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Benefits of Water Loss Reduction Program based on IWA WLTF methodology - example from Croatia

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Summary

Water distribution system is located in the northern part of Croatia, 30 km east from its capitol Zagreb (South-east Europe) and covers approx. 300 km of pipelines with 5500 service connections (visible towns on the map; Ivanic Grad, Klostar Ivanic, Kriz and Novoselec with smaller villages in Figure 1).

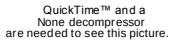

Figure 1 Water distribution system location (Source: Google Earth)

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 in1998 because NRW was constantly between 40-45%.

Historical overview of the main water balance components is presented in the following graph (Figure 2).

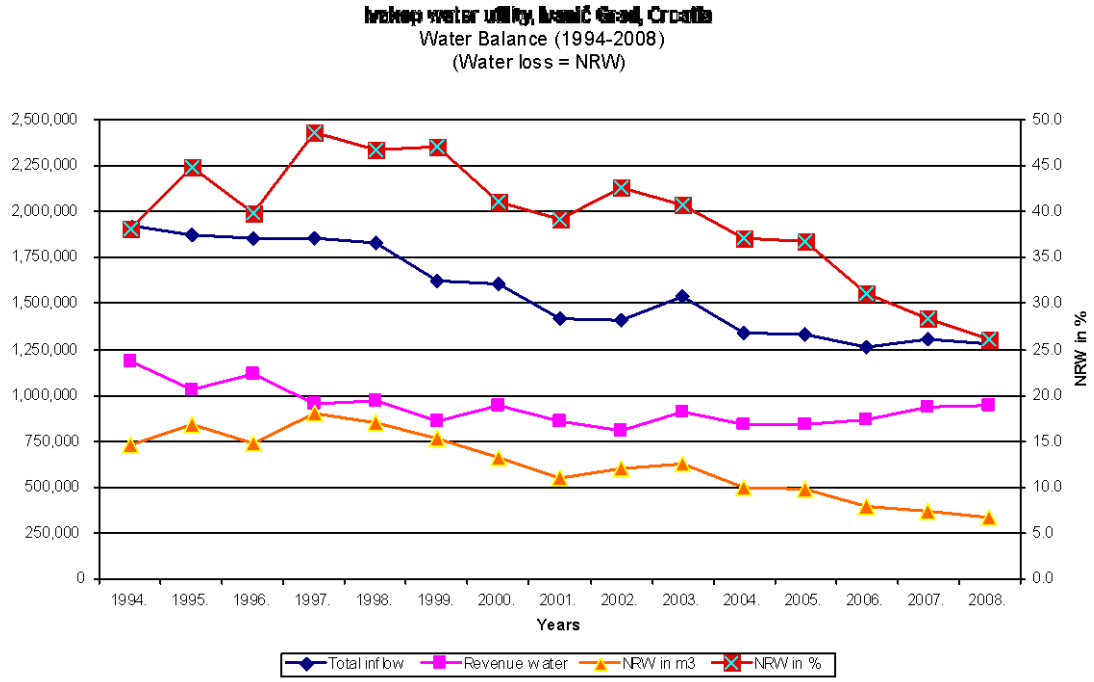

Figure 2 Water balance historical data

In this paper we are proud 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 WLTF methodologies and latest technologies.

Initial water losses reduction program

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) 4 times a year (quarterly).

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

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 .

Advanced program with IWA WLTF methodology and new technology

Maximum of this approach for water utility was reached in 2001. when the period of stagnation began. Water utility management realised that approach they had 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. Then started the collaboration between Ivakop water utility and company specialised for water loss management, which set forward the

implementation of the new methods and technologies to improve the reduction of water losses.
This positive trend remained successfully in the following years, 2004-2008 (Figure 2 and 3) what is even visible in NRW indicator (Figure 2).

