

Jiří Chmelenský

Prague Power Engineering of the Late 19th to the First Half of the 20th Century : What is left of it in Prague

ANNOTATION

The dynamic building development of Prague, the capital of the Czech Republic, has resulted in the past and today in rapid disappearing of historic industrial buildings, potentially the most endangered category of monuments. This also includes monuments of historical power engineering. The article primarily sums up an overview of important Prague power stations and other power plants and draws attention to their heritage values. Secondly the issue of power engineering monuments is outlined regarding the substance of power stations – their electrotechnical devices. The descriptive part is concluded by appeal to higher awareness of the values of today's rare electrotechnical equipment, which in fact determines the value of power plants more than their purely architectural form. Despite the sad decline in recent years, several architecturally interesting industrial monuments of Prague electrification at the end of the 19th and the first half of the 20th century have survived to the present day.

SUMMARY

Monuments of power engineering have been slightly neglected in terms of industrial heritage interest. They are specific due to their clearly defined function – generation, distribution, conversion and distribution of electricity – and their key position in the production flow, specifically at the beginning of the processing chain, primarily for heavy industry, transport and finally for current household consumption. These monuments, buildings and especially their machinery and equipment rapidly become obsolete by its very nature; they are modernized, demolished, removed. Thus, the historical development sequence of electrotechnical equipment disappears both in terms of technical-historical and architectural-typological, as a representative study material, necessary for the professional and lay public.

The aim of the current heritage care is to create a protected complex of electrotechnical monuments of electricity generation and use in the Czech Republic across their technological-historical and architectural-typological spectrum. At present, the most comprehensive inventory possible is being created within The Industrial Heritage research project. Due to the dynamic development of the modern city, only a small number of monuments of industrial architecture have been preserved within the capital of Prague, with surprisingly relatively comprehensively preserved monuments of power engineering from the late 19th century to the mid-20th century. The first period of the so-called DC power plant (electrification of Prague from the end of the 19th century to the First World War) includes the municipal power stations in Žižkov, Libeň, Karlín and Smíchov. From the later – alternating – power plants after 1914, at least construction and architectural features have survived: the facade of the Holešovice thermal power station and the hydroelectric power station on the island of Štvanice. Ervénice, the first modern central power station outside Prague that supplied electricity to Prague from the brown coal basin in Most, has unfortunately not survived. But the large hydroelectric power stations Střekov and Vrané nad Vltavou are preserved. The power system was distributed from the power stations by a high-voltage and very high-voltage distribution system – the Ervénice – Prague long-distance line to variously powerful distribution substations and numerous converter stations - transformer stations providing tram network operation, including Krenovka railway substation or a substation for film studios in Barrandov. This system also includes a power station and heating plant at the Vysočany waste incineration plant or electrotechnical equipment: electric elevators or paternoster lifts with electric motors or own distribution transformer stations in the basements of houses built in the late 1920s and during the 1930s.

Preservation state of the electrical machine equipment itself is sad – only a few electrical rotating machines and devices have survived: Ward-Leonard drive system of funicular to Petřín, a rotary converter in the Barrandov film studio and a motor-generator in a mobile converter in Střešovice DPP museum. Some of them would certainly deserve protection in the form of a movable cultural monument.

Fig. 1. Prague 7-Holešovice, No. 960, Jankovcova 40. The substation - distribution transformer station somewhere in a house basement in Prague, an illusion of a Prague transformer station from the 1920s, assembled in the PRE Museum in Prague-Holešovice. Two three-phase transformers on the right, 0.4 kV LV outlets on the top, 3 kV HV disconnectors on the left (photo by author, 2016).

