

**Are we going to win the war against NRW?**

***Cambodia Case Study and Lessons learned***

Michel Vermersch, Ek Sonn Chan, Patrick Vaughan

michel.vermersch@free.fr

eksonnchan@hotmail.com

***Water utilities struggle to reduce water loss with more or less success despite the development of many new tools and techniques. The authors present a very significant case study from Phnom Penh Water Supply Authority (PPWSA) and show how lessons learned could generate some overall solutions at the international level.***

This paper was partly published by Water 21 in August 2012.

The authors hereby confirm that they are entitled to grant this permission for copies to be made available free of charge for reading and/or downloading from the LEAKSSuite website.

## **Are we going to win the war against NRW?**

### ***Cambodia Case Study and Lessons learned***

Michel Vermersch, Ek Sonn Chan, Patrick Vaughan

***Water utilities struggle to reduce water loss with more or less success despite the development of many new tools and techniques. The authors present a very significant case study from Phnom Penh Water Supply Authority (PPWSA) and show how lessons learned could generate some overall solutions at the international level.***

#### About the authors:

EK SONN CHAN was the General Manager of PPWSA, the Phnom Penh Water Supply Authority since 1992 . He is presently the Under Secretary of State of the Cambodian Ministry of Industry, Mines and Energy. In 2004, PPWSA received the Asian Development Bank Water Prize in recognition for its efforts in dramatically overhauling and extending the Cambodian capital city's water supply system and, in 2010, Ek Sonn Chan received the prestigious SIWI (Stockholm International Water Institute) award.

Michel VERMERSCH is an active member of the IWA Water Loss Specialist Group and led the Apparent Losses Initiative from 2009 to 2010.

Patrick VAUGHAN is the international operations director of Safege, a leading firm of consulting engineers in the field of water and the environment; he has a worldwide experience and has been assisting the Phnom Penh Water Authority over the last 2 decades.

In December 2006, the World Bank estimated that average water losses worldwide were around 35% of the total water produced. What is the situation today? Is the global non-revenue water (NRW) ratio lower or higher? Is the international community winning or losing the fight against NRW?

There is no doubt that the situation is improving in many places in the world and that the number of water supply utilities forming part of the small club of the most highly efficient utilities, with less than 10% losses, is increasing every year. However, at the same time, water utilities with more than 50% NRW are not exceptional. Some utilities may temporarily manage to reduce their losses within the framework of a dedicated action plan, but their results are often not sustained. Accordingly, although we may accept that there is a global tendency towards higher network efficiencies, it is clear that the improvement is very slow and significant results will not be achieved before many years.

Why does such a situation persist, despite our increasing knowledge of the main components of NRW and of the solutions available for improvement? And how will it be possible to boost water loss reduction efforts and successes worldwide?

## Concepts, Techniques and Tools

To reduce their losses, utilities generally use the many strategies and techniques that have been developed and promoted over the last 15 years.

The basic steps for achieving a low level of NRW are:

- A reliable water audit, based on the establishment of a water balance to quantify losses and to prioritise activities for reducing them (Alegre, 2006).
- An appropriate action planning model to control for NRW (Rizzo, 2007).

As far as *real (physical) losses* are concerned, numerous contributions have increased our theoretical knowledge. The use of the ILI (Infrastructure Leakage Index) performance indicator enables a more realistic approach on real losses. The main techniques used to reduce the real losses are: district metered areas (or DMA) operation; active leak detection; and pressure management; together with optimised asset management programmes. New tools have been developed over the last decade and performances have been improved year by year : leak detection based on leak noise, on gas (hydrogen, helium), on thermal or infra-red photography; leak noise correlators; leak localising equipment; and mobile or permanent correlating noise loggers. These are frequently linked to IT systems: GIS (Geographical Information System), SCADA (Supervisory Control and data Acquisition System) and internet tools.

The techniques used to reduce *apparent (commercial) losses* include: efficient customer management; customer meter maintenance and replacement and the introduction of measures to fight unauthorized consumption. New techniques and equipment have also been developed to address the apparent losses: improved accuracy of water meters; automatic meter reading; and ever-better performing software to manage meters, customers and water consumption altogether.

However, these techniques and tools can produce good results only when they are used within the framework of an effective and efficient action planning process - based on a holistic approach combining the various tools and techniques. New concepts introduced in the "*Dynamics of Water Loss*" (Carteado, 2008) enable the utilities to avoid some of the usual sources of failure such as the misuse of the *coefficient of return of anomalies* and the *migratory nature of the losses* (Carteado, 2007).

Finally, an action plan cannot be considered as successful if the results achieved are not sustainable. Therefore, it is necessary to take steps to improve utility management, communication and capacity building, and to make all levels of staff aware of the new techniques and procedures for implementing the action plan. In other words, it is necessary to implement a "*Change Management*" programme (Vermersch, Rizzo, 2008).

