional aspects of water. This fact requires a high level of continuous commitment, capabilities and active integration/application with appropriate knowledge from water utility management.

Management

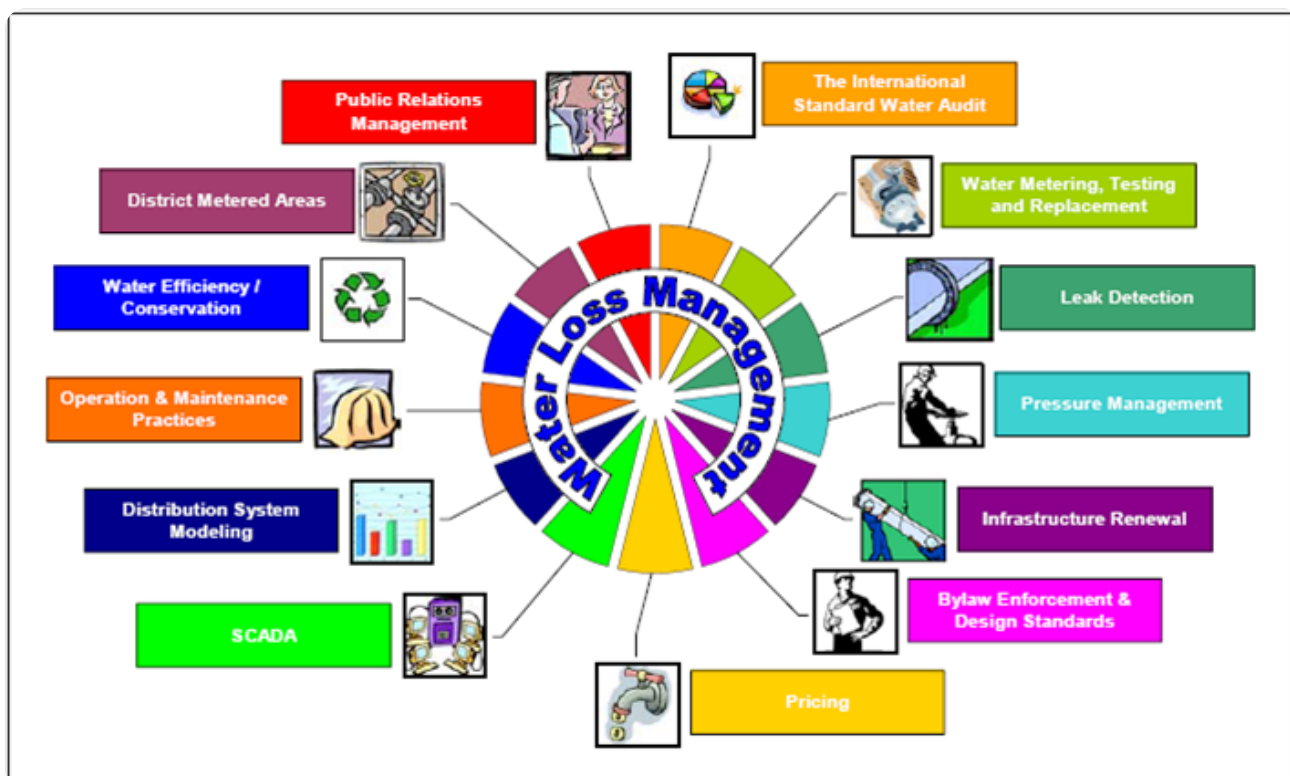
(source: McCormack, 2005)

We have at our disposal the latest global knowledge on water loss management, such as the IWA methodology which provides realistic perception of the issues involved as well as a selection of appropriate methods and practices to control and reduce water losses coupled with a variety of technical solutions and technologies but still it does not guarantee a successful water loss management program implementation and achievement of goals.

It is important to understand and appreciate that besides technical knowledge regarding water loss management other aspects or dimensions must also be considered for a successful and sustainable implementation of water loss management activities through changing existing practices. The concept of 3 dimensions of change was well described by Rizzo and Vermersch (1) and involves the following: operational dimension, project management dimension and change management dimension.

Coping with the above mentioned changes is a serious and very complex challenge for managers in water utilities. The solutions available to this challenge are essentially provided by two approaches: implementing changes autonomously or by outsourcing necessary assistance and guidance.

A key element in providing the right solution is the people within the water utilities, and without proper training, coordination and assistance it is extremely hard



to expect positive results. The problem becomes even more complicated with the continuous retirement of dependable and experienced staff. The new generation of employees which will come in to fill the gap will be faced with the challenge of how to duplicate skills and experiences gained over many years by those who leave and at the same time how to cope with accumulated water loss issues.

The management of a water utility is responsible for recognition, understanding, defining and implementing changes. So, it is crucial to identify a change champion (2) or metaphorically to identify a 'captain' who will lead his/ her ship and crew through stormy waters on a journey from the existing situation into a better one. In order to transform the water utility the captain must have many qualities besides knowledge of water loss management.

Usually the key manager is often one of the best in the utility with already various existing obligations and taking on new ones that involve many changes will not and cannot give sustainable results. The issue of adequate capacity and capability of key managers to deal with all problems within an organisation exists in all markets and industries and in the last few decades has been identified as an emerging need for new special kind of personal outsourced assistance to key managers called coaching.

It has been realized that change management has become a continuous condition in our world with accompanied issues like; how to design needed process, definition of goals and objectives, how to implement it, how to monitor progress and efficiency and most importantly influence on employees (resistance to change, willingness and capacity for new learning, motivation), etc. has brought to market experts with accumulated experiences from different fields of human and business activities.

It is extremely important to have people with 360 degree vision who are able to comprehend existing challenges and to provide guidance and required assistance as and when necessary and requested. Such people are called 'business coaches' and are able to provide coaching to business in order to assist them in moving forward and achieving their goals. 'Business coaching' is a collaborative relationship, solution-focused, results-oriented, systematic and enlightening process in which the specific remit of the coach is to work with an employee to achieve improved business results, improved business performance and/ or operational effectiveness.

Existing challenges

Water losses could successfully be managed through a series of comprehensive activities covering many issues such as real and apparent losses, speed and quality of repairs, asset management, employees' education, use of appropriate technology, etc and all these to be associated with the necessary financing capabilities.

This comprehensive approach is challenging for a water utility management and successful examples are rare. Perhaps the main reason for this is the difficulties faced by the management to introduce and

lead necessary improvements by relying solely on the utility's own human resources, technical expertise and financial capabilities.

Currently many utilities around the world are being faced with numerous problems some of which are set out below under the three broad headings of employees and management, infrastructure and investments:

Employees and management

- reduction in number of employees due to the financial downturn
- ageing workforce (with problems in duplication of skill to new younger employees)
- unbalanced competence and responsibilities
- low motivation
- bad habits
- insufficient education and training in new technologies and methodologies
- Insufficient organization or control
- management influenced by politics and lobbying

Infrastructure

- expanding but without proper follow up in maintenance and secondary development (monitoring, control, etc)
- ageing networks
- increased complexity of the urban environment (roads, other installations, activities,...)
- Lack of new technology and innovation
- Poor security of supplies

Investments

- insufficient
- limited in implementation
- without continuity
- partial in solutions and quality
- influenced by lobbying and politics

The majority of successful examples show the importance of outsourced assistance in successfully dealing with the above problems. Outsourced assistance is appropriate in most cases such as dedicated projects, specified consultancy services, performance based projects. There are many advantages with current practices in these areas but the authors' intention is to highlight some of the disadvantages and how to resolve these through coaching. As an example the following problems may arise:

Dedicated projects and specified consultancy services:

- selection of wrong priorities or solutions
- predefined with limited capabilities for adaptation
- limited in implementation scope and solution
- limited duration
- limited knowledge transfer
- often below standards in quality
- influenced by lobbying
- high costs with problematic financing
- tendering and contracting procedures

Performance based projects

- legal issues (applicability and limitations)
- long tendering and contracting procedures
- political sensitivity
- share of responsibilities

In addition to all the above challenges the problem

of insufficient education and training programs for water utility employees must be emphasized. It is also important to highlight the fact that water utilities are generally reluctant to adopt new strategies, technologies and staff is not responding to new challenges due to the public nature of the organizations. Without continuous, specific and dedicated education it only becomes more difficult for water utilities to tackle increasing number of problems in a constantly changing environment.

