

IWA METODOLOGIJA UPRAVLJANJA Z VODNIMI IZGUBAMI

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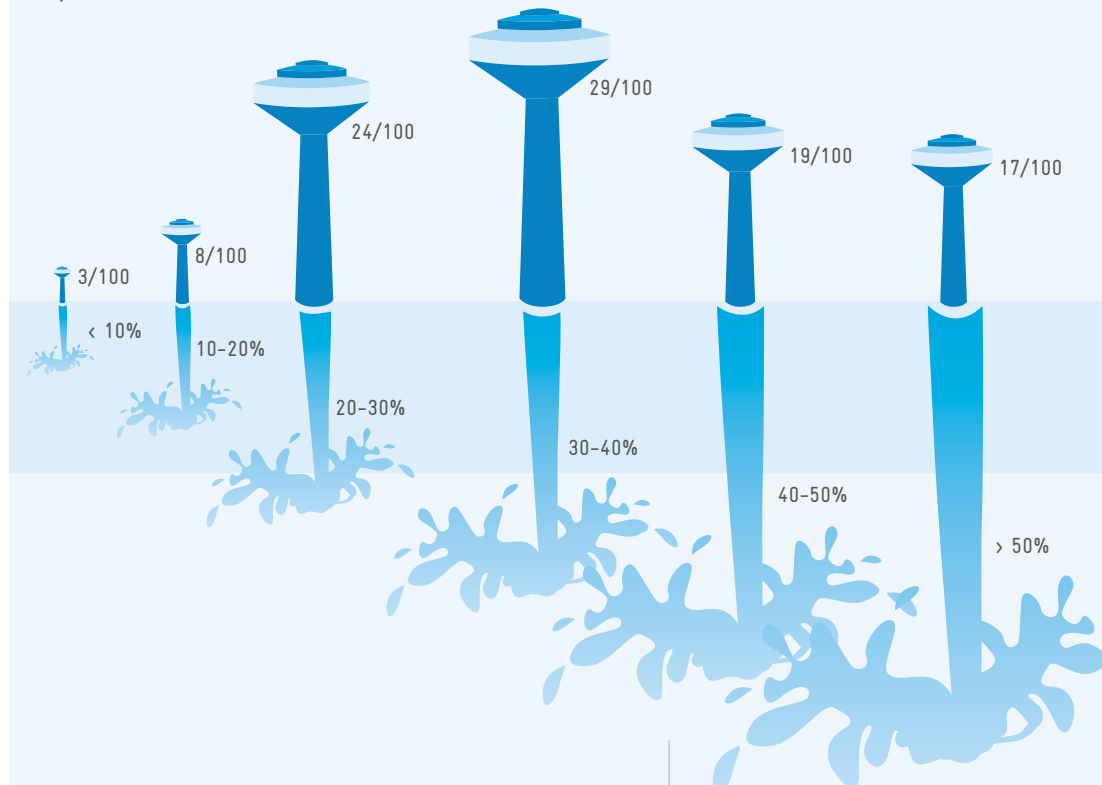
neodvisni svetovalec za upravljanje vodnih izgub
član IWA specialistične grupe za gubitke vode
Aqua Libera d.o.o.

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3. problemska konferenca komunalnega gospodarstva
Podčetrtek, 20.09.2013.




Proportion of water utilities



Gubici vode u svijetu (u %)
Range of NRW level

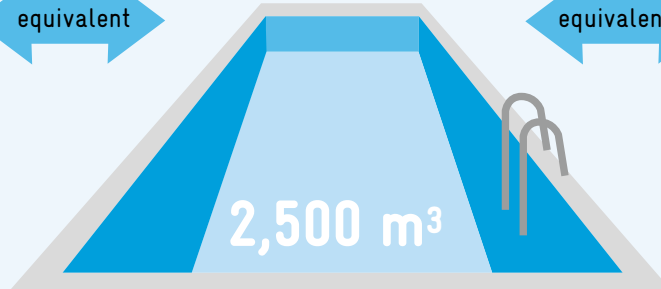
izvor: IBNET , World Bank

U 2011. bilo je 576 985 000 m³ ukupno zahvaćenih i preuzetih količina vode. U javnoj vodoopskrbi HR i dalje su bili veliki gubici vode, koji su u 2011. iznosili 227 293 000 m³ ili 39%



6 mm

equivalent



equivalent



Hole \varnothing = 6 mm
Pressure = 50 m
» Leakage = 43.2 m³/d

Olympic size swimming pool
 $V = 2,500 \text{ m}^3$
» filled in less than 2 months

Per capita consumptions = 136 l/cap/d
 $Q = 317 \times 136 \text{ l/cap/d} = 43.2 \text{ m}^3/\text{d}$
» Water for 317 persons

Problemi - uzroci

- Pasivna kontrola gubitaka
- Spor i nedovoljan tehnološki razvoj sustava
- Nepostojanje strategije/programa djelovanja s ciljem smanjenja/kontrole gubitaka vode
- Čovjek - kapaciteti, sposobnosti, motivacija, učinkovitost, znanje
- Nerazumjevanje složenosti problematike gubitaka vode (i prikaz gubitaka vode u % kao temeljnog indikatora)



Posljedice...

- Ekonomske
- Tehničke
- Socijalne
- Ekološke



- Osposobljavanje (Metodologija i Tehnologija)
 - Mjerenje u sustavu - zoniranje
 - Daljinski nadzor
 - Regulacija pritiska
 - Strategija saniranja ili izmjene cjevovoda
 - Točnost mjerenja isporučene/prodane količine vode
 - Utvrđivanje mjesta curenja
 - Prikupljanje i obrada podataka
 - Izgradnja sustava
 - Redovno održavanje sustava
 - Upravljanje sustavom
-

Sveobuhvatni pristup
rješavanju gubitaka vode

| Vprašanje in rešitev | Naloge |
|--|--|
| <p>1. KOLIKŠNE SO VODNE IZGUBE? Določitev vseh elementov vodne bilance</p> | <p>VODNA BILANCA</p> <ul style="list-style-type: none"> · Kakovostne meritve in ocene količin · Umerjanje merilcev pretoka · Nadzor merilcev pretoka · Posodobitve pri registriranju merjenja |
| <p>2. KJE SE VODA IZGUBLJA?</p> <ul style="list-style-type: none"> · Količinsko opredeliti puščanje · Količinsko opredeliti navidezne izgube | <p>REVIZIJA SISTEMA</p> <ul style="list-style-type: none"> · Analiza izgub (meritve in analiza podatkov) · Analiza sistema (distribucija, poraba) |
| <p>3. ZAKAJ SE VODA IZGUBLJA?</p> <ul style="list-style-type: none"> · Analizirati omrežje in način vzdrževanja sistema | <p>ANALIZA VZDRŽEVANJA SISTEMA</p> <ul style="list-style-type: none"> · Zgodovina izgub · Praksa pri reševanju izgub · Kakovost upravljalvske strukture · Kakovost materialov in opreme · Lokalne specifikke · Družbeni, kulturni, finančni vidiki |
| <p>4. KAKO IZBOLJŠATI UČINKOVITOST?</p> <ul style="list-style-type: none"> · Posodobiti sistem · Oblikovati strategijo in akcijski načrt | <p>POSODOBITVE IN RAZVOJ STRATEGIJE</p> <ul style="list-style-type: none"> · Posodobitev podatkov o sistemu · Uvesti delitev sistema v zone · Uvesti nadzor puščanj · Uvesti nadzor pritiska v sistemu · Ugotoviti vzroke navideznih izgub · Pričeti z aktivnostmi zaznavanja puščanj/nujne sanacije · Postaviti kratkoročne /srednjeročne /dolgoročne načrte |
| <p>5. KAKO OBDRŽATI UČINKOVITOST?</p> <ul style="list-style-type: none"> · Zagotoviti dolgoročnost in učinkovitost s pravilnim upravljanjem kadrov in organizacijo | <p>SPREMEMBA POLITIKE, ŠOLANJE, UPRAVLJANJE IN VZDRŽEVANJE</p> <p>Šolanje:</p> <ul style="list-style-type: none"> · Posodobiti znanje in spoznanja · Povečati motivacijo · Prenos veščin · Uporaba najboljših izkušenj in tehnologije <p>Upravljanje in vzdrževanje</p> <ul style="list-style-type: none"> · Vključitev širše skupnosti · Oblikovanje programa varčevanja (ohranjanja) vode |

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A global network for water professionals.

The International Water Association (IWA) is the global network of 10,000 water professionals spanning the continuum between research and practice and covering all facets of the water cycle.

[Read more about us](#)

Key Themes

[Cities of the Future](#)

What's new

The IWA network is structured to promote multi-level collaboration among its diverse membership groups to create innovative, pragmatic and sustainable solutions to challenging global water needs. Here is a snapshot of the latest IWA initiatives.

Watch UNU video: Water loss reduction in cities around the world
 45 million m³ of water is lost annually in urban water systems. This could provide over 200 million people with access to clean water.

