

# Management Optimisation of Water Distribution Systems. The TILDE Project (Tool for Integrated Leakage DEtection)

M. Fantozzi

*Studio Fantozzi, Gussago (BS), Italy; e-mail: marco.fantozzi@email.it*

A. Pretner

*SGI, Sarreola di Rubano (PD), Italy; e-mail: augusto.pretner@sgi-spa.it*

D. Marshallsay

*WRc plc, Swindon Wiltshire, UK; e-mail: Marshallsay\_D@wrcplc.co.uk*

**Keywords:** Integrated Leakage Management , Water Supply, Decision Support System

**ABSTRACT:** The TILDE (Tool for Integrated Leakage Detection) project, developed under the sponsorship of the Innovation and SME Programme of the European Commission, is aimed at optimising the performance of public water supply networks by controlling water losses. TILDE focuses on developing tools that will advance the state of the art in leakage management. Leakage is a major problem in many cities around the world, with many distribution networks losing over 50% of the water put into supply.

The TILDE project is carried out by a Consortium of European partners (Italian Ministry of Environment and Territory (Italy), Acquedotto Pugliese (Italy), Servizio Idrico Integrato Sassarese (Italy), Water Council of Nicosia (Cyprus), Bergen Kommune (Norway), SGI (Italy), Z&A Associates (Greece), WRc (UK), Sintef (Norway)) endeavoured to consolidate their knowledge and experience in developing a *Decision Support Tool (DST)* and a *Web Portal*.

The overall value of the project is Euro 1,871,267, and the EC's contribution is Euro 879,542. The project's commencement date was 1st September 2003 and its duration is 36 months.

The *TILDE DST* will guide water utilities in the process of operating their water networks and programming their investments. The TILDE DST will be developed to provide end-users with solutions tailored to their specific needs whilst ensuring its applicability to other potential users throughout Europe, or even worldwide. The TILDE DST will help to supply customers with a better water service; it will contribute to save water that is currently wasted, and it will optimise the cost benefit ratio of the investments planned.

The *TILDE Web Portal* aims at disseminating Best Practice on water distribution at a European wide scale. The Portal is envisaged as a reference instrument for water operators and professionals where they will be able to find out about innovative methods and technologies in the water sector. TILDE technologies are tested and validated in four European pilot sites: two in Italy, one in Cyprus and one in Norway. Pilot demonstrations focus on endorsing the TILDE system with a European validity and ensuring that end-users' real needs are met. The pilot sites present substantial differences in infrastructure, technological, management and socio-economic terms, thus providing a range of typical situations found across Europe.

## 1 INTRODUCTION

**Water losses** represent a major problem for water undertakings, consumers and the environment. Aged and poorly maintained water assets loose a large quantity of the water through leaks. In addition, not all of the water that is actually consumed is metered and paid for. This situation has negative impacts on the performance of the water service suppliers: on one hand they are spending more in water production and distribution, and on the other, they are not obtaining revenues from

all the water supplied to consumers. Water losses therefore translate into underperformance of the water utility, poor levels of service to clients and unsustainable use of the water resource.

TILDE aims to make a step forward in **leakage control**. It seeks to support water operators in choosing leakage management strategies suitable to their specific needs.

## 2 THE TILDE PROJECT – WHAT IS IT ABOUT?

TILDE is a research and validation project sponsored by the DG INFSO-E6 of the European Commission under the "Innovation and SME Programme".

TILDE stands for “**Tool for Integrated Leakage DEtection**”. The aim of the TILDE project is to advance the state-of-the-art of leakage management in public water distribution networks across Europe. Leakage is a common problem to all water distribution networks. The volume of non-revenue water may reach values higher than 50% of the water put into supply, thus causing a substantial socio-economic and environmental loss.

The TILDE project focuses on supporting water operators in leakage management. In the last couple of decades much progress has been made to deal with water losses. In this framework it is relevant to highlight the role of the International Water Association’s Water Losses Taskforce ([www.iwahq.org.uk](http://www.iwahq.org.uk)); established in 1996 and including specialists from all over the world, endeavoured in developing and standardising best practice for controlling leakage.

The Task Force has advocated four leakage management activities. These initiatives include pressure management, active leak control, speed and quality of repairs, and pipeline asset management, maintenance, and renewal.