Is coaching a solution?

Evidently available knowledge regarding water loss management is not sufficient to secure improvements in water utilities. Outsourcing could help but is not always easily and affordably accessible. It is therefore crucial for the successful planning of activities and their subsequent implementation, to improve the ability and capacity of people working in water utilities. This would involve acquiring knowledge and experience in many different fields of expertise such as, project management, time management, document management, human and technical resources management (3). Sometimes even with all this it is not enough to leverage change and search for additional tools like thinking skills, learning skills, capabilities for improvisations, etc. must be sought. Beyond these knowledge layers there is even a bigger challenge on how to use these tools and skills in a proper manner.

Management and operations in water utilities and in particular those activities relating to water leakage is a daily task. Water Loss Management integrates all kinds of management activities at the same time (reactive, proactive, preventive, risk) and if the right solution or a balanced advice is needed it must be on daily basis and coaches are the kind of experts who could be able to provide it. The more qualities a coach has, the better and more efficient his relationship with a water utility will be. Water utilities need someone who was successful in facing this challenges and changes before. Someone who was on this voyage before and who can bridge over huge gap that exists between existing knowledge and experiences and desired goals for effective and efficient water loss management.

How coaching works?

Transfer of knowledge alone is not enough and will not guarantee that a person who acquired this knowledge will know how to use it. There is usually a lack of practical guidance and application. The aim of practical guidance through a dedicated program of activities and a close relationship between someone like a coach and employees is to transfer virtues and knowledge from the former to the latter from one to another.

How learning works could be presented in a simplified form as follows (4):

- *Talk to me...I forget.* (typical example – conferences and seminars)
- *Present me...I remember.* (typical example – practical presentations)
- *Let me do it...I understand.* (coaching)

A coach is known from the world of sports. He/she is someone doing training, teaching, encouraging, monitoring, etc. either individual athletes or members of a team or a team as a whole. The basic tasks which a coach performs are the following:

- defining objectives and goals
- supporting and encouraging
- presenting success of a team before personal
- evaluating positive and negative sides of each team member
- motivating team members
- creating favorable environment for success
- communicating with each team members

The most important aspect of coaching is the capacity building applying a specific way of teaching which is presented in a simplified form as follows:

- *I am doing it. I am explaining it.* This first step serves in presenting a new issue.
- *You are doing it. I am explaining it.* This second step is transitional with new knowledge.
- *You are doing it. You are explaining it.* Final step with transferred knowledge.

The approach in coaching varies but in general could be presented with the following steps (5); observe, gain trust, guide the change, give trust, make it stick (see picture):

Specifics of coaching in water loss management

A coaching person can be a valuable assistant to our key manager (captain or change champion) or in some circumstances temporary replacement. Guidance provided by a coach can help in all aspects of water loss management. He or she could fill in existing knowledge gap and skills with the aim to assist utilities in building their own capacities and independence over time.

A coach could provide specific assistance in the following areas:

- key manager's "right hand" with aim to identify areas of weakness and improve them, identify strong points and emphasize them, and build new skills and virtues
- defining and monitoring water loss control programs
- wide experience helps in the selection of appropriate solutions
- clear and realistic definition of goals and expectations
- education and training in various topics including water loss methodology but also managements skills, and other skills (for example mind mapping technique for taking notes, analyses of problems, brainstorming, learning)
- evaluation, control and assistance of employees (teacher, trainer, leader, role model)
- communication bridge between management and technical staff
- fast and reliable advice regarding technical solutions and technology
- organizational changes advice
- understanding and evaluating change (more objective point of view)

Advantages

Compared to other available alternatives a coaching person has the following advantages:

- large knowledge potential, capabilities and readiness to assist
- experience gained from many years of work on a large number of projects
- affordable prices (comparing to standard projects)
- simpler contracting procedure (often without tendering)
- open and flexible cooperation adjusted to the needs of the water utility
- proximity, availability (personal, online, phone, email)
- simplicity (in cases of shared language)
- secured continuity and confidentiality
- transfer of knowledge adjusted to the needs and without limitations
- constant development and upgrade with latest new knowledge and examples

Who can be a coach?

Evidently from the description above, finding a coach is not an easy task. All those with excellent knowledge of Water Loss Management are potential coaches, but additional knowledge and skills are needed to be able to provide appropriate coaching service. As it has been shown in this article, sole application or transfer of knowledge related to water loss management is not enough. From available examples in other industries and from the authors' own experience a coach must combine the following basic qualities/expertise:

- Water Loss Management
- Change management
- General management skills (project, time human resources, document, risk)
- Human behavior, psychology and pedagogy
- Communication skills and motivation

It is realistic to assume that in the future water loss experts will turn their attention and focus toward business coaching with the aim to learn and become experienced in other fields of expertise thus becoming suitable for potential clients with higher expectations and desire to accomplish and sustain organizational change in water loss management.

Examples and experiences in coaching

Examples of full scale coaching in water industry are still rare. Many independent consultants or consulting companies are already on the market with services very similar to coaching and with additional fine tuning of their capabilities soon we will be witnessing a rising number of coaching examples in water utilities. Until reliable data from the water industry is available below available general research findings are quoted.

The UK's Chartered Institute of Personnel Management reports (6) that 51% of companies (sample of 500) 'consider coaching as a key part of learning development' and 'crucial to their strategy', with 90% reporting that they 'use coaching'. More recent research in 2011 by Qa Research, an independent marketing research agency

in the UK, found that 80% of organizations surveyed had used or are now using coaching, but also found that while 90% of organizations with over 2,000 employees had used coaching in the past five years, only 68% of companies with 230–500 employees had done the same (7).

As a final remark regarding existing examples the authors are noting that in the last couple of months of this concept becoming better known to water utility managers, there is an extremely positive response and in the future the authors will be able to report on experiences gained from a number of coaching case studies in water loss management.

Way forward

The knowledge gap between those who know and those who need help is huge and cooperation is necessary if fast changes in the field of water loss management are to be witnessed. Alternatively a slow process of change with many mistakes may take place with perhaps steady declining potential for improvement which could perhaps adversely affect organizational viability.

Coaching as a discipline presents an opportunity for water utilities to improve performance as well as to build the necessary skills, capacities and efficiency among water utility managers and technicians to assist them in dealing with the multi disciplinary field of water loss management.

Jurica Kovac
Bambos Charalambous

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APPLYING ADVANCED SOLUTIONS FOR WATER LOSS MANAGEMENT IN WATER DISTRIBUTION NETWORKS

SUCCESS STORY: IVAKOP, IVANIĆ GRAD, CROATIA

The water distribution system is located in the northern part of Croatia, 30 km east from its capital city, Zagreb and it covers approximately 300 km of pipelines with 6,000 service connections. The visible towns on the map are Ivanic Grad, Klostar Ivanic, Kriz and Novoselec with smaller villages, as in Figure 1.

An organisation for utility services responsible for this system; IVAKOP Ltd., performs for a couple of years dedicated programs for reduction of water losses, with primary intention of achieving the conditions for the rational use of this natural resource, but also because of reduction of their expenses. Strong driving force for this activity is the fact this utility has no own water source but it must buy water from another supplier.

There are few ultimate, traditional factors that ensure efficient solution of water loss in water distribution system, and they are:

- Separation of the system in the zones and the implementation of the flow measurements in each of the zones;
- Balancing of the system, i.e. implementation of the pressure-control measures in the system or in particular zones;
- Activity of leak detections and urgent repair.

These traditional methods were early recognised and according to them, initial program of water loss reduction was implemented in 1998 because non-revenue water (NRW) was constantly between 40-45%. Historical overview of the main water balance components is presented in the following graph (Figure 2).

In this paper I want to present success achieved with implementation of early recognised methods of water loss control and even better what can be done if we introduce IWA methodologies and latest technologies.

