

Exporting Israel's water expertise

● Israel is working hard to export its water expertise.

KEITH HAYWARD reports on some of the new developments there, following a visit put on in anticipation of the country's Watec event coming up in November.

Technology aids Israel's Coca-Cola bottling efficiency

The latest generation of two technologies, one providing UV disinfection, the other providing on-stream water quality testing, are helping Israel's Coca-Cola bottling plant meet its ambitious goals on a path to being a world leader in operational efficiency.

The Central Bottling Company, the Coca-Cola franchisee in Israel, operates what is known as a 'mega-plant' close to Tel Aviv, producing some 1.5 million items each day spread across a range of carbonated soft drinks.

Dov Landman is head of technology at the plant. His role in ensuring the drinks leaving the plant are of the right quality involves a number of challenges, not least due to the variable quality of the incoming water supply and an early commitment that preservatives are not used at the plant. There is also an ongoing drive to reduce the amount of water used at the plant, driven by the scarcity of supplies

in the country. Given that on top of this the plant must meet Coca-Cola's quality requirements, Landman describes the task of meeting all these challenges as 'almost impossible'.

The plant is supplied by Mekorot, Israel's bulk water supply company. Water to the plant can come from a number of sources, including the coastal aquifer, the mountain aquifer and the National Water Carrier, which draws in particular from Galilee in the north of the country. Landman comments that different types of water can arrive at the plant 'in a few hours', each with different water quality issues. 'There is a big gap between the water supply quality and what we need to do in order to make [the sources] good [for our use],' he comments.

A multi-barrier approach to water treatment is therefore used at the plant. Key aims of the treatment are to deliver both the microbiological purity and the alkalinity required.

Two treatment trains are used. The first comprises lime softening, with



Atlantium's new 'RZ' unit, as installed at the Central Bottling Plant (courtesy Atlantium).

flocculation, settling and sand filtration, followed by chlorine disinfection, activated carbon filtration to remove organics and chlorine, and then a polishing filter stage. As an extra precaution, because no chlorine is present in the polishing filter stage, an additional UV sterilisation step has been added. The second treatment train comprises sand filtration, chlorination, activated carbon and then reverse osmosis. Treated water enters a tank, so again UV has been added, circulating water from the tank through this. Water from the two trains is blended automatically to achieve the alkalinity required.

UV treatment at the plant is provided by systems from Israeli company Atlantium. The Coca-Cola plant was one of the first locations to get the company's original technology, around four years ago. This, the 'R' series, features a medium pressure UV lamp located out of the water, and was installed in the first of the treatment trains. Around a year ago a new 'RZ' series unit was added to the second of the treatment trains. This retains the key features of Atlantium's technology, but has the lamp in the water, a configuration that makes it suited to larger applications such as the municipal market. Atlantium only launched its small-end RZ units on the market in recent months and is now rolling out larger units.

Key features of Atlantium's technology are that water flows through a quartz tube and that UV light is projected along the tube, using the phenomenon of total internal reflection to keep the UV light in the tube. This creates what the company describes as a 'killing zone' that ensures there is uniform effective disinfection. Also, two UV monitors are used, one to measure the UV emission of the lamp, the other to measure UV in the water, allowing direct online measurement of UV transmission.

When the plant decided to stop using preservatives, Coca-Cola set a stricter water quality standard, reducing the microbiological standard from 25 colony forming units (cfu) per ml to 100cfu / 100ml for water

The Central Bottling Plant site, Israel (courtesy CBP).



entering the product. The UV system helps ensure this is met. Atlantium's international food and beverage sector director, Rotem Arad, explains that the company puts a lot of effort into the detailed sizing of installations. As a result, it guarantees what its units will achieve. At the Coca-Cola plant that means better than the standard. 'They are more than partnering us – they are challenging us,' he comments.

