

Modular reservoirs

CEMENT & CONCRETE

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Corestruc's development of a novel precast system provides a faster and more cost-effective alternative to in situ methods when constructing large reservoirs.

Corestruc is preparing to manufacture and install a 25 Mℓ and two 10 Mℓ precast concrete reservoirs. This follows the recent successful deployment of the company's unique modular system on two 10 Mℓ reservoir projects in Mpumalanga.

Willie de Jager, managing director, Corestruc, says the projects provided an important opportunity for the company to refine the technology. "We are now confident that we're able to complete a 10 Mℓ reservoir in about six weeks, by enabling the construction of the floor, walls and roof simultaneously," he explains, adding that with conventional in situ techniques, the typical timeframe is four to six months.

Corestruc first installs the centre portion of the roof system, comprising precast concrete columns, beams and hollow-core slabs. The process starts with the installation of the columns on to the in situ bases and it generally only takes four working days to build the centre portion of the roof of a 10 Mℓ reservoir.

Once the ring beam has been completed, the wall panels are dispatched to site. They are placed on top of the ring beam using a mobile crane. The first panel is supported by props that are removed once it has set and the remaining elements are then placed against the other to complete the wall.

A 10 Mℓ reservoir wall consists of 60 panels, each weighing 8 t and measuring 9.8 m in length and 1.9 m in width. This is in addition to four 11.7 t buttresses, containing numerous cast-in steel components that reinforce the structure.

Post-tensioning design

Perfecting the design of the grouting and post-tensioning process took more than five years from conception. Notably, vertical and horizontal tensioning are used to resist applied forces. This is opposed to conventional construction methods, where reinforcing and post-tensioning are used to control rather than resist applied forces.

"About 6.6 km of post tensioning ducts and cables have to be installed by hand between the joints of the wall panels in preparation for the grouting. This is in addition to numerous 3D-printed components to secure the rubber cast that acts as the temporary shutter," explains Tian de Jager, technical director, Corestruc.

The grout has been designed to reach a compressive strength of 100 MPa within four days and to further react when the medium comes into contact with water. It has to be extremely flowable, so that it can be pumped through all the post-tensioning ducts from a single position, using two pumps.

ABOVE LEFT The first panel is supported by props that are removed once it has set and the remaining precast concrete elements are then placed against the other to complete the reservoir wall

The working time of the grout is extended by cooling it down to 7°C and it takes up to 40 hours in a continuous process to pump the grout around the entire circumference of a 10 Mℓ reservoir.

While the cost of the system is comparative to in situ techniques on smaller structures, it provides a more affordable means of constructing larger reservoirs.

"This is where the real value of our system will be realised, considering the growing backlog in water infrastructure and the pressure municipalities are under to better manage their dwindling budgets," De Jager concludes. ❦

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Corestruc is the leader in the design, manufacture and construction of Precast Concrete structures.

Our solutions have been deployed on a host of successful projects, including reservoirs, water-treatment works, stadia and bridges, as well as commercial, retail and industrial property development.

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