The initial program of water loss control was based on installation of internal water meters in the system

(approximately 30 locations were implemented in the next few years), with organised readings every 30 days together with large and industrial consumers, and reading of the individual users (households) on a quarterly basis.

Also there was an implementation of pressure control with hydraulic pressure control valves in 3 areas, the main town of Ivanic Grad and 2 smaller regions with constant reduction of pressure from initial 7 bar to lowered 4-5 bar.

The control of the system which started in 1998 provided continuous reduction of the water loss (see Figure 2, data for years 1998-2001), which wasn't clearly representative, because of the usage of in that time standard but non-transparent indicators of non-revenue water calculation and its presentation in percentage regarding total water income.

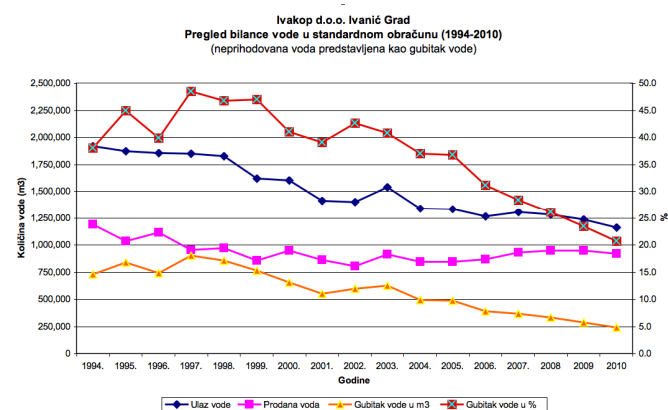


Figure 2 Water balance historical data

Advanced program with IWA methodology and new technology

This approach reached its peak in 2001, when a period of stagnation began. Water utility management realised that their approach was facing limitations and new inputs were needed. Decision was made to search for a strategic outside partner who will be able to help in further reduction of water losses and develop new dedicated strategy to cope with this challenge. A new development was initialised in 2003. The collaboration between Ivakop water utility and company (expert) specialised for water loss management started, and set forward the implementation of new methods and technologies to improve the reduction of water losses. IWA (International Water Association) methodology developed by specialists and experts and today recognised by many institutions and utilities from around the world was used.



Figure 1 Water distribution system location (Source: Google Earth)

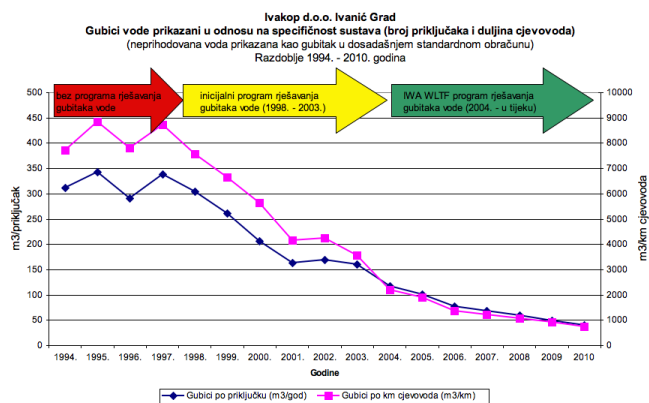


Figure 3 NRW in correlation with service connections and pipes length per year

This positive trend remained successful in the following years, 2004-2010 (Figure 2 and 3), which is even visible in the NRW indicator (Figure 2).

The basic improvements were the following:

- Systematic analysis of the water loss in the system and leakage detection (2003)
- Implementation of IWA methodology (2004)
- Implementation of the remote monitoring on selected existing measuring locations (from 2005)
- Implementation of the new locations for the pressure control (2006)
- Improvement of the pressure control with new technologies – flow and time modulation (2006-2007)
- Definition of District Measuring Areas (DMAs) according to IWA methods (2007) – establishing a data base
- Training and education of water utility staff (continuous).

Results

The implementation of the program resulted in a couple of outcomes; 51 DMA with 58 flow measuring meters including 32 remote monitoring locations of flow and many also with pressure measuring (selected technology is based on data loggers with GSM modems, battery operated), 5 areas with pressure control in the system (2 of them with advanced regulation; time or flow modulations).

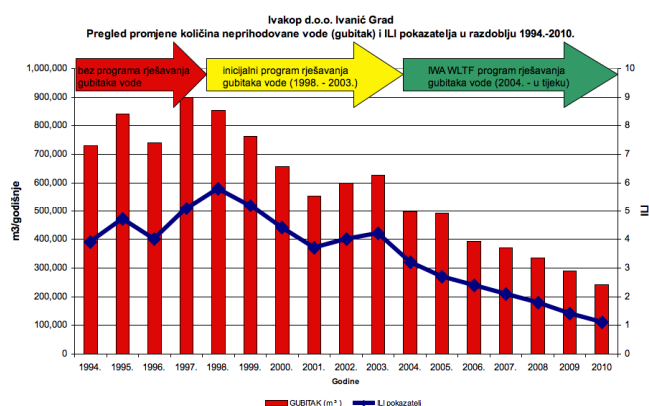


Figure 4 ILI indicator and NRW in volume

In the same time, training was provided for the personnel of the water utility, with main purpose to help them understand these new methods and technologies, IWA methodology, their advantages and usage. The main goal was to enable them to become as much as possible autonomous in regular daily activities regarding water loss management.

According to the analysis (Figure 4) we can notice the reducing of ILI indicator (how many times real losses of water are larger than unavoidable losses of water), in past years, if we compare that with the condition in 2003 (when IWA methodology approach was initiated) ILI was 4.2 and in 2010 was 1.14. In NRW 2003 was 41%, but in 2010 was reduced to 21% (Figure 1).

Tremendous results are achieved when we compare last year without dedicated programme related with losses control (1997) and period after it (until 2010). In 1997 the NRW was 900,000m³ and last year 240,000m³. The NRW was reduced in volume by 73% in last 14 years.

Another issue important to mention is that all presented results were achieved in parallel with continuous expansion of the network in size and in complexity what is shown in the next figure no. 5. Interesting to emphasize is the fact that in this period (1994-2010) we have been witnessing a rise in quantity of leaks occurring in the network (due to rise in complexity of the network but also ageing of the materials) and reduction of average

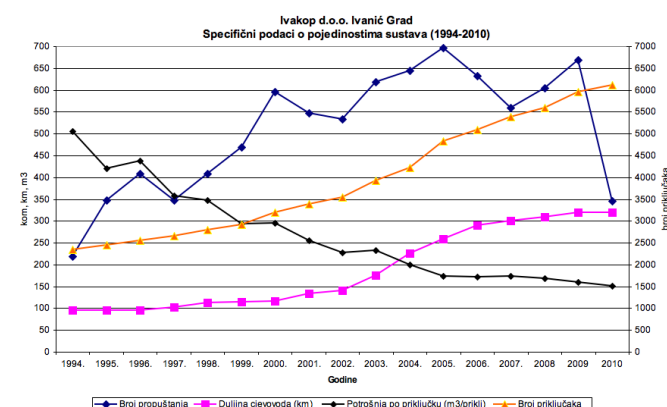


Figure 5 Expansion of the network in size with changes in burst quantity and reduction of average consumption

consumption of the users (partly due to disappearance of large industrial consumers and partly due to constantly more efficient use of water by domestic users). 5

Also, the success of our program is visible in Figure 6 where we have presentation of data collected from our region. Ivakop water utility is shown under number 1.

For additional presentation of used technology here is presented collection of pictures from flow measuring locations within the network (9 out of 58). In all cases in the network are used simple mechanical water meters.