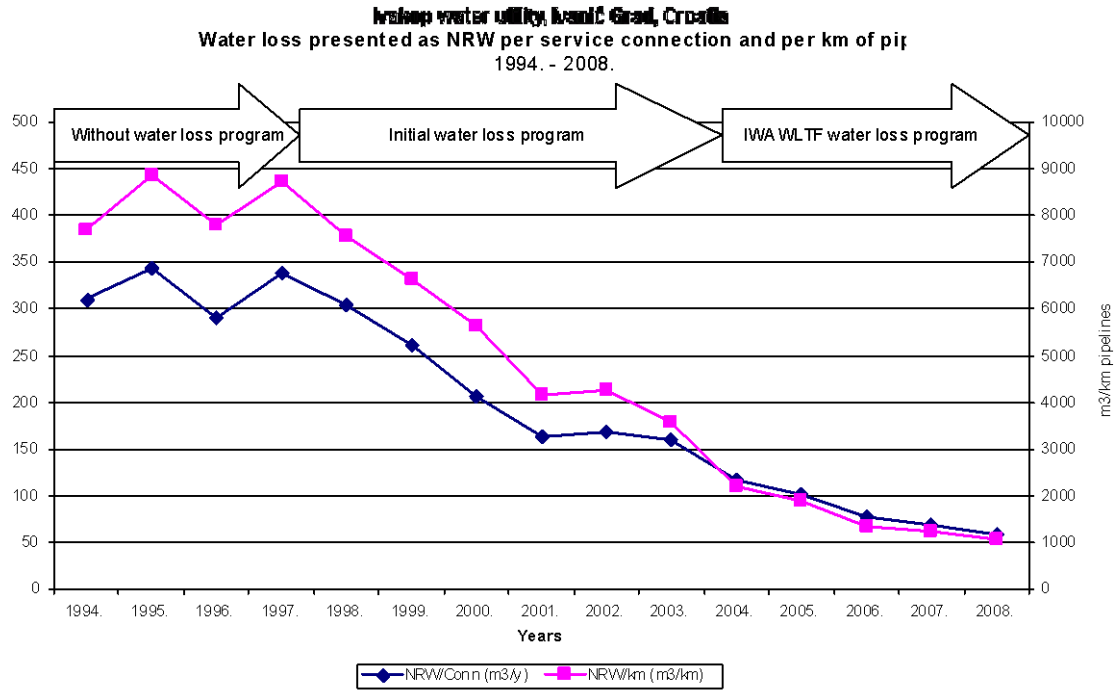

Figure 3 NRW in correlation with service connections and pipes length per year

Basic improvements were following:

- Systematic analysis of the water loss in the system and leakage detection (2003)
- Implementation of IWA WLTF methodology (2004-2008)
- Implementation of the remote monitoring on selected existing measuring locations (2005-2008)
- 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 WLTF methods (2007) – establishing data base
- Training and education of water utility staff (2004-2008)

Results

Implementation of the program resulted with couple of outcomes; 51 DMA with flow measuring meters including 22 remote monitoring locations of flow and many also with pressure measuring (selected technology is based on data loggers with GSM modems, battery operated), 4 areas with pressure control in the system (3 of them with tome or flow modulations).
In the same time was provided training for the personnel of the water utility, with main purpose to help them understand these new technologies, IWA WLTF methodology, their advantages and usage. Main goal is 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, in past years, if we compare that with the condition in 2003 (when IWA WLTF approach was initiated) ILI was 4,2 and in 2008 was 1,8. In NRW 2003 was 41%,but in 2008

was reduced to 26% (Figure 1). Tremendous results are achieved when we compare last year without dedicated programme related with losses control,1997 (ILI was 5 but volume of NRW was 900.000m3 and 47%) and last year, 2008 and NRW was reduced in volume by 2/3 in these 11 years.

