

Progress on Implementing the IWA approach in Italy: Case Studies, Dissemination and training activities of the Italian Water Loss User Group and Links with European Funded Projects

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Abstract

The paper describes the application of the IWA WLTF Approach in Italy with particular reference to implementation of IWA Water Balance and Performance Indicators to case studies, training courses for Water Utilities staff and National User Group activities. The IWA WLTF Approach is currently being implemented in Italy and the results of the application to case studies will be presented in the full paper.

Fondazione AMGA (a member-supported, non-profit organization that sponsors research to enable water utilities, public health agencies, and other professionals to provide safe and affordable drinking water to consumers) and FEDERUTILITY (Federutility is the organization gathering 400 water and gas utilities in Italy supplying water to roughly 36 million people in Italy) wish to promote the application of international best-practices and measurements in water loss management among its members and more generally to help improve the management of water losses in the Italian water Industry.

To achieve this goal Fondazione AMGA, together with Federutility has created a Water Losses User Group. The activity of the Group, gathering more than 60 members from Italian Utilities, Universities and Water Institutions, began officially on 25 October 2004 in Genova (Italy) on occasion of the Federutility Workshop "Towards More Effective Management of Water Losses in Distribution Systems".

The Water Losses Users' Group is a vehicle for:

- increasing water utility awareness of the importance and economic benefits of improved management of pressure-dependent leakage;
- acting as a National Centre for promoting International Water Association (IWA) specialist information to the Italian Water Industry;
- disseminating the practical approach developed by IWA Water Loss Task Force to a wide number of potential end-users and obtain their feedback;
- communicating available methodologies and innovative techniques for efficient water loss management, allowing end users to make contact with each other and exchange ideas and experiences.

To achieve this goal the User Group will take into account Italian and international case studies, international standards and manuals, the latest IWA Water Losses Task

Force 'Best Practice' methodologies and first hand field knowledge of both practitioners and utility members.

To enhance chances of successful application of the IWA approach, the Italian Water Losses User Group also qualified as Official Observer in the TILDE (Tool for Integrated Leakage Detection) project that endorses and promotes the IWA approach. More information about the User Group are available at the website: www.waterportal.com The Tilde Project, that is developed under the sponsorship of the Innovation and SME Programme of the European Commission, is aimed at optimizing the performance of public water supply networks by controlling water losses. TILDE has been officially presented at the 2004 IWA World Congress in Marrakech and a link between the IWA WLTF and the Tilde Project has been established.

The Italian User Group, in conjunction with other Italian and European Institutions, is also promoting joint meetings in Italy between the IWA Water Loss Task Force, Italian User Group and TILDE members to be held in May 2006. The work program will also involve a number of briefings with political decision makers to help IWA to continue to build momentum for water loss issues in Italy and in Europe as well.

Status of the Water Services and Leakage in Italy

Traditionally, the Italian water sector has been always linked to the public sector and water has always been considered as a social wealth. Still nowadays most of Italian water companies are publicly owned, the total number of bodies active in the water sector is estimated to be about 8,000 and less than 5% is constituted by private operators.

This is the result of a water "social" policy, with tariffs that are not linked to the effective exercise costs, investments financed by public funds, low service levels, strong horizontal fragmentation (territorial, because linked to all municipalities) and vertical (for the service: supply, sewerage, sanitation, in many cases operated by different companies/bodies even in the same town).

The management is not equally distributed (in size and level of services). Concentrated mostly in the major town of the North and Centre of Italy there are well organised companies: the "Municipality owned companies – MoC" (including Special Companies and public Joint Stock Companies).

Regulatory Framework: Galli law

A number of almost 8.000 operators for over 57 million inhabitants in 8.000 Municipalities, together with a very heterogeneous level of services provided to the customers made necessary the definition of a framework law for the reorganisation of the Italian water industry: the "Galli Law" issued on 6th January 1994.

The general objectives of the law are:

- improve the water service offered to customers
- attain a greater economic efficiency at all levels (from structural design to asset management)
- protect the environment

The Galli law leaves to the central administration the major planning issues relative to the basins, the adduction for transfers of water between regions, of the priority's definition of multiutilities. The Galli law aims to surmount the existing fragmentation, relating to the service' scattering between several operators, (most of them small or very small) on the

territory and to reorganise the cycle of the service by unifying operators of water distribution with those of sewerage and the ones of waste water treatment plants.

