THE HISTORY OF KŐBÁNYA AND THE KŐBÁNYA WATERWORKS

BUDAPEST WATERWORKS

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Budapest Waterworks

Budapest XIII, Váci út 182.
PO Box: 1397 Budapest, Pf. 512.
www.vizmuvek.hu
Failure notice line: +36-80 247 247
Call centre service: +36-1 247 7777

THE HISTORY OF KŐBÁNYA

The mine that the district of Kőbánya (literally: stone mine; quarry) was named after was already operational during the rule of the Ottoman Empire. Its stone was supplied to build the Calvinist church of Kecskemét and the church in Szada, and, later on, to a number of construction works around the capital city: to the Hungarian Academy of Sciences, ELTE University Library, St. Stephen's Basilica, Chain Bridge, Buda Castle Tunnel, and the several metres thick castle wall of medieval Pest. The extraction of resources reached its peak in the 19th century. An 1866 ranger report notes the shipment of 10 032 wagons of stone („1-1 square fathom of stone equals 3 wagons of stone"). There was an effort to utilize the church-sized, dry, easily accessible cavities that were left behind following the extraction of the high-quality stone. In the beginning, these were used by wine merchants who could store and stock their precious beverages tax-free outside the borders of Pest. (One can observe the beauty of a decorated, man-sized wine barrel carved out of marble at the cellar warehouse of Kőbányai Könnyűfémmű Kft., under Petrőczy utca 4).

Forrás: Fortepan / Semmelweis Egyetem Levéltára

Later, in the 1800s, following the establishment of brewing in Hungary (Breweries of Dreher Antal Rt., First Hungarian Stock Brewery, etc.), fermentation tanks and warehouses were placed in the cellars.

By the 1860s, the condition of several already out-of-production mines had deteriorated and started to disintegrate and crumble. Well-known mining engineer Vilmos Zsigmondy (who set the locations to drill artesian wells at the Margaret Island and the City Park) was tasked with the structural survey of the cellar system stretching under Kőbánya. Zsigmondy ordered the reinforcement and backfilling of several mines, both out-of-order and still operational ones.

The high-quality mineral deposits had got exhausted by the end of the 1870s, and the city leadership ordered the closure of the mines. Based on a 1913 report by the Budapest engineering office, a 33 km long cavity with a surface of 178 thousand square meter stretches under the Kőbánya neighbourhood. At the time, calculations concluded that 890 thousand people could find shelter in this labyrinth in case of an emergency (although, in today's standards, 5 people per square metre seems to be a bit too crowded).

The 20th century brought considerable prosperity to Kőbánya. More than 100 industrial factories moved here: pharmaceutical factories, a vegetable oil manufacturer, slaughterhouses, an industrial bakery, a cannery, etc. The first estate-like workers' housings were built in this area, for the factory workers and the thousands of people settling down here after the Treaty of Trianon. However, the destructions of World War II hit Kőbánya badly, too.

From the 1960s, the unhealthy colonies had been gradually demolished, replacing them with housing estates. The housing stock got doubled in three decades. As a consequence of this increased utilization, the underground, deteriorating cellars had become safety hazards.

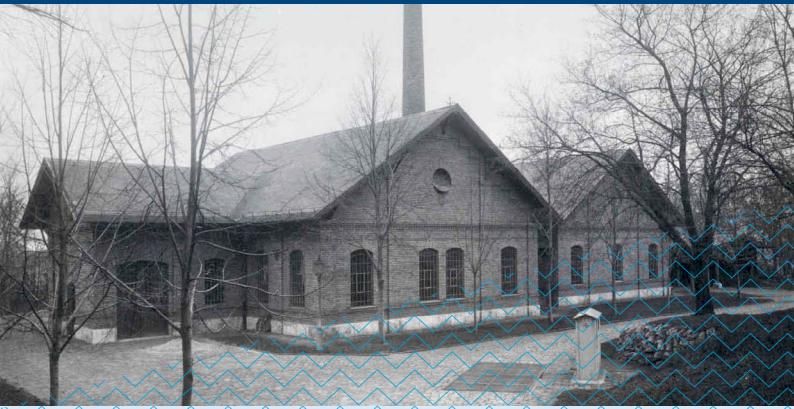
By the 1990s, the negative impacts of urbanization (buildings with high lateral earth pressure, vibrations of the above-ground traffic, frequent malfunctions of public utilities and them being undetected for a long time) created a situation that required bringing a Kőbánya Cellar Risk Prevention Programme into life in 1992, as part of the National Cellar Risk Prevention Programme (which concerned 43 towns and several hundred kilometres of cellars). During the implementation of this programme, several hundred million Hungarian forint was spent to explore, partially reinforce and backfill these cavities. In 1997, a cavity of a 1,2 km long, 5500 m^2 former stone mine was discovered 15-20 metres below the grounds of Óhegy park. These were used as shelters during World War II. Its entrances and air vents were filled up with rubbish and debris later on.