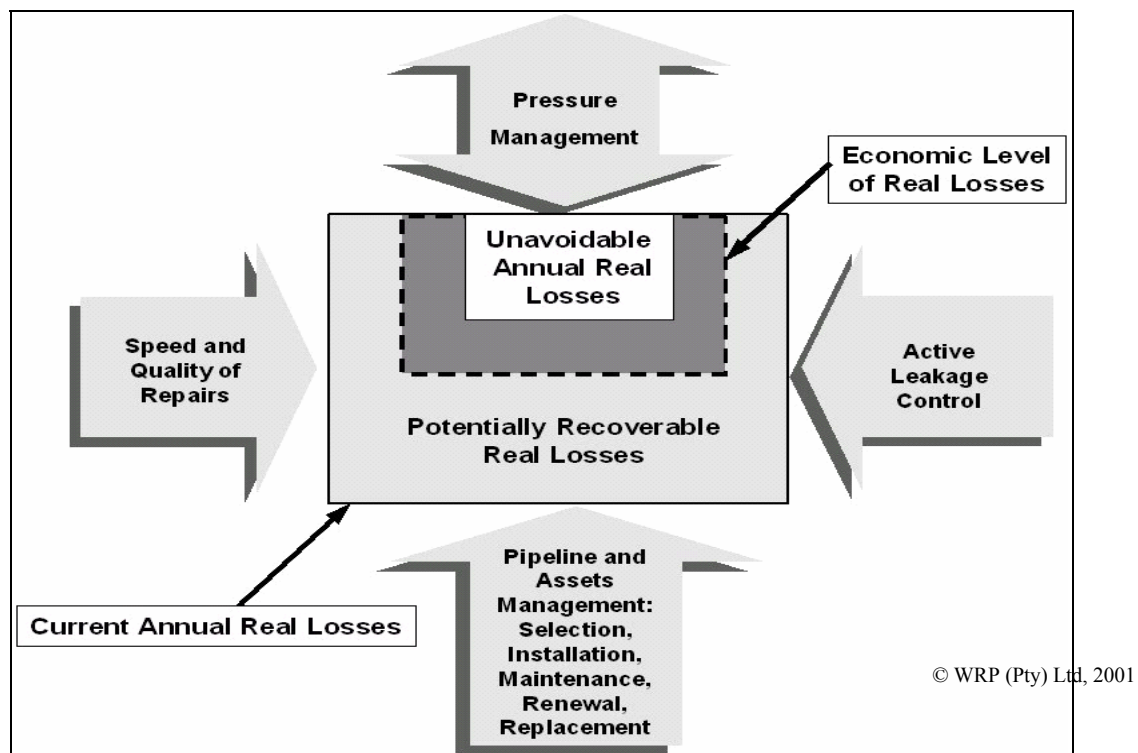


Figure 1. The four Leakage Activities (IWA Water Loss Task Force)

The extent of a utilities investment in each of these activities must be considered in an overall economic analysis to optimize monetary investment in resources and activities for non-revenue water loss reduction, as compared to the cost of water saved arising from these programs.

Experience has shown that the technical margin for water loss recovery is very high but, at what cost? Cost is directly affected by the economic-environmental value of the resource and local conditions. Bringing socio-economics into leakage management makes the selection of a strategy a hard task. TILDE provides the tool for such a complex analysis: the **TILDE Decision Support Tool (DST)**. By examining the local context in which the operator works, the TILDE DST guides the user in choosing appropriate methodologies and technologies to bring leakage to sustainable levels.

