



**CASE STUDY**

# Malta: Use of leakage control in water management strategy



## Summary

The Maltese islands experience acute water shortage. To address this, leakage control has been developed to become a strategically important component for water resource management and has been used to reach an optimum economic balance between water supply and water demand. The key lesson is that leakage management is an effective supply side action to increase efficiency in water use leading and can be used as a strategic tool.

## Background

The Maltese islands, like other parts of the Mediterranean area is an area of acute water shortage. The Maltese archipelago consists of 6 islands and islets, the main islands being Malta, Gozo and Comino. The total surface area is approximately 316 Km<sup>2</sup>. The Islands have a population of approximately 376,000. Water is a scarce resource, particularly in view of the local hydroclimatological conditions, including the low rainfall and high evapotranspiration rate, relatively long dry season, small surface area, the irregular topographic relief and the characteristics of the local aquifers.

Shortages in supply have partially been overcome by the use of reverse osmosis. However, the water is expensive at a cost of 20c per cubic metre, excluding the capital cost, nearly three times that of groundwater extracted and treated. However, the level of exploitation of aquifer-based groundwater is high and largely uncontrolled, mainly illegal extraction for irrigation purposes. Increased use of groundwater is therefore not an option for municipal water supply. Furthermore, per capita consumption of water in Malta is extremely low for a

developed country, at around 250 litres per connection per day. This implies that there is little potential for reduction on the demand side.

Leakage management therefore became seen as an important contributor to balancing supply and demand, and the prime aims of reducing production costs, improving the economies of the water supply organisation, and postponing capital investments in water network renewal. An understanding of the economics of leakage control, the target setting of leakage goals, and the strategic management of leak control resources is vital.

The Water Services Corporation Act XXIII of 1991 serves as the legislative basis and includes all tools and instruments for water resources management issues in the Maltese Islands. The act regulates the whole water cycle (acquisition, production, distribution of drinking and second-class water, disposal and reuse of sewage and wastewater and reuse of storm water runoff) as well as water trading rights between individuals. It sets up the WSC as the corporate body in charge of water management in Malta. In February 2001 the WSC handed over its regulatory responsibilities to the newly setup Malta Resources Authority (MRA), by means of the Malta Resources Authority Act XXV of 2000. This move allowed for a much-needed legal delineation between regulatory and operational responsibilities within the Maltese Islands.

### **Actions taken**

The Water Services Corporation has, from its setting-up in 1992, been aware of the importance of achieving and sustaining an economically viable leakage level.

**Quantification of leakages:** The initial step taken by the Corporation was directed at quantifying leakage. Continuous data logging of all zone inlets and metering of all service connections allowed computations of leakage to be made on a 'bottom-up' (using minimum night flows) basis and a 'top-down' (using annual water balance) basis, in accordance with recommended best practice from the International Water Association (IWA).

**Management approach:** Following initial leakage quantification based on sector night flows, the Corporation gradually implemented a leakage control programme based upon a delicate balance between five key components; pressure management, network rationalization, active leakage localization, dynamic leakage repair and replacement of critically weak pipework.

**Initial programme in Gozo:** As the implementation of a viable leakage control methodology in the whole of Malta would take a number of years, the Corporation initially targeted the smaller island of Gozo for comprehensive and integrated pilot leakage studies and trials. Over a six year period, a staged development took place. By 1999 Gozo annual system input volume had fallen to less than 70% of the 1995 figures and was actually lower than 1989 system input volume. Total leakage for the Island, calculated using the lowest night flow in each sector each week, was generally maintained at below 770 m<sup>3</sup>/day. This was less than a third of the initial leakage level calculated before on the same basis. Lessons learned in this first programme were then replicated in Malta. Corresponding to earlier leakage reductions in Gozo, in 1995 the first effects of falling leakage levels were felt in Malta also.

**Standard methodology and indicators:** Throughout 1998 and 1999 the Corporation participated in an international leakage comparison exercise, as part of the IWA 'best

practice' Task Force activities. The comparison exercise carried out by the IWDC on 27 supply systems in 20 countries showed Gozo as one of the system leaders, with an ILI of close to 1.5, based on the initial calculations of leakage based on minimum night flows.

**Ongoing developments:** The ongoing major developments for both Gozo and Malta are, at present, as follows: A study into the quantification and control of apparent water losses, through the introduction of an Off-Site Meter Reading Scheme; the completion of an innovative economic leakage intervention model that is being developed; the development of an Integrated Water Management System, or IWMS which is, in essence, an information system that utilizes a corporate data model and a geographical information system (or GIS) to integrate the various functional modules within the Corporation's sphere of operation.

## **Outcomes**

Overall, the leakage control programme has been successful and has led to substantial reductions. More importantly, the approach has been integrated into the corporate strategy within the WSC.

The study describes the major advances made in the fields of technology, training, HR skills and management techniques that collectively enabled the Water Supply Corporation to more than half its leakage within 5 years. The reduction in National leakage from 2,800 cubic metres per hour to 1,200 cubic metres per hour over 5 years, as well as the achieving of an internationally recognized leakage target for Gozo, is the focus of this case study. This has been achieved despite the technical difficulties of a dense and complex water network. Elements illustrating the strategic aspects of leakage management include:

- **Use of performance indicators:** The Water Services Corporation has adopted the Infrastructure Leakage Index (ILI) as the official corporate performance indicator for leakage. The Corporation has set the achieving of an ILI of close to 1 within 10 years as a strategic target.
- **Economically efficient Leakage Management:** The Water Services Corporation has developed an innovative "economic leakage intervention model", designed to act as a tactical planning tool focused towards daily resource utilization and tactical planning decisions with one objective to guide the leakage practitioner towards reaching the long-range goals and targets of the Corporation as quickly and economically as possible.
- **Continuous Research and Development:** The Corporation is fully aware that, in order to keep abreast of technology in the field of leakage control, it must constantly research into innovative techniques and technologies. For this reason a partnership was set up with the Department of Power and Control, Faculty of Engineering, University of Malta with the objective of joint research into network control and leakage detection techniques.

## **Lessons Learned**

Malta faced shortages of water, and limited groundwater (due to illegal abstraction in the agricultural sector). Leakage management is an effective supply side action to increase efficiency in water use leading, and can be used as a strategic tool.

Despite severe technical difficulties, leakage reduction has played a significant role in

reducing dependence on (high cost) water supply from desalination.

To be effective, leakage control should be seen as a major component of corporate strategy for water resource management, involving sophisticated management techniques as well as technical innovation.

Leakage control is more than just capital investment into modern technology; it is an exercise in proper strategic management at a corporate level. The role of management on a lower, tactical level and a higher, integrative level is central.

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