



The hydraulic design uses the system's pressure to connect three Lagos village areas to water tanks.

Hydraulic Leap Forward

By Craig Stanners

Hydraulic network provides Lagos with a reliable water supply

According to the United Nations, Nigeria's population is expected to surpass that of the U.S. by 2050, to become the world's third most populous country. Former capital Lagos with a current population of around 21 million—more than double that of a decade ago—poses a massive burden on the public water system.

A group of islands bestowed with creeks and a near 2,500-sq-mile lagoon, Lagos has a massive endowment of water, but haphazard development of Africa's most populated city not surprisingly means that there has been an acute potable shortage.

The recent connection, though, of three areas to a new hydraulic network could present Lagos and other rapidly growing cities with a cost-effective opportunity to create, manage and maintain a reliable water supply.

A Hydraulic Solution

It is fair to say that there is a fear or at least a lack of understanding of hydraulics—the world over, not just Nigeria. When presenting the design, the consultant admitted that it was quite unlike anything they had seen before, yet the mathematical equation of water movement through gravity, gradients, pressure and flow goes back to the Romans.

The task was to revolutionize two distribution networks in order to create a brand new system that would connect three village areas to a water tank, plus one super tank. Agbowa/Itoikin, Isashi, and Iganke/Ajebo/Ago all had suffered from sizable pressure and flow management issues, with an outdated distribution system long abandoned.

Use of numerous pumps to revitalize the network had been considered, but capital cost, ongoing maintenance and an unreliable or non-existent electricity supply ruled this out for these three outlying locations of the seemingly never-ending Lagos sprawl. Covering a distance of 4.5 miles, with inclines of up to 240 yd, the hydraulic design—incorporating the use of multi-functional control valves—seeks to utilize the pressure that already is in the system. In the past, a significant investment was required to get the water in there in the first place; therefore, a hydraulic system will utilize the power (sometimes up to 40 bar or more) that already is there. In areas without any gradients, pumps are a necessity, with variable-speed drives offering the most flexibility for energy efficiency and longevity.

With aging networks, there arguably is more fear of the existing system bursting and leaking than the thought of switching over to hydraulics. But in Nigeria, after years with seemingly no alternative and little to no consistent potable

supply, the Lagos Water Corp. has opted for hydraulics in this project because other systems could not meet particular configuration requirements or budgets. Raw water from reservoirs and water courses to the villages' tanks and super tank had to be connected in a highly controlled manner, and there was simply no option, especially with power shortages and additional ongoing maintenance requirements to have pumps running 24/7.

Embracing New Technology

Unfamiliarity with the hydraulic design led to some reservations prior to the switch-on. Reputations were at stake, so to allay any fears, the project team made sure that it was present at each location to help commission the new valves into the network and offer detailed advice as well as training. Representatives from the Lagos Water Corp. had placed great trust in what was quite a bold move.

When the green light was given to start the pumps at the source location, the project team waited for the system to charge the full length of the network. As the water entered the first tank in a calm and controlled manner, corporation representatives jumped for joy. These heartwarming emotions underlined just how special it was to supply fresh potable water to the villages.

In no time at all, people emerged to gather the water in almost anything they could find to carry it. In addition to providing fresh, safe drinking water to the three villages for the very first time, production costs also have been reduced and the network operation is now streamlined.

Pressure and network management is a global problem affecting almost every water company and municipal provider. Nigeria faces huge infrastructure challenges, especially in regard to water, but as Africa moves forward with its development, this hydraulic connection demonstrates how a negative water management situation can be turned into a positive solution that properly distributes and sustains a valuable supply.

There has been so much enthusiasm for harnessing Lagos' endowment of water that a new phase of the project already is moving forward with proposals to use the differential pressure in the new water system to create power for much-needed street lighting. The potential is enormous. [www](#)

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The system offers a cost-effective opportunity for rapidly growing cities to maintain a reliable water supply.