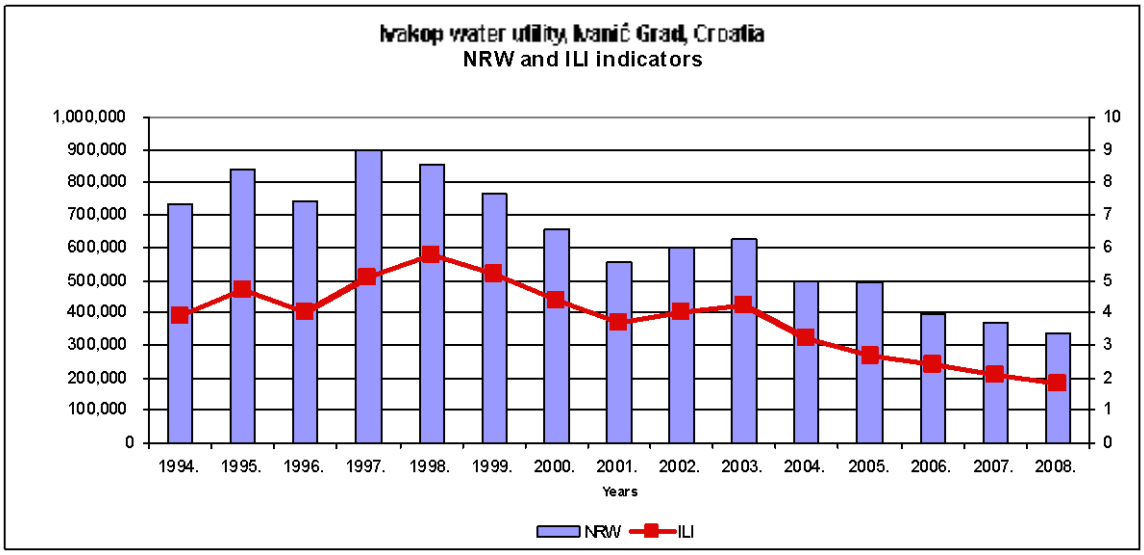

Figure 4 ILI indicator and NRW in volume

Other results of successful IWA WLTF approach implementation were;

- total quantity of non-revenue water reduced from 628.000 m3 to 334.000 m3 (2003-2008) – achieved year's savings of 294.000 m3
- NRW reduced by 47% in just 5 years
- Reduction of BFI (Burst Frequency Index) from 27 to 15 (Figure 5)

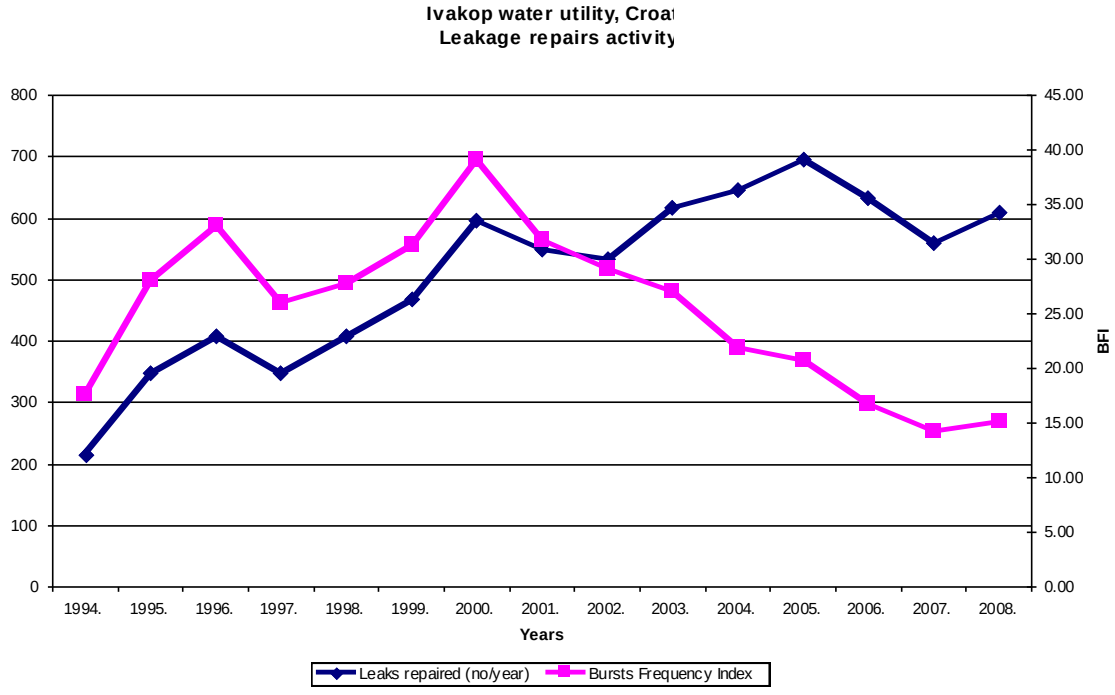

Figure 5 Leakage repair activity

Also, success of our program is visible in Figure 6 where we have presentation of data collected from our region. Ivakop water utility is shown as number 3.