Return of investments

According to the price of 1 m³ of water, which the Ivakop water utility pays for to its supplier, it is important to mention also the financial side of the water loss reduction

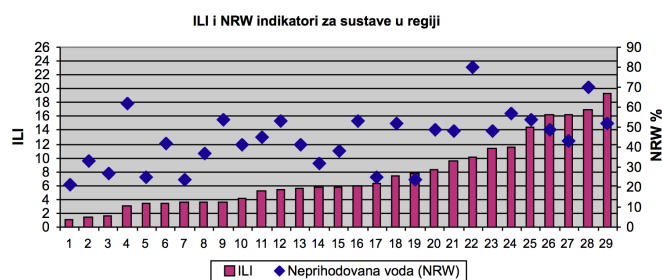


Figure 6 Water loss indicators from the region of Croatia, Serbia and Bosnia and Herzegovina

activities. Total value of the savings for reduced leakage in previous years already covered total investments of above 200.000 Euro. This shows that investing in reduction of water losses can be financially positive and in a very short time.

Further activities

All previous activities were provided with short-term goals. It is important to define further goals and also to address new challenges. A very important one is the issue of high burst/leaks frequency in the network. For the last year 2008 we have made analysis of all basic types of bursts repaired (608) and results are shown in Figure 8.



Figure 7 Selection of flow metering locations in the network (9 out of 58)

It is interesting that out of 443 burst (73%) repaired on valves we had 410 on valves with sizes below 1". These are valves in service connections water meter chambers.

It was assumed that quality of the material is the main cause of this alarming situation.

Changes were made during 2009 regarding policy of purchasing new valves what included higher standards regarding quality (and not as previously was the case that lowest possible price was the only indicator) and results of this change are presented in figure 9 (also you can spot reduction of burst in graph from figure 5).

The reduction of new burst/leaks occurrences in the network was of 50% in 2010 comparing to 2009.

Working on losses control never ends and this is also visible from figure 9, because in 2011 we again have a rise comparing to 2010 in number of leaks, which needs to be further analysed and corrected.

Another point of interest is the implementation of the performance indicators that will help in future analysing. The intention is to use IWA PI system as example for future program development.

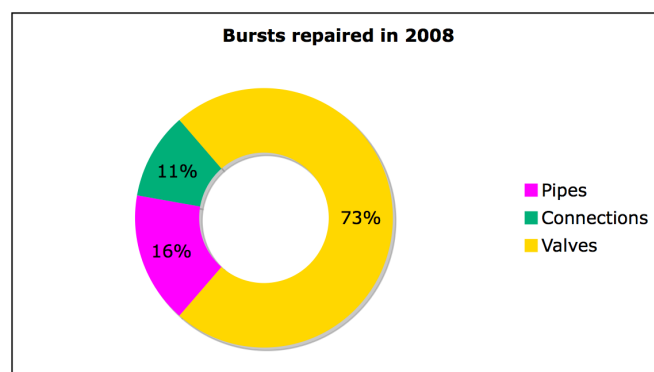


Figure 8 Burst repaired in 2008

It is also necessary to provide activities that are linked with the implementation of the newest methods and standards and IWA methodologies are our way forward.

Education is the key and in the future utility must invest and support programs that will allow them to rise quality of their performance. This is crucial because the system is more complex, with many new technologies, advanced monitoring and analyzing solutions. In the same time it is evident that quantity of revenue water sold per consumer is dropping what will have negative influence on the financial aspects of the utility. All these influences and changes will even more raise the importance of efficient management of the water distribution system and water loss control as one of the most important. As an excellent tool that can help in the future is use of alternative method for taking notes and making analyses, called MindMapping (example Figure 9). 8

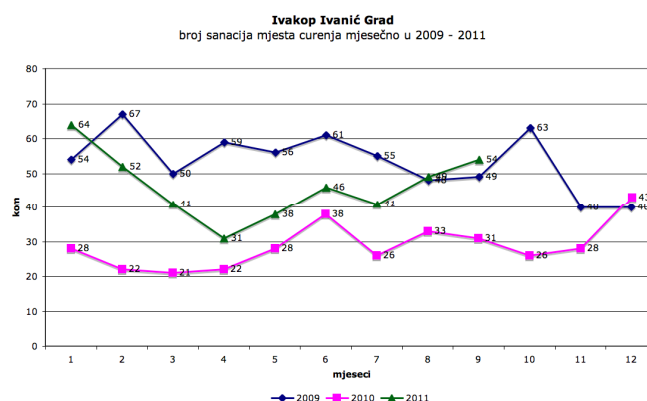


Figure 9 Selection of flow metering locations in the network (9 out of 58)

Conclusion

It is evident that IWA methodology brings fast and large improvements within the water distribution network regarding reduction of water losses and increase of efficient operation and management.

Very basic measures like dividing network in zones with additional measuring points and pressure control are proven to be successful and if we improve them with advanced knowledge and technologies then is even possible to achieve world' best results. Here we had small, undeveloped water distribution system and utility without educated staff, but this was not an obstacle to introduce necessary changes and achieve great results. Most important is willingness to change things and wisdom to use the right knowledge.

In the end I want to mention one saying that reflects our vision: "We can't solve problems by using the same kind of thinking we used when we created them." Albert Einstein.

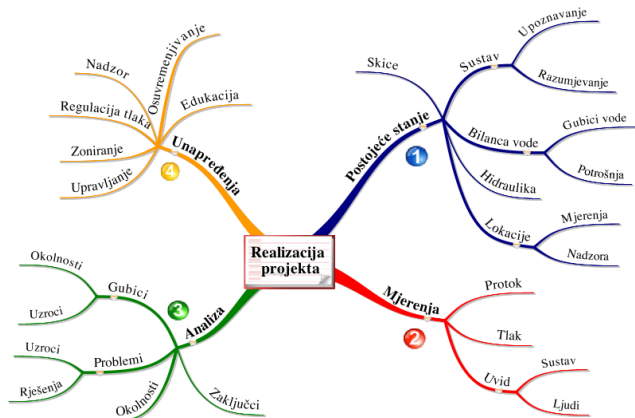


Figure 10 Steps in analysing water distribution network (MindMap)

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Bulgarian Water Association



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SIXTH INTERNATIONAL CONFERENCE ON WATER LOSS REDUCTION IN WATER SUPPLY SYSTEMS

11 -12 November 2013

Inter Expo Centre (Mussala Hall), Sofia, Bulgaria



TIM WALDRON, IWA DIRECTOR AND WATER LOSS MANAGEMENT EXPERT SHARES HIS VISION AND IDEAS ON THE ISSUE OF WATER LOSS CONTROL:

“THE WHOLE AIM IS TO SAVE MORE WATER AND EXTEND INFLUENCE ALL OVER THE WORLD”

With an interview in mind, I asked Tim Waldron, Chair International Water Association WLSG and Board Director of IWA, a couple of questions. These were namely concerned with the water loss management know-how in the world, the possible obstacles and the future role of WLSG, his opinions on the influence of politics on public utilities and the development of technology. However, Mr. Waldron gave me some exhaustive responses accompanied to his in-depth considerations addressing the most challenging issues of this domain. This is why I gave up the initial idea, to publish an interview with Tim Waldron, and, instead, we reproduced all his responses in the following article. Much more than a technical contribution from an international expert in water loss management, the article presents the author's understanding and approach of a global challenge - saving more water around the world - based on a lifetime experience.

Jurica Kovač

First of all I have to congratulate all in your region for the excellent work being done since our Water Loss Conference 2007 in Romania. This does not happen without top class leadership fully focussed on saving water. That leadership can be demonstrated by anyone in the water industry, through the conviction of their determination to succeed combined with a knowledge of water loss strategies that have been well developed by the International Water Association.

One of your leaders who helped promote water loss reduction was Vasile Ciomos, and I was very sad to hear of his death. I offer my condolences to his family and friends from not just myself, but the IWA water loss colleagues from all around the world. I'm sure he would want to see all of you carry on the good work that he was instrumental in starting in your region of the world.

Your question is timely, and although a short question, but needs a long answer.

Our Water Loss Specialist Group (WLSG) are seen as very successful by IWA, and the water industry generally. This is because our strategies using the “water balance”, the methods of measurement (ILI), and the action plans to reduce losses, have all had a major influence on the water industry around the world. Other recognised success criteria has been the popular growth in attendance at IWA WLSG Conferences. However, reflecting on success and influence our management team asked the following questions: «What are the “GAPS” in our success?», «What are the “GAPS” in influence?», «How do we improve representation and persuasion?» and «What will move the unmovable managers who do nothing about water losses? ».

