MIYAHUNA Water Company
Operation Directorate
MIYAHUNA NRW
Management
Service Area

<table>
<thead>
<tr>
<th>Population</th>
<th>2.7 Millions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers</td>
<td>520,000</td>
</tr>
<tr>
<td>Areas</td>
<td></td>
</tr>
<tr>
<td>Served</td>
<td>1,026 km²</td>
</tr>
<tr>
<td>GAM</td>
<td>1,680 km²</td>
</tr>
<tr>
<td>Network</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>9,640 km</td>
</tr>
<tr>
<td>Wastewater</td>
<td>2,262 km</td>
</tr>
<tr>
<td>Main Pipe Material</td>
<td></td>
</tr>
<tr>
<td>Water</td>
<td>DI, PE, Steel, GI, PVC</td>
</tr>
<tr>
<td>Wastewater</td>
<td>Concrete, DI</td>
</tr>
<tr>
<td>Water Supply</td>
<td>128.7 MCM</td>
</tr>
<tr>
<td>External</td>
<td>73%</td>
</tr>
<tr>
<td>Internal</td>
<td>27%</td>
</tr>
<tr>
<td>Supply</td>
<td>Through Rationing</td>
</tr>
</tbody>
</table>
Introduction

• LCD has been established in 1999 for the major purpose of reducing and controlling losses in water network in Amman:
  – High percentage of NRW 54%.
  – Lake of Resources.
  – Hygienic Aspect.

• Methodology and references based on IWA.

• Performance Measures (Operational)
Leakage Control

• (Active)
  – Sounding.
  – Investigation and Step tests.
  – Using New Technologies (SAHARA, Gas Detection ...)

• (Passive)
  – Pressure Control
NRW Reduction Achievements In Amman:

NRW History

- Q3, 99 54%
- 1999: 49.8
- 2000: 48.3
- 2002: 47.3
- 2004: 46.5
- 2006: 44.6
- 2008: 41.9
- 2010: 34.3

X7 HandHand

Commissioning of last Contract of CIP (C14)
CIP Needs Highlight

- Old expanded network
- No planning for network upsizing
- Amman topography-pressure variation
- Primary network not structured to take elevations into account
- Network inter-connections
- Lack of network monitoring and control at small scale
CIP Activities

• Secure funding
• Redesign the network
  – Distribution zones based on elevations
  – Subdivide DZ into Districts
  – Utilize physical separation among DZs
  – Supply by gravity
  – Design transmission (primary) lines
  – Design secondary lines
  – Utilize existing network (existing lines status)
CIP Activities (cont.)

• **Restructure the network**
  – Establish districts management facilities (DMs, PRVs, ARVs ...etc.)
  – Lay new pipes
  – Connect to utilized existing pipes
  – Disconnect redundant pipes
  – Transfer house connections
  – Isolate the DZs (disconnect pipes, install BVs)
  – Isolate the districts (disconnect pipes, install BVs)
Results of CIP

- 44 metered DZs
- 325 metered districts
  - 15 Tower Districts near DZ Reservoirs
  - 190 District with PRVs
  - 5 to 6 PM points in each District
- Utilized other facilities (GIS, CIS and Call Center)
Results of CIP

Pipe Types Under the CIP

1. Primary Main
2. Secondary Main
3. Secondary Main outside its DZ (No connection allowed)
4. Tertiary Line
5. Tertiary Line outside its District (No connection allowed)

District Feeding Point

House Connections, feed from tapping points on Tertiary lines to house meters (CIP_JUP_TYPE = 8)
District Establishment

Work Strategy:
To establish distribution zone with certain criteria's that can be measured and controlled.

Control transmission and main line with regular investigation and measurement (Flow Balance).
District Establishment

- Work Plan:
  - (115) out of (325) district has been established by the end of 2008.
  - As part of MIYAHUNA strategic plan for the next Five years (154) district should be established as followed:

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of district to be established</th>
<th>No. of customer's in the established district</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>27</td>
<td>33,300</td>
</tr>
<tr>
<td>2010</td>
<td>44</td>
<td>33,000</td>
</tr>
<tr>
<td>2011</td>
<td>43</td>
<td>8,900</td>
</tr>
<tr>
<td>2012</td>
<td>20</td>
<td>38,600</td>
</tr>
<tr>
<td>2013</td>
<td>20</td>
<td>36,500</td>
</tr>
<tr>
<td>2014</td>
<td>154</td>
<td>150,300</td>
</tr>
<tr>
<td>Sum</td>
<td>154</td>
<td>1,500,000</td>
</tr>
</tbody>
</table>
Action Plans

- Clarify responsibilities among teams
- Check district isolation
- Understand district topography
- Check districts history (complaints)
- Repair visible leaks
- Determine initial NRW (FB or MNF)
- Locate (and GPS) internal valves
Action Plans (Cont.)

• Survey the district
  – Check drainage and TLC systems
  – Basic acoustic tools
  – Correlating
  – Noise logging when applicable.

• Repair none visible leaks

• Disconnect redundant mains

• Conduct Commercial Campaign and remediate.

• Determine post repair NRW (FB or MNF)

• Divide into sub-districts & repeat actions.
District Establishment

Activities Sequence:

- Isolation and Border Check
  - District Isolated:
    - Yes
      - Calculating the Baseline NRW
      - Proposed NRW Ratio
      - Delivering a non-visible leakage survey + Repairing
      - NRW After Repairing
      - Proposed NRW Ratio
      - Commercial Campaign Start
      - NRW After Repairing and Correction
    - No
      - Re-view and new activities to deliver
  - No

- District Assumed to be Established
  - Yes
    - Proposed NRW Ratio
  - No
Restrictions

Technical:
- Shortage of Water.
- Non Completion of C15.

Administrative:
- Domestic Water Meter Inaccuracy.
- DB (GIS / CIS) Inaccuracy.
- Illegal Usages.

Financial:
- Lake of funds for big investment projects (Customer water meters replacement, HC Replacement…etc).
- Water Tariff.
What Else?!

• Completion of Districts isolation and Establishment (In the Process).

Bench Mark and Boundaries Tightness
• District Meters and PRV’s Verification Surveys (Done).
• Domestic Water meter replacement and up-grading.

Preventive maintenance program.
• Resources Water meter Verification Survey (In the Process).
• Automation Of District Meters and PRV’s (Future) SCADA.

Monitoring & Controlling

Effective DMA Management System