## Lessons Learned from Cambodia

Most of these techniques have been used in Cambodia, where the Phnom Penh Water Supply Authority (PPWSA) has contributed in developing a number of them. PPWSA operates the water distribution system in a city of 1.4 million inhabitants. Under the leadership of its General Manager Ek Sonn Chan, the Authority has succeeded in reducing its water losses, over an 18-year period from 72% in 1993 to 5.9 % in 2012. This has been achieved by a combination of real and apparent loss reduction processes. Over the same period, the customer database has increased from 26 900 service connections to 200 000 and the water distribution network has grown from 288 km to 2 000 km. The water service coverage has gone up from 20% to 90% and the revenue collection ratio is now more than 99%. Furthermore, PPWSA has succeeded in ensuring the sustainability of these results.

PPWSA started from a very poor situation in the early nineties. The transformation stage was based on two main concepts: (i) restructuring the management; and (ii) changing corporate and consumers' culture.

The actual implementation of the concepts involved the following activities:

- Extension of the water coverage and improving customer services.
- NRW reduction.
- Training of human resources.
- On-the-job training.

PPWSA had to regain customer trust. This was achieved via:

- Public consultation and public information campaigns.
- Giving specific information to customers.
- Water quality control and water metering control.
- Staff and public involvement in NRW reduction.
- Providing water for the poor under acceptable and realistic conditions through subsidies, improved tariffs and easier payment procedures.

Innovative techniques were used in terms of water and energy savings:

- Implementation of SCADA and large DMA for both leak detection and pressure management.
- Variable speed drivers to control pumps and optimize energy consumption.
- Flexibility and innovation throughout all stages of project design and implementation.

In order to achieve such a high level of success, support from the Government was necessary. This involved two main elements:

- Accepting not to interfere in the operation and management of PPWSA.
- Accepting the tariff set by the utility and its "Water For All" policy.

Support from international financing agencies was also essential at every stage of the programmes. However, neither the Government nor Donors' assistance would have been so effective if PWSSA had not proved its strong commitment through its culture for driving through changes, spirit of ownership, leadership through example, hard work, responsiveness and self-motivation.

Last but not least, *the continuity in an efficient management and in coaching* was a determining factor for success.

### **Contribution to Global Solutions: Regulatory Background and Transformational Leadership.**

In many developed or developing countries very low levels of efficiency are accepted as unavoidable by both public and private water utilities. Why should we accept such a poor level of performance in the water industry when we would not accept it in any other industry? The authors believe that the root problem is a lack of awareness of the importance of the subject and a lack of available information to decision and policy makers. The PPWSA success story would be easier to duplicate if a similar context could be created in other utilities in need for reform.

In the Phnom Penh case one of the main reasons for success was the long tenure of efficient managers with a clear vision, who were able to deal with the institutional context. Obviously, it is not possible to recommend managers' longevity as a standard rule, and, unfortunately, there is a high manager turnover in many utilities and countries. But the authors believe that it would be possible to create an *international institutional and regulatory framework* which could reinforce the continuity and sustainability of the actions, even in unfavourable contexts.

IWA has taken the lead in this regard and proposes the establishment of an "*International Water Loss Protocol to galvanise into action and investment by Governments and the water authorities*" (Waldron, 2010) and the *transformational leadership* of IWA members to support the overall action plan (Daigger, Water 21, December 2011).

Creating a more motivating institutional framework would imply the participation and active involvement of many stakeholders, including, for example : a real commitment from the financing agencies, which could effectively impose specific conditions for loans and grants; clearer and more tightly-imposed regulation by national regulatory bodies; specific standards established by the international and national standards organizations; and a higher level of consciousness of the implications of water losses on the part of policy makers, government ministries, municipalities and regulatory authorities.

The implementation of IWA action planning to achieve global stakeholders' awareness has a long way to go and the current implementation needs to be continued and strengthened.

Based on these principles, the authors propose some specific recommendations

- i. Creating a genuine international benchmark system

The objective would be to develop an observatory, by completing the existing national or corporate databases and making them consistent.

- ii. Creating an NRW certification

The objective would be to develop a sort of multi-level NRW certification for water utilities similar to the ISO quality certification for services (ISO 9000 and ISO 12000/14000).

- iii. Improving management performance in reducing water losses through coaching via a whole-utility approach

Many institutional arrangements have been developed in the past to assist under-performing utilities: technical assistance, twinning agreements, water operation partnerships (WOP) and various kinds of contracts promoting transfer of knowledge. The results are contrasted.

Experience and PPWSA show that coaching in the context of a whole-utility approach may be the best way to assist utilities' management in an effective way (Kovac, Charalambous, 2012). Coaching - implemented by *certified specialists* - would reduce the knowledge gap between those who know and those who need help. Coaching can greatly help in activating the change process.

### **Concluding Remark**

There is a tremendous gap today between our increasing knowledge on water losses - and the ever-more performing devices available to control them - and the actual level of losses worldwide.