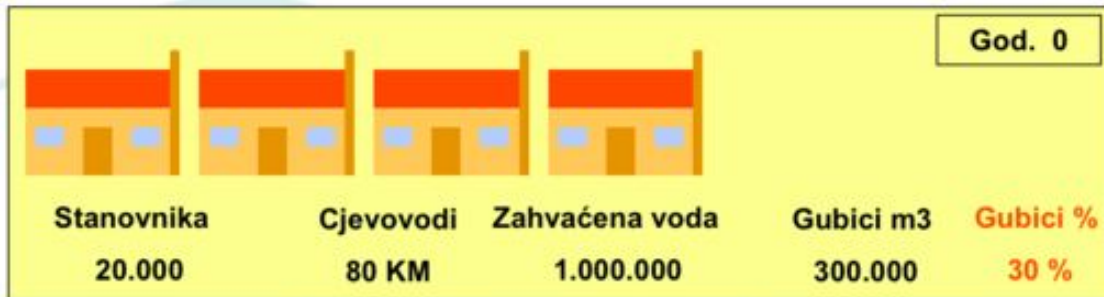
IWA Events

Each year IWA organises and co-organises over 40

Cities of the Future Booklets
 Early Bird Registration Deadline: 22 March 2011

Međunarodno udruženje
za vode

podrška i suradnja



Problem prikaza
gubitaka vode u %

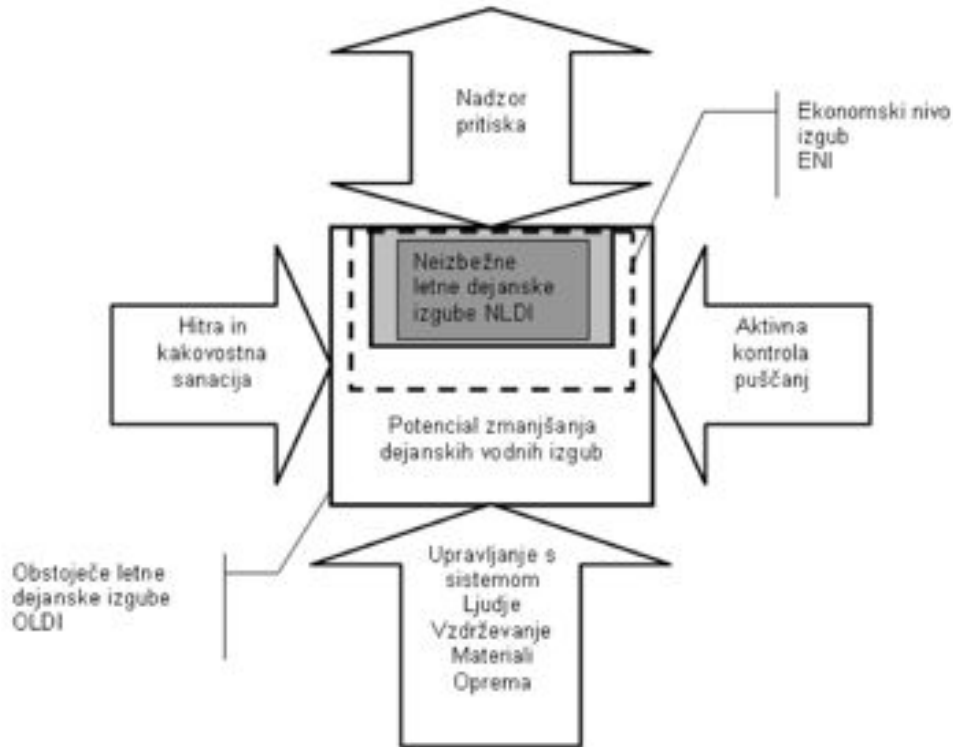
(od ulazne količine vode)

| | | | | |
|-----------------|-----------------|-----------------------------------|---|--|
| Dobavljena voda | Pooblaščen raba | Fakturirana pooblaščen raba | Fakturirana merjena količina vode (odčitani vodomeri porabnikov) | Obračunana Fakturirana nemerjena količina vode (pavšal) |
| | | Nefakturirana pooblaščen raba | Nefakturirana merjena količina vode | |
| | Vodne izgube | Navidezne izgube | Nenatančnost vodomera porabnika (in napake pri obdelavi podatkov) | Neobračunana voda |
| | | | Nepooblaščen raba vode | |
| | | Dejanske izgube | Puščanje cevovodov | |
| | | | Prelivanje in puščanje rezervoarjev | |
| | | Puščanje na priklonih do vodomera | | |

IWA Bilanca vode



Water Loss Specialist Group



Kontrola stvarnih gubitaka vode

KAZALNIK USPEŠNOSTI REŠEVANJA TEŽAV DEJANSKIH VODNIH IZGUB – KAZALNIK ILI

- Kazalnik ILI daje podatek o tem, kako dobro se vodooskrbni sistem vzdržuje (vzdrževanje, popravila, rekonstrukcije, posodobitve), s ciljem nadzora in zmanjšanja dejanskih vodnih izgub.
- Kazalnik ILI predstavlja razmerje med OLDI (obstoječe letne dejanske izgube) in NLDI (neizogibne letne dejanske izgube) in je predstavljen z naslednjo formulo: $ILI = OLDI/NLDI$

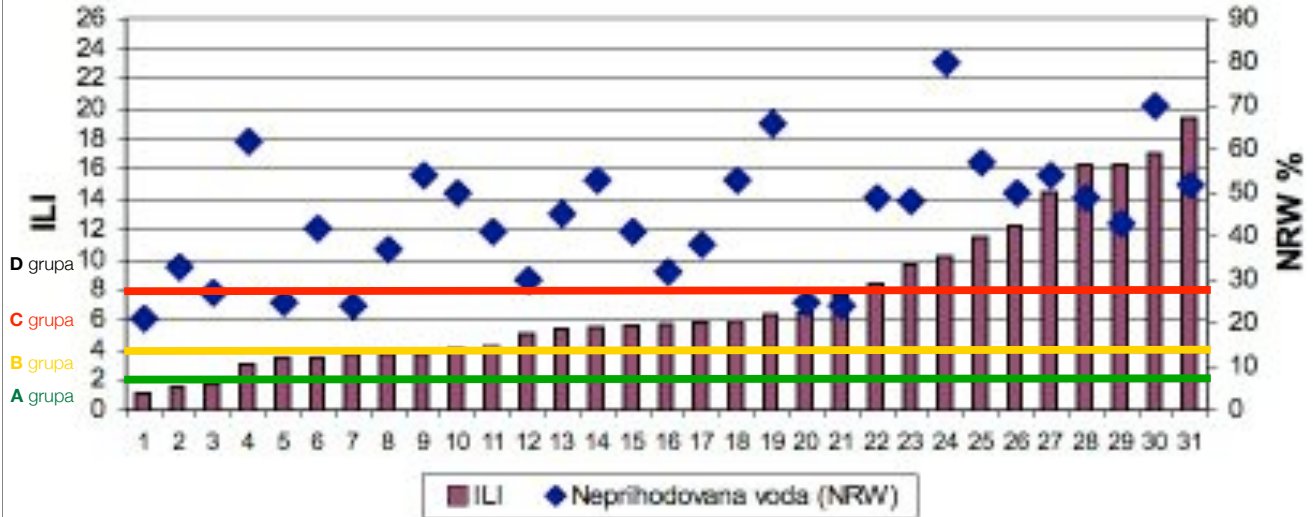
| Razvite države | Skupina | Izračunan ILI za sistem | Splošen opis kategorij nadzora dejanskih izgub za razvite države in države v razvoju |
|----------------|---------|-------------------------|--|
| Območje ILI | | | |
| Manj od 2 | A | | Nadaljnje zmanjševanje izgub je lahko ekonomsko neupravičeno, razen v primeru pomanjkanja vode; potrebna je natančna analiza za ugotovitev finančno najučinkovitejše izboljšave. |
| 2 do < 4 | B | | Potencial za navedene izboljšave; razmislite o nadzoru pritiska, aktivnejšem nadzoru puščanj ter boljšem upravljanju in vzdrževanju sistema. |
| 4 do < 8 | C | | Slab nadzor izgub; lahko se uporablja samo, kadar je voda poceni in je v izobilju; še v tem primeru analizirajte stopnjo in naravo izgub in povečajte aktivnosti pri zmanjševanju izgub. |
| 8 ali več | D | | Zelo neučinkovita raba vira; prednostno so potrebni programi zmanjševanja izgub. |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|------------------|--------------|----------------|-------|---------------|---------------|----------|-----|
| Vodovod (sustav) | Cjevovodi Km | Priključci kom | NRW % | CARL l/prik/d | UARL l/prik/d | Tlak (m) | ILI |
| 1 | 142 | 6310 | 33 | 111 | 73 | 55 | 1,5 |
| 2 | 1500 | 42000 | 27 | 168 | 99 | 60 | 1,7 |
| 3 | 290 | 5084 | 31 | 182 | 76 | 40 | 2,4 |
| 4 | 991 | 30375 | 42 | 277 | 82 | 50 | 3,4 |
| 5 | 338 | 9000 | 37 | 290 | 82 | 60 | 3,7 |
| 6 | 1500 | 23000 | 54 | 451 | 122 | 60 | 3,7 |
| 7 | 550 | 21700 | 41 | 230 | 55 | 40 | 4,2 |
| 8 | 450 | 4142 | 77 | 909 | 169 | 55 | 5,1 |
| 9 | 20 | 1754 | 53 | 294 | 53 | 47 | 5,5 |
| 10 | 435 | 12000 | 38 | 464 | 80 | 50 | 5,8 |
| 11 | 20 | 1720 | 53 | 314 | 53 | 47 | 5,9 |
| 12 | 265 | 13995 | 52 | 346 | 47 | 40 | 7,4 |
| 13 | 97 | 4535 | 53 | 486 | 73 | 45 | 7,5 |
| 14 | 117 | 9184 | 49 | 345 | 40 | 35 | 8,7 |
| 15 | 769 | 42308 | 70 | 1069 | 63 | 50 | 17 |