I copied on a world map of annual precipitation of rain and snow, the geographic parts of the world that we have influence. I have attached a copy of this. It shows we perhaps only influence 20-25% of the world, and in many large countries, such as Russia and China, we have

little representation or influence. We therefore decided to have a target through a refocussed VISION.

This vision is drafted as: By 2018 water loss methodologies of the Water Loss Specialist group will be implemented by 90% of the water authorities and governments around the world”

Regional Representatives

To achieve this we decided that we need regional representation, and some new strategies. The first step was to broaden the base of the management team of the Water Loss Specialist Group by creating a Change Management Project to harness the other regional representatives and any additional professional support needed to achieve our objective(s).

A second tier management team has been introduced. The second tier is representatives of world regions (12 regions), with each representative having voting rights on all other aspects other than policy. The existing senior management team continues with policy responsibility and consists of myself as Chair, and the former Chairs, Allan Lambert, Ken Brothers and Bambos Charalambous. The 2 groups join together for all other matters, including any democratic voting needs.

A strategic plan for each region will be proposed by the regional representatives

Each nominated person for the regional management team needed to meet criteria that the senior management team set.

The World Regions and Expert Representatives are as follows:

Western Europe – Stuart Trow and Jo Parker

Eastern Europe – Bambos Charalambos and Marco Fantozzi

South Africa – Ronnie McKenzie

Central Africa – Harrison Mutikanga

North America and Canada – Ken Brothers + 1
 Central America and Caribbean – Paul Fanner +1
 South America – Julian Thornton +1
 Russia and the neighbouring regions – Stuart Hamilton +1
 Australasia and Pacific– Tim Waldron +1
 Eastern and Western Asia – Roland Liemberger
 China and the neighbouring regions ---- Malcolm Farley +1
 North Africa and Middle East – Jan Janssen and Bambos Charalambos.

Of course this is just a first step, and many other people will, in time be brought on board to help within these regions. Leaders demonstrate leadership with integrity, total commitment to our aims, gain the respect of their peers, and will emerge to be the choice preferred people to help. I will be looking for them.

The World Regional Representatives will become the WLSG and Management Committee representatives for all the WLSG activities within their region, and democratically represent that region at their management meeting. Each region consists of at least 2 countries, and therefore does not conflict with individual countries water association's strategies or representation.

They provide the strategic leadership for that region and organise conference, meetings and other activities to have IWA influence to reduce water losses. Liaison experts will be available to assist them to open doors for influence and finances, and in cases work directly with the Regional Experts. These include Paul Reiter, Allan Lambert, Jan Janssen, and Arjun Thapan.

As far as the establishment of a Draft Protocol is concerned, work to develop a DRAFT 'Water Loss Protocol' – to influence nations via a top down approach from government and international agencies is being approached from a perspective that to influence more of the world, and managers that are not already motivated to reduce losses.

Top Down Strategy

The "Top Down Bottom up" dual direction motivation strategies have not previously been in place. All the motivation and influence has been through professional officers applying and sharing skills and knowledge. To raise our game, and save more water around the world, then we must influence at a higher international level.

The spin-offs for professionals already applying IWA strategies, will be that there will be work opportunities opening up world-wide.

There are many successes by the experts consulting and in utilities, however some utilities are still taking no action and ignoring water loss problems. Some managers resist any change

Why? There misplaced reasoning is a long list, including : It rains, other urgencies, its extra work, their employer has no knowledge on the topic, it can be easily hidden, plus excuses of no budget, no people,

I am used as a retired CEO to audit other water companies efficiency levels by their CEO's, and

whenever they say they do not have enough money or people, my audit always shows that there is, and its just a case of focussing on priorities that a utility really wants to achieve, and making it happen. My favourite quote from Henry Ford is "Whether you think you can, or think you can't you are usually right". He means that you have to believe heart and soul that you can achieve. If you think like a failure, you will be! Don't do this. Think positive. There is no reason why YOU cannot be as brilliant as anyone else. The world needs you to succeed, and to help all around you to succeed.

A top down strategy to influence national governments and international agencies will be developed. Three international media experts were asked how they would strategise a top down approach. The World Wildlife Fund International media agent gave the advice that a "Reference of Quotes" for use of the media. This should have appropriate international quotes from influential people, whether they be water leaders, national leaders or film stars, should be published from internationally recognised people who will attract the media to get quotes from. This will help to muster an international agreement to save water.

IWA have also just appointed a communications expert, and we will be collaborating to achieve such an aim. The whole aim is to save more water and extend influence all over the world. You asked that from my position as Chair of the IWA WLSG, what are our present worldwide thoughts for progression, and although I have answered with a comprehensive insight, the strength of our achievements will always rely on the efforts, brilliance and dedication of the Water Loss people in every region. If there is anything more I can do to help you achieve at the highest levels in your Region, then please let me know.

We need every bit of help we can get from technology

Technology is always improving rapidly, and we should always listen intently to the companies investing in development. The days are gone when governments and research centres produce essential products for the water loss reduction needs of industry. Today that void is filled by commercial companies and a few water companies.

The available products are superb compared to what we had 40 years ago. However a BIG WARNING to everyone must be given. Technology should always be in line with basic needs of additional knowledge about your water distribution system, and help you not just find leaks, but also understand the influence that has had on pressures and flows. I have heard some salesmen of Correlating Noise Loggers, that if you put enough of these on your network permanently, then you don't need District Meters. This is a message from a salesman who is only interested in immediate sales, and have no long term interest in helping you. I announced at a South African conference that I publically challenge these salesmen to a public debate. I was disgusted that they try and influence in a manner that could leave the purchaser without any good data for managing the distribution system well. Leakage control is part of that, and the

knowledge night flows from DMA's is the major indicator of problems and success.

One of my problems is, that I have been around for many years, and worked in many countries. Many years ago I saw Leak Noise Correlators being sold to developing countries in the same way, telling the prospective purchaser that these will replace the need and the cost of District Meters. I feel sorry for the people who may have believed them. Of course Correlators are good, but only in the perspective of the fact they are just another tool to help. Perhaps I am sensitive to these issues because I was involved with the development of the first leak noise correlator with Water Research Centre (WRC UK) and North West Water UK, and helped with the specification of the very first water industry data loggers for pressure and flow recording with Spectrascan and WRC. On top of this I was the project leader with the first successful Flow Modulated PRV in England along with David Pearson plus a great technical team. I say this, to demonstrate that I am a great believer in using technology to answer our water loss problems. We need these advances. However always be wary if you ever hear someone say that their products can save you costs by rendering the need of measuring flows and pressures as unnecessary. If you do meet anyone saying this, then please send their name to me and I will publicly challenge them to a debate, and shame them. We have enough problems with our efforts to reduce losses, and need every bit of help we can get from technology, so support the companies who want to help with products, rather than have a quick sale.

Politics and public utility

Wow that's a difficult one. It used to be the same in South America many years ago. We found a water utility in San Paulo Brazil that thought differently and had a motivated CEO. IWA offered to send 5 of the top experts to a Forum of Leaders, and this was sponsored by the utility. Hearing speakers from 5 different parts of the world, plus hearing the Utility leaders saying their needs, could not be ignored by government. The Utility went on to have great results in Water loss, and supplied an extra 2 million people with water from the savings, just as predicted. Although this was a large and powerful utility, they still needed IWA help to assist in political persuasion.

A message from leaders of the International Water Association is powerful, especially when targeted to political leaders. However, this cannot be done without having a thorough understanding of local problems, and the strengths and weakness of optional strategies.