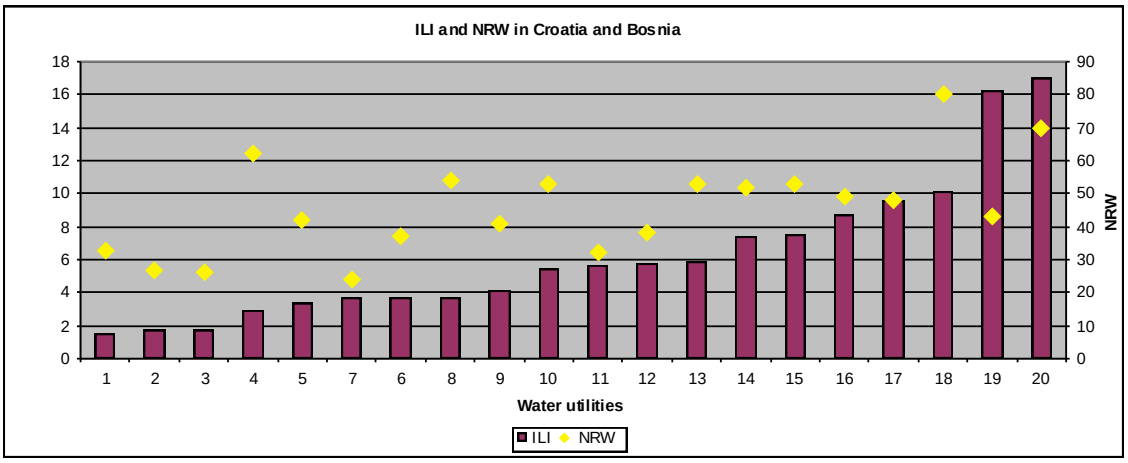

Figure 6 Water loss indicators from the region of Croatia and Bosnia and Herzegovina

Additional indicator is shown in Figure 7 where we can compare results according to the average pressure in the system and CARL (3,35 l/serv conn/day/m of pressure). It is evident that Ivakop water utility is very successful in reduction of water losses.

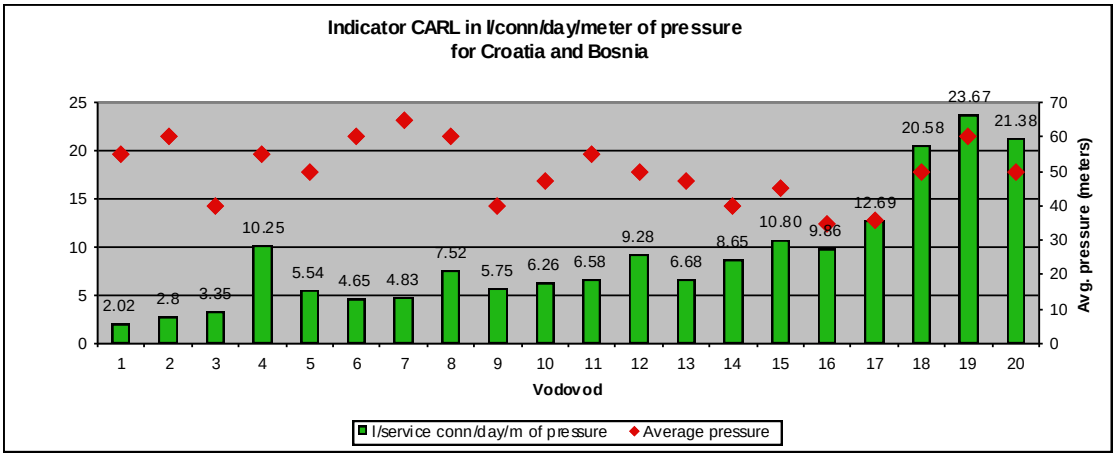

Figure 7 CARL according to the average pressure in Croatia and Bosnia (Ivakop utility - number 3)

Return of investments

According to the price of m3 of water, which Ivakop water utility pays for to its supplier, it is important to mention also the financial side of the water loss reduction activities. Total value of the savings for reduced leakage in 4 previous years (IWA WLTF approach implementation) was 127.000 Euro and total investments were 130.000 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 the short-term goals. It is important to define further goals and also to address new challenges. One very important is problem of high BFI (now 15). For the last year we have made analysis of all basic types of burst repaired (608) and results are shown in Figure 8.