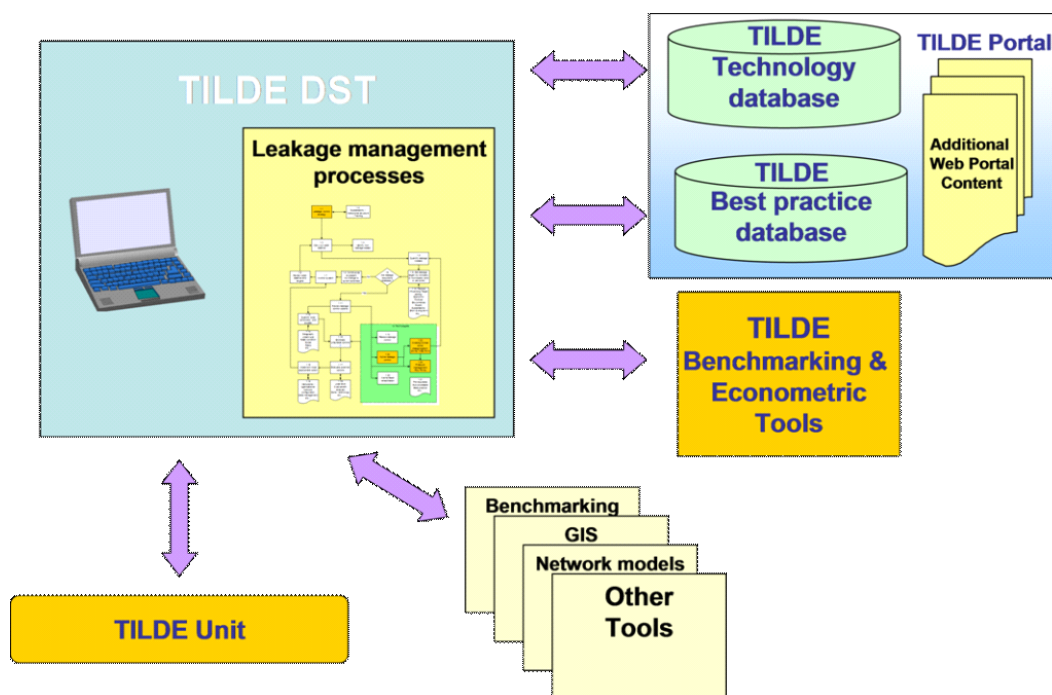


Figure 2. TILDE DST

The TILDE DST will maintain a core application which delivers real decision support but is not burdened by functionality that can be better delivered elsewhere. When carrying out a leakage management programme, the DST will provide guidance on the steps to take, the key data to extract and advice on how to assess a study area. The decision support algorithm will require a relatively small amount of data produced by the modelling exercise and design phase to tailor the leakage control method that will best serve the study area. In addition, the data requested and stored by the DST will be limited to that which is necessary to provide decision support.

The TILDE DST operates in conjunction with other tools developed in the project. These include a **Technologies and Best Practice Database**, published in [www.waterportal.com](http://www.waterportal.com), and specific leakage **benchmarking and econometric tools**. The whole set of TILDE technologies provides the user with an intelligent source of information on leakage management.

In order to make sure that TILDE is applicable to a diversified range of conditions, the tools are tested and validated in 4 pilot areas across Europe: Sassari and Bari in Italy, Nicosia in Cyprus and Bergen in Norway.

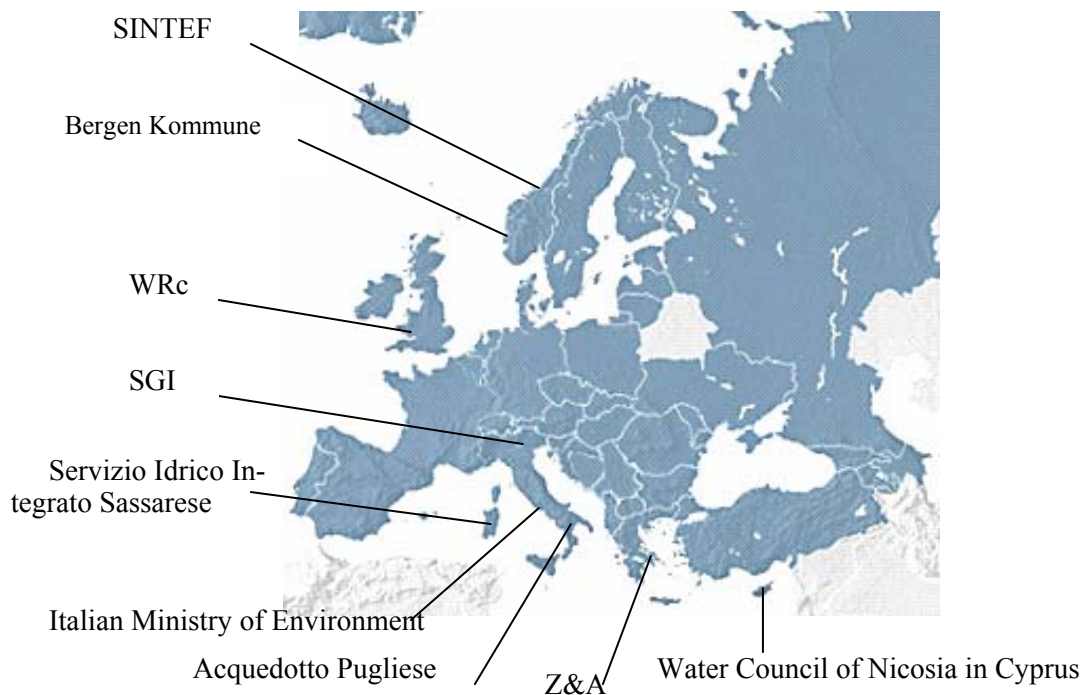


Figure 3. Tilde Partners

### 3 TILDE PROGRAMME

The Project comprises a research component, dealing with the development of TILDE technologies, and a demonstration component, aimed at validating the TILDE tools in four pilot sites. The work programme has been structured in nine “work packages” (WP) contributing to the achievement of the project objectives. Work packages are interrelated, often interacting and exchanging information with each other.