The definition of territorial areas (in extension and in configuration) aims to protect natural water resources used and generally to optimise interaction between water and territory. The overall dimension of the integrated water service (in terms of served users, natural water resources used and interested surface) must be such as to reach compatible dimensions with an evolved management in order to join an acceptable level of “economy of scale”. The reform started with the Galli law proposes in perspective the following:

- To rationally cover full costs (operation, maintenance and replacement) with tariffs
- To homogenise tariff systems within the territorial areas
- To defend essential household consumptions and to penalise the excessive ones

The Galli law proposes to achieve managements characterised by efficiency, efficacy and effectiveness, even by the progressive involvement of private operators.

Leakage in Italy and Decreto 99/97

In Italy, non revenue water levels range from 15-60% of total system input volumes, the average being 42% (ISTAT 2003). Some European countries – notably the United Kingdom and Malta – have fully sectorised distribution networks, with continuous night flow measurements, and frequent interventions to locate unreported leaks. In Italy however, the majority of Water Utilities only repair ‘reported’ leaks, and do not practice any regular form of active leakage control, except perhaps as an emergency action response during droughts, and of pressure management.

In an effort to stem these losses, regulators are looking at legislative measures to require water businesses to report on and better manage water loss from their systems. Therefore, following the Galli Law, the Decree n° 99/97 (DISPOSIZIONI IN MATERIA DI RISORSE IDRICHE: Decreto Ministero Lavori Pubblici n°99 del 8.1.1997) regarding water balance calculations was issued on January 8, 1997. According to the Decree, Italian Utilities are required to calculate the water balance for each of their water systems. The main characteristics of the Italian Decree 99/97 are:

- Definition of a standard water balance method and terminology for use in Italy
- Separate calculations for ‘raw water’ and ‘treated water’
- Recommends customer metering as close as possible to the public mains, at the limit of private property
- Recommends district metering, reduction of excess pressures
- Recommends permanent installations for measuring pressure
- Defines some performance indicators for real losses, including
 - ‘Indice lineare delle perdite totali’ in m³/km mains/year
 - % of System Input

Italian Decree 99/97 introduced some important recommendations regarding pressure and flow measurement, but also has lost the opportunity to give the Italian Utilities a practical tool to developing a strategy for management of non revenue water (NRW) based on a better understanding of the reasons for NRW and the factors which influence its components. In Italian Decree 99/97 water losses, as well as Non-Revenue Water

(NRW) and leakage, are still quoted as % of System Input (or water production), although % water losses are a very misleading indicator. Also, since the publication of the IWA 'Best Practice' Performance Indicators (Alegre et al, 2000), it is recognised that m³/km of mains/day is unsuitable for the large range of connection densities (per km of mains) experienced in Italy – litres per service connection per day, or Infrastructure Leakage Index (ILI) are more meaningful for comparisons.

We know that, as early as 1980 the UK National Water Council had started to warn that the use of percentages is wrong and misleading (Report 26). The German DVGW followed in 1986 (Liemberger, 2002). Meanwhile, since 2000, the IWA, the American Water Works Association as well as national organisations in a number of countries are also discouraging the use of Percentages.

In recent years there is an effort of a detailed and systematic evaluation of the state of water supply systems in terms of water losses. Percentages of non-revenue water or percentages of water losses in the network per total input volume are stated as basic standard indicators in this area on the national level.

However, these criteria are not suitable for evaluating and comparing the technical level of particular operators and water supply systems. So, how can Italy benefit from International advances in leakage management over the last 10 years

The Ferrara 2004 Workshop

The first impact, on the Italian Water Industry, of the IWA Water Losses Task Force and the methods it promotes, occurred in May 2004 when Task Force members Ken Brothers, Malcolm Farley, John Morrison and Marco Fantozzi ran a ½ day Seminar at the Ferrara H₂O Conference entitled 'Water Loss Control: How Italian Waterworks can benefit from IWA Approach'. This attracted an attendance of around 100, who were impressed not only by the technical quality and logic of the methodologies, but also by the very strong commitment of the Water Loss Task Force members to their subject, and the reported successes in applying the methods in diverse international situations.