This large cavity complex was damaged at a number of places by water leaks and the lack of ventilation. Reinforcement and backfilling works started at the locations that endangered above-surface facilities the most.

Nowadays, the Municipality of Kőbánya is aware of the existence of a 32 km long, 195 thousand square metres cellar system. Besides the once-again fashionable Dreher Sörgyárak Rt., the Budapesti Likőripari Kft., Promontor-vín and a few smaller enterprises growing mushrooms in some cellar units, the district would like to make at least some parts of this vast labyrinth open to visitors on a regular basis.

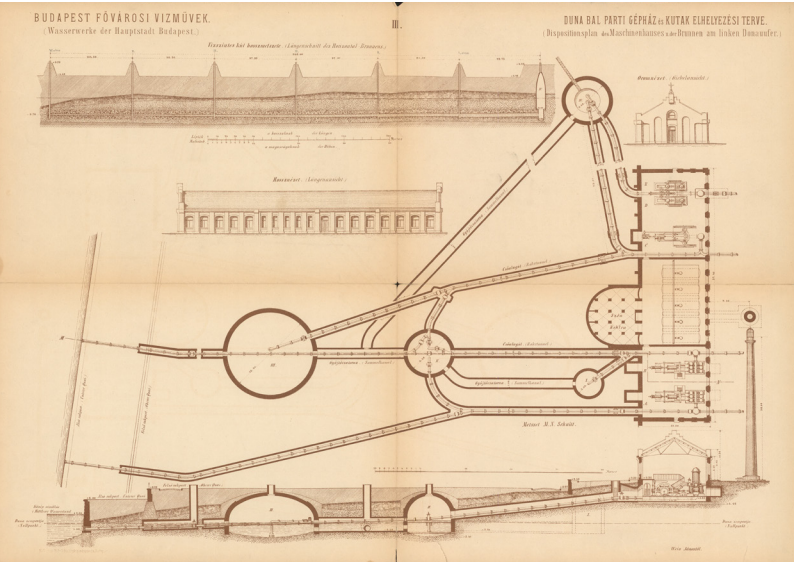
Forrás: Wikipedia / Készítette: VinceB - A feltöltő saját munkája, CC