ILI indikator:
stvarni gubici / neizbježni gubici

$$ILI = PGSG / NGSG$$

ILI i NRW indikatora za sustave u regiji



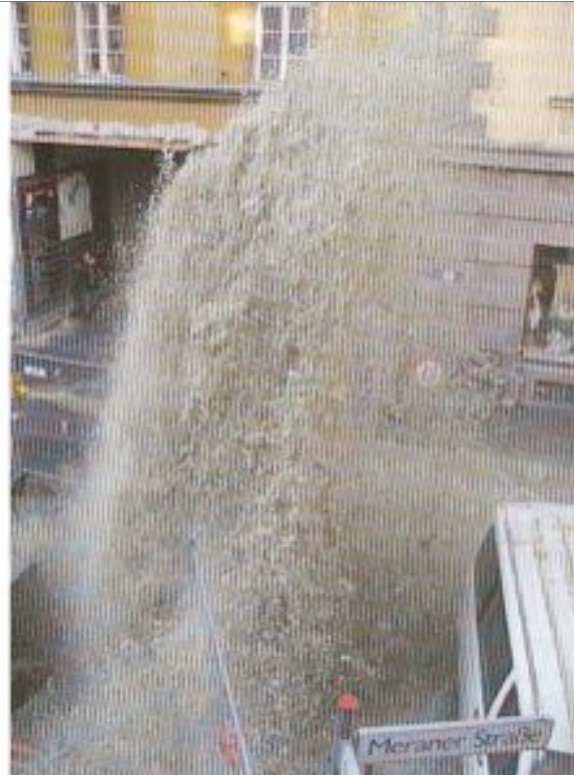
Realna usporedba
sustava

Novi obračun koncesijske naknade (od 1.1.2015.)

- http://narodne-novine.nn.hr/clanci/sluzbeni/2010_07_82_2335.html
- Članak 9. (dio)
- ... do roka određenog člankom 95. stavkom 1. Zakona o financiranju vodnoga gospodarstva, naknada za korištenje voda za vodu koju isporučuje isporučitelj vodne usluge javne vodoopskrbe obračunava se prema članku 95. stavku 2. Zakona o financiranju vodnoga gospodarstva, a visina naknade za korištenje voda iznosi:
 - – **0,80 kuna** za prostorni metar (1 m³) isporučene vode, ako je **omjer stvarnih i tehnički prihvatljivih gubitaka** (u daljnjem tekstu: koeficijent gubitka) u sustavu javne vodoopskrbe na tom području **veći od 8**;
 - – **0,76 kuna** za prostorni metar (1 m³) isporučene vode, ako je koeficijent gubitka u sustavu javne vodoopskrbe na tom području **od 4 do 8**;
 - – **0,72 kuna** za prostorni metar (1 m³) isporučene vode, ako je koeficijent gubitka u sustavu javne vodoopskrbe na tom području **od 2 do 4**;
 - – **0,64 kuna** za prostorni metar (1 m³) isporučene vode, ako je koeficijent gubitka u sustavu javne vodoopskrbe na tom području **ispod 2**,

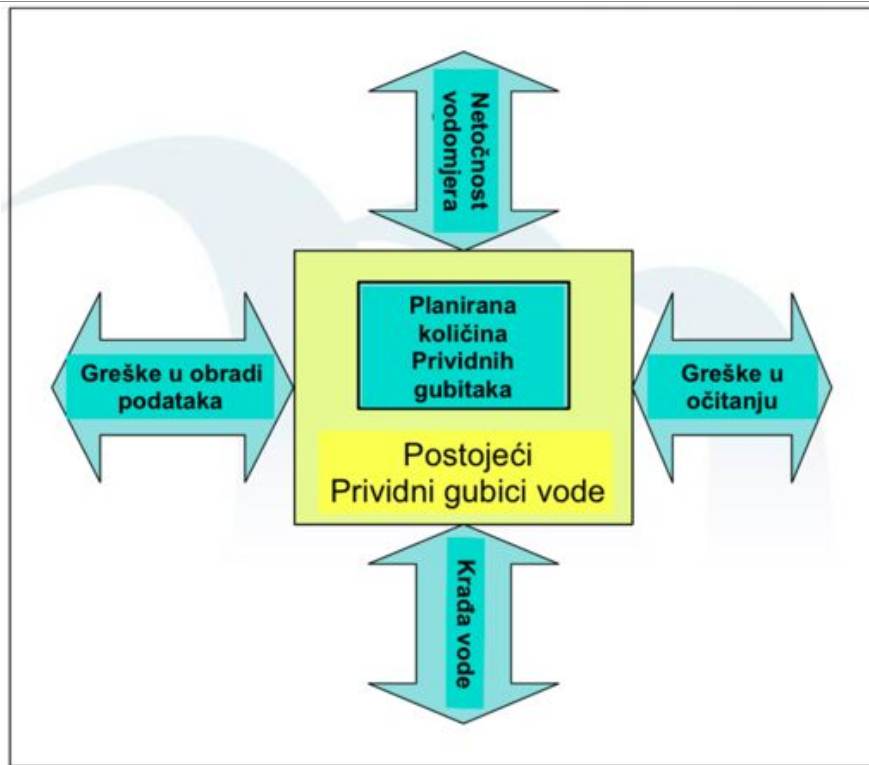
Austrija, OVGW W63 indikatori (PI) 2009

- Omjer gubitaka vode u postotku od ulazne količine (qVR)
- Stvarni gubici po km cjevovoda (qL)
- Stvarni gubici po priključnom vodu (qAL)
- Omjer neprihodovane vode (qNRW)
- **Infrastrukturni indikator curenja (ILI) - glavni indikator**



Primjena metodologije:
Austrija

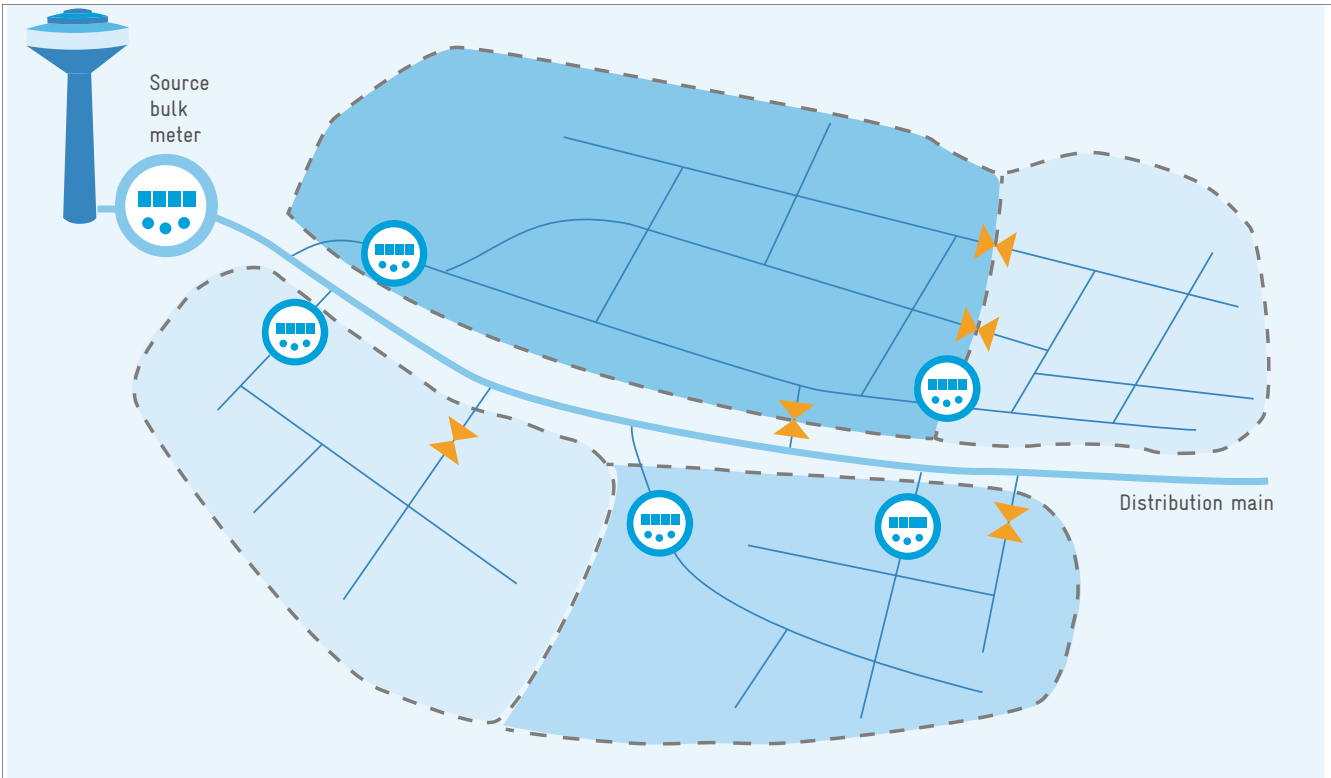
| Temeljni elementi strategije | Opis nalog in aktivnosti | Cilji |
|---|--|--|
| Posodobitev podatkov o sistemu | Uvedba GIS-a, integracija baz podatkov, IT | Popolno poznavanje sistema, učinkovita uporaba informacij |
| Razdelitev sistema v zone (DMA zone - ang. District Measurement Area) | Uvedba merjenja pretoka v manjših delih sistema, daljinski nadzor, analize minimalnih nočnih pretokov, evidenca vseh podatkov o sistemu in porabnikih po zonah | Pravočasno opažanje pojavov puščanj v sistemu, hitrejše izvajanje iskanja puščanj, bolj kakovosten nadzor dogajanj v sistemu |
| Aktiven nadzor puščanj (ALC - ang. Active Leakage Control) | Iskanje neprijavljenih puščanj, proaktivno preizkušanje cevododa (uporaba napredne tehnologije - npr. merilcišuma) | Skrajšanje časa trajanja puščanja |
| Nadzor in upravljanje pritiska v sistemu | Uporaba hidravličnih ventilov za regulacijo pritiska in frekvenčnih pretvornikov za delovanje črpalk | Zmanjšanje intenzivnosti puščanja vode na mestih puščanj, zmanjšanje frekvence pojava novih puščanj, podaljšanje življenjske dobe infrastrukture |
| Reševanje navideznih izgub | Analiza natančnosti vodomero, izbor in uporaba vodomero z večjo natančnosti, analiza finančne upravičenosti, uvajanje merjenja za vse uporabnike sistema | Povečanje natančnosti merjenja porabljene vode, povečanje prihodkov, nadzor in zmanjšanje nelegalne rabe vode, nadzor pooblaščne nefakturirane rabe vode |
| Hitrost in kakovost izvedenih sanacij | Vodenje statistike o puščanjih in sanacijah, posodobitev službe vzdrževanja | Zmanjšanje trajanja puščanj, posodobitev kakovosti del |
| Izobraževanje in organizacija | Kontinuirano šolanje ljudi (metodologija in tehnologija), posodobitev procedur in procesa dela | Povečanje učinkovitosti, optimalna raba razpoložljive tehnologije, kakovostno načrtovanje |



