FUSEGATE NEWS

N° 14 - November 2008

FUTURE OF DAMS

History has shown that hydraulic structures have played a key role in the development of civilisation as we know it and their role will gain in importance in a changing world where water resources will become even more stressed than before with the development of concomitant challenges such as oil price, population growth, climate change and public awareness.

The major problems in the next decades will certainly be the safe supply of ecological and renewable energy as well as the supply of water of good quality and sufficient quantity in order to meet even existing needs in a sustainable manner. Flood protection measures are also an important application of dams and become more vital for many regions of the world considering the population growth combined with the greenhouse effect. Signs of stress and strain are apparent across every sector: health, ecosystems, cities, food, industry and energy.

Besides those basic needs has emerged a growing demand for more safety, which focuses attention on the needs of existing ageing dams. Environmental and social awareness also complicates the authorization process for new reservoirs development. It is nowadays the often difficult responsibility of the designer to develop ideas to ways to meet the basic needs whilst coping with these challenges and constraints.
Hydroplus can assist engineers to meet these challenges since the Fusegate system can improve the efficiency of existing schemes by providing more storage capacity with no significant modification to the dam and limited social and environmental constraints. Such improvement complements the construction of new dams and contributes actively to sustainable development. Moreover, the use of Fusegates can also provide attractive solutions for bringing undersized spillways in line with modern safety standards.

Model tests at Canton Dam

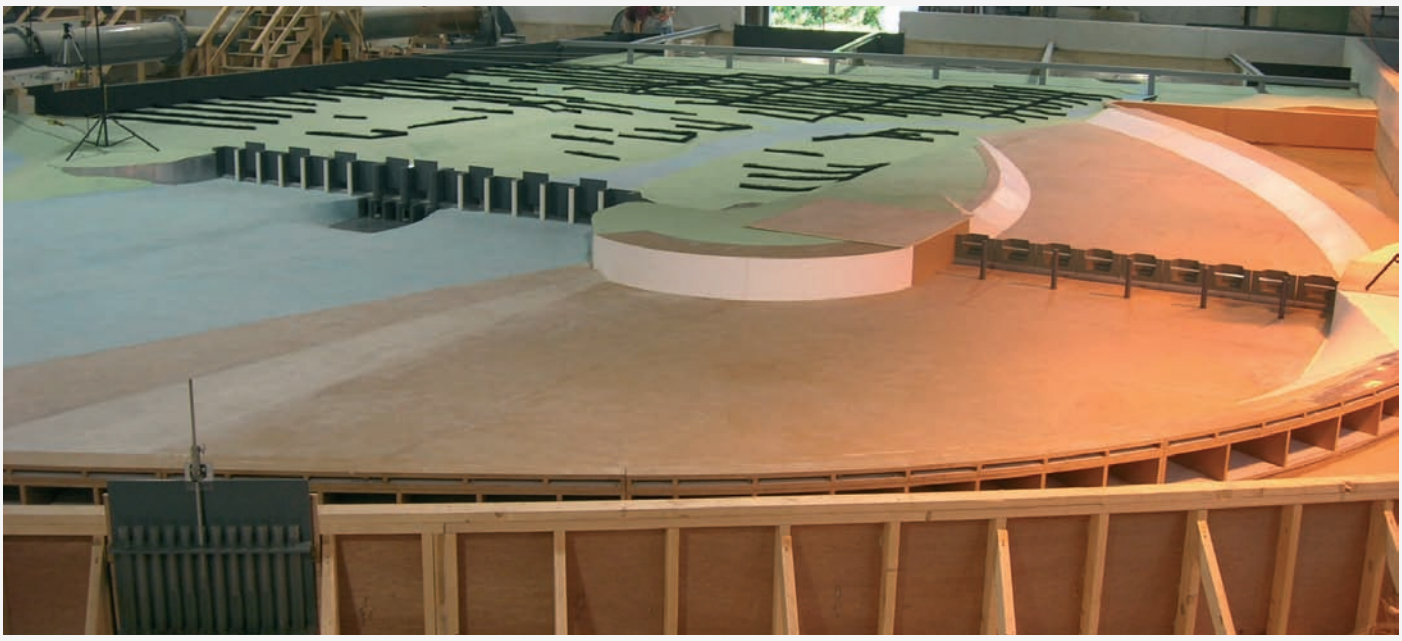
The US Army Corps of Engineers, Tulsa District, has decided to increase Canton Dam's spillway discharge capacity by adding a Fusegate-controlled auxiliary spillway. The first stage of the project consists in performing combined physical and digital modeling to determine the optimal position for the proposed auxiliary spillway required to safely discharge the revised probable maximum flood (PMF).

A computational fluid dynamics (CFD) model study was carried out for six configurations to investigate flow patterns, water surface elevations, and flow-rate splits between spillways. Maximum reservoir levels ranged between 0.37m and 1.14m above the targeted elevation partly because the service spillway's hydraulic efficiency was slightly less than anticipated.