Atlantium will potentially be able to help Landman further in his search for greater efficiency at the plant. For example, Vice-President of R&D Itzik Rozenberg explains that his team is working on applying the technology in cleaning membranes. They are looking at different types of water and different conditions with the aim of giving tools to their sales and marketing colleagues so that they can give guarantees about system performance. 'We are putting a lot of money into it... We have more than an initial [indication] that we can give something to the industry,' he comments.

Other new technology used at the plant includes the water quality monitoring equipment provided by Blue I Water Technologies, another Israeli company. Its multi-parameter systems can measure up to eight parameters, including chlorine, acid, base and turbidity. Important features of the equipment are that it provides colorimetric analysis using a reaction cell of just 10ml and, thanks to a new algorithm, can give results every two minutes for free chlorine (to 0.02mg/l) and total chlorine (to 0.03mg/l).

The newest of three units at the plant was only installed complete with new algorithm in June, to provide a final check of the treated water. The first unit was installed four years ago to check the chlorine removal by the carbon filters. The second unit was installed two years ago to ensure no chlorine enters the reverse osmosis membranes. Both these earlier units have been upgraded with the new algorithm.

Further improvements will be needed at the plant. The water use ratio at the plant, i.e. the amount of water used per unit of finished product, used to be 1.55. This rose to 1.63 when the plant switched to using no preservative. It was back down to 1.52 by 2008, and now stands at 1.41, with a goal of 1.3. 'We are not far away from top in the world,' comments Landman, adding: 'We think we can be first.' Technology is playing its part in these improvements, but it will be as much about improving everyday operational decision making. 'Management can't [do it] without technology; technology can't without management,' says Landman. ●

Extending Israeli reuse in the urban environment

Israel is well known for its extensive reuse of wastewater, with this focused on reuse in agriculture. But reuse can also help reduce stress on resources in an urban context. A new project in the town of Ganei Tikva, to the east of Tel Aviv, looks set to do just this, at the same time providing a valuable example of how wetland-based treatment systems can be integrated in an urban environment.

The project is based around a development of 550 residences that have been constructed to allow collection of grey water. The intention is that water in the 100m³/day system will be collected in an underground settling pond to separate out any non-degradable material. The water will then be pumped to the top of a constructed wetland treatment system and will flow down through this by gravity. It will be collected in a reservoir and, after UV treatment, will again be pumped to the top of the system, this time to flow down through an ornamental pond. Excess flow will be drawn off and used for landscape irrigation around the development.

The heart of the system is the

natural biological treatment system. This comprises 96 cement cells each 4m by 4m and 0.8m deep. This configuration was chosen to fit the project architect's concept of the site, but need not have used this number of cells. Similarly, the plants, featuring Cyperus sedges, irises, sedges and Butomus flowering rushes, were chosen both for their role in the treatment system and for aesthetic reasons.

The accompanying ornamental pond is approximately 900m², with the inlet water quality to this set at 5mg/l BOD, 5mg/l total suspended solids, and a zero value for *E. coli*.

The system was designed by Eli Cohen, of Ayala Water & Ecology, who is working alongside Syrkin Buchner Kornberg Consulting Engineers. The project looks like it is nearing completion, with the cells all planted and the ornamental pond due to be sealed, but some significant hurdles need to be overcome despite go-ahead for the project having been given seven years ago. The pumps and electromechanical equipment still need to be installed and a significant sum of money is needed for the project to be completed. Also, Cohen explains, the project is still awaiting approval by the Ministry of Health. The Ganei Tikva project is relatively large, is in the centre of a town and involves ornamental use, and Cohen describes it as 'the first in Israel of this kind'. The ministry is, he says, 'afraid of the different concept'. In the meantime, grey water from the residences is routed to the sewer and the plants of the natural treatment system are being watered by mains water.

Nonetheless, Cohen is optimistic. The project has been built with the contingency that flow can be drained from each stage to sewer if need be. The plant may even have to be operated using mains water initially to ensure confidence around the scheme. And, Cohen points out, the town's mayor, who has pushed the project from the start, has said he will have the system put into use in any case.