NRW is not only an engineering matter; although innovative tools are now available to water professionals to address the challenges they face, solving the water problems of tomorrow cannot be done by water professionals alone. Fully committed managers and stakeholder involvement are required for winning the war against water losses.

Charismatic leaders are able to deal with all challenges and to involve stakeholders, but the long-term solution includes facilitating the task of any water utility manager by creating a favourable institutional environment and involving the stakeholders – in particular the policy makers. IWA is exploring this avenue. The authors hope that their contribution will help.

---

### **Some References**

Carteado, F. and Vermersch, M. (2008) Dynamics of Water Losses, IWA Cape Town 2009

Ek Sonn Chan (2007), PPWSA - The Renaissance

Kovac J. and Charalambous B. (2012) Achieving water loss management through coaching a whole-utility approach, Water 21 April 2012

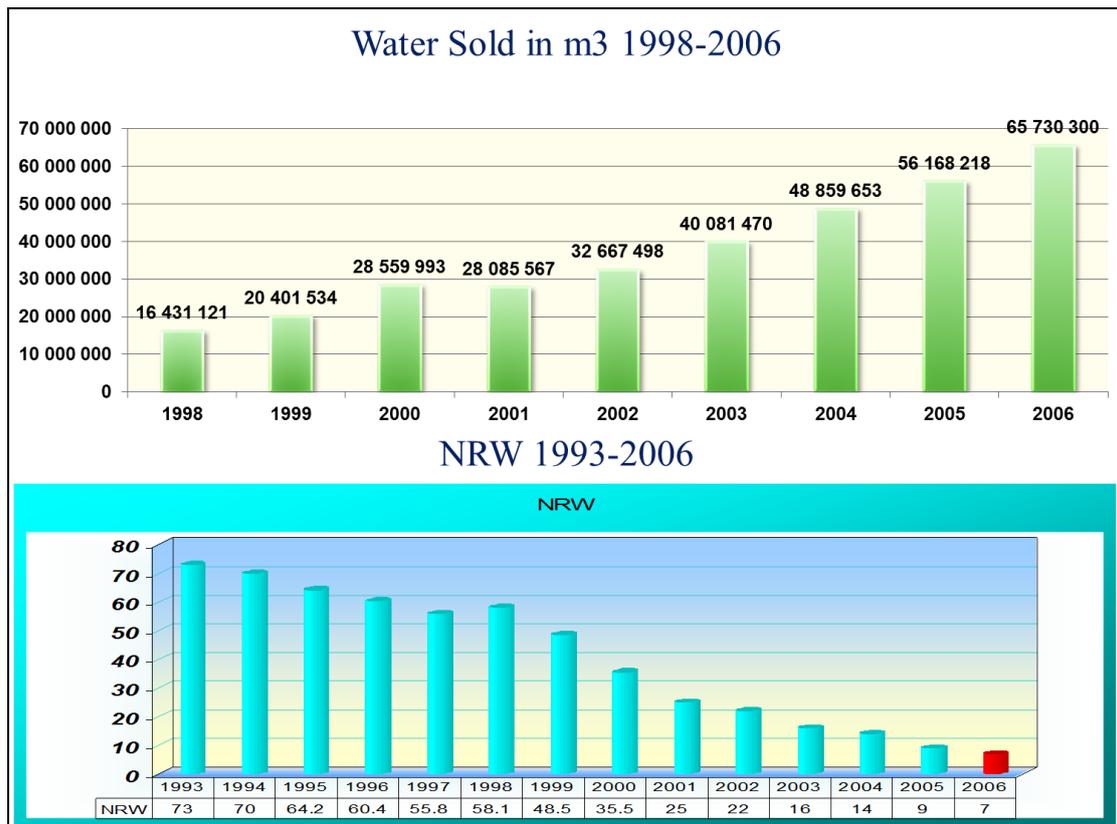
Long Naro and Vaughan P. (2012) Successfully Meeting Rapid Water Demand Growth in Phnom Penh: a Fastrack and Sustainable Solution (Sixth World Water Forum, Marseille, 2012)

Rizzo, A. and Vermersch, M. (2007) An Action Planning Model to Control For Non-Revenue Water, Water 21 April 2008

Vermersch, M. and Rizzo, A. (2008) Change Management as an Indispensable Component when Planning for NRW Control. IWA Cape Town 2009.

Waldron, Tim (2010), The Path Forward (IWA Water Loss, Sao Paulo, July 2010)

**Some pictures :**



Phnom Penh Water Supply: a continuous expansion and NRW reduction process since 1992

**Institutional reform**

**Turnaround The Process**

- Restructuring
  - Streamlined job responsibility
  - Reshuffling management based on quality
- Changing of culture
  - Management model
  - Incentive & penalty
- Team work
  - Common goals
  - Friendly environment, Participation
- Educating, Motivating & Disciplining.

Phnom Penh Water Supply: Bases for the Change Management



Water Festival in Phnom Penh