THE FIRST WATERWORKS OF PEST



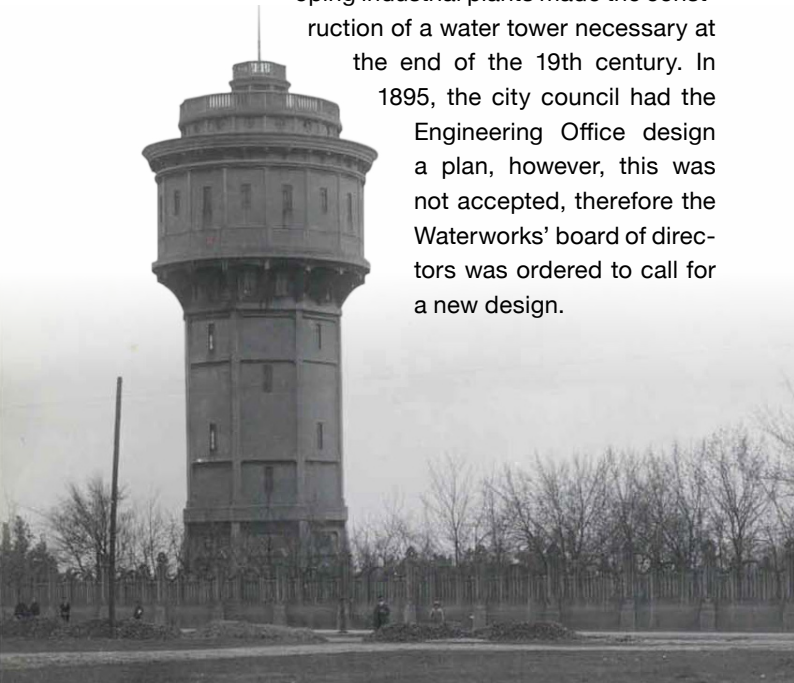
The 1866 cholera pandemic forced the establishment of the First Temporary Waterworks of Pest at the site of today's Kossuth Lajos tér. The construction of its counter pressure basin started on the Óhegy of Kőbánya (today: Ihász utca) in March 1868, under the direction of English engineer William Lindley. The first reservoir was completed by the end of 1869, and the second one was ready by 1870. The dual reservoirs' bottom is at +33,88 m, their overflow drain is at +41,88 m from the gauge zero level of the Danube.

The reservoirs were built of brick, with using hydraulic lime and cement as binding agents. The reservoirs have a cathedral-like inner area divided by brick columns, are covered with dynamic brick arches, and each has a volume of 10 800 m^3, so their combined capacity exceeded that of the 17 800 m^3 reservoir located on the Gellért Hill, Buda. Installing a reinforced concrete water tower and pump houses next to the reservoirs in 1903 opened up a possibility for the further development of Kőbánya, as these structures provided adequate water pressure to distribute water reliably to higher floor apartments.



THE KŐBÁNYA WATER TOWER

This was the very first water tower of reinforced concrete structure in Hungary. The water demand of the apartments located at the higher altitudes of Kőbánya and the developing industrial plants made the construction of a water tower necessary at the end of the 19th century. In 1895, the city council had the Engineering Office design a plan, however, this was not accepted, therefore the Waterworks' board of directors was ordered to call for a new design.



Szilárd Zielinszky's estate includes two designs. One of them envisioned a reservoir of 120 m^3 capacity, 6,28 m diameter, 3,50 m height, with its floor plane being 20 m above the ground, and a 29,2 m tall water tower. The reservoir side-walls are 8 cm thick, and are surrounded by a 30 cm wide airspace and an 8 cm wide reinforced concrete exterior shell. There is only a pencil-drawn, undated top-view ground plan of this design. With no further documentation attached to it, the design was possibly intended as a draft only. This is considered to be the very first attempt for designing a reinforced concrete water tower in Hungary.

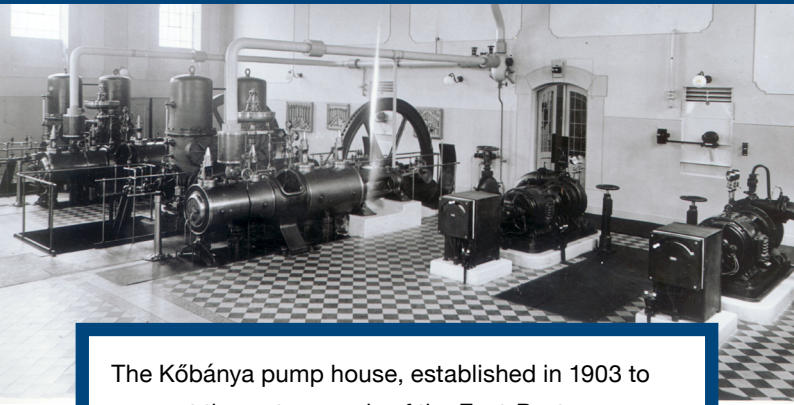
The reservoir of the actual water tower has a capacity of 350 m^3. Dated 7 May 1902, the Hennebique corporation prepared a 1:1000 scale plan. On this, the circle-shaped reinforced concrete reservoir is 10 m in diameter and is held up by a beam grid supported by 12 pillars. The reservoir is surrounded by a 1,10 m wide corridor, where the staircase is also located. The outer space divider of the corridor is a concrete wall among 12 T-shaped pillars, braced by beams in a circle. The tower is an enclosed, standing cylinder with no outer divisions. The tender was submitted with a quote of 71 000 Hungarian korona.