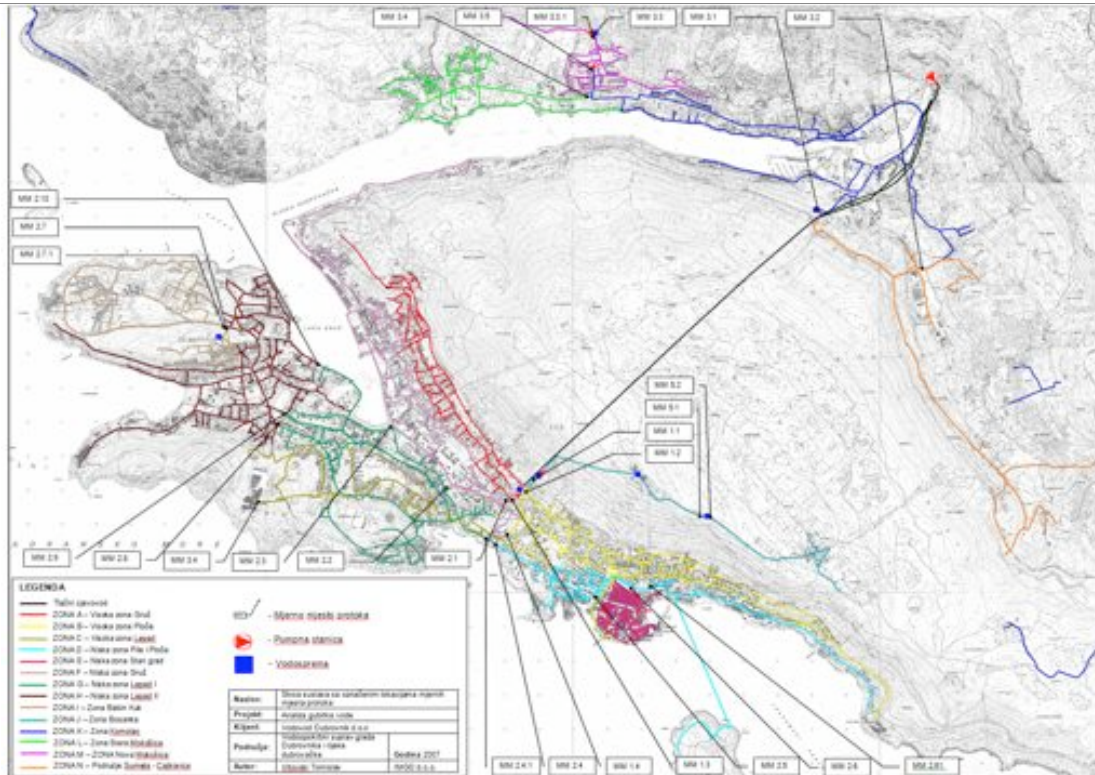
Prividni gubici vode

| Kategorije (izmjenjena WBI podjela za ILI indikator) | Netočnost mjerena i greške u obradi podataka | Prividni (komercijalni) gubici vode | | |
|---|---|-------------------------------------|------------------|------------------|
| | | Nelegalno korištenje vode | Ukupno | l/priklj.v./dan |
| A1 | < 2.5% | < 0.5% | < 3% | < 30 |
| A2 | 2.5% - 5% | 0.5% - 1% | 3% - 6% | 30 - 60 |
| B | 5% - 10% | 1% - 2% | 6% - 12% | 60 - 120 |
| C | 10% - 15% | 2% - 5% | 12% - 20% | 120 - 200 |
| D | > 15% | > 5% | > 20% | > 200 |

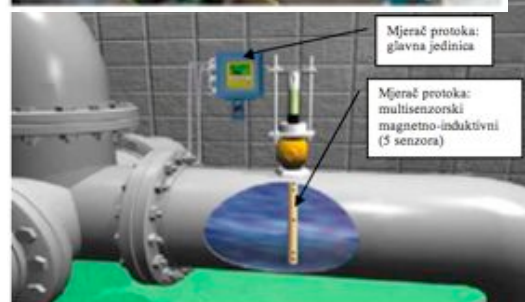
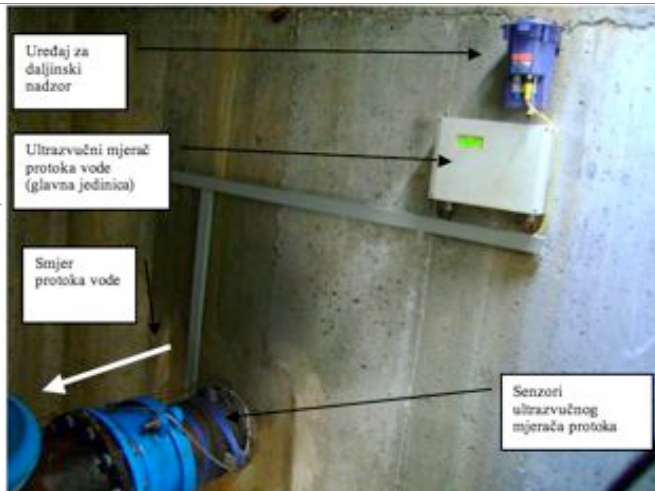
Razumjevanje udjela
prividnih gubitaka vode