Cohen can have wider cause for optimism too. His systems have been used to treat demanding wastewaters such as leachate and dairy farm and oil industry wastewaters. He does also have grey water systems in Israel, at the Ampa Business Center in Tel Aviv and at the 'Poleg' residency near Netanya. And his philosophy is very much in tune with modern water management

Planted natural treatment system at Ganei Tikva and, BOTTOM, schematic of treatment system and ornamental pond (courtesy Ayala).





thinking – the need to incorporate decentralised treatment in urban areas to help relieve pressures on the centralised systems, and the potential for

natural treatment systems to help enhance the urban environment.

‘I have a lot of confidence... It is going to happen,’ says Cohen. ●

Emergency support for Jerusalem’s supply

A computer-based decision support system to help operators know how to react to a contamination incident in the supply network is being developed for the city of Jerusalem. The system is being built by Tahal Consulting Engineers for Hagihon, the Jerusalem Water and Waste Water Works Corporation.

If control room operators are alerted that a contamination incident has or is thought to have taken place, they will be able to flag up where the contamination has occurred. The system will rapidly model the spread of contamination through the network. It will then provide the operators with the location of the valves that field teams should close in

Earlier Israeli grey water treatment system, at Ampa Business Center, Tel Aviv (courtesy Ayala).

order to minimise the spread of the contamination, allowing for the time it is likely to take the teams to reach the valves.

Work has been underway on the system since the start of the year, developing a pilot system covering much of the network. This is due to be installed shortly and will then be tested, hopefully to be followed by expansion to the rest of the network.

The first component of the system is the input data. This includes the physical properties of the network along with three seasonal demand scenarios. It also includes input of information on when and where the contamination occurred, the length of simulation required, starting conditions such as tank levels, and any actions already taken.

The second component is the hydraulic simulation, using Tahal’s Hadmaya software, coupled with a ‘tracer simulation’ model also developed by Tahal to project contamination spread. There is a topography variation of 350 metres in the Jerusalem network and 30 separate pressure zones. ‘The topography is very complex,’ comments Yaron Gerfen, head of the Comprehensive Design Unit of Tahal’s Water Resources and Planning Department.

The third component is the user interface, designed for the system to be easy for operators to use. For example, in an emergency situation, two kinds of devices can be defined – reservoirs or external sources such as regional network connections. Users can adjust pre-set conditions based on their knowledge of the network at the time of the incident. The same interface can also be used in non-emergency situations, for example to carry out routine checks.

The final component is the graphical presentation of results. As part of this, a ‘polygon’ defining the area limited by the valves identified for closure will be exported to Hagihon’s own GIS system to support implementation of the action. Defining this polygon might have taken eight hours previously, says Gerfen; now the simulation is ‘instant’.

The result, says Gerfen, is ‘a stand-alone decision support system with no external hydraulic tools’ that will be able to reduce the time needed to react, reduce danger, and reduce financial losses.

The key innovation is in how the elements have been combined. ‘We are connecting a few components that, when connected, creates a tool that helps you get decisions in a critical time,’ says Gerfen, adding that such a tool is ‘valid for anyone in the world, not just Jerusalem’. ●

Jerusalem, for which Tahal is developing a computer-based system to predict spread of contamination of the water network (picture KH).



Israeli expansion of AMR

Israel is extending its use of automated meter reading (AMR), building on the success of what is said to be the world's largest fixed AMR system, in the town of Petach Tikva, to the east of Tel Aviv.

The Petach Tikva system was installed around four years ago by Israeli company Arad Technologies and includes 74,000 meters. The system uses fixed equipment to gather and transmit meter readings, as opposed to using hand-held or drive-by readers. Further recent work involves installing the technology in three towns in the north of Israel: 3000 meters in Kazrin and 600 meters in Metula, all installed in the last few months, and 9000 meters in Kiryat Shmone, which are currently being installed. The company has also so far installed around 6000 meters out of a total of 34,000 for the town of Kfar Saba.

