Technical Report

Non-Revenue Water Round Table Discussion

Utility Performance Monitoring Unit

Second Workshop

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Amman Kempinski - Hotel

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Abbreviation

MWI	Ministry of Water & Irrigation
WAJ	Water Authority of Jordan
NRW	Non-Revenue Water
IWA	International Water Association
AWWA	American Water & Wastewater Association
AMR	Automatic Meter Reading
UPMU	Utility Performance Monitoring Unit
GIZ	Deutsche Gesellschaft für Internationale Zusammmenarbeit GmbH
USAID	United States Agency for International Development
FARA	Fixed Amount reimbursement Agreement
AMI	Automatic Meter infrastructure
ERP	Enterprise resources planning
DMA	District Meter Area
DZ	District Zone
PPSC	Public Private Sector Participation Contract
AW	Aqaba Water
KfW	Entwicklungs bank
ILI	Infrastructure Leakage Index

Technical Report

Second round table discussion on Non-Revenue Water reduction Through Utility Performance Monitoring Unit

WAJ Secretary General addressed the workshop by short speech.

On behalf of the Minister of Water and Irrigation, the Secretary-General of the Water Authority, Eng. Bashar Bataineh, opened the NRW Workshop, which was held in Amman and organized by the Utilities Performance Monitoring Unit (UPMU) in cooperation with the German International Cooperation (GIZ), in the presence of Mrs. Frauke Neumann - Silkow, Director of GIZ Water Portfolio in Jordan. The workshop attended as well by CEO of Miyahuna, CEO of Aqaba Water and Yarmouk Water Company representatives.

The WAJ SG stressed the need to do more work and intensify efforts and procedures to reduce water losses and the need to adopt unified concepts for measuring water losses as Jordan is considered one of the poorest countries in the world.

On the other hand, Dr. Ahmad Alazzam director of UPMU welcomed the participants with the hope to find an appropriate solution to the biggest challenges facing the water sector such as water losses. There is no doubt that reduction in NRW will lead to increasing water resources, providing better services to the citizens, increasing in billed quantities which will reflect in increasing the revenues.

Recognitions must be directed to the German Agency for its continuous support for the water sector in particular and UPMU exclusively.

Finally, this gathering, hopefully will lead to a revolution to achieve goals that raise the performance of the water sector, benefit from the exchange of experiences and knowledge acquisition.

The workshop had several working papers submitted by UPMU, Miyahuna, Aqaba, Yarmouk and the consultant, all presentations will be attached as a part of the report.

A. Miyahuna Presentation.

The National Water Strategies 2016-2025 which was approved by the cabinet 2016, states that NRW is one of the major issues that impact the water supply availability in Jordan. The intention of Miyahuna to achieve sustainable reduction of Water Losses.

Reduce and Maintain NRW in 12 DZs in Amman

1. Performance Based Contract for Non-Revenue Water 4 DZs (PBCI)

- NRW reduction approach in Miyahuna aim to reduce water losses in partnership with the private sector. The main objective of the PBC I Project is to achieve sustainable reduction in NRW to the level of (24%) or less and to maintain it for two consecutive years. In case the measured NRW baseline was less than 30%, it is required to reduce at least 20% and maintain the reduction or achieve further reduction for two consecutive years.
- Different Areas under the project; DZ-24 Um Uthaina, DZ- 32 Yasmeen, DZ- 33 Yadoudeh,DZ- 34, Wadi Al Seer with total customer of 97,831.

2. NRW Reduction and Maintain in Eight DZ's through Miyahuna's Staff

- Miyahuna has selected DZs with the aim to achieve the targeted NRW % in at least eight DZs. Total Number of DMAs 66, Number of Customers 145,083, Length of Main (km) 1,461 Miyahuna is following an integrated approach in achieving its objectives through careful management of different elements of the scope of services; and introducing technologies and techniques to demonstrate an effective way of reducing NRW levels cost effectively while meeting and sometimes exceeding minimum service requirements.
- The methodology consists of:
    1. Data Review and Analysis.
    2. Hydraulic Models Reviewing and Calibration.
    3. DZ/ DMA Isolation Verification.
    4. Pressure Management, Implementation Bulk Meters and PRVs Monitoring/ Replacement (DZ/ DMA).
    5. Active Leak Detection and Bursts Repairing.
    6. Predictive and Preventive Maintenance.
    7. Big Customers Water Meters Monitoring/Replacement.
    8. Customers Water Meters Replacement and / or remediation.
    9. Illegal Use campaign.

10. Quarterly Flow Balance.
11. Monitoring and Reporting.

B. Aqaba Water (AW) Presentation

The presentation discussed the Project for Ultrasonic residential and non-residential flow meter and the customer water supply condition in Aqaba city.

1- Project of ultrasonic flow meter goals:
   - Study the effect of using Ultrasonic flow meter instead of mechanical flow meter.
   - Install 16 ultrasonic flow meters in series with new mechanical flow meters.
   - Using different sizes of meters: ¾'', 1'' & 2''.
   - Project Result: The Ultrasonic flow meters read +16% compared to new mechanical flow meter after 1-year pilot project running.

2- Aqaba City Customer Water Supply Condition.

Aqaba city water supply continuously (24/7). Each customer has a roof top tank ($2m^3$) with floating valve. The continues flow maintain the water level in customer water tank almost full. The customer consumption led to minimal drop in water level at rooftop tanks so the float valve will be opened with very low flow to replenish the tank.