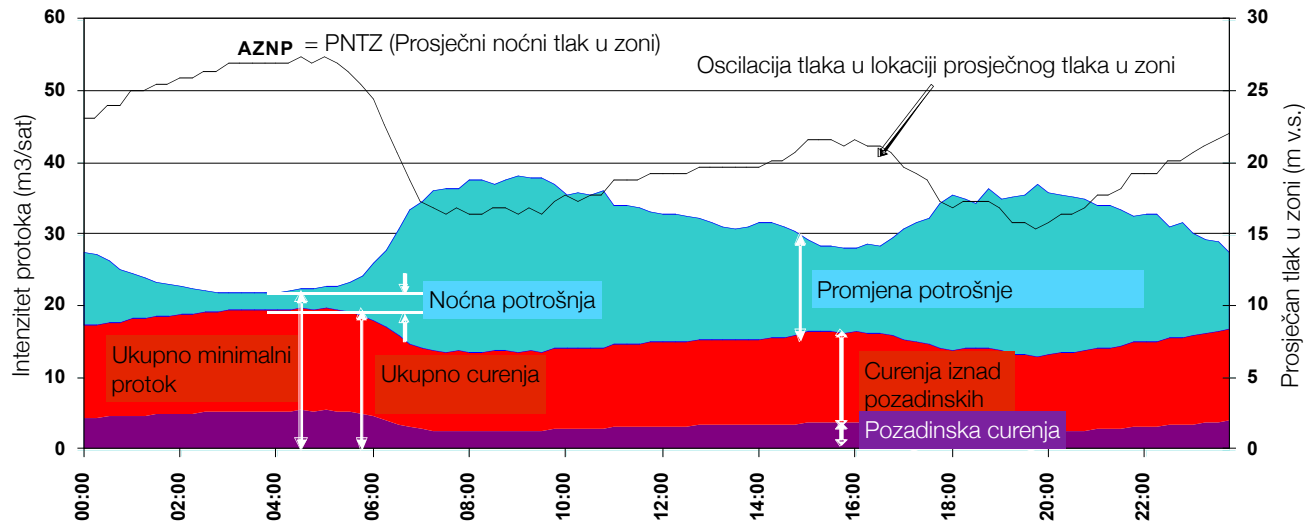


Korisnost podjele
sustava u zone



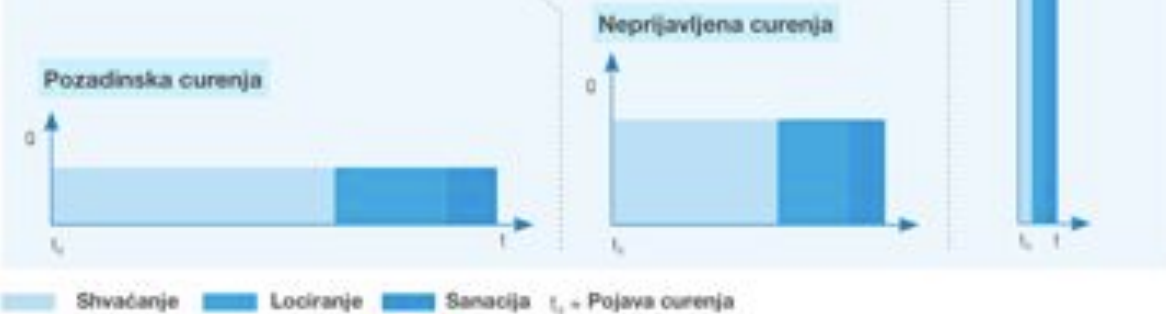
Podjela sustava u zone

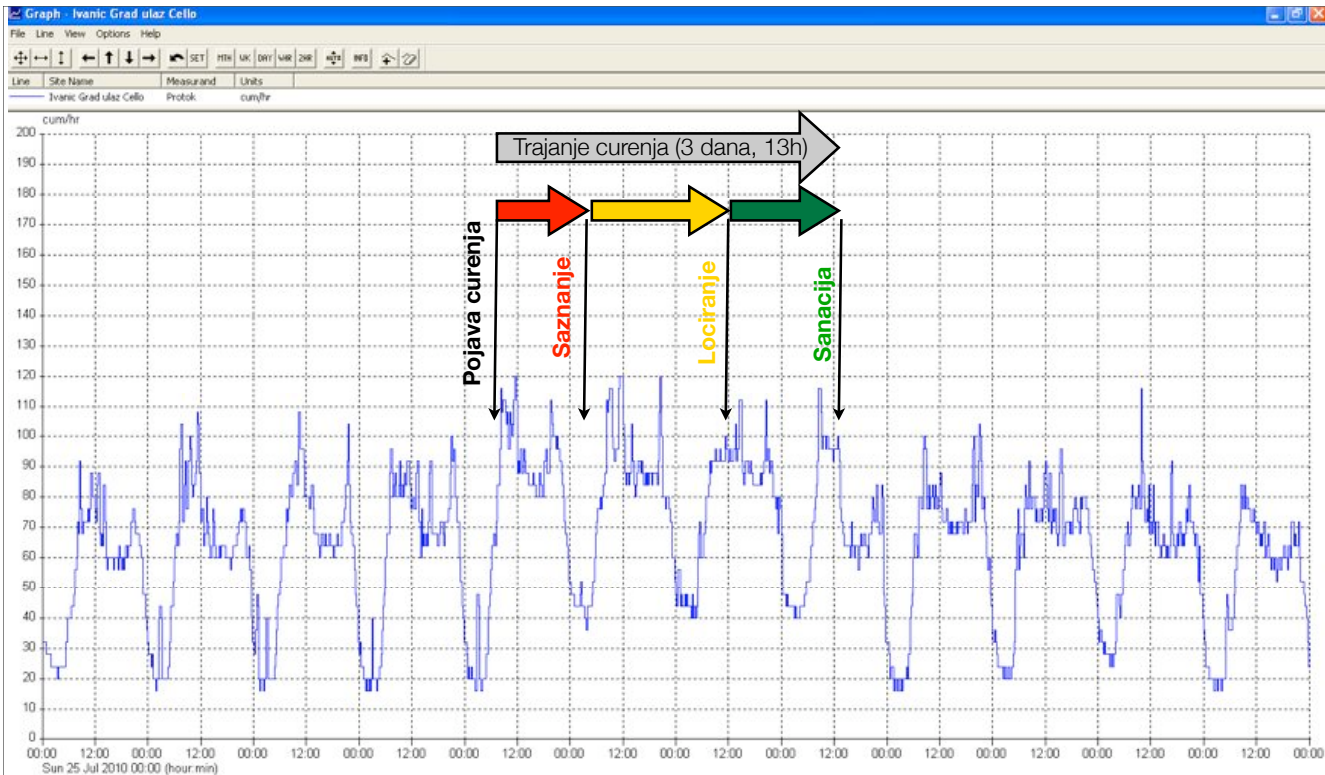




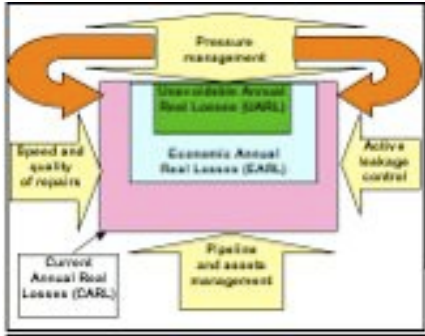
Komponente protoka i tlaka u zoni

Curenja u sustavu



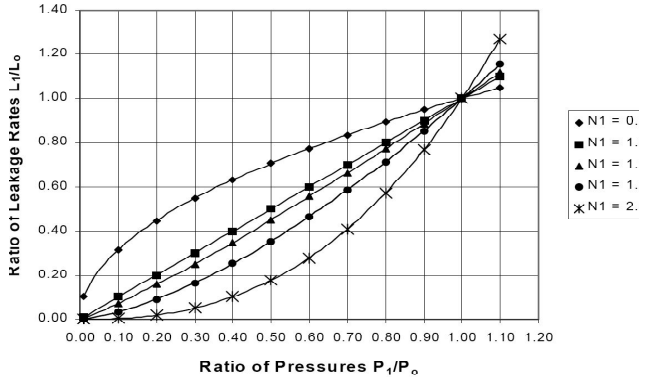
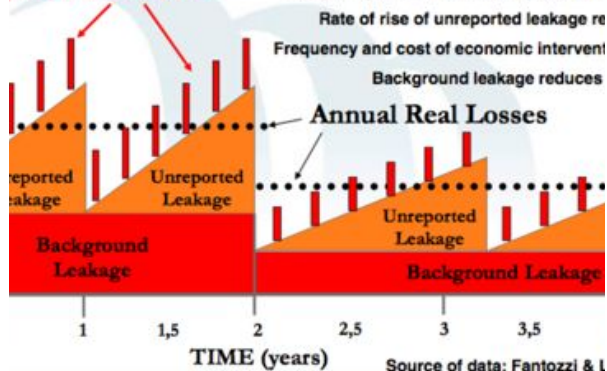


Saznanje/Lociranje/Sanacija

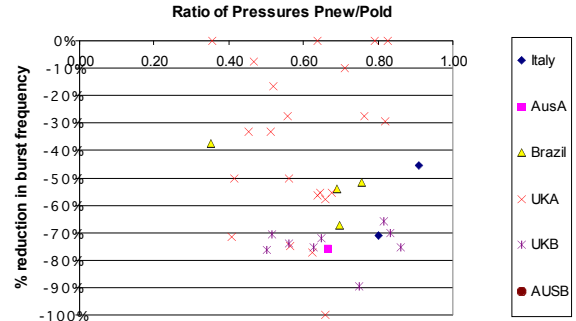


Pressure Management **After Pressure Manage**

Reported Leaks and Bursts



% change in burst frequency (mains and services)