The Italian Water Losses User Group

Fondazione AMGA is a member-supported, non-profit organization that sponsors research to enable water utilities, public health agencies, and other professionals to provide safe and affordable drinking water to consumers. Federutility, the organization representing water and gas utilities in Italy; has more than 400 members supplying water to some 36 million people in Italy. In their efforts to promote the application of international best-practices and measurements in water loss management among their members, and more generally to help improve the management of water losses in the Italian water Industry, jointly created the Water Losses User Group (GOA Gruppo Ottimizzazione Acquedotti) in 2004.

In particular, Fondazione AMGA was established in 2003, as a non-profit organization, to initiate, promote and further cultural and scientific initiatives in the water sector. Foundation activities include promotion and carrying out of research, training and dissemination projects, as well as support of activities undertaken by other entities for management and safeguard of water resources.

The aim of the Italian Water Losses User Group is to collate, develop, document, publish and disseminate knowledge through Utilities in Italy on Water Losses, Water

Losses Quantification and Control. The knowledge and understanding that will be developed shall be compiled and made available for the benefit of both team members and the Federutility members in general.

The Italian Water Losses User Group (GOA Gruppo Ottimizzazione Acquedotti) is structured as six investigative teams (in a similar way to IWA Water Loss Task Force) for focused activity in:

- Active leak control
- Pressure management and control
- Water Balance, Performance indicators and Economic Level of Leakage
- Real water loss
- Apparent water loss
- Rehabilitation

In Fig. 1 you can see the structure of the Italian Water Losses User Group.

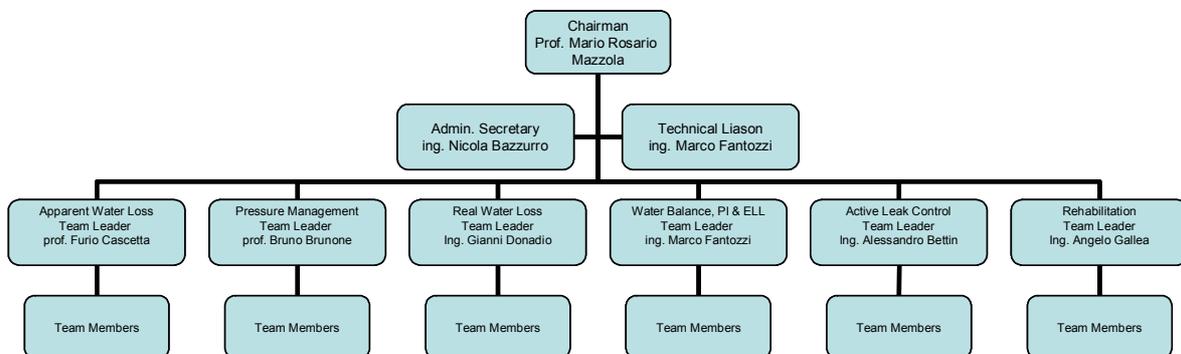


Figure 1: The Italian Water Losses User Group

Each Team on the User Group will study its specific activity and will report about Italian case studies applying best water loss practice management and performance measurement using the IWA international approach

The activity of the Group officially began on 25 October 2004 in Genoa (Italy) on the occasion of the Federutility Workshop “Towards a more effective management of water losses in distribution systems”, which included Sessions on the IWA Water Balance and Performance Indicators, and Pressure Management. This was followed by a second Workshop in April 2005, in which principles of Economic Intervention, and night flow analysis were discussed, together with experiences of managing pressure to reduce new burst frequency . The Group already comprises more than 60 members from Utilities and practitioners from the whole of Italy, and is now a working vehicle for:

- increasing water utility awareness of the importance and economic benefits of improved management of pressure-dependent leakage
- acting as a National Centre for promoting and disseminating International Water Association (IWA) specialist information to the Italian Water Industry.
- communicating available methodologies and innovative techniques for efficient water loss management, allowing end users to make contact with each other and exchange ideas and experiences.

- establish an official liaison between Regulators and Utilities on targets and level of services related to efficient water loss management and on the relationship between water tariffs and network efficiency.