The actual construction significantly differed from the French plan both in its structure and in its appearance. Here, the typical solutions that later on would be utilized for constructing water towers, can be already observed. Four central pillars and eight exterior pillars – the latter ones designed as arched from the base – hold the beam grid supporting the reservoir. The inner diameter of the reservoir is 10,22 m, its side-walls and bottom slab are both 14 cm wide. The maximum water level of the reservoir is 4,6 m, and its side-wall (reinforced with a fringe) is 25 cm higher than the water level. The reservoir is surrounded by a 65 cm wide corridor that is bounded by a reinforced concrete wall divided by avant-corps. A staircase made of reinforced concrete leads up to the resting point under the reservoir, and from there on, there is a ladder, positioned in a shaft right in the middle of the reservoir. In accordance with the width of the corridors, the beams holding the reservoir extend beyond the pillars on the edge, forming a favourable, bludgeon-like outlook. The base of the tower is a reinforced concrete slab lying 4 m deep underground, strengthened with a beam grid with a cross-section of 25/40 cm. The inner pillars have overall dimensions of 55/55 cm in the plane above the base, with a hexagonal cross-section, and the outer pillars have a cross-section of 50/65 cm.

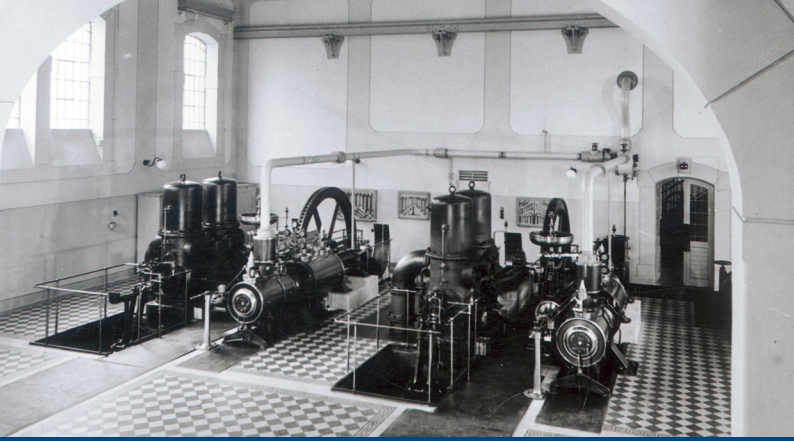
The 6-6 vertical iron rods per pillars are held together by 50/3 mm sized iron flat bars at every 40 cm at the interior pillars, and at every 20 cm at the exterior pillars. The iron flat bars got punctured and pulled onto the vertical iron bars. The bottom plan of the reservoir is 23,50 mm above ground, the full height of the tower is 33,3 m.

The tower was built by the Grünwald and Schiffer construction company, with a contractual deadline of 1 August 1903. It is worth to mention that the construction offer was dated on 2 September 1902, the groundwork plan on 10 November, the iron order itemization in December, and the Resica factory of MÁV confirmed the shipment of this latter one in a letter dated 12 January 1903. The works contract was only signed in 1903, approved by Deputy Mayor Rózsavölgyi on 31 May 1903. Due to spatial planning, the first reinforced concrete water tower of Hungary (as an out-of-order facility by that time) was demolished by using explosives on 23 December 1968.