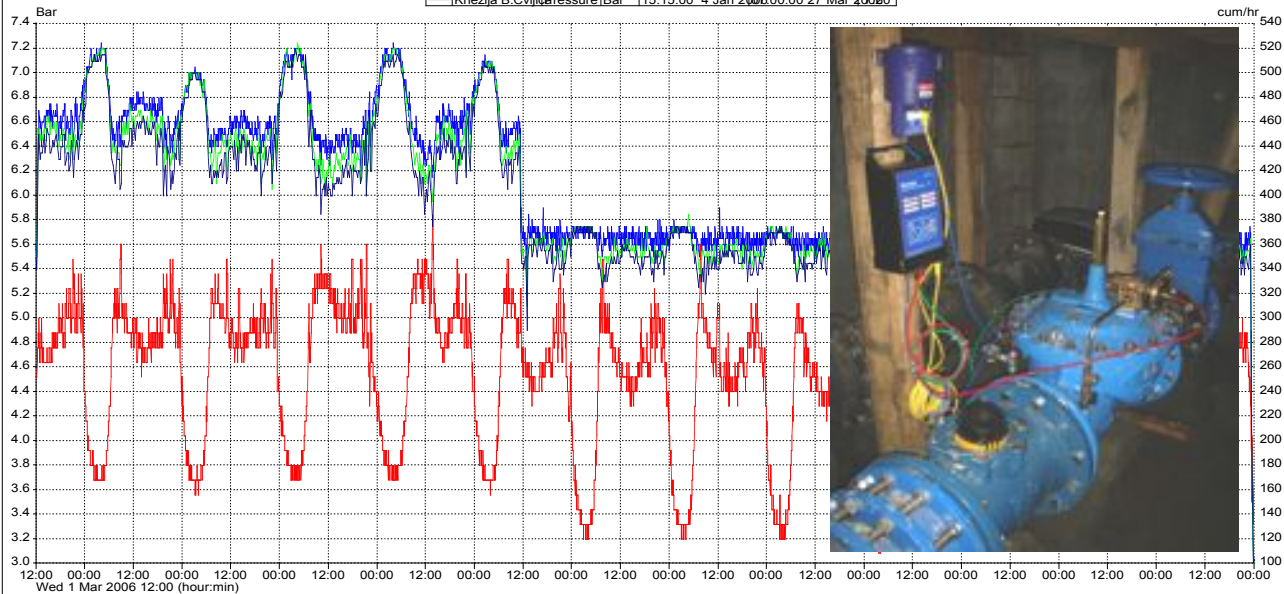
Korisnost kontrole tlaka



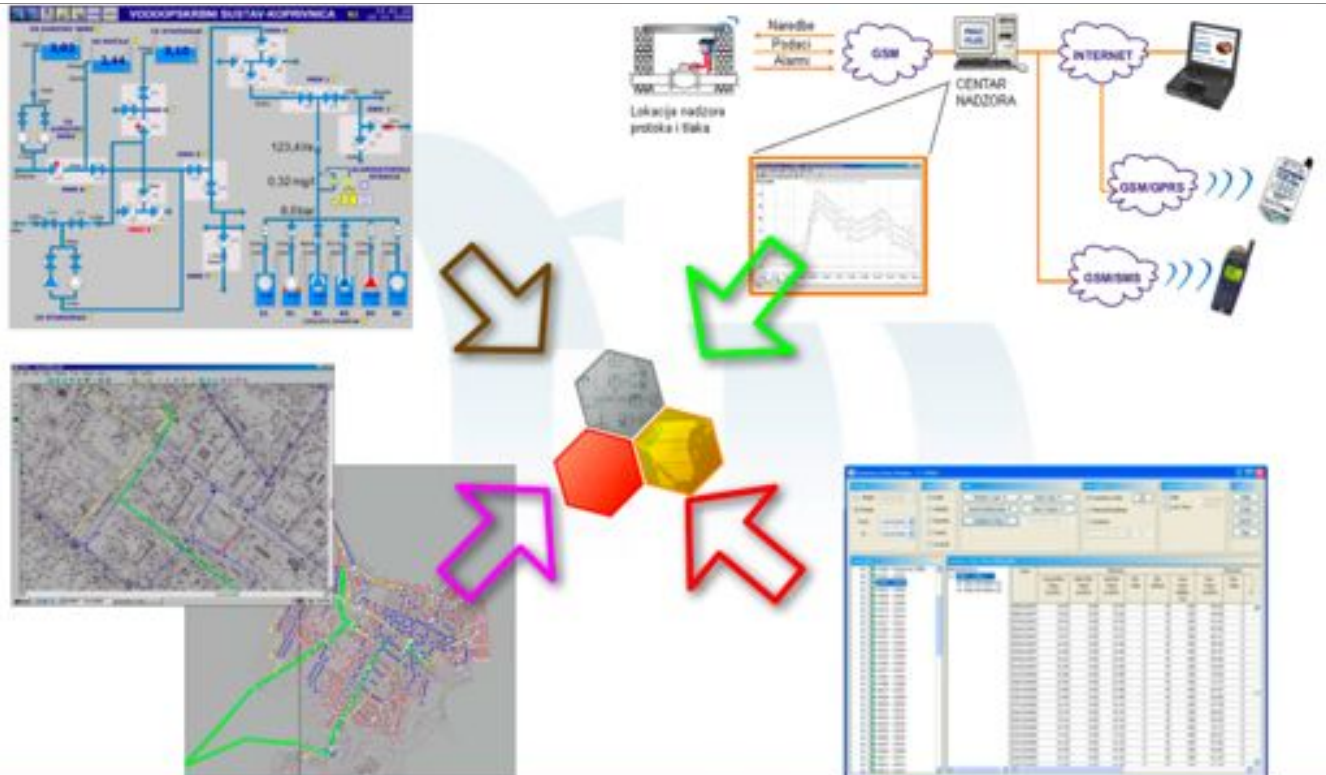
Regulacija tlaka: tehnologija

Zagreb Knezija

| Line | Site Name | Measurement | Units | Start | End | Max |
|------|------------------|-------------|--------|----------------------|-------------------|--------|
| 1 | Zagreb Knezija | Pressure | Bar | 13:20:00 16 Dec 2006 | 00:00 27 Mar 2008 | 7.085 |
| 2 | Zagreb Knezija | Protok | cum/hr | 13:28:00 16 Dec 2006 | 00:00 27 Mar 2008 | 498.00 |
| 3 | Knezija S.Rom | Pressure | Bar | 15:00:00 4 Jan 2006 | 00:00 27 Mar 2008 | 7.085 |
| 4 | Knezija B.Cvijet | Pressure | Bar | 15:15:00 4 Jan 2006 | 00:00 27 Mar 2008 | 7.085 |



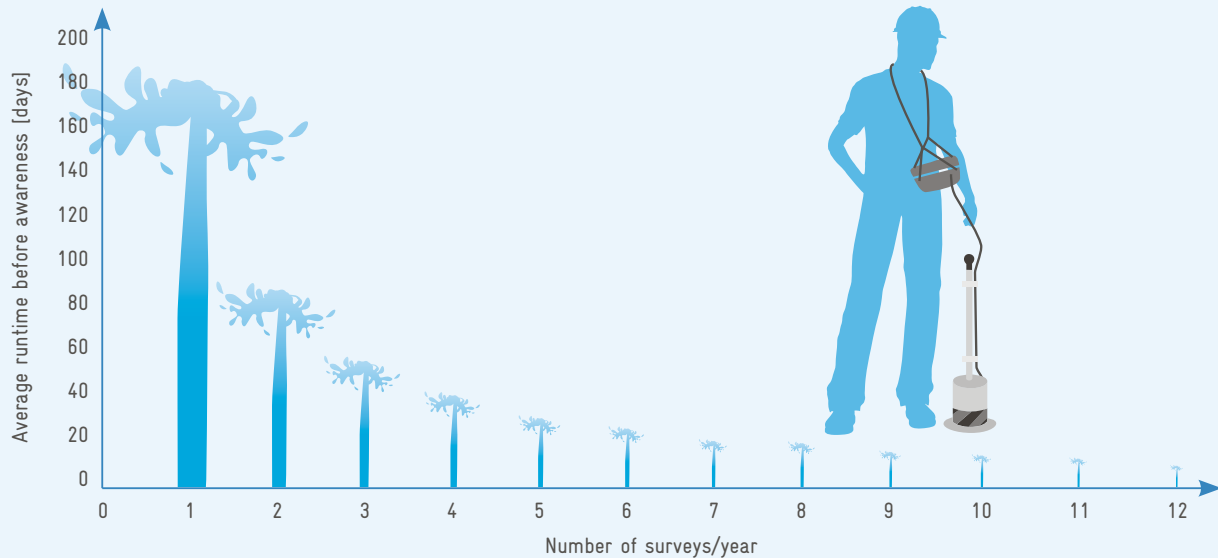
Rezultati regulacije tlaka



Povezivanje podataka - objedinjena analiza
 Integracija IT rješenja i izvora podataka



