WEEG NEWSLETTER January 2019

The newsletter is published monthly by the University of Southampton's Water and Environmental Engineering Group WEEG, and reports things of interest in this field worldwide, as well as ongoing undergraduate student and research work in WEEG itself.

We believe that water and energy are the most important topics worldwide for the next decades. Our work covers river and coastal engineering, water and wastewater and energy related to water.

Editorial: Tailings dams... if and when these words are uttered, most hydraulic engineers look blank. Those who do know, try to look somewhere else. So, what are tailings dams and why do we not want to hear about them? Read on, then read the international news...

Hydraulic Engineering International: *tailings dams*

Tailing dams are earth dams built to contain the by-products from mining operations. They are usually made up from the dead material removed from the mines and contain slurry, or liquids, and more often than not toxic material. Fig, 1 shows a typical dam.

Fig. 1: Copper mine tailings dam

The dams are not built as one structure, but construction begins with a starter dam, with a low height. When this reservoir is filled up, the height is then subsequently increased, in steps, as the tailings accumulate. The actual structure depends very much on the location, the material available, the type of tailings and of course the costs. The dams can be very large: the Syncrude Tailings Dam in Canada has a height of 88 m although most dams are in the 20 to 50 m range.

Because the dams are built from mining material, which can be quite inhomogenuous, and not in one piece, it is difficult to engineer them properly. In addition, they are often constructed in remote areas. As a result, failures occur frequently at a rate of 2 to 5 per year. Fig. 2 shows a dam failure at an iron ore mine in Hungary. The consequences of failure depend on the height of the dam and the reservoir volume as well as the type of tailings. In the 2000 Baia Mare cyanide spill in Romania, the tailings of a gold mine where the highly poisonous cyanide is employed to separate the gold from other metals were released.

Fig. 2: Kolontar dam failure 2010, Hungary

Around 100,000 m^3 of water with cyanide and a collection of other metals spilled into the Danube, killing large numbers of fish and endangering the water supply for 2.5 million people in Hungary. Fig. 3 shows another dam failure in Brazil in 2015.

Fig. 3: Samarco mine dam failure (Minas Gerais Province, Brazil)

Fig. 4: Bridge destroyed by flood wave, 25.01.2019

The most recent tailings dam failure occurred in Brumadinho, Minas Gerais Province / Brazil on 25.01.2019. Fig. 4 shows a bridge

destroyed by the dam break. At least 60 people were killed, and more than two hundred are still missing. Improved oversight is urgently needed for these structures.

3rd year Module: *Applied Hydraulics CENV3063*

In Year 3, Civil and Environmental Engineering Students take the Applied Hydraulics module, which contains several topics taken from engineering hydraulics such as unsteady flow, advanced numerical modelling, hydropower and a set of laboratory experiments. The latter include one basic experiment with Oscillating Water Columns (OWC), and one advanced test which is usually taken from ongoing experimental work in our laboratories – this year, the students looked at the drag coefficient for fence weirs.

Fig. 5: The OWC experiment

Module coordinator: Dr Gustavo de Almeida, email: G.deAlmeida@soton.ac.uk

3rd Year student Project: *The Fitz Waterwheel Company*

Not many people are aware of the fact that waterwheels were very common in the United States in the 19th and early 20th century.

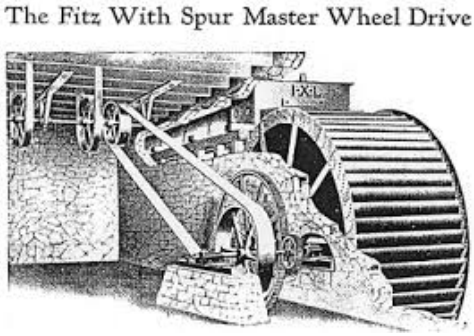

Fig. 6 Fitz Waterwheel

They served to grind flour and grist, but also to provide mechanical power for textile mills, to pump water for irrigation and municipal water supplies, and to generate electricity. Fig. 6 shows a typical overshot wheel to drive machinery, as can be seen by the overhead transmission shafts. The Fitz Waterwheel Co. of Hanover, Pa built several thousand water wheels until 1964! Unfortunately, not much is known about the company, or the water wheels it built. So, in this project we will try to accumulate as much information about the Company as we can – and of course, will see whether we can learn something from that.

Fig. 7: the 50 ft wheel at Fair Water, Wisconsin.

Fig. 7 shows the largest wheel built by the company, a 16.7 m diameter, 3.3 m wide, 140 HP / 103 kW wheel built for the Fairwater Electric Company in 1929. Contact: Dr G Muller, g.muller@soton.ac.uk

Jobs in water engineering:

This gives you an idea of the type of work you can do when working in industry.

Advert: A topical job given the theme of this month's Editorial

Assistant Civil Engineer - Rivers, Dams and Maritime - Atkins

https://careers.atkinsglobal.com/job/assistant-civil-engineer-rivers-dams-and-maritime-jobid-if-002513?src=jb-11800&utm_source=jb-11800&src=JB-11800

Civil and Environmental Engineering at Southampton University:

WEEG: the Civil and Environmental Engineering pathway offers the chance to deepen your knowledge in water-related areas, and gives you a better preparation for environmental engineering projects.

Contact: Prof Sonia Heaven, s.heaven@soton.ac.uk, Bldg. 7, Room 5004

Further information:

We have two Facebook pages, which provide a logbook of our laboratory activities:

www.facebook.com/Hydraulicslaboratory/

www.facebook.com/environmental.lab.university.of.southampton/

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