KŐBÁNYA PUMP HOUSE



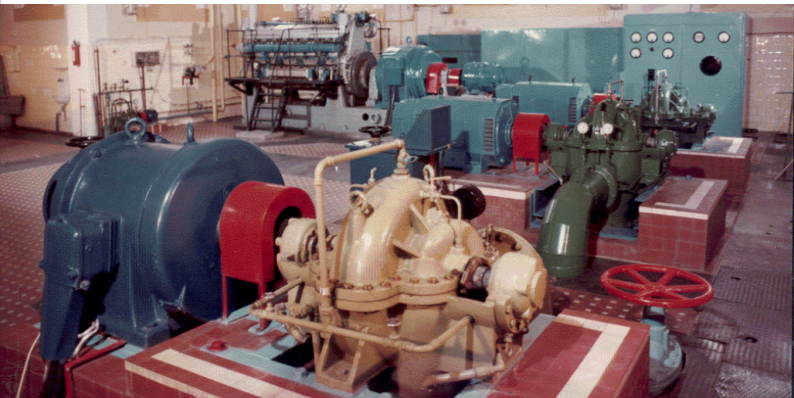
The Kőbánya pump house, established in 1903 to support the water supply of the East-Pest upper zone, utilized the technology of its era and received steam-driven piston pumps. 4 groups of machines were installed at this time: made by the Láng L. Gépgyár Rt., steam-powered, flywheel, double-acting, with pistons and a capability of 4x8000 m^3/day, so 4x 333 m^3/hour water supply, 44 m lifting height, and 4x50 nominal horsepower.



Two of these machines were uninstalled in 1931, and they were replaced with two electricity-powered centrifugal pumps. The mechanical and electrical reconstruction works were completed in Kőbánya by 3 March 1931. After the war, in 1945, the two remaining piston pumps were also replaced by electrically powered centrifugal pumps. It is in this period that, based on the recommendations and designs of Sándor Máttyus, a mechanical water-level regulation was introduced in the reservoirs. The drinking water demand of the Pest base zone was higher than what the system was capable of producing, and the Káposztásmegyer main site was not able to fill the reservoirs to an adequate degree. In addition, the reservoir could not hold the network pressure up, either. This was a typical symptom of a pipe network that was relatively narrow, compared to the volume of water that it distributed.

Sándor Máttyus designed a combined propeller pump group of machines for pumping in two directions, manufactured by using the CSV pumps of the Ganz factory. This group of machines was installed into the 500 mm diameter feeder-release pipe of the reservoirs, in the middle of its pipe tunnel. It was called “Kőbánya FA” – underground pump house (Kőbánya UG, i.e. underground) in the waterworks jargon. This was meant help handling the pressure surface of the Pest base zone.

Following the war, the Kőbánya pump house got gradually equipped with group of machines of higher and higher performance. To substitute lost electricity, two diesel generators of the Ganz – Ganz Villamos factory were installed in the pump house to replace the last two removed steam engines. After setting up a dual power supply, this diesel generator was dismounted.



The introduction of the new pump station wet wells that were built at the place of the demolished water tower, and the 1970 completion of the East-Pest upper zone's new Cinkota út counter pressure basin, marked a turning point for the operation of the Kőbánya pumps. The bottom level of the new upstream pressure basins conformed to the work-in-progress Sánc utca, Gellért Hill reservoirs, hence it was built 10 m higher than the old reservoirs. Therefore they provided a significant influx of water for the pumps in the pump houses, making the later shift to an automatic operation easier.

After 1979, 4 DAF400 model Ganz-MÁVAG pumps were in operation. Their nominal features: 1800 m^3/h, at 40 m lifting height, 1475 / min rotational frequency, 320 kw driving power. The introduction of the new pump station wet wells made the Máttyus' group of machines (tasked with feeding and releasing) redundant. To fill the new reservoirs, a new underground pump house (UFA) was built in 1970. Its two pipe pumps suction the feeder pipes of the old reservoirs and boosts the water into the new reservoirs' water main that also feeds the pump house.

The lower and upper reservoirs of the Kőbánya site, together with the so-called Lower, Cave, and Upper Sánc utca reservoirs of the Gellért Hill, formed the two most passive points of the Pest base zone's pressure surface. The lower ones operated as being filled in the night time, and the upper ones worked on the network during the day, keeping a higher pressure level with the help of the boosted water.