Aktivna kontrola curenja



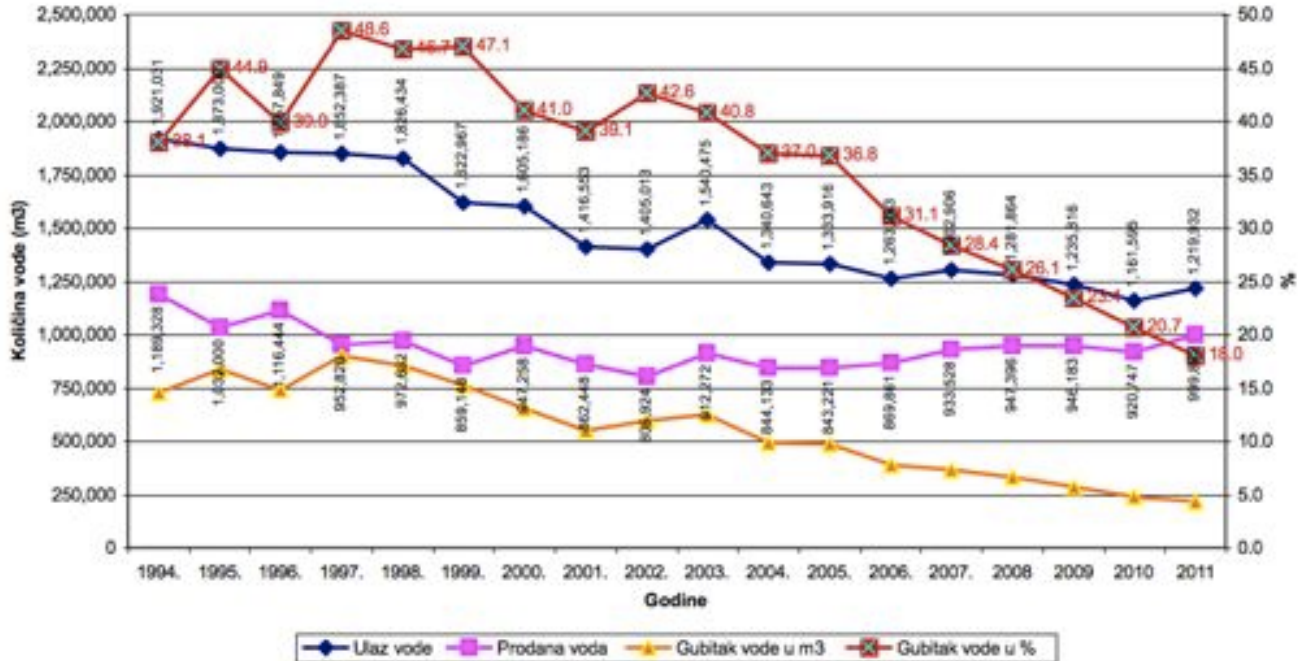
Aktivna kontrola
curenja: pristup

| 'LEAKS'-a : LEAKAGE EVALUATION and ASSESSMENT KNOW-HOW SOFTWARE | | | | | | | |
|---|---|----------------|--------------------|----------------------------------|------------------------|--|--|
| CheckCalcs - besplatni računalni program za utvrđivanje gubitaka vode i mogućnosti kontrole tlaka | | | | | | | |
| alcs | Razvijena zemlje | Verzija 3a | 14.09.2010. | Europa | EURWB.0043 | © ILMSS d | |
| OVAJ RADNI LIST KORISTI SE ZA IZRAČUNE NEPRIHODOVANE VODE, GODIŠNJIH STVARNIH GUBITAKA I POTENCIJALA SMANJENJA STVARNIH GUBITAKA VODE | | | | | | | |
| izvanje: | Unos podataka | Osnovni podaci | Početni podaci | Izračunate vrijednosti | Podaci iz drugog radno | | |
| EDNOSTAVLJENA IWA BILANCA VODE - IZRAČUNI za | | | Ivakop Ivanić Grad | | vodovod IVAKOP | | |
| je od | 01/01/2011 | do | 01/01/2012 | = | 365 | dana | |
| Podatke stav u lja. početne (u %) u tim te ih e ako bnje oji će lati nost a. | KOLIČINA VODE IZ VLASTITIH IZVORA | | | | | 0 | m ³ x 10 ⁶ /u razd |
| | Preuzeta voda u sustav | | | | | 1220 | m ³ x 10 ⁶ /u razd |
| | KOLIČINA VODE KOJA ULAZI U SUSTAV | | | | | 1220 | m ³ x 10 ⁶ /u razd |
| | Isporučena voda iz sustava | | | | | 0 | m ³ x 10 ⁶ /u razd |
| | DOBAVLJENA VODA u sustav | | | | | 1220 | m ³ x 10 ⁶ /u razd |
| | Fakturirana mjerena potrošnja | | | | | 1000 | m ³ x 10 ⁶ /u razd |
| | Fakturirana nemjerena potrošnja | | | | | 0 | m ³ x 10 ⁶ /u razd |
| | NEPRIHODOVANA VODA (NRW) | | | | | 220 | m ³ x 10 ⁶ /u razd |
| | Nefakturirana ovlaštena potrošnja | | 1.80% | od Dobavljene vode | | 22 | m ³ x 10 ⁶ /u razd |
| | GUBICI VODE | | | | | 198 | m ³ x 10 ⁶ /u razd |
| | Necvlaštena potrošnja | | 1.30% | od Dobavljene vode | | 16 | m ³ x 10 ⁶ /u razd |
| | Netočnosti vodomjera potrošača | | 2.00% | od Fakturirane mjerene potrošnje | | 20 | m ³ x 10 ⁶ /u razd |
| | PRVI GUBICI | | | | | 36 | m ³ x 10 ⁶ /u razd |
| | POSTOJEĆI GODIŠNJI STVARNI GUBICI (CARL) | | | | | 162 | m ³ x 10 ⁶ /u razd |
| | NEIZBJEŽNI GODIŠNJI STVARNI GUBICI (UARL) | | | | | 168 | m ³ x 10 ⁶ /u razd |
| POTENCIJAL SMANJENJA STVARNIH GUBITAKA = CARL - UARL | | | | | -6 | m ³ x 10 ⁶ /u razd | |
| Nakon što završite s izračunima Bilance vode, prijdite na radne listove 'IWA tablica Bilance vode' i 'Indikator' >>>> | | | | | | | |

Programi za osnovni izračun
Bilance vode i indikatora

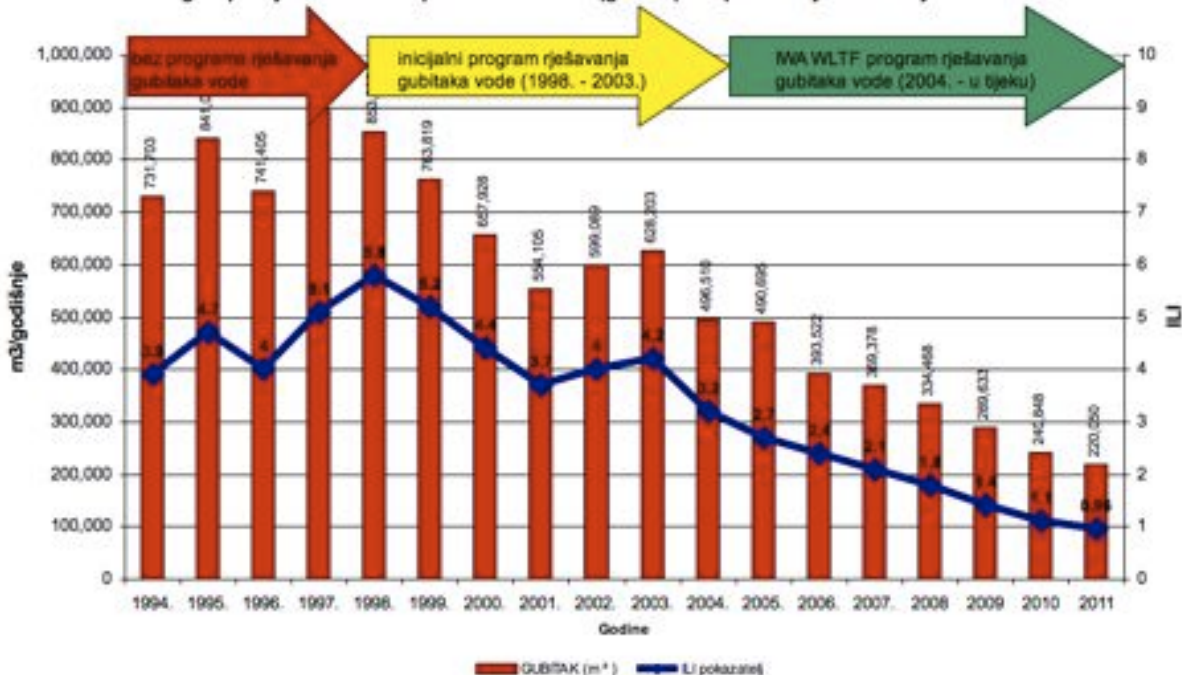
CheckCalcs

Pregled bilance vode u standardnom obračunu (1994-2011)
(neprihodovana voda predstavljena kao gubitak vode)



Višegodišnje sustavno
djelovanje

Ivakop d.o.o. Ivanić Grad
 Pregled promjene količina neprihodovane vode (gubitak) i ILI pokazatelja u razdoblju 1994.-2011.



Višegodišnje sustavno
 djelovanje

Sustavno djelovanje

- Stvaranje strategije/programa kontinuiranog djelovanja u domeni kontrole gubitka vode
- Usvajanje znanja i vještina upravljanja
- Kontinuirano osposobljavanje u područjima metodologije i tehnologije
- Provedba strategije/programa uz neophodnu promjenu stečenih navika
- Primjena benchmarkinga – ocjenjivanje (kontrola uspješnosti realizacije primjenom indikatora - pokazatelja)
- Upravljanje podacima i dokumentima
- Upravljanje procesima



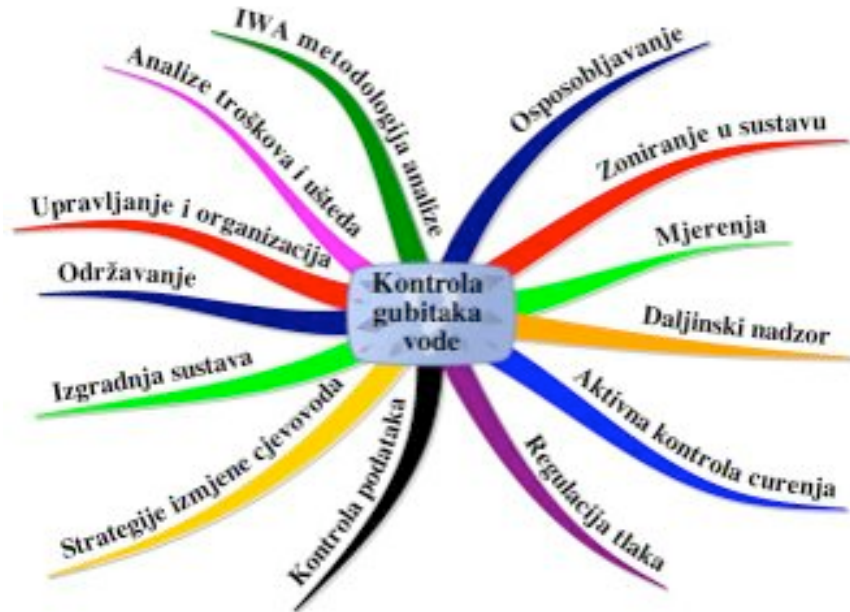


Ključ uspjeha su ljudi...
...i kontinuitet u djelovanju.