IWA Water Loss Specialist Conference in Vienna

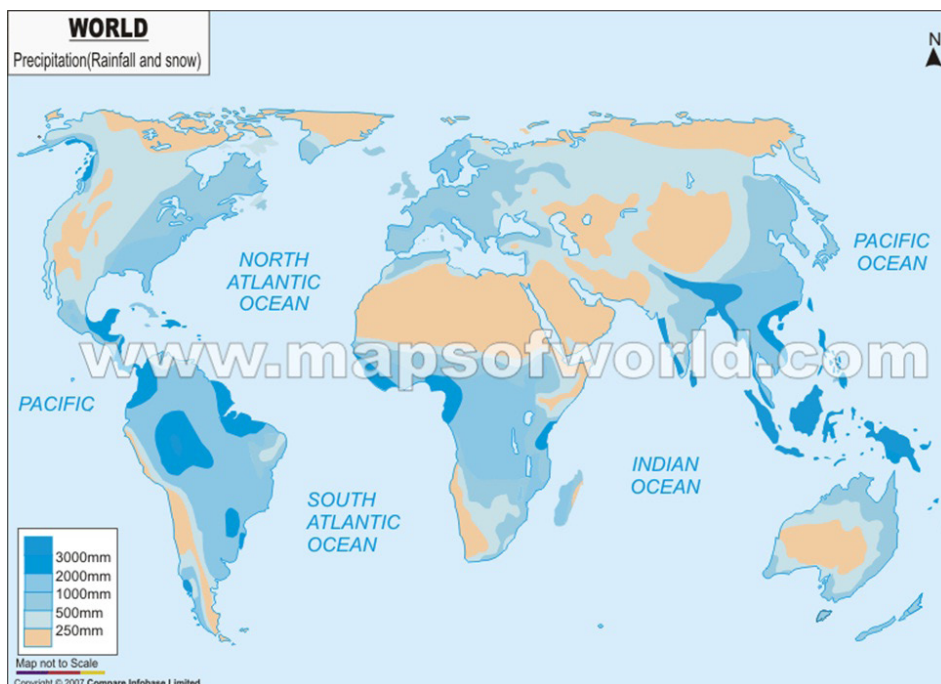
Vienna is close to your region, so I hope many of you travel in March to the Water Loss 2014 conference in Austria. The program will be published shortly, but we already have many great papers submitted, and surprisingly lots from countries who have not previously submitted. Our conference organisers are working hard to keep costs down in these difficult economic times, and compared with other conferences we are still much cheaper, and have the all the worlds top experts attending, plus being available for advice. Allan Lambert has indicated that this may be his last major conference to attend, so this could be very special. We all recognise Allan's importance in developing strategies.

We plan to introduce some new thoughts for managers, engineers and scientists to be able to take away and put into practice. Your Water Loss Detectives could have special time allocated to inform the world about, so I would welcome a proposal from your region that can be used as a special presentation, including your competition details and history. Have a think about this, because I am so proud (like a father I suppose) of all the great work that is being done in your area.

Finally I would like to say a warm hello to all my friends there. It's a little sad that when I am running the international conferences that I am so busy during the week, that I have little time to give to friends. So please accept my apologies for this, and perhaps consider going on the "follow-on" 3 day tour of somewhere in Austria, where I can relax and spend lots of time with you all, as I would love to see you all. Believe it or not, although it is supposed to be a non work tour, guess what we talk about? Yes, that's right, Water Loss reduction !!!! But maybe with a glass of wine!!! See you all soon hopefully, and don't forget, let me know how we can help you

Tim WALDRON

chair of IWA Water Loss Specialist Group

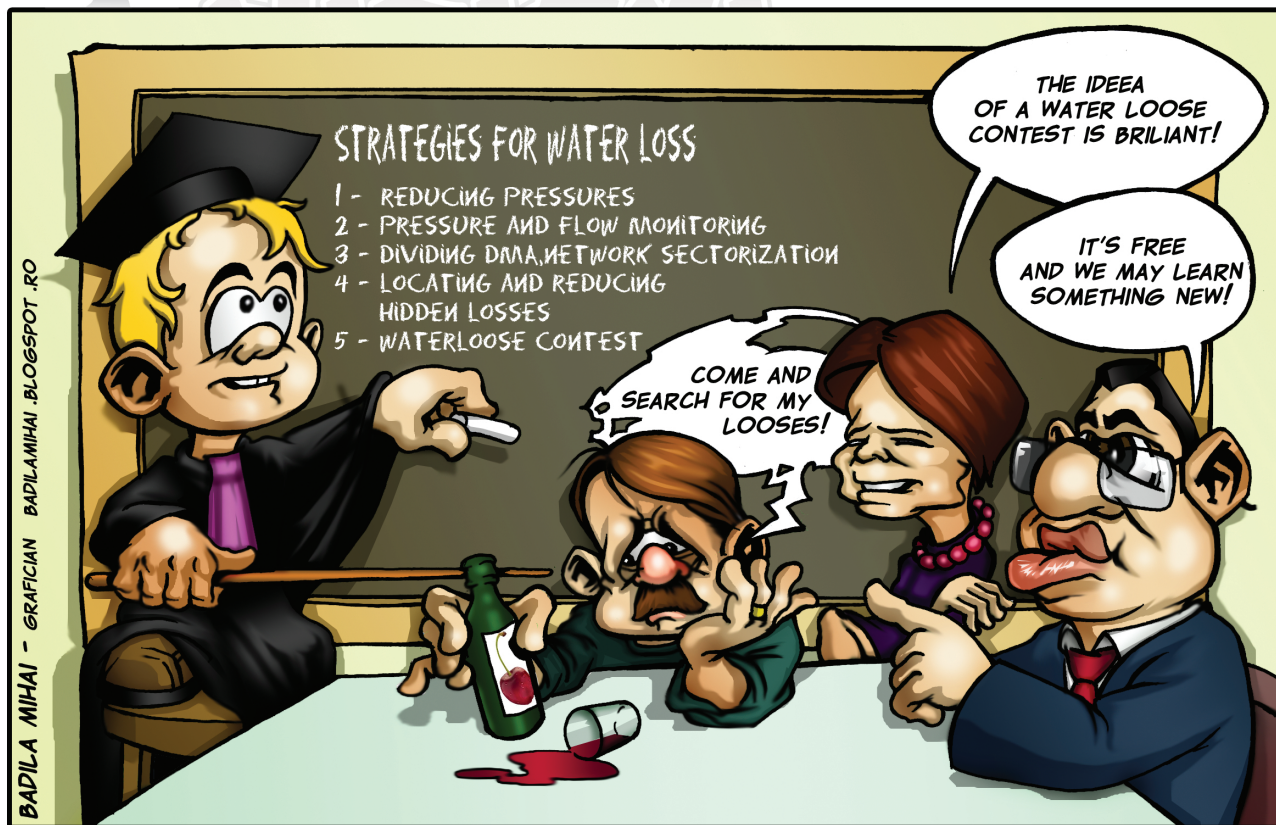


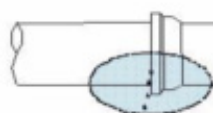
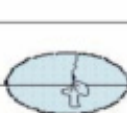
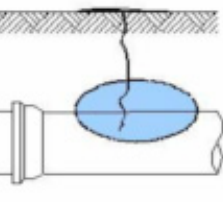


A.L.EX.

Acoustic Leakage EXpert

EPISODE 2 REDUCTION STRATEGIES LOSS



surface		
		
Background leakage	Un-reported leakage	Reported leakage
Un-reported and un-detectable using traditional acoustic equipment.	Often does not surface but is detectable using traditional acoustic equipment.	Often surfaces and is reported by the public or utility workers
Tools	Tools	Tools
<ul style="list-style-type: none"> • Pressure stabilization • Pressure reduction • Main and service replacement • Reduction in the number of joints and fittings 	<ul style="list-style-type: none"> • Pressure stabilization • Pressure reduction • Main and service replacement • Reduction in the number of joints and fittings • Proactive leak detection 	<ul style="list-style-type: none"> • Pressure stabilization • Pressure reduction • Main and service replacement • Optimized repair time

AQUAKNIGHT PROJECT

A CBC-MED SEA BASIC PROGRAMME

Many countries in the Mediterranean region face water scarcity which is expected to worsen as a result of the increased demand and climate changes. In addition to an increased pressure on already limited resources, the problem is aggravated by huge amount of leaks in water distribution systems and the volumes of water distributed without being invoiced. This calls for solutions which need to be tailored to local circumstances due to variation in the cause of water loss and the mechanisms available to manage them.