#### 3.1 WP 1 User and system requirements

The start point is to identify and define the short, medium and long term needs of the end users in tackling leakage management. User requirements have been collected through interviews and focus group meetings with the four TILDE end-users and eleven other water utilities across Europe. Users’ requirements have been reviewed and organised into a report which concludes with the features of the TILDE DST.

#### 3.2 WP 2 Analysis of available tools and technologies

This work package provides end users with a complete guide to state-of-the-art technologies, processes, methodologies for reducing leakage in water distribution networks. This guide constitutes the basis of the TILDE Best Practice Database published in the Web Portal [www.waterportal.com](http://www.waterportal.com).

### *3.3 WP3 Development of benchmarking and econometric tools*

The benefits of leakage control can only be achieved if information exists on the volume of water that can be saved and the costs of detection, location and remedial action. In order to facilitate the adoption of best practice, the TILDE DST will be coupled to benchmarking and econometric tools that will allow to measure operational performance as well as define cost-benefit ratios for alternative leakage management schemes.

### *3.4 WP4 Development of the TILDE DST*

The TILDE DST is a software specialised in leakage management, that supplies information on a wide range of topics directly relevant to today's water service provider and allowing the practitioner to make informed decisions by customising the decision support responses to his/her local needs. The TILDE DST is designed to interact with the other project tools (TILDE database, benchmarking and econometric tools, etc.). Furthermore the TILDE DST must be able to interface with the field equipment aimed at detecting and locating leaks.

### *3.5 WP5 TILDE Demonstration*

TILDE technologies will be tested in the 4 pilot cities: Sassari and Bari in Italy, Nicosia in Cyprus and Bergen in Norway. The 4 pilot projects present significant differences in technological, infrastructural, organisational and socio-economic terms, thus providing the TILDE prototype testing with a wide validity.

### *3.6 WP6 TILDE Standardisation*

The TILDE testing process generates a communication flow between end-users and technical partners aimed at making the TILDE tools ready to be commercialised throughout the EU. A user's manual will be developed which will include all relevant technical information relating to the TILDE Tools.

### *3.7 WP7 TILDE Web Portal and Database*

A Water Portal is under construction ([www.waterportal.com](http://www.waterportal.com)) that will offer state-of-the-art information on the best practice and technologies available for leakage control. The Portal's contents include a set of databases where the user will be able to find details about instrumentation, manufacturers, services and methodologies related to leakage and water distribution on the whole. The Portal is to become a knowledge platform where water professionals can advertise their services and products as well as obtain specialist and updated information.

### *3.8 WP8 Dissemination*

Dissemination is fundamental to promote the exploitation of project results. Dissemination will be conducted through the Internet Portal, by producing publicity and information material (project brochures, newsletters) and organising and participating in events such as conferences, seminars, workshops, etc. TILDE is a good opportunity to strengthen links with international water associations like IWA, and promote the set-up of professional networks.

### *3.9 WP9 Management*

Activities contained in this Work Package are meant to ensure a harmonious progress of the project, generating sufficient momentum for the fulfilment of contractual obligations. Amongst others,

activities include communications, reporting, organisation of meetings, definition of strategies for the exploitation of results.

#### 4 PROGRESS TO DATE

The TILDE Project is at one third of its full duration. The first six months work focussed on three main areas, identifying the water operator's needs and requirements for the DST, developing best practice process, and collating state of the art information on tools and technologies. Following the initial six months, the project obtained the GO from the European Commission and work has progressed on further development.

