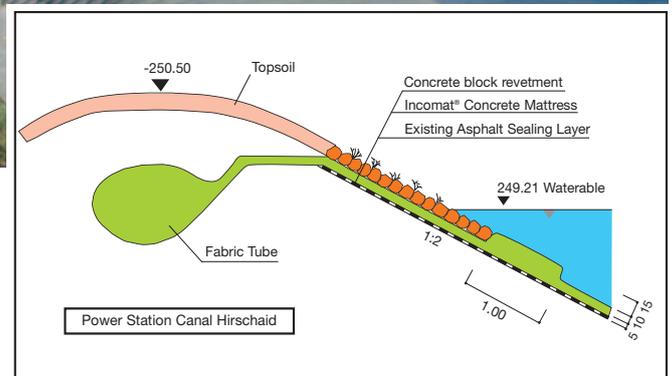


Restoration of the Hirschaid Power Station Canal with Incomat®-concrete mattresses



Background

The Hirschaid hydro power station is situated approximately ten kilometers south of Bamberg, Germany, directly adjoining the Main-Donau-Canal. This power station, which was put into operation sixty years ago, is fed by a canal, bordered on both sides by embankments. Over time, the 5 cm thick asphalt sealing layer on the embankments has deteriorated and become permeable to water. Water seeping through surface cracks has reduced the stability of the soil embankments and necessitated the restoration of the facing layers.

Solution

Installation of an impermeable asphalt or membrane liner would have required the canal to be drained. Consequently the Nürnberg Waterways Authority decided on a special process developed by Colcrete-v. Essen Construction Company located in Rastede. Using this method, the old asphalt sealing layer was restored on the upstream embankment with a double-layered woven geotextile filled with impermeable concrete. **Incomat®** standard mattresses, provided by HUESKER Synthetic Company, was the geotextile specified by the contractor.

The concrete used in this case was made of sand and a slow hardening furnace cement, HOZ 35 L, in a special mixing process having a water/cement ratio of 0.5; this ensured excellent pumping of the mixture.

The **Incomat®** concrete mattress consists of two layers of fabric, woven from high tenacity polyamide and polyethylene yarns. The two fabric layers are joined by binder threads, which control the thickness of the filled mattress.

The pore size of the woven layers is designed to retain the concrete fines and yet allow the passage of surplus water from the fill material. **Incomat®** concrete mattresses can be installed above and below water (up to depths of 50 m) and can cope with flow velocities up to 2 m/s.

For this project **Incomat®** Standard, 3.75 m wide, was prefabricated into units 35 m wide by 15.9 m length.

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Each unit was divided by woven-in seams into ten filling sections.

After being laid on the embankment, the 35 m wide sections were joined using a portable sewing machine, thus producing a continuous sealing layer over the entire embankment surface.

The tensile forces during fill operation were contained by an anchoring channel at the top of the embankment, ensuring the mattresses did not slip on the 1:2 slope. The anchor was a fabric tube, 1.1 m dia., seamed to the mattress and filled with concrete.

Below the water line a 1 m wide strip of concrete mattress, 25 cm thick, was used as an abutment for a concrete block revetment. This type of revetment was a first in terms of design from the Nürnberg Waterways Authority. It is environmentally attractive, blending in well with the surrounding landscape.

Due to site limitations the concrete fill was prepared on a construction barge and pumped into the **Incomat**® mattress by a network of flexible hose. A diver monitored the work under water to ensure a complete filling of all the sections. The mattress was filled at a pumping speed of 6 - 8 m³/h. The entire construction project, including all ancillary work, lasted just six weeks and was completed in May 1991.

The Nürnberg Waterways Authority were very pleased with the speed of execution and the successful result.



Project: Hirschaid Hydro Power Station

Client: Nürnberg Waterways Authority

Constructor: Colcrete- v. Essen-Bau, Rastede

Year of construction: May 1991

Product: **INCOMAT**® - concrete mattresses



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