These systems are built on Arad's water meters. Every Arad meter has a unique barcode and reference number. All the electronics are contained in the meter, including a transmitter / receiver and a battery, so that no external wiring is required. The meters are generally pre-set to transmit a reading every 30 seconds, at which rate the battery has a life of ten years. The meters operate using 916MHz radio

Arad repeater unit installed on a lamppost as part of the Petach Tikva fixed AMR system.

transmission, and can transmit up to around 2-2.5km based on line of sight. Data is collected at 'concentrator' units and transmitted usually once or twice a day via GPRS transmission back to Arad's servers. Eight concentrators are used in the Petach Tikva network. 'Repeater' units are placed as necessary to relay data between meters and concentrators, with each repeater able to serve up to 500 meters. Smaller 'sub-readers', serving up to 20 meters, can also be used if there are transmission black spots. Arad's wireless system can also be used to upgrade mechanical meters, retaining the wet side of the original meter, but replacing the mechanical register with the wireless one.

Arad's meters include a number of features to allow better management of the network. The meters are designed to signal an alert if there is a suspicion of tampering, such as the customer using a magnet to try to disrupt the reader. An alert is raised if the meter remains static for a period, usually set at

seven days. An alert is also raised if the meter is reversed in an attempt by the user to cheat the billing system. And an alert is raised if there is flow throughout the day, possibly indicating leakage.

Petach Tikva's metering staff receive the alerts and use them to programme further investigation. Generally the alerts are provided twice a week but the system can transmit them immediately, by email, SMS or fax, if, for example, tampering using a magnet is suspected.

A further important feature of the Arad system is that, once the data has been received at its server, all customers are able to check their consumption online. This will be particularly valuable given government plans to increase charges across the country this summer for use above a certain level.

The Arad system is also helping Petach Tikva in its leakage management efforts. Leakage in 2008 was put at 5.48% (891,000m³), down from 8.38% (1,317,000m³) in 2004. ●

Push begins to export Israeli water security

One Israeli company, Whitewater Security, is now looking to take the country's combined expertise with water and security to water utilities around the world, particularly those in developed countries. 'In 2007 the Whitewater Group got a mandate to start sharing Israel's [experience with] security,' explains Rani Weinberg, senior assistant to Whitewater Security's CEO, Dovev Lewinsohn. The company has packaged this expertise around its core product, the WaterWall security management system. It is currently working to implement this in two locations in Israel, but has this year been making presentations around the world, notably in the US.

Weinberg explains that the company offers a 'comprehensive solution', based on the pillars of prevention, protection, detection, crisis management, and recovery tools. Detection is a key step, with Weinberg describing it as today's 'biggest concern'. Consequently, for this aspect Whitewater Security has developed its 'BlueBox', which is a sophisticated computerised event detection system. This gathers data from the water supplier's water quality sensors and, using comparisons with historical trends, recognises abnormal behaviour.

The challenge is how to manage all these aspects, and this is where

WaterWall comes in. This is used as the hub of a water utility's security management. It has been designed to address three needs: to unify security-related activities, to act as an early warning system, and to provide a means of managing events. It comprises a computer, keyboard and three large screens, used to present video images, a GIS map view, online graphs of water parameters and an event management screen. 'Any existing data should get to the system,' comments Weinberg, meaning some 190 different possible sources, such as water monitoring data, surveillance images, and plant SCADA systems.

All of this provides the operator with a platform for making security decisions. For example, the operator can cross-check alarms with maintenance schedules to assess whether activity might be expected at a location. The system also feeds the operator with a list of tasks to carry out, such as dialling information for relevant people to check with. There is 'always a synergy' between the human decision and the system decision, says Weinberg.

The company sees great potential for what it offers. 'It addresses a big gap,' comments CEO Dovev Lewinsohn.

Weinberg notes that it is not just direct utility interest that will drive take-up: 'Perhaps our biggest push will come from insurance companies – maybe.' ●