The mechanical meter does not register the low flow rate (below ½ Q_{min}) so the flow pass to customers with no registration (10 to 20 L/h) by field experiment conducted by AW teams according to mechanical meter condition). As a result of this water supply pattern leads to increase the percentage of NRW.

C. Yarmouk Water Company (YWC) Presentation

The presentation explains several points as follows.

Main water resources are: Zatery well fields, Wadi Arab wells field 1 and 2 and local wells in deferent locations within the utility service area. The water deficit at YWC is about 8 MCM/Y.

- The plan for the year 2022 is to improve the water supply input by:
  1. Initiating a new project of Wadi Arab well fields to improve the water supply for Jarash, Ajloun and Bani Obeid.
  2. Treatment of Kufranjeh Water Dam to supply Ajloun ROU.
  3. Drilling new water wells at Alaqeb and Corridor well fields.
  4. Renting private wells at Zatery, Mafraq and Ramtha.
- Establishing NRW Unit to cover all Yarmouk Water Company 2022-2024
  a) Reduce commercial losses 5% by the end of 2022

- Replacement and Improve customer water meter reading, install smart meter and detect Illegal uses.
- Bulk water meters at resources to be connected with SCADA system

b) Reduce physical losses 5% by the end of 2022

- The target of NRW reduction by the end of 2024 to reach 40% compared to 49% at 2020.

D. NRW and FARA Projects – NRW Unit /WAJ

NRW Reduction Planning and Implementation Framework consists of strategic plan, detailed design and implementation. Reduction of NRW in water system includes:

a. Reduce water administrative losses
   i. Increase accuracy of water meters for subscribers and bulk meters at water resources.
   ii. Increase billing ratio and reduce illegal use of water.

b. Reduce water physical losses
   i. Increase isolated District Metering Areas (DMAs).
   ii. Pressure managements.
   iii. Rehabilitate the water network.
   iv. Reduce the response time to repair reported leaks

c. Improve NRW measurements and monitoring by establishing SCADA system and GIS on the national level.

E. Utility Performance Monitoring Unit (UPMU) Presentation

The presentation elaborates the equation and calculation of NRW for water utilities.

1. The components of the definition are.
   - Water Distributed = water produced + imported water
   - Water Billed = Authorized billed consumption + Exported Water
   - NRW= (Water Distributed - Water Billed)/ Water Distributed
2. NRW Percentage for the utilities for year 2020 based on the above equation.
   a. Miyahuna NRW 46.1%
      i. Amman ;40.6%
      ii. Zarqa; 56%
      iii. Madaba; 41.8%
   b. Aqaba Water; 37%
   c. Yarmouk Water Co. NRW 49.5% includes Irbid, Ajloun, Jarash and Mafraq ROU's.
3. Analysis of Water supplied Quantities and Distributed for the Kingdom.

The Water Authority (WJ) supplied water about 505 MCM for 2020 and the share of the utilities as follows:

- **Share of the three Utilities;**
  i. Miyahuna 55.9%
  ii. AW 5.6%
  iii. YWC 20.8%

  83% of the water supplied serve 89% of Jordan population
- Utilities Share
  a. Balqa 9.1%,
  b. Karak 4.2%
  c. Tafielh 1.6%
  d. Maan 2.6%

  17% of water supplied serves 11% of Jordan population

F. Consultant Presentations:

- **An overview of 1st NRW Round Table Discussion the impact of negative and positive input component of NRW;**
  - Improving Water Supply Networks
    - Bulk Flow Measurement
    - Customer Metering and Database
    - Pressure Management
    - Leakage Management
    - Asset Management (water networks)
    - Water Balance and Key Performance Indicators (KPIs)
    - Human Resources
  - Impacts of NRW includes the Negative and positive Circles
  - Reasons for Failure & Road to Success
  - Two fundamental steps for NRW
  - Four pillars of commercial losses
  - Rotated meter's accuracy test
- **Pressure Management as a tool for NRW Reduction**.
  NRW can be reduced significantly by reducing distribution pressure.
  - Four pillars of pressure management
    - Pressure variations
    - Active leakage control
    - Speed of repair
    - Assessment management of water distribution
- Fuhies Pilot Area Reducing NRW by Reducing distribution pressure

- Management of Installation PRVs is a key to Control the Pressure over the Pilot Area
- Reducing distribution pressure shows significant drop in NRW percentage from 31% to 18%.

- **Minimum Night Flow measurement**

  It is the only tool to define the physical losses from the distribution, the presentation gives a real calculation of the physical losses during the implementation of Capital Investment Project (CIP) in Amman.

- **Infrastructure Leakage Index (ILI)**

  The ILI was developed by the International Water Association (IWA) Water Loss Task Force (WLTF).

  - The Infrastructure Leakage Index is calculated as follows:

    = Current Annual Real Losses (CARL) /Unavoidable Annual Real Losses (UARL)

    - The Current Annual Real Losses (CARL) calculate from MNF
    - The Unavoidable Annual Real Losses (UARL) calculate from this equation

      = (18 x L main + 0.8 x N taping points + 25 x Length of service connections) x Pressure

Recommendations

- The intention of the workshop is to examine the tools and means by which the utilities can calculate the administrative and technical water losses more accurately,
- All current projects that are implemented on the ground (Amman, Aqaba and YWC) must have the goal to calculate the physical and commercial losses.
- UPMU should start the campaign to introduce the ILI as a performance indicator at least in (AW then Miyahuna).
- UPMU should coordinate with utilities to present result from the current projects in the next round table discussion. (Planned May 2022)