APPLICATION REPORT Water & Wastewater

Remote monitoring of groundwater abstraction points in city of Jakarta

- Test and evaluation of a one-stop-solution for water metering, wireless transmission and remote monitoring of readings
- Retrofitting of mechanical water meters to charge customers for abstracted water from wells
- Comparison of operability and data security of two remote monitoring systems

1. Background

It is quite common in emerging countries that major water consumers like residential parks, hospitals, hotels, industrial companies, golf clubs or shopping malls abstract their raw water directly from deep water wells. The lack of financial funds forces the governments to build wells instead of constructing new or maintaining the existing pipelines. This way, the risk of illegal tapping is also minimised. The water wells are up to 300m deep and often located directly on the consumer's property. The groundwater is either used for utility purposes or it is treated and used as drinking water. In Jakarta, Indonesia, the water wells are operated by Jakarta city government.

2. Measurement requirements

To charge the customers for the amount of abstracted water, dedicated water meters are needed. Up to now mechanical meters are used. As the abstracted water often contains a high percentage of minerals and solids, these meters are subject to serious wearing and clogging, leading to high maintenance expenses and a limited lifespan.

For retrofitting of the operated abstraction points, Jakarta city government started a project to test and evaluate possible solutions. Next to robust, non-wearing and low maintenance metering instruments, a remote data transmission of meter readings and alarms was asked for. In addition, the whole solution should be self-sufficient regarding power supply to keep on-site installation costs as low as possible. The water meters must fit into the existing pipeworks, no additional piping should be carried out. Although each measuring point is different with regards to flow conditions, pump capacities and installation restrictions (e.g. a 90° bow before/after the meter), the initial start-up, configuration and operating of the meters need to be easy and user-friendly.

KROHNE

As part of the project, a PC- or Web-based solution for remote monitoring of the readings was also asked for. Emphasis was put on the security of remote transmission as well as a clear and user-friendly analysis and visualisation of values at customers' control room.

3. KROHNE solution

KROHNE was the only supplier to match the given requirements and was choosen for the first field test in 2010. KROHNE delivered a one-stop-solution of stand-alone water meters with wireless data transmission together with remote monitoring system. Field and office personnel were trained on-site by two KROHNE engineers.

For the local measurements, five WATERFLUX 3070 C battery powered electromagnetic water meters (DN50 to DN80) were installed on five randomly selected abstraction wells together with KGA 42 GSM antennas (also battery-powered). All devices are sealed tamper-proof.

WATERFLUX water meters are not sensitive to flow conditions or installation restrictions on site. This is due to their design: the rectangular cross section of the measuring tube allows for an accurate measurement of high and low

WATERFLUX 3070 C and KGA 42 installed at different sites

flows. As it optimises the flow profile, there is no need for straight inlets and outlets or flow straighteners. The pressure loss resulting from necking is negligible, especially when compared to mechanical meters. Being electromagnetic meters, there are no moving parts or obstructions in the measuring tube that are subject to wearing or maintenance. All five WATERFLUX meters were equipped with two integrated batteries, providing for up to 15 years of operation (depending on ambient temperatures and frequency of measuring).

For remote transmission of the readings, each water meter was connected to a KGA 42 GSM antenna. For access to local GSM network, a SIM-card for every device was provided by the customer. Next to transmitting the readings, the KGA 42 can also store them for several weeks in case the network is down. The device also has programmable alarm functions: when pre-set thresholds are reached, the KGA 42 will send an alarm message to a given phone number, e. g. mobile phone of a service engineer.

For remote monitoring of readings, KROHNE offered two different solutions: PC Win and WebKGA. On customer's request, both were installed and configured for testing. PC Win is a "Mini-SCADA" system that is installed on a local computer together with a GSM modem, requiring another SIM card for GSM network access. A personal computer (PC) workstation equipped with PC Win can monitor up to 250 metering points/antennas. Although they were planning far more than 250 metering points (which would require additional workstations), Jakarta government wanted to test the PC Win system.

WebKGA is a server-based remote monitoring solution. It is set up by KROHNE on a remote secure server infrastructure with direct connection to GSM network. WebKGA can be accessed via any standard internet browser. Requiring only a valid login/password, operation is very user-friendly and can be compared to an online e-mail account. No additional hardware or specific knowledge is needed. The WebKGA server can connect to an unlimited number of metering points/antennas.

For a direct comparison of the two systems at a government control room, two of the five abstraction points were set up to be monitored with PC Win, the others were monitored with WebKGA. PC Win was installed on one computer, another PC with internet connection was used to connect with WebKGA server. For testing web server access from different locations, a third PC at a second office was used.
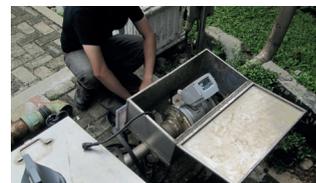
Schematic diagram of the test installation:
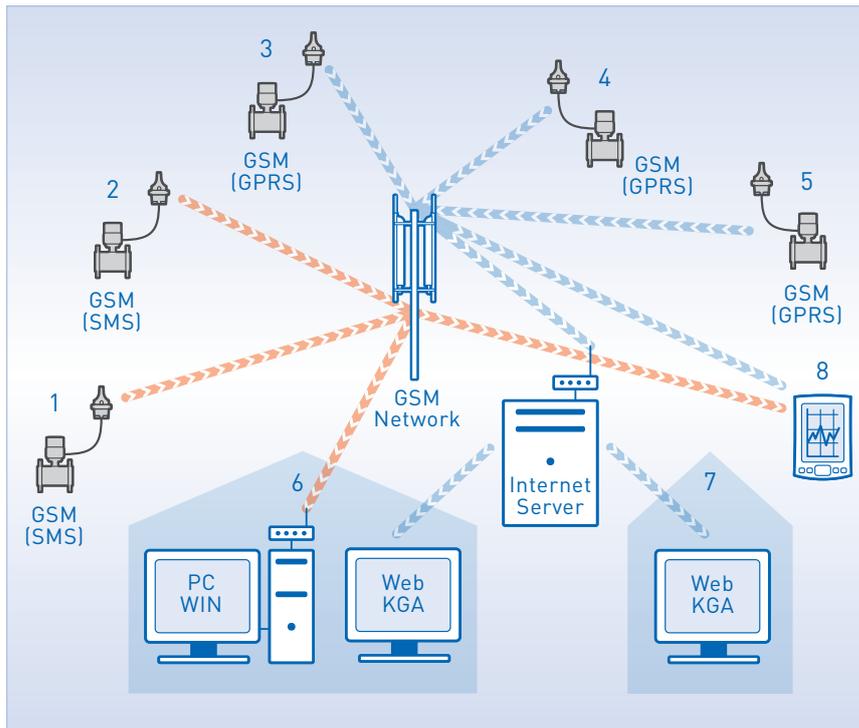
Measuring points:
1 Hotel, South Jakarta
2 Residential Park, North Jakarta
3 Hospital, North Jakarta
4 Factory, East Jakarta
5 Golf Course, East Jakarta