**Učinkovita kontrola
gubitaka vode**

=

**Sustav upravljanja
gubitcima vode**





Napredna iskustva iz
regije

Registration tutorial

Operator profiles



1 2 3 4



EUROPEAN COMMISSION
PRESS RELEASE

Brussels, 18 December 2012

Environment: €40 million for innovations in water

An important step was taken today in developing solutions for the major challenges Europe faces in managing water. The Strategic Implementation Plan (SIP) adopted by the European Innovation Partnership (EIP) on Water, chaired by Environment Commissioner Janez Potočnik sets out priority areas where solutions are needed. Action Groups will now draw up tools and mechanisms to promote innovations in water policies and technologies. 45 million euros of research funding will be made available in 2013 to support projects that contribute to the aims of the EIP Water.

Columns

Water coverage 44.25
Registration code Address Code Water Share



GWOPA's Operator Profiles feature water and sanitation service providers from around the world. The database helps utilities find potential partners with whom to engage in twinning or online sharing.

Members Login

Username

Password

WOP-SEE



Serbia Conducts the first WOPs in SEE



A first set of Water Operators' Partnerships in SEE were launched by the Governess of the South Backa District of Serbia, Ms. Darija Sajin, during the Sajam Voda 2010, in Belgrade this November. Utilities from 11 South Backa municipalities were exposed to the successful water loss reduction approaches of Croatian utilities a short distance across the border then accompanied in developing their own WLR programs. The Serbian-Croatian WOPs, realized with support of Serbia's Inter-institutional Professional Network (IPM)

WATER LOSS DETECTIVES



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YEAR 3 / NO. 3



ROMANIAN LEAKAGE MAGAZINE

MARCH 2013

EDITORIAL

YEAR OF THE SNAKE

Dear readers,
On February 10, 2013 The Chinese New Year of the Snake began. The Snake is said to be a mysterious, intuitive, introspective and refined sign. The 2013 year of the snake will be a favourable year for self improvement and learning which will encourage us to use our available tools, wisdom and intelligence.

The Water Loss Detective magazine reached its fifth issue and we have prepared new things for you, hopefully enjoyable. We switched to A4 page size, having in mind those of you who get only the electronic version and would probably like to easily print out copies.

The Water Loss Detectives is our means to keep the professionals interested in the water leak topics informed on the latest developments, the progress made in the implementation of various non-revenue water management solutions. Our readers are our co-workers involved in this field, students, professors, consultants and those who propose strategies for water loss management.



SUMMARY

GLOBAL LEAKAGE SUMMIT 2013

PAG. 2

The 6th Global Leakage Summit will be held at the Thistle Marble Arch, London, from 11-14 March 2013. The research process used by the Summit conference... [read more in page 2](#)



INTERVIEW WITH ALLAN LAMBERT

PAG. 3

Leader of the 1st International Water Association Water Loss Task Force "Don't be afraid to listen to, learn from the experiences of your team and other people" ... [read more in page 3](#)



STUDIES AND PROCEDURES OF WATER LOSS REDUCTION IN THE WATER SUPPLY SYSTEM OF THE TOWN OF VIGN

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This paper is assessing the current level of the losses ... [read more in page 18](#)



CHANGES IN WATER LOSS MANAGEMENT IN WESTERN BALKAN REGION

PAG. 8

CHANGES IN WATER LOSS MANAGEMENT IN WESTERN BALKAN REGION

Abstract

The aim of this paper is to present current situation, experiences and development of activities regarding water loss management in the region of the Western Balkan. Particular focus will be given to the following countries: Croatia, Bosnia and Herzegovina, and Serbia.

Keywords

Water loss management, strategy development, performance indicators, education

INTRODUCTION

In the 90's Western Balkan region (ex Yugoslavia) has affected besides economical downturn with war activities. All this in combination had tremendous negative impact on water distribution infrastructure condition and as a result rise of water losses.

Individual distribution systems are relatively small and dedicated to separate municipalities or large town and cities. For example in Croatia we have some 100 utilities supplying water for a total population of



1.3 M but only Zagreb, the capital city, has one utility responsible for a 800K population. Similar situation we have in Bosnia and Herzegovina with Sarajevo and in Serbia with Belgrade.

In average, NRW is between 40 and 50%. Conditions of the infrastructure are poor due to many reasons (war damages, lack of preventive maintenance, limited or no investments in rehabilitation, low revenue water prices, etc.). Above all, an increasing problem is the lack of educated workforce.

In the second half of the 90's, the rehabilitation of the whole region started, with a huge financial support from the international institutions, such as EU funds, World Bank, EBRD and others. From numerous donations and loan programs significant investments were done into the water distribution infrastructure but still this had little or no effect on water losses levels. Many utilities needed technology for water loss control and in particular leakage detection, but in most cases what remained was old practice in water losses understanding and approach in

problem solving (NRW in % as the main indicator, leaks anticipated as the cause of the losses problem etc.).

In the last decade we have witnessed a slow, but definite rise in understanding of water loss importance in the region and in parallel with that acceptance of IWA WLT approach.

Many utilities recognized this new approach as beneficial and numerous cases have shown that the water loss issue can be tackled with relatively simple and fast implementing programs and strategies. IWA WLT approach proved to be also economically feasible.

Now we have strong development evident on different levels in the region and few examples will be presented showing success accomplished and obstacles faced which can be an example for others.

CROATIA

Since the end of the 90's, there has been an evident slow rise in understanding the importance of water losses. A couple of utilities started with measures like zoning, pressure management and active leakage control, but most utilities operated their systems without a dedicated water loss control policy. Due to the fact that the country's water reserves are one of the largest in Europe and the government policy focuses on the expansion of the water distribution infrastructure, investments in water loss control were sporadic and evident only in rare cases where some utilities had limited sources of water or high rise in consumption demand.



Following examples can be outlined:

- Water utility in town Rijeka (700 km network): strong industrial and tourist centre on northern Adriatic coast. The company started a dedicated water loss control project in the beginning of 1990 implementing zoning, remote monitoring, pressure control and leak detection. Succeeded in reduction of NRW from over 40% to below 2% in 10 years and maintained this level until today.

- Water utility Istarski Vodovod (5000 km network): large system covering almost whole Istra peninsula – strongest tourist region in Croatia. From mid 90's the company has had dedicated activities including system analysis, ALC equipment purchase, zoning, pressure control. Now, the NRW is below 20% (first utility who started with use of insertion flowmeters for DMA control in Croatia in late 90's)

- Water utility Zagreb (3000 km network), capital of Croatia. The utility started its own water loss program with development of advanced hydraulic mathematic modeling in mid 90's but lost some momentum until recently when IWA methodology was implemented in 2008 (featuring tests of advanced pressure control application and system analysis). Now, preparations and strategy definitions for comprehensive active water loss control program are under way.

- Water utility Iwakop (300 km network): The small system near Zagreb started in late 90's zoning policy with use of simple mechanical meters but on a large scale (some 30 locations in relatively small network – then 150 km pipelines) and until today, they expanded the monitoring system (53 measuring locations, 51 DMA zones, 4 PMA zones) with excellent results (ILI 1.4, NRW in 2010, 19%).

- First serious changes started with local conference organized by the association of water utilities held in 1998 dedicated to the subject of water losses. Interesting to note is that a couple of experts came from Europe to present papers. Also it is interesting to remember that in this beginning period in town Dubrovnik well known company Istarski Water Services conducted NRW audit (financed by the donations from EU).

- In the last 10 years we have slow but definite growth regarding advanced water loss control with many utilities starting to use, besides recognized standard measures like zoning, pressure control and ALC, also new IWA



WLT methodology on standardization and performance indicators. In 2007 we had another very successful conference (with over 450 participants from the whole region) about water loss issues where IWA methodology was officially introduced for the first time, and also several case studies were discussed. Now, over 20 utilities have data analysis done with use of IWA methodology. In one case we have utility that integrated IWA methodology performance indicators in their ISO9001 standard and planned improvements in water loss control are not anymore presented as change of NRW % but as reduction of ILI.

Latest changes on the horizon show recognition of water loss importance on national (governmental) level. Association of water utilities has encouraged water utilities to start using IWA methodology since 2009 and, from July 2010, Croatia has new regulations regarding policy of concessions payments for the water extracted by the water utilities. Concession price has 4 categories values relevant to the water losses coefficient based on 4 World Bank Institute categories and IWA WLSG Infrastructure Leakage Index.

We present herewith the translation of the specific paragraph section regarding concession values related with coefficient of losses:

- 0.80 HRK for a cubic meter (1 m³) of water delivered, if the ratio of actual and technically acceptable losses (hereinafter referred to as the coefficient of loss) in the public water supply in this area is greater than 8;
- 0.78 HRK for a cubic meter (1 m³) of water delivered, if the coefficient of loss in the public water supply in this area is between 4 and 8;
- 0.72 HRK for a cubic meter (1 m³) of water delivered, if the coefficient of loss in the public water supply in this area is between 2 and 4;
- 0.64 HRK for a cubic meter (1 m³) of water delivered, if the coefficient of loss in public water supply system in this area is below 2.

This new legislation will for sure motivate Croatian utilities to start changing situation about water losses issue. Currently utilities have few years moratorium on this law that should be used for preparations and improvements.

Another important development is related with initiation of dedicated Training and Competence Centre in water utility in town Karlovac (300-karlovac.org). This centre is result of cooperation between German and





Hvala na pažnji.

JURICA KOVAČ

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Water Loss
Specialist Group