Automatic Meter Reading

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Automatic Meter Reading – It’s all about control

- There are 3 reasons to implement AMR (Automatic Meter Reading) in a Utility:
  - Reduction of expenses.
  - Increasing of income.
  - Improvement of costumer service.
Reduction of expenses.

- There are several elements that are leading the list of expenses
  - Optimization of water meter sizes
  - Reduction of water losses
  - Controlling water supply.
  - Monitoring the water supply net.
Reduction of expenses.
Optimization of water meter size.

- One of the benefits of viewing your water system 24 hours per day is that you get a complete picture of the water actual consumption!
- By viewing the actual consumption we can optimize the size of the water meter and by that decreasing water loss and improve the income from each meter.
Optimization of water meter size.

Considerations in selecting water meter:

a. Learn the water consumption behavior.

b. Select water meter type that meets the type of water that flows in the pipe.

Water flow in a water meter should be as close as possible to the water meter Qn!
Optimization of water meter size.

Accuracy Curve

- $\pm 5\%$ accuracy limit
- $\pm 2\%$ accuracy limit

Delivery in $\% Q_{\text{max}}$

$E\%$

$Q_{\text{min}}$, $Q_t$, $Q_n$, $Q_{\text{max}}$
Optimization of water meter size.

Water flow is too high:

Head loss – as high as the consumption the bigger is the head loss!

In case the water flow is too high, although the accuracy is not effected so much, the life time of the meter is effected and will cause a negative metering or in other words – uncounted water consumption!
Optimization of water meter size.

Water flow too low:

The water accuracy in low flows is up to -5% in accordance with ISO standard we must select a meter that will be away from this point.

A smaller water meter will be advised.
Optimization of water meter size.

Water flow with pick demand:
When the water flow varies dramatically from $Q_{\text{min}}$ to $Q_{\text{max}}$, pick demands, a compound meter should be advised.
Reduction of expenses.

- Controlling water supply – water losses
- Consumption analysis.
- Water supply control.

One of the issues that is challenged by AMR system is the water actual consumption. Today most of our consumption analysis is done in the pumping area via SCADA system using statistic analysis. By implementing AMR network we can easily control our pumping and boosting system in linear relation between the consumption and the actual demand.
Controlling water supply.

By monitoring the water system we enable the utility detection of water theft the moment it starts.

Via Arad Metering Technology we can disconnect the water supply as the theft begins!
Less reading errors.

- **Automatic Meter Reading by radio – of all the meters.**
- The AMR system enables full 24 hours meter reading without the need of sending people to read the water meters.
- Difficult access meters – some of the meters are in close locations and it is very difficult to approach them.
- In some cases people do not let access to the meter!
Reduction in Water loss!

- Real Time Water pipe net monitoring.
- Controlling of water loss:
  - At an apartment.
  - In a building.
  - In street.
  - In area.
Controlling of water loss:

- At an apartment.
- The Arad Technology designed the first (patented) water meter that includes bi-directional radio inside – the Dialog3G.
- Installing the radio inside a water meter enables us to “see” the movement of the grease. Continues flow of water for predetermined period of time will generate water leak alarm by the water meter!
Controlling of water loss:

In a building.

By comparing the water flow via the incoming building meter vs the total water consumed by each apartment we can diagnose water loss in a building (leak, theft, too high common consumption)

\[
T_0 - (\text{Master-Meter})(5\%) = \sum (M_1+M_2+M_3+\ldots+M_n)
\]

\[
T_1 - (\text{Master-Meter})(5\%) = \sum (M_1+M_2+M_3+\ldots+M_n)
\]

(5\%)- *predetermine* accepted loss
It is all about timing

- Transmitting every 30 second.
- Collecting the information on the same timescale!

\[ T_0 - (\text{Master-Meter})(5\%) = \sum (M_1 + M_2 + M_3 + \ldots + M_n) \]

\[ T_1 - (\text{Master-Meter})(5\%) = \sum (M_1 + M_2 + M_3 + \ldots + M_n) \]

- (5%) - predetermine accepted loss
Controlling of water loss:

- In a building.

Diagram: Master Meters (M1, M2, Mn) with water flow directions and connections.
Controlling of water loss:

- In street.

\[(M6'' \pm M6'') + 5\% = \Sigma M1\frac{1}{2}'' + 5\% = \Sigma M1\frac{1}{2}''\]

The Dialog3G can read meters in both directions!
Controlling of water loss:

- Water meters that do not work – different definitions to each meter enable determine if a water meter is stuck or been tampered.
- High consumption – the system
- Back flow – water may flow in circles – a water meter is not balanced between the two flow direction (negative direction is much less accuracy.)
Controlling of water loss:

Example:

1. The city of Petach-Tickva Israel, 73,000 water meters.
2. The city of Mansfield Texas USA 21,000 meters
3. Ariel – Municipal in Israel with 6500

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Improving costumer services:

- Reading on line – The costumer can easily compare between the billing reading and the current reading.
- Daily reading – the meter is read at any time so if costumer would like to pay now – *He can!*
- Consumption History – Costumer can read his consumption and compare it with his historical consumption.
- Reading your meter in the WEB – each costumer can read at any time his meter on the WEB (pass word and User name) and reduce the need of coming to the utility for complain!
Summery:

- Increase in revenue and control:
  - Better metering.
  - Better meter reading
  - Better cash flow