To achieve this goal the User Group takes into account Italian and international case studies, international standards and manuals, the latest IWA Water Losses Task Force 'Best Practice' methodologies and first hand field knowledge of both practitioners and utility members. The User Group wishes to play a major role in facilitating new ideas, development of the technology and increasing water utility awareness of new methodologies and techniques available. The User Group also wishes to compare the performance of Italian Utilities with that of other countries, using IWA International 'best practice and performance indicators, and will promote publication of such data by Utilities on a voluntary basis.

Quite a considerable effort was spent since 2004 in dissemination activities. The WLTF Articles published on Water21, translated in Italian are progressively posted on the water portal www.acqualab.it and IWA Approach to water loss management has been presented at the following workshops and conferences that have seen the participation of more than 80 water professionals from Italian Utilities:

- Federutility Workshop "Towards a more effective management of water losses in distribution systems" Amga Conference Centre in Genova (Italy) October, 25 - 26 2004
- Federgasacqua Workshop "Effective management of small distribution systems" Amga Conference Centre in Genova (Italy) April, 11-12 2005.
Future activities include:
- Federgasacqua Workshop "Water Losses management" University of Perugia Conference Centre in Perugia (Italy) September, 22 2005.
- International Water Loss Conference at H2O Conference in Ferrara (Italy) in May 2006

The User Group is aware that legislative measures, requiring water businesses to report on and to better manage water loss from their systems, are a key requirement to improve quality of service and reduce tariffs. Therefore the final goal of the User Group is to influence political decision-making related to water management. Given that water leakage reduction is a key requirement to improve water systems management, an amendment to the current Water Act could be proposed in order to require water suppliers to develop water loss management plans. To achieve this goal the User Group will organise, along with conferences, a number of briefings with senior politicians and political decision makers in order to continue building momentum for water loss issues in Italy and in Europe as well.

The User Group also involves representatives of the main Italian technical and economic Journals (e.g. Il Sole 24 Ore, Acqua e Aria etc.). The results of the Tilde Project and of Italian real case studies applying IWA practical approach will be published by the above-noted Journals, thus effectively facilitating the dissemination process to a wide audience. More information about the User Group are available at the website: www.gestioneperdite.it actually available at www.studiomarcofantozzi.it/Grperdite.htm

Interaction with the IWA Water Loss Task Force and European Commission funded projects (Tilde Project)

The Italian User Group maintains a close relationship with the Water Loss Task Force of the International Water Association (the world's pre-eminent group on managing water loss) and the most relevant European funded projects on water loss management and leak detection (Tilde project).

The Group also recognizes that the participation of their representatives at international activities and as Observers in main European Projects, can enhance the chances of successful innovation by promoting the exchange process between innovators and users. The benefits include the dissemination of the new approaches and receiving feedback from a wide number of potential end-users. The idea is to create:

- a common place to integrate knowledge needs and points of view of practitioners and researchers;
- a meeting point on a world scale for professionals who are involved in managing and researching in water losses.

Within this framework, members of the Water Loss Task Force will visit Italy in May 2006, to hold a limited number of workshops in Genova and at 'H2O' International Fair in Ferrara for the country's water business leaders. The work program will also involve joint meetings in Italy with TILDE project members, EC Officers and a number of briefings with senior politicians and political decision makers to continue to build momentum for water loss issues in Italy and in Europe as well.

Application in Italy of the IWA Water Balance

The activity of the Group, already gathering more than 60 members from Italian Utilities, Universities and Water Institutions, has been initially focused on the application in Italy of IWA WLTF Practical Approach and specifically on IWA Water Balance calculation in Italian case studies.

Italian spreadsheets already exist for Decreto 8 gennaio 1997, n.99 calculations. Therefore the components needed to be reassembled in the IWA International Water Balance, 95% confidence limits needed to be added to the calculations and IWA 'best practice' performance indicators needed to be calculated and compared with international data sets. As water systems can consist of up to 3 systems: Primary transmission system (to treatment works output), Secondary transmission (to distribution system) and Distribution system (to customer meters), it is good practice to do a separate water balance for each system. In smaller systems, Utilities can consider the secondary transmission and distribution systems as one system.

