Network Sectorisation & Monitoring for Non-Revenue Water Control
CASE STUDY KEY POINTS

How to **build capacity** and network knowledge to **reduce water losses** and **sustainably maintain** those gains

**Active Leakage Control** ‘find and fix’ in **DMAs** supported by **software application** data analysis

How **EPAL** **reduced leakage by 200 m³/hour from 500 to 150 litres/connection/day**

**Be as smart as you need to be**
PORTUGAL NATIONAL CONTEXT

Portugal
- 92.200 square km
- 10.6 million population
- Majority of Water sector publically owned
- Mix private, public & concession operators
- Divided into bulk treatment companies, separate from distribution utilities

We know that water losses within distribution systems are an economic & environmental problem which must be addressed.

A water loss reduction project brings operational efficiency along with financial and sustainability benefits.
Problems contributing to Non-Revenue Water (NRW):

• Poor measurement of system water balances;
• Aging networks and often built with poor quality materials;
• Deficit of knowledge regarding networks: GIS, technical, operational;
• Insufficient data, standardization & systematization of reporting;
• Insufficient technical teams with low skill levels and poor knowledge.

In Portugal, efficiency targets have been set for utilities to achieve and funding mechanisms created for their implementation.
EPAL – ORIGINS IN 1868

**Bulk Supply** to around 2.9 million people in 34 municipalities around the Lisbon area and the city itself

Management of Águas de Lisboa & Vale do Tejo totalling 96 municipalities

**Direct Supply** to 350,000 domestic and commercial customers within City of Lisbon

**Largest water supplier** in Portugal with a net profit of €47 M and a turnover of €144 M in 2015
EPAL NON-REVENUE WATER SITUATION

Challenge

How to reduce annual NRW volume in the Lisbon distribution network which reached 40 million m$^3$ at the turn of the millennium?

EPAL adopted solutions which:

1. Minimize inefficiency generated by water losses;
2. Are easily implemented and sustainable;
3. Are transversal to all areas of the company;
4. Allow optimization of investments and resources;
5. Generate financial return for the company and stakeholders, creating greater resilience.

Project undertaken by company employees to build capacity & retain knowledge in-house
STRATEGY REQUIREMENTS

DMA Network Segmentation & continuous telemetry monitoring

Basic Data: Clients, Network Length, Connections Pressure

Data analysis: Selection Criteria & Performance Indicators

Optimization of Active Leak Control

Quick & Effective Repairs with good materials
4 PHASES TO IMPROVE NETWORK KNOWLEDGE

1. DMA PLANNING & SET UP
   Create metering points & telemetry
   Design & boundary validation
   DMA Implementation

2. CONTINUOUS MONITORING
   Recording of pressure & flow
   Passive system with active alarms
4 PHASES TO IMPROVE NETWORK KNOWLEDGE

3. DATA ANALYSIS
Integration in analysis software
Practical Performance Indicators
System Alarm & Alert Management
Leakage assessment & Target setting
Surgical Control of leakage

4. INFORMATION REPORTING
DMA Proposals & Reference Manuals
DMA Analysis & Audit Project Reports
Distribution Network
1.250 km sectorized mains
1600 Monitoring Points
156 DMAs
### DMA Data Integration & Performance Analysis Table

#### DMA Daily Control - Net

<table>
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<th>DMA</th>
<th>Day</th>
<th>Flow Minimum (m³/h)</th>
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<th>Snap Flow Minimum (m³/h)</th>
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<th>Total Volume (m³)</th>
<th>Mixing Flow Coefficient (%/30%)</th>
<th>Peak Flow Night (m³/h) (10%)</th>
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Daily Total and Min. Graph

Daily Total Consumption & Minimum Nightline

DMA Total

Initial Date: 1/22/2014
Final Date: 2/21/2014

Min (Y1): [Value]
Max (Y1): [Value]
Min (Y2): [Value]
Max (Y2): [Value]

DMA 1050 - Algés e Restelo

Wednesday, January 22, 2014 - Friday, February 21, 2014
Leak Detection
Quantification
Repair
Validation

Pressure and Flow Profile Graph

Initial Date: 7/26/2012
Final Date: 8/7/2012

Monitoring Point: 41100000 - R Vieira Almeida

Sunday, July 29, 2012 - Tuesday, August 07, 2012
Constant Vigilance: 2014
Six years of waiting, then three in a row
CASE STUDY: DMA 1060

DMA Analysis Project Methodology:

Data analysis revealed
Recoverable Night Flow 130 m³/h

Fieldwork – Find ‘n’ Fix:
DMA boundary valve validation
• Leak Detection
• Ground microphones
• Acoustic Correlation
• Temporary DMA Alterations

Leak Repair
Validation of results
Leak location registered on GIS
CASE STUDY: DMA 1060

Critical Area – old Alcântara roundabout

Repair
CASE STUDY: DMA 1060

Critical Area – old Alcântara roundabout

Daily Flow and Pressure Profile

Water Loss equivalent to 500 000 m³/year

Repair
Leak reduction in two DMAs paid for entire DMA project for whole city in 3 years!

110 m³/h

1.4 million m³/year
• Impact of Network Rehabilitation & Active Leakage Control
• Enhanced network management & control
• Positive results across all performance indicators
• Improved Resilience & greater know-how created within EPAL
KEY CASE STUDY RECOMMENDATIONS

Provoke a **cultural change** at all levels and areas, **adapting to new concepts of management**

Build **water loss control capacity**, both **physical infrastructure** and sufficiently **trained staff**

Acquire and retain **empirical knowledge** of the company’s network within the organisation

Success achieved by creating a **dedicated water loss control team**, supported directly by management, with **resources and responsibility** over fundamental factors;
- DMA planning, implementation and subsequent management
- Maintenance of DMA meters, telemetry and boundary valves
- Active leak detection
- Data management software with KPIs focused on water loss assessment

Consider the correlation between **DMA size** and potential **achievable water loss reduction**

Water loss control concepts are well-known, the **challenge of sustainably managing** such systems over the long-term with **constant vigilance is the key goal**

Common-sense solutions, Smart People...
EPAL sharing Water Solutions