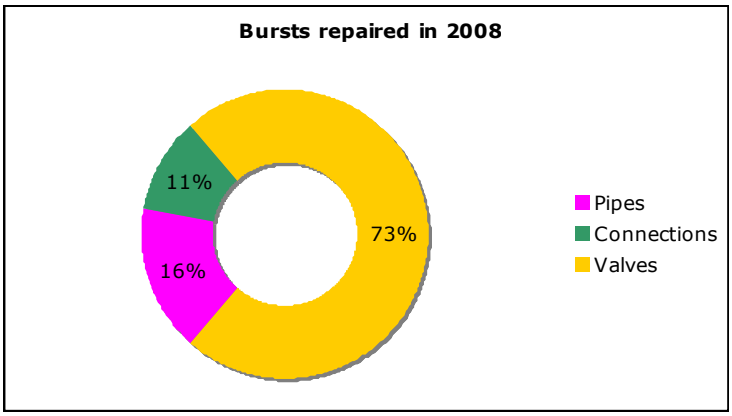

Figure 8 Burst repaired in 2008

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 is very high probability that quality of the material is the main cause of this alarming situation and for this year plan is to have detailed specification for all repaired or replaced valves. It is evident that this indicator must be reduced what will have positive financial outcome and additional reduction of losses.

Another point of interest is implementation of Performance Indicators that will help in future analysing. Intention is to use IWA PI system as example for future program development.

It is also necessary to provide activities that are linked with the implementation of the newest methods and standards and IWA WLTF 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 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 financial aspects of the utility (Figure 10). All these influences and changes 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).

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Figure 9 Steps in analysing water distribution network

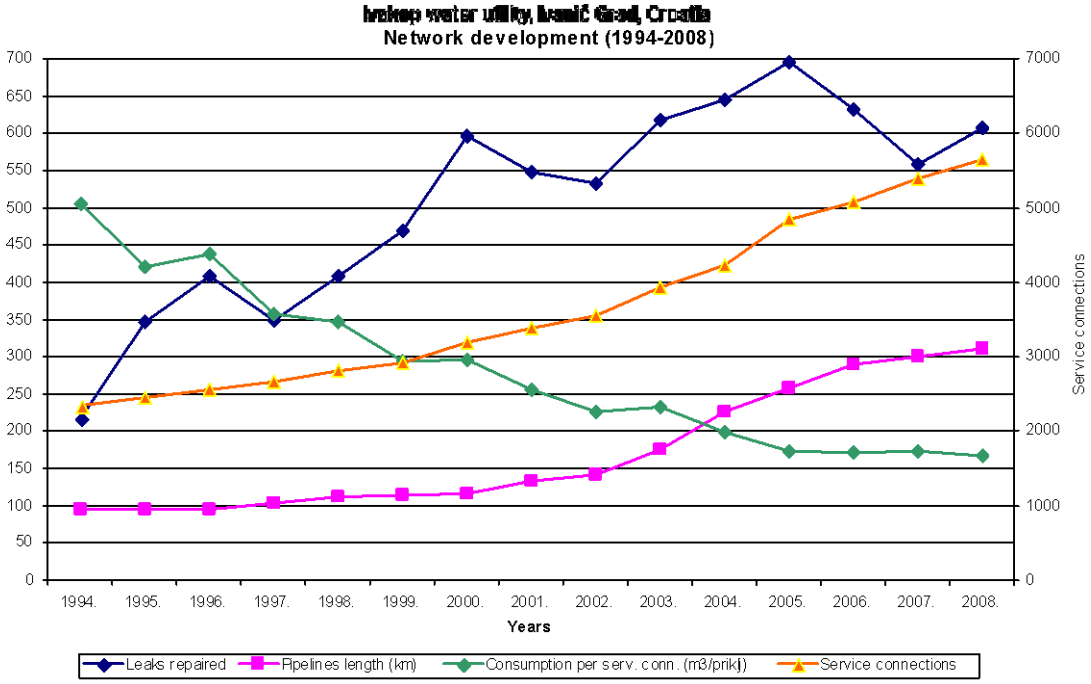

Figure 10 Ivakop water distribution system development

Conclusion

It is evident that IWA WLTF approach 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 achieve great results. Most important is willingness to change things and wisdom to use the right knowledge. For 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.

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