Most of the information that is needed for the IWA best practice international water balance is already in the Italian Decree 99/97 water balance. The two water balances use mostly the same input data, except 'Volume perso in disservizi' (a black hole!) that is not shown separately in IWA, and so is included in 'Real Losses', but the IWA grouped calculated outputs are not exactly the same as those in the Italian Decree. Both balances use the terms 'authorised' and 'unauthorised', but the IWA balance is used for operational and financial calculations, so each component must be shown as 'Revenue' or 'Non-Revenue', while the Italian Decree 99/97 is used for operational calculations only.

'Fastcalc' software, already developed for use in several countries (USA, Canada, UK, Australia, Brazil) for rapid calculations and easy customising (including to languages other than English), has been completely customised and translated into Italian, to calculate the IWA water balance from existing Italian water balance spreadsheets, and has been applied to Italian case studies. The philosophy of the software is to encourage rapid calculation of the IWA Water Balance and PIs (with confidence limits), so that Utilities with sub-standard performance can quickly identify their technical performance, and initiate appropriate further action. This approach has already been successful in stimulating a number of Utilities in Brazil, North America, Australia and New Zealand to take a more pro-active approach to pressure management and leakage management.

A shortened Italian language version of Fastcalc (Mini-Fastcalc) has been developed to take into account the requirements of the Italian Decree n° 99/97, allowing export of data from the Italian Water Balance to build the IWA Water Balance. This Software has been made available through the Italian Water Loss User Group. It gives a quick approximate estimate of % Non Revenue Water and the Infrastructure Leakage Index (ILI) without 95% confidence limits. There are currently more than 20 customised copies of 'Mini-Fastcalc' software in use in Italy (in Italian) allowing users also to fulfil Italian requirements.

ILIs have now been calculated for 14 Italian systems, and typically range from close to 4.0, to 15 or more (Fantozzi and Lambert, 2005), although occasionally figures in excess of 70 (not included in the data set) have been identified. Only 2 Utilities have been identified, to date, as achieving an ILI in the range 4.0 to 5.0, which may represent somewhere close to the best currently achieved technical standard of Real Losses management in Italy.

In Fig. 2 you can see the first Infrastructure Leakage Index ILI data set for Italy