- The final design of the **TILDE DST** has been conducted. The menu and screen displays of the software have been defined, and the conversion of the best practice processes into programming code is under way.
- The TILDE **Water Portal** ([www.waterportal.com](http://www.waterportal.com)) sponsored by the Italian Ministry of Environment and Territory was launched last April 2004. So far it contains information about the TILDE project but it aims to become the source of information on leakage control. It will include databases on leakage related technologies, best practice and suppliers. Anyone interested in broadening their knowledge on the subject and advertising their products and services is called to register within the site.
- The development of **TILDE benchmarking and econometric tools** is currently focused on analysing the state-of-the-art of these tools at international level. Worldwide developments are being scrutinised in order to extract lessons learnt. The benchmarking tools developed by the International Water Association (IWA) and the achievements made by the TILDE Technical Partners will provide a solid basis on which to expand.
- The selection of the **TILDE Units**, i.e. equipment for leakage detection in the pilot sites is under way. End users are being involved to establish their specific requirements whilst technical partners develop the links between the TILDE units and the TILDE DST.

Consultants and end-users are currently working in the preparation of the **pilot projects** to ensure they will be ready for testing the TILDE tools from March 2005.

#### 5 CLUSTERING AND INTERACTIONS WITH IWA AND WATER LOSSES USERS' GROUP

##### 5.1 Clustering

The European Commission is actively promoting the "clustering" of Innovation Projects (IP). Clustering entails bringing people from different projects in order to favour discussion and experience exchange with the ultimate aim of facilitating the success of IPs, both during and after the IP's life.

IPs' representatives have been invited to several meetings around Europe and are now divided into 4 cluster sub-groups; TILDE belongs to the "**Dissemination, marketing & design of innovation**" cluster. The objective of this group is to promote the successful exploitation of IP results and help projects conquer final barriers towards market breakthrough.

TILDE has become involved in an initiative proposed by the HYDROPLAN-EU project ([www.hydroplan-eu.com](http://www.hydroplan-eu.com)), that fosters the set-up of an **observers' network** formed by potential users of the IP's results and aimed at encouraging their future exploitation of IP's innovations.

In this framework TILDE has proposed the interaction with the "**Water Losses Users' Group**", established by FederGasAcqua (Federgasacqua is the organization gathering water and gas utilities in Italy. Its more than 400 members supply water to roughly 36 million people in Italy. [www.federgasacqua.it](http://www.federgasacqua.it)) and 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. [www.fondazioneamga.org](http://www.fondazioneamga.org) ).

### *5.2 Interaction with the Federgasacqua Water Losses Users' Group*

The activity of the USER GROUP, gathering more than 40 members from Italian Utilities, Universities and Water Institutions, began officially on 25 October 2004 in Genova (Italy) on occasion of the Federgasacqua Workshop "Towards More Effective Management of Water Losses in Distribution Systems".

The Federgasacqua Water Losses Users' Group would be 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 TILDE and International Water Association (IWA) specialist information to the Italian Water Industry;
- disseminating the TILDE approach to a wide number of potential end-users and obtain feedback from potential end-users;
- 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.

### *5.3 Interaction with the Water Loss Task Force of IWA and other International Institutions*

As a fundamental activity that can enhance chances of successful innovation and effectively facilitate the exchange process between innovators and users, TILDE wishes to draw on "**Official Observers**" from European and International Institutions and Utilities.

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.

To extend and complete the knowledge about innovative strategies for water loss reduction, the IWA Water Loss Task Force has already identified the participation of a representative of the Task Force as Official Observer in the Tilde Project as an important activity that can effectively facilitate the information exchange process between innovators and professionals on an international basis. This link can facilitate the improvement of methods and the deliver and exchange of knowledge process between practitioners and researchers.

Through the Italian User Group, TILDE would also like to promote joint meetings in Italy with the IWA Water Loss Task Force and TILDE members to be held in 2006. The work program could also involve a number of briefings with senior politicians and political decision makers to help Tilde to continue to build momentum for water loss issues in Italy and in Europe as well.

## **6 CONCLUSIONS**

The TILDE project focuses on supporting water operators in leakage management. TILDE will provide users with a comprehensive view on the state-of-the-art in the water distribution sector. This will be of great help to users when they are looking for information on technologies and methods to solve their leakage related problems. The Portal will be useful as a commercial tool wherein users can advertise their own products and services. The TILDE partners trust to make the Portal a reference point for the water professionals. As such companies will be interested in being advertised in the TILDE portal. The Portal is aimed to promote the sustainable use of water. The

reduction of leakage entails saving of water resource as well as decreasing energy (less pumping) and treatment costs (less water is produced as the system becomes more efficient). The Italian Ministry of Environment is the partner that officially promotes the development of the Water Portal as a fundamental instrument to disseminate best practice in leakage control.