AQUAKNIGHT (Aqua Knowledge and Innovation Transfer for Water Saving in the Mediterranean Basin), is a 3-year ENPI CBC MED project, coordinated by the Institute of Communication and Computer Systems of Athens. The partnership also includes nine organisations from five countries: IREN Acqua Gas SpA, University of Palermo, SGI Studio Galli Ingegneria - Italy, Water Board of Lemesos, SignalGeneriX - Cyprus, Sonede, Comete Engineering - Tunisia, Alexandria Water Company - Egypt and Aqaba Water Company - Jordan. The project intends to facilitate the dialogue among water institutions and operators from different regions in the Mediterranean area, and promote sustainable solutions for tackling water scarcity in the region.

The issue of Non-Revenue Water is addressed through the development of five parallel pilot projects in the cities of Limassol, Genoa, Alexandria, Tunis and Aqaba and capacity-building of water companies and public institutions concerned with water management.

During the project life two international conferences are scheduled to facilitate dissemination of best practices and state-of-the art techniques for efficient water management. The 1st AQUAKNIGHT conference has taken place in Alexandria, Egypt on the 15th May 2013. The event has been attended by more than 85 participants, from water utilities, manufacturing companies, water authorities and administrations. The event was attended by Dr. Abdel Kawi Khalifa, Minister of Water and Wastewater in Egypt, Mr. El-Sayd Nasr Arfat, Chairman of Holding Company for Water and Wastewater in Egypt and Mr. Mamdouh Rasalan, Vice Chairman of the same company. The event opened with a particular session on the Water Services in the Mediterranean, where the project coordinator, Dr Angelos Amditis – ICCS Research Director and Mr. Mamdouh Raslan of HCWW, gave an overview of the project, its activities and impact in the Mediterranean level. Also the chairman of Chemonics SA gave a presentation on the state of the art trends in water services management worldwide. Three more sessions followed on the project activities, Success stories and modern technologies on NRW and Water Demand Management as well as International best practices.



ZONESCAN ALPHA SELECTED BY SCIENTIFIC JURY AT GERMAN ENVIRONMENTAL AWARDS

"Efficiency, innovative algorithms, good visualisations and - above all - the possibility of pinpointing and repairing leaks quickly and efficiently", these were the main factors for the jury to choose Zonescan Alpha at the 3rd Environmental Technology Awards of the German federal state of Baden-Württemberg. Overall, about 120 companies submitted their technology ideas and products this year at the awards sponsored by the Ministry for Environment, Climate and Energy of Baden-Württemberg. The combined prize money amounts to 100,000 Euros. The categories were "Energy Efficiency", "Material Efficiency", "Techniques for Emissions Reduction" and "Process Measuring and Control Technology".

This award is already the sixth technology award that Gutermann has won with ZONESCAN Alpha. The innovative product has lead some competitors to recently launch their own version of permanently installed leakage monitoring systems. However, Zonescan Alpha is the only system that provides automatic correlation of all neighbouring logger pairs, enabling utilities to detect leaks even when the leak noise is so low that it remains under the radar of simple noise level alarms. Daily correlation also enables utilities to pinpoint leaks with very high accuracy. This is the main reason, why a number of larger customers have recently decided to purchase and install Zonescan Alpha in their network.

Link to the official page: <http://utp.umwelttechnikportal.de/umwelttechnikpreis/preisverleihung/preisverleihung-2013.html#k14>



Congratulations! The Gutermann team (from left: Dr. Andreas Traub - CTO, Jens Herzberg - Sales Germany, Simon Fechter - Product Manager Fixed Network Monitoring) together with Environment Minister Franz Untersteller.

SOFIYSKA VODA FIGHTS AGAINST THE NRW

Sofiyska Voda JSC was established in October 2000 by a 25-year Concession Agreement, according to which the Municipality of Sofia grants to the company the operation and maintenance of Sofia's WSS system. Our shareholding capital is divided between the Municipality of Sofia (22.9 %) and the French company Veolia Water (77.1 %).

In 2012 the company invested BGN 40 M. The Sofia WSS operator uses modern technologies at the rehabilitation of the water supply and sewerage network, in order to achieve high quality and sustainability of services. From this, more than BGN 28 million were invested in Sector Water Supply.

The main objective was reduction of the losses – complex solution of the issues by water meter zones, improvement of the proposed service and the quality of potable water. As result of it:

- the water volume abstracted from nature was reduced by 8.7 million m³ for the period January – December 2012;
- more than 44.13 km water supply pipes were replaced and rehabilitated;
- more than 900 new stop valves were replaced and installed that leads to limiting the number of the households, affected in case of necessary water supply interruptions;
- 16,361 revenue water meters were replaced and installed;
- 280 new water service connections were constructed and 2 570 replaced;
- 195 fire hydrants were installed.

In 2012, Sofiyska Voda JSC continued to implement all good world engineering practices for optimization of the functioning of the water supply network by



reducing the levels of non-revenue water, reducing the frequency and density of accidents, effective pressure management, improving the hydraulics in the system. For Sofiyska Voda JSC, the reduction of unaccounted-for water (UFW) is a process related to many factors – economic, social and environmental. In 2012, in the provision of WSS services, the company strived to achieve the most economical and effective way of using the water resources. Reduction of water losses (UFW) and compliance with the key indicators in this area are a constant priority of the company.

WSS companies should measure correctly the water volumes abstracted from water sources in nature and the water volumes supplied in the water systems. This had not been done until the establishment of the concession (2000) and a large part of the Concessionaire's obligations are not based on realistic data on the years before the concession.

Precisely for the purpose of accuracy and better control, Sofiyska Voda JSC commissioned new technologies such as the system for telemetry – until now the data on flow / pressure along the network were transmitted remotely by SMS. In 2012, GPRS communication was introduced that submits data directly to the SCADA system. The water volumes are measured at new points in pressure sections of Rila and Passarel water mains. 10-year old ultrasound water meters were replaced at key points of the system. 18 new pressure reducing valves were commissioned with the important function of reducing the physical losses and failures along the network and optimizing the work of the system of strategic water mains. In 2012 as compared to 2011, Sofiyska Voda abstracted from nature 8.7 million m³ less water (including the increase by 1.14 million m³ in February due to the severe winter conditions) – i.e. actual impact in the remaining months of almost 9.9 million m³, taking into consideration also the reduction of non-revenue water in water system Sofia by 8.8 million m³ (including increase by 1.4 million m³ in February due to the severe winter conditions) i.e. actual impact in the remaining months of 10.2 million m³.

In 2002 Sofia WSS operator abstracted a total of 260,497,112 m³ of raw water for potable purposes, and at the end of 2012 the volume was 203,437,028 m³.



The reduction is of 57 million m³.

In 2002 the levels of non-revenue water in Sofia's water system were of 176,281,058 m³, whereas as at the end of 2012 were of 112,258,200 m³. The reduction is 64 million m³, or about 36%.

For better monitoring, analysis and understanding of the water supply network in the DMAs, the supplied and consumed water volumes and pressure are measured. Based on this, specific network management activities are planned, i.e. for improving the service, reducing the water losses – commercial and physical, reducing the number of customers affected by water interruptions, etc. In 2012, network management was ensured in a number of DMAs of strong priority such as Banishora r.q. Thus we reached serious hidden leaks at Vladayska Reka Str. with flow 45 m³/h, at Krusha Planina Str. with flow about 130 m³/h.

Sofiyska Voda constantly strives to reduce the response time for removing the registered leaks. 4 teams have been formed for active localization of hidden leaks; new high-tech equipment has been ensured for finding leaks for which this cannot be done by other means.

In 2012, there was a 14% decrease in the failures along street water mains (total decrease by 1 305 leaks).

In the last months of 2012, 4 interruptions were performed at the key trunk water rings and boundary/side valves, air release valves and water outlets were replaced,



which ensures more flexible water supply in case of failures and reconstructions of large areas including several residential quarters and residential complexes.

