Annonce de conférence

Jeudi 14.02.2013 à 17:15, Salle GCC30 (Génie Civil)

Helmut Wannenmacher

Amberg Engineering AG, Sargans, Suisse

Niagara Falls Pressure Tunnel

TBM 2006

The Niagara Tunnel Facility Project in Ontario, Canada, is one of the most outstanding hydropower projects recently completed. The pressure tunnel with a nominal internal diameter of 12'800 mm is constructed with a final unreinforced concrete lining of 600 mm. The long-term stability of the final lining is ensured by a passive pre-stressed unreinforced concrete lining, designed for an operational static pressure of 13 bars, encountered at the low point of the tunnel. Upon installation of the final concrete lining, interface grout is injected at high pressure between the waterproofing system and the shotcrete lining to pre-stress the lining. Both the final lining and the rock mass are compressed by the applied grouting pressure.

The designed compression of the lining needed to withstand the operational water pressure depends on the strength, the deformability and the creeping parameters of the concrete lining and the surrounding ground as well as the shrinkage of the concrete lining and strain losses caused by temperature changes during watering-up.

The waterproofing membrane in place guarantees a full tightness of the pressure tunnel and acts as a seepage barrier.

The coextruded waterproofing membrane consists of four layers, a single layer of VLDPE, an electrical conductible layer of VLDPE, a non-conductible layer of VLDPE and an electrical conductible backing fleece. High-voltage measurements, upon installation, allow for a detection of any voids or defects of the membrane during handling and secure the installation of a watertight layer within the composite system. Considering the water tightness and pre-stressed concrete lining of the composite system, an adequate alternative is build, limited to an internal pressure of approximately 20 bars.

The pre-stressing process is a rather sensitive process in capturing the small strain rates of the lining in the various stages prior to watering up. Due to the length and size of the tunnel as well as the on-going tunnelling works, a completely new and improved monitoring method was developed. The sophisticated monitoring system combined with a grouting control system allows for the continuous detection of increment deformation within the range of 2/10 of a millimetre in real-time.

The back-calculated radial deformation from the strain gauge readings matches the measured deformation values form the scanner perfectly, indicating the overall applicability of the system and closing the circle from design to construction.

Rock mass failure 2007

La conférence sera donnée en anglais. Durée env. 45 minutes, suivie d'une discussion.

Prof. Dr Anton SCHLEISS