Remote monitoring points:
6 Government control room
  with PC Win workstation and
  WebKGA access
7 Government office
  with WebKGA access
8 Mobile phone of service engineer

4. Customer benefits

The measurement requirements were fully met. At all metering points, the installation of the water meters together with the GSM antennas did not present any problems. On-site tests included response of the meters to variations in flow rates as well as the alarm functions.

At control room, personnel were able to operate both remote monitoring systems after a short training. Next to the meter readings, also trend analysis, total consumption, average flow rate, night time flow rates or customised time periods, etc. can be displayed. Both solutions can also provide additional information about the status of each metering point, e. g. power status and need for battery change is indicated for water meter and antenna.
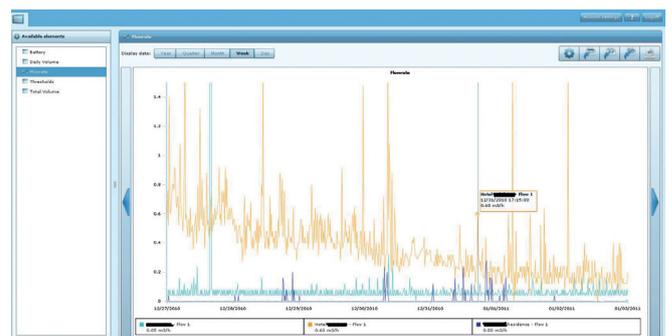

On-site training at the office

Remote monitoring of meter readings at the PC Win-workstation
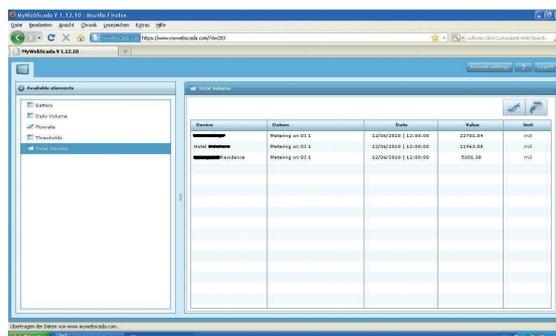
Access to WebKGA server via internet browser

Flow rates and trend analysis of each meter is visible online

Next to operability of the systems, officials were focusing on installation effort and data security:
• Installation: For setup of PC Win, the GSM modem needed to be installed and connected before installing the software. As internet connection and a standard internet browser were available, there was no installation effort for WebKGA (Server was pre-setup by KROHNE).

- Data communication security: with PC Win, the GSM antennas are set to send the readings via Short Message Service (SMS). For WebKGA, they are set to send the readings via General Packet Radio Service (GPRS). A GPRS connection requires that the receiver responds to the sender before the data is send: the local device will only send data when the receiving device confirms standby.

- Data storage security: with PC Win, any received data is stored locally on the dedicated workstation. In case of a PC-crash, a computer virus any physical damage to the hard drive, the stored data will be lost. With WebKGA, the received data is stored on a secure web server infrastructure with disk mirroring, eliminating the risk of loss.

During the test phase customer expressed his satisfaction with the solution. Next to the products, the quality of technical services, training and support provided by KROHNE was very appreciated. As some of the measuring points can be temporarily flooded due to monsoon, the project will include a compact IP68 protection class version of the WATERFLUX.

5. Products used

WATERFLUX 3070 C

- Battery-operated stand-alone water meter
- Suitable for custody transfer according to OIML R-49 and MI-001
- No wear, no deposits
- Precise measurement without (straight) inlet/outlet lengths
- Bi-directional measurement from 0...12 m/s / 0...40 ft/s
- Compact IP68 version available
- Sizes DN 25...600 / 1"...24", Rilsan polymer coating

KGA 42

- Data logger and GSM antenna for remote transmission of readings
- 4 digital and 2 analogue inputs
- Strong GSM signal specially designed for manholes
- For installation sites with no power supply
- Standard protection category IP68

WebKGA

- Server-based remote monitoring system for large networks
- Access via any PC with internet browser
- High data security through mirrored disks
- Unlimited number of measuring points can be monitored

PC Win

- PC based remote monitoring software with local GSM modem
- Easy installation and setup
- Up to 250 measuring points can be monitored with one workstation

Contact

Would you like further information about these or other applications?
Do you require technical advice for your application?
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Please visit our website for a current list of all KROHNE contacts and addresses.

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