



Three Gorges Dam has a locks system as well as a shiplift system.

RISING TO THE CHALLENGE OF CLIMBING A RIVER DAM

The advantages of having a dam across a river was my topic last week. For a dam improves livelihoods for those living near it and boosts the growth of civilization.

But however useful a dam may be in combating floods and harnessing renewable energy, it would be pointless if it does not allow river navigation traffic and hinder mobility and the transport of goods.

Engineers soon found ways to deal with the situation.

Like on a canal, they built locks to enable vessels to pass. The locks are compartments built in the waterways at the side of the dam.

As river boats cannot climb inclines we need mechanical devices to allow the passage of vessels.

A typical system of locks will have about five compartments. Each compartment can be separated from the next through movable steel gates.

Imagine a river boat traveling upstream. A boat enters the first compartment and the gate behind it closes. The gate in the next compartment then opens to allow the water level to rise, and the boat enters compartment two. The process is repeated and the vessel travels upstream as if it is climbing stairs, slowly and surely, to reach the higher level.

This method was already used in the Panama Canal, and the marine traffic is regulated to ensure two-way traffic with best efficiency, with vessels traveling in convoy.

As the process of balancing water levels in adjacent compartments take time this tends to be slow and the throughput small, and navigation soon reaches a maximum capacity and additional facilities are required to meet the ever-increasing traffic.

A new shiplift to augment the existing lock system allows a vessel to pass



Nuts and bolts

Edmund Leung

through the Three Gorges Dam in less than an hour, compared to four hours required by a lock system.

The principles of the shiplift are similar to that of a giant elevator, which is capable of lifting a 3,000-tonne marine vessel and traversing a height of some 110 meters – equivalent to the height of a 40-story building.

Compared to a building lift this is a mammoth piece of machinery. It took a team of local engineers supported by European specialists to conceive the design and some 20 years to build and test the system before it was commissioned in 2016 for commercial operation.

To ensure safety, the shiplift uses a continuous toothed rack system instead of cables to allow a vessel to stay in position without risks of slipping or falling in the remote event of a power failure. Such occurrences will be extremely rare, as the dam has a huge hydroelectric power station right at its foot.

With the lock system catering for smaller vessels and the shiplift for larger vessels and those carrying passengers, the throughput of river traffic is now significantly enhanced.

Locks and shiplifts are proven devices for negotiating through dams and canals, but the enormous size of this system used in the Three Gorges Dam places it rightly in the champion position for size.

It is innovation, with continuous enhancements, that makes huge infrastructure the reliable servant to our community, fueling growth and prosperity for those living in its vicinity.

Veteran engineer Edmund Leung Kwong-ho casts an expert eye over Hong Kong's iconic infrastructure