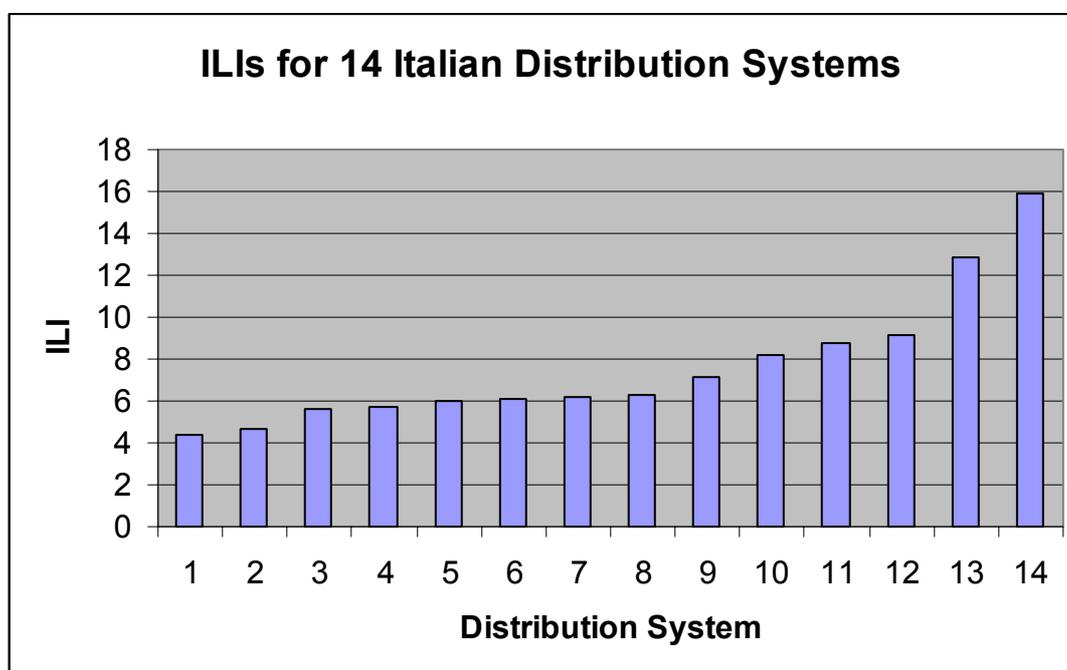


Figure 2: The Infrastructure Leakage Index ILI data set for Italy

Practical Progress to Date

The theme of the 'Water 21' articles is a 'Practical' approach to Water Loss Reduction. The setting up of User Groups, and the promotion of the Task Force concepts - through training, Workshops, Seminars and articles - is of course an essential foundation for disseminating the methods, experiences and case studies.

However, true progress can only be achieved by the commitment and actions of individual members and Utilities in Italy, and it can only be demonstrated when actions result in the outcomes predicted by the new methods, and show actual measurable improvements. Although many successful international case studies can be shown from outside Italy, probably the strongest belief that major improvements are possible will occur when there are successful case studies from within Italy, and other Italian Utilities become enthusiastic to attempt their own initiatives.

In this connection, it is pleasing to specifically mention a most successful pressure management scheme in Torino, reported at the October 2004 Genova Workshop. In this case, the installation of a well-placed booster station resulted in a 10% reduction in night pressures (and average pressures) over a major part of the city, and has resulted in a sustained reduction of around 50% in annual repair costs, as well as a reduction in real losses. Mention of this scheme at the October 2004 Workshop, coupled with explanation the evolving theories of pressure:burst frequency relationships, and international examples of burst reduction by pressure management, stimulated three other Utilities to successfully attempt pressure management schemes, which were reported at the April 2005 Genova Workshop.

It is hoped that through such Italian success stories, supported by the expertise and commitment of the Water Losses Task Force, and the efforts of the Italian User Group, it will be possible to achieve real progress in reducing water losses in Italy, which are clearly far too high at present.

Conclusions

In Italy, non revenue water levels range from 15-60% of total system input volumes, and an initial sample of 14 ILI values is in the range 4 to 13. The Italian Government is proposing to amend the Water Act to require urban water suppliers to develop water loss management plans, while system loss minimisation is a key requirement of the Italian Decree. With these moves underway, there is an urgent need for water managers to gather information and tools for implementing such requirements.

The activity of the Italian Water Losses User Group, already gathering more than 60 members from Italian Utilities, Universities and Water Institutions, has been focused on the application in Italy of IWA WLTF Practical Approach and specifically on IWA Water Balance calculation in Italian case studies, as described in this paper.

The Italian Water Losses User Group intends to reinforce the message and in conjunction with Fondazione AMGA and key industry organisations such as Federutility and Ferrara H2O Fair has started a number of initiatives, workshops and meetings in order to increasing industry awareness, understanding and implementation of water loss strategies. The principal of these initiatives will be the Visit of the Water Loss Task Force

to Italy in May 2006, including a series of meetings and workshops to be held in Genova and Ferrara (Italy).

Acknowledgements

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References

- Fastalc (2005) Software for calculating IWA Water Balance and Performance Indicators. Contact Marco Fantozzi or ILMSS Ltd for further information
Marco Fantozzi Website: www.studiomarcofantozzi.it
Italian Water Losses User Group Website: www.gestioneperdite.it
Acqualab water portal: www.acqualab.it
TILDE (Tool for Integrated Leakage Detection) project Website: www.waterportal.com
Lambert A and Fantozzi M. (2004) Applying the IWA 'Best Practice' Standard Water Balance and Performance Indicators", Federgasacqua. ACCADUEO Conference "Water Loss Control: How Italian waterworks can benefit from IWA approach", Ferrara, Italy, May 2004.
Decree n° 99/97 (DISPOSIZIONI IN MATERIA DI RISORSE IDRICHE: Decreto Ministero Lavori Pubblici n°99 del 8.1.1997)
Liemberger R (2002) Do You Know How Misleading the Use of Wrong Performance Indicators can be?, Paper presented at the IWA Managing Leakage Conference, Cyprus, November 2002