Engineering- and Hydrogeology of Danube Hydropower plant in Austria: HPP-Freudenau compared with former construction sites at the Danube

Gangl Georg

Verbundplan, A-1010 Wien, Parkring 12 or A-2102 Bisamberg, Fasang. 4, Austria

On the occasion of the termination of the construction work of the Danube hydropower station in Vienna (HPP Freudenau) this summer a brief review of the engineering geologic and hydrogeologic data are given. The results are compared with the geology of former completed hydropower plants at the Danube

General geologic situation

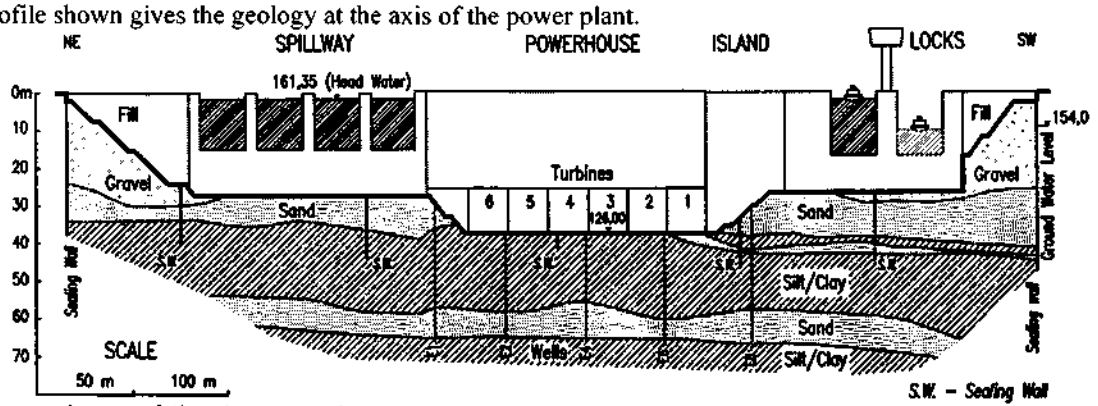
The Danube river crosses the Vienna Basin from west to east. In the west the Danube flows through the alpine Flysch zone, the basement fill of the tertiary soft sediments is the basis of the quaternary topmost gravel layer. The power plant is situated near the deepest part of the basin (Schwechat depression). The backwater of the plant reaches back to the Flysch zone in the „Wiener Pforte" to the next upstream hydropower station Greifenstein.

Geology at the construction site

Based on the detailed pre-investigations of drillings and soil mechanic tests the geologic sequence of layers was well known before the start of civil works:

- gravel up to 25 m (including the sandy and silty top layer and fill)
- sand about 10 to 15 m
- clay and silt layer called „Wiener Tegel" about 15 m thick and a further
- deep sand layer

As the construction of the new power plant has to be performed in the Danube river – the so called island construction mode was performed in two phases. For the construction pits cut-off walls to the depth of the clay and silt layer were constructed (up to 55 m below ground), dewatering of gravel and the fine grained sand has to be performed. Water pressure of the deepest sand layer was reduced by vacuum wells to prevent raising of the foundation soil of the power house at the time of excavation of the pit 20 m blow the river bed. The profile shown gives the geology at the axis of the power plant.



Hydrogeology of the impoundment area

As the water level of the impounded river rises up to 8 m, inudation of the surrounding land is prevented by sealing walls. 13 km of cut-off walls were constructed at the right river bank. Boxes were formed by double thin diaphragm walls up to a depth of 33 m. To garantuee the proper function prior to impoundment, tests were performed by impounding water in the cut off boxes checking the water losses. In order to maintain the groundwater regime unaltered the flow is regulated with the help of 21 pairs of withdrawal and recharging wells placed on either side of the walls. The clogging processes due to impounding has to be analized and the data of ground water modelling were used for the planning of the impoundment area.