In 2012, Sofiyska Voda continued to work for reducing the commercial losses by effective management of the revenue meters (including programs for testing, replacing, correct dimensioning etc.) and implementation of effective programs for finding illegal consumers along the network. In the period January – December 2012, 420 addresses illegally connected to the network and illegally using potable water were found. 280 illegal consumers of WSS services were fined.

Maya Baneva



3M ANNOUNCES INVESTMENT IN TAKADU

The companies look to leverage this investment pairing TaKaDu's water network monitoring with 3M's water pipe rehabilitation solutions

3M New Ventures (3M's corporate venture organization) announced an equity investment in TaKaDu, a leading provider of advanced analytics services to monitor water networks. The cloud-based solution offered by TaKaDu takes available raw network data and uses sophisticated analytics to detect and predict network issues, improve incidence response times and monitor and mitigate operational issues in the water grid. The terms of the transaction were not disclosed.

Founded by data analytics innovator, Amir Peleg, in early 2009, TaKaDu transforms the way water networks are operated and managed. Instead of using costly traditional methods, TaKaDu employs data fusion of raw network data (flow, pressure, water quality and more) and enriches it with secondary data (weather, GIS, calendar) while using advanced statistical algorithms to identify deviations from historical patterns. This approach allows TaKaDu to detect, classify and locate network inefficiencies including leaks, bursts, faulty meters, and zone breaches. In addition to day-to-day alerts about network inefficiencies, the solution provides utility owners with a holistic view of their network, supporting smarter long-term planning decision making.

"We see 3M as an important strategic investment partner based on their focus on underground utility locating and marking solutions, trenchless water pipe rehabilitation, as well as their premium reputation in the infrastructure protection market," said Amir Peleg, founder and CEO of TaKaDu. "Following ABB's strategic

investment in TaKaDu last year, we are now excited about the opportunity to add 3M to our existing relationships as we continue to scale our solution to water network owners around the world and expand our technology capability."

3M has been a leader in infrastructure protection solutions for over 50 years. Ryan Rogers, Global Business Manager - Water Infrastructure Renewal for Electrical Markets Division of 3M, commented: "With 250,000 local water networks worldwide and non-revenue water between 20% and 30% globally, there is an incredible growing need for a solution that provides the eyes and ears into the chronically aging water infrastructure. TaKaDu's novel solution is unique in combining a big data approach, cloud based service, and strong IP. It is cost effective to implement and can quickly pinpoint and address issues as they arise, arming the water network manager with new knowledge and insight to help them address water loss and improve the effectiveness of their maintenance organization allowing for higher customer satisfaction."

Stefan Gabriel, President of 3M New Ventures added: "We are delighted to announce our investment in TaKaDu. Addressing the increasing water scarcity, the company offers a strong value proposition for water utility customers to help balance critical maintenance and repair needs with the limitations on the funding side. 3M's Electrical Markets Division is well positioned to leverage this investment by pairing TaKaDu's software offering with our existing water pipe rehabilitation solutions."

<http://www.takadu.com>

THE OPTIMIZATION OF THE WATER STORAGE AND TRANSPORT SYSTEM

Insuring the uninterrupted operation of the water transport and distribution system has become, nowadays, more and more an imposed condition not only by the industrial consumers – for which, the interruption of water delivery has grave repercussions (i.e. furnaces electrolysis sections etc.) but also by major urban centers, where human life, concentrated in apartment buildings comprising tens of floors, cannot be conceived in lack of constant water delivery. [2], [3].

The delivery of water within the transport systems can come to be, in particular, due to the following reasons:

- Decommissioning of the adductions, because their break

The timespan of the downtime is given, in this case, by the sum of the time frames necessary for detecting and localizing the malfunction, necessary repairs to be made and ultimately rebooting the entire system. In the case where exploitation is optimal and the organization process of manpower and utility is exceptional, the downtime of a gravitational water distribution system does not exceed 24 – 30 hours. In the case of gravitational flow adductions, the frequency of malfunctions depends, in particular, by the length of the adductions and the operating pressure.

- Interruption in delivery of electrical energy to the pumping stations

At systems with simple power supply, the downtime can take between 24 – 72 hours, and at systems with double power supply feed, it can take between »2 – 3 hours.

In cases where a significant safety is demanded for the transport systems, which function through pumping, the insurance of dual electrical power supply feed to the pumps is indicated, for the purpose of minimizing the period of the downtime in accordance with the timespan needed by the pipes to undergo repairs [4].

The measures which are foreseen toward insuring functionality, along with a certain degree of safety of the transport system, are, generally, extremely high cost measures. As such, they need to be rigorously established by means of very detailed technical economic calculations.

In order to insure the uninterrupted functionality of a water distribution system, where the flow is gravitational, and which can undergo certain damage, that is reparable within a certain timeframe T , the economic solution is chosen depending on :

- the length of the adduction, L [m];
- the debit of the adduction, Q [m³/s];
- the hydraulic slope available on the adduction;
- $i = h/L$, where h [m], is the difference in piezometric elevation between the ends of the adduction.

The economic solution is realized by:

- a) a dual wire adduction, for length $L \leq L_{\max}$, each pipe being sized for a debit $Q_1 = s \cdot Q$;

- b) a single pipe, for length $L > L_{\max}$, having a damage reservoir boasting a volume V , corresponding to a period of damage T [h].

L_{\max} represents the length of the adduction up to which the solution with double pipeline is applicable and is determined by the explicitation of the value L , from the equality (7), between the aforementioned solution investment costs [1], [2].

The investment cost, for double pipeline, in solution a):

$$C_d = \{a + b[m^{0,188\alpha} \cdot i^{-0,188\alpha} (0,66 \cdot Q)^{0,375\alpha}]\} \cdot 2L [lei] \quad (1)$$

Considering a double pipeline with three braces, for which the sizing debit of a single pipe is $Q_1 = s \cdot Q$, where $s = 0,66$, according to table 1.

Table 1 - s as sizing coefficient for the debit, in the case of the addition of braces

Number of braces n	1	2	3	4
$s = Q_1/Q$	0,86	0,71	0,66	0,63

The investment cost for single pipe, in solution b):

$$C_s = [a + b(m^{0,188\alpha} \cdot i^{-0,188\alpha})] \cdot L [lei] \quad (2)$$

in which: a , b and α are constant characteristics for the used type of pipeline (table 2);

$m = 1,494 \cdot 10^{-3}$, for pipes made of steel and reinforced concrete;

$m = 1,270 \cdot 10^{-3}$, for pipes made of asbestos cement.

Table 2 – defining constants of the pipe's cost

Pipe material	a	b	α
Steel	392	1 470	1,4
Reinforced concrete PREMO, SENTAB	635	800	3,0
Asbestos	80	1 393	1,6

Base relation for reservoir cost, according to usable volume, V [thousands m³]:

$$C_r = 6 \cdot 10^5 \cdot V^{0,87} [lei] \quad (3)$$

$$V = 3,6 \cdot T \cdot Q [miim^3] \quad (4)$$

Introducing in (3) the value V from (4), results in:

$$C_r = 1829 \cdot 10^3 \cdot Q^{0,87} \cdot T^{0,87} [lei] \quad (5)$$

From the equality between solutions a) and b), with the expressions (1), (2) and (3):

$$C_d = C_s + C_r \quad (6)$$

Culminates in the calculation expression of the value L_{max} :

$$L_{max} = \frac{1,829 \cdot T^{0,87} \cdot Q^{0,87}}{a + (2 \cdot 0,865^a - 1) \left(b \cdot m^{0,188 \cdot a} \cdot i^{0,188 \cdot a} \cdot Q^{0,375 \cdot a} \right)} [km] \quad (7)$$

The number of linking braces between parallel pipes must be chosen by basis of an economic calculus, taking into account that, a single brace requires five separation valves, concentrated in three manholes. As the debit Q_1 , for sizing the pipes, decreases considerably at a number of braces larger than 3, the overall number of braces is limited generally at 2 or 3. For each particular case, at adduction lengths below 10 – 12 km, the alternative to applying two parallel pipelines, without linking braces and each pipe sized to the debit Q has to be verified by comparison.

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