Following the CFD modelling process, a physical model was built at a 1:54 scale, which serves to fine-tune the auxiliary spillway configuration, derive the flow pattern, and ensure that the Fusegates evacuate when they are tipped. The model Fusegates will not be self-operating since the US Army Corps of Engineers has now gained sufficient confidence in operating the system.

The physical model reproduces the two spillways and a sufficient distance upstream to accurately model approach flow patterns and downstream to achieve accurate representations of tail-water levels and flow patterns. At a 1:54 Froude-scale model, the physical model dimensions are 33m x 21m; the PMF flow rate of 17,800m^3/s prototype scales to 830l/s. The model Fusegates will be large enough (17cm high, 30cm wide) to accurately simulate their geometry, mass and mass distribution, and resistance to motion.

Advantages of this dual digital and physical model approach are that numerous modifications of the approach channel can be made easily until a satisfactory configuration is achieved and that computation of the flow field will cost comparatively less than additional physical model runs once the digital model is set up and available.



Physical model with auxiliary spillway equipped with Fusegates at the right and service spillway at the left.

Fourth Contract Award to Hydroplus Australia

Little Para's existing service spillway and to it's left position for excavation of new Fusegated auxiliary spillway.

In October 2008 SA Water awarded Hydroplus Australia with its fourth contract in Australia for design and construction of five 6.5m high labyrinth crested straight Fusegates for a new auxiliary spillway.

The project is part of a dam safety upgrade for Little Para dam on the Little Para river approximately 40km inland from Adelaide. Consulting engineers GHD (Melbourne) determined that the Fusegate system offered a technical benefit (improved reliability and accuracy of operation over a number of fuseplug alternatives developed) at a lower capital and operating cost. The System for Little Para is designed in such a way that under a joint probability flood analysis the auxiliary spillway is not operated until a flood of probability approximately 1: 1300 years occurs and the first Fusegate doesn't tip until a flood of probability approximately 1:60 000 years occurs.

According to Bill Hakin (regional director Hydroplus Australia), the design approach for the Little Para is unique in that for the first time, the Fusegates will be built in stainless steel rather than mild steel or concrete. "This has only become possible due to the fairly recent arrival on the market of duplex stainless steel" says Bill, which offers similar corrosion resistance to Gr 316 but at a much lower price point. As a result the units will be manufactured in a fabrication yard over a four month period and assembled on site over just one or two months in the middle of 2009. "Not only does this innovative approach reduce construction risk and site administration overheads but SA Water were keen to reduce the project's carbon footprint to a minimum and the duplex stainless approach achieves these results admirably" observed Van Kennewell (SA Water's project manager).

A First contract in Greece

Once it is completed, the Dafnozonara dam, part of a hydro-electric power plant located on the Aheloos river in western Greece, will have a power-generating capacity of 8.50MW.

Terna Energy SA, the owner of the dam, decided to optimize the structure's performance without upgrading the dam crest; as a result, they selected the Fusegate system for its cost-effectiveness and low maintenance requirements. Comparative cost studies have shown that Fusegates can increase the return on investment on a project by a factor of two.

The project calls for the installation of an auxiliary spillway consisting of nine straight steel Fusegates, each 3.30m high and 6.67m wide and weighing 8 tonnes. The project is set to be completed in February 2008.

This contract caps a fruitful partnership between Hydroplus and Raypcap Corporation, a Greek manufacturing and service company. It also confirms the Fusegate system's potential as a means of increasing power-generation at hydro-electric power plants.

Dafnozonara dam under construction.

Upgrading the Goéland and Vigies dams

The Goéland and Vigies dams are used to supply water to the town of Saint-Pierre in the Saint-Pierre and Miquelon islands, France. Following a diagnostic study by CEMAGREF to assess the safety of the two dams in 1998, a decision was made to rebuild the Goéland dam and to upgrade the Vigies dam.

The Conseil Général de Saint-Pierre et Miquelon, the regional authorities, have opted for a temporary increase of the storage capacity at the Goéland dam in order to compensate for the suspended operation of the Vigies dam during its upgrade.

The recommended solution calls for the installation of 8 Fusegates, each 0.60m high and 1.00m wide, on the crest of the new spillway. This configuration allows for a capacity increase of 20% while ensuring the safe discharge of the design flood.

Using the smallest Fusegates ever constructed, this project highlights their broad range of application: Fusegates are both a robust technology and a viable temporary solution.

Events

Dam Safety Management 2008
NANJING, CHINA
22 to 24 October 2008

2008 Conference ANCOLD
GOLD COAST, AUSTRALIA
12 to 14 November 2008

2009 USSD Annual Conference
NASHVILLE, USA
20 to 24 April 2008

Hydroplus
5, cours Ferdinand-de-Lesseps
92851 Rueil-Malmaison Cedex
France
Tel: +33 1 47 16 44 34
Fax: +33 1 47 16 42 12
E-mail: contact@hydroplus.com