- Reduction of expenses:
  - Reduction in water losses
  - Improvement in the selection of meters
  - No need of on site reading
  - No question ask about the reading accuracy,

- Improving of Costumer relations – by making the information clear at any time to the costumer.
Managing wireless metering networks

Dialog 3G System

Managing wireless metering networks

ARAD TECHNOLOGIES LTD.
ARAD Technologies – sales development

$K

Year

0 5000 10000 15000 20000 25000 30000 35000 40000

2000 2001 2002 2003 2004 2005 2006 2007
Dialog 3G

Automated computerized system for controlling municipal water, electricity and gas metering systems
Dialog 3G System

Dialog 3G modules

Meters - The only Truly wireless metering system
Dialog 3G System

Dialog 3G modules

Data collection - Sophisticated and diverse data collection systems
Dialog 3G System

Dialog 3G modules

Control - Internet based advanced system, providing management and control over metering systems
Dialog 3G System

Dialog 3G modules

**Billing** - Advanced billing and bookkeeping system
How does it work

**Meters** – Array of mechanical/electrical meters with continuous metering broadcast
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How does it work

**Data Collection** – Receiving and registering the data from the meters and transmitting it to the heart of the system.

The Data Collection system “burst” when identifying problems or destruction in the metering system.
Dialog 3G System

How does it work

Control – The system enables full control of the network from anywhere anytime
How does it work

Billing – Comprehensive system takes care of all billing and bookkeeping activities
Dialog 3G Advantages

- Precise metering according to the highest standards
- Flow of information allowing full control over the network
- Variety of real time warnings
- Flow of full and quality information to the billing system
- Real Time meter reading
- Variety of comparison, historical, Irregular use reports
- Minimize cost of managing the metering network
- Improves the revenue from the metering network
Dialog 3G System

System Elements
Dialog 3G Meters System

The Wisdom Within

- Every meter of the system is installed with a transmitting / receiving unique unit
- Eliminates any wiring networks
- A worldwide patent

Water Meters  Electricity Meters  Gas Meters
Dialog 3G Meters System 3G

Water meters

- The only truly wireless meter in the world
- Simple installation, maintenance free for 7 years
- Transmits the meter reading
- Accepts demands for real time reading
- Identify the following problems
  - Water flow in wrong direction
  - Damaging the meter
  - Water leakage
Electricity meters

- ARAD Technologies has developed electricity meter containing a transmitting / receiving unit
- ARAD
- Meter is transmitting the reading even during power break
- System incorporated meters:
  - ABB
  - Sensus
  - Itron
  - AMPY
  - L&G
  - KAAN
Dialog 3G Meters System

Gas meters

- ARAD Technologies has developed gas meter containing a transmitting / receiving unit
- Transmits the meter reading
- Accepts demands for real time reading
- Programming end device according to gas provider network
- Highest quality and safety standard
Dialog 3G System

System Elements

Data Collection

Meters

Water
Gas
Electricity

Control
Billing

Reports
Alarms

ARAD Technologies Ltd.

Completely Wireless Complete Control
Dialog 3G Data Collection

Central Reading

- Central and full installation providing full meter reading from the local authority offices
- Managing the entire metering network without human touch
Dialog 3G Data Collection

Drive By

- Collecting the data with a drive by car
- The car is equipped with a smart end device that collects and stores the data
- The stored data is transmitted to the main network
Dialog 3G Data Collection

Walk By

- Collecting the data through a walk by persons
- The person is equipped with a smart end device connected to a palm computer that stores the data
- The stored data is transmitted to the main network
- Option of transmitting control commands directly to the meter
Dialog 3G Data Collection

Dialog 3G - Cellular

- For remote and isolated meters
- Works for 5 years with internal power source
- Transmits data through cellular networks
- Transmits optimized information several times a day
- Information is categorized by: time frames, usage and warnings
Dialog 3G System
System Elements

THE WISDOM WITHIN

METERS
DATA COLLECTION
CONTROL
BILLING

Water
Gas
Electricity

Reports
Alarms

COMPLETELY WIRELESS COMPLETE CONTROL

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Dialog 3G Control System

ATUS 2000

- Internet based application
- Collecting, processing and displaying all metering data
- Provides warning for:
  - Arial leakage
    - Specific home leakage
    - Irregular usage
    - Multi user option with customized permissions
  
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Dialog 3G Control System

ATUS 2000

- No need for local installation
- Very low maintenance cost
- Highest standard of information security
- Information can be reached anywhere any time

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System Elements

DATA COLLECTION

METERS

CONTROL

BILLING

Water
Gas
Electricity

REPORTS
Alarms

COMPLETELY WIRELESS COMPLETE CONTROL
Dialog 3G Billing System

- Direct billing with no need for intermediate centers
- Wide range of payment options: internet, phone etc.
- Simple adaptation to existing billing systems
The Interpreter Concept

- Upgrade any conventional water meter into 3G transmitting technology
The Interpreter Advantages

- High accuracy
- Highly sensitive
- Optical pick-up improves sensitivity and accuracy
The Interpreter Advantages

- Can be attached to any meter
The Interpreter Advantages

- Truly and fully dialog 3G member
  - Two way communication
The Interpreter Advantages

- Mechanical appearance with digital accuracy
THE WISDOM WITHIN

Dialog 3G System

COMPLETELY WIRELESS
COMPLETE CONTROL