Fig. 2. Section of an engine room of a 1930s steam power station on a period depiction. **A** – compensating tube, **G** – generator, **H** – turbine exhaust port, **K** – condenser, **M** – assembly crane, **S** – starting valve, **T** – two-box turbine, **a** – turbine bearing oil tank, **b** – water separator, **c** – cooling pump, **d** – vertical condensate heater, **k** – suction basket, **m** – engine, **n** – emergency exhaust valve, **o** – oil cooler, **p** – steam jet pump, **s** – condensing pump with engine, **t** – auxiliary reserve turbine (copied from DVOŘÁK/HANZLÍČEK 1941, 43).

Fig. 3. Two mercury rectifiers producing electric current of 1 000 A and 600 A from the 1930s on a period picture (copied from VESELÝ 1941, 96).

Fig. 4. Scheme of a steam power station from the 1930s on a period depiction. The coal extracted from the mine, stored in coal dumps, was automatically transported to the storage tank next to the boiler room to be burnt on the moving grate of the boiler. The ash falling at the end of the grate was gathered in carts and transported to the heaps. The combustion of coal generated heat, which accumulated in the boiler in steam at high pressure and high temperature. The steam was led to the turbine, which converted its thermal kinetic energy to rotate the alternator rotor. As the steam passed through the turbine, where it transferred its heat, it was directed to the condenser. There, it was cooled back to water, reused to power the boiler. In the alternator, the kinetic energy was converted into electrical energy, led then to the substation, where it was measured and distributed to the individual supply lines, and eventually to the place of consumption. If the place of consumption was remote, it was necessary to increase the voltage of the produced current in the transformer. At the point of consumption, the voltage was reduced again to 400 V required for motor drive and 230 V for lighting and other purposes (copied from DVOŘÁK/HANZLÍČEK 1941, 88).

Fig. 5. Prague 3-Žižkov, No. 1730, plot No. 479/1, Koněvova 13 and 15, former power station Žižkov. The hall with eloquent inscription *Thai physical massage* is an extension of the market from 1931, converted from the original hall of the engine room of Křížík power station (photo by author, 2019).

Fig. 6. Karel Smolka, around 1900: Smíchov municipal power station. The hall of the engine room, built according to the project by architect František Šafránek, can be found under No. 3199 in Jindřicha Plachty 19a Street, Prague 5-Smíchov. The photograph was taken from the premises of No. 535, Jindřicha Plachty 16. The two-storey extension by architect Karel Hajný from 1909 (would be on the left) was not yet standing at the time of this photograph (Prague City Archives, Collection of photographs, sign VI 74/9).

Fig. 7. Prague 5-Smíchov, No. 3199, plot 466/1, Jindřicha Plachty 19a, former Smíchov power station. Today, the hall of the engine room belongs to PRE (photo by author, 2019).

Fig. 8. Jindřich Eckert, 1900-1901: Central Power Station of Electric Enterprises of the City of Prague No. 1 in Holešovice after its completion. The complex also served as a tram depot. In front of the engine room hall are drums with high voltage cables for the currently built distribution system in Prague. The poles for electric arc lamps were used, in addition to lighting, also for low-voltage distribution (Prague City Archives, Collection of Photographs, sign. VIII 1296).

Fig. 9. Prague 7-Holešovice, No. 1 and 218, plot No. 1/25 and 1/26, Holešovice power station. Central Power Station of Prague on a postcard issued around 1900 (author's private collection).

Fig. 10. Jindřich Eckert, 1899-1900: The engine room of the Central Power Station hall of the Electric Enterprises in Holešovice No. 1. The upper half of the generator stator is currently being mounted on the rotor using a gantry crane. The generator from the František Křížík firm was not manufactured until 1904, had an output of 2 000 kW and gave a current of 3 000 V (Prague City Archives, Collection of Photographs, sign. VI 76/10 b).

Fig. 11. Prague 7-Holešovice, No. 1 and 218, plot No. 1/25 and 1/26, Holešovice Power Station. The engine room of the steam power station Holešovice No. 1, parc. No. 1/26, on a historical photograph from 1928 (private collection of the author).

Fig. 12. Jindřich Eckert, 1900-1901: The interior of the Malá Strana tram substation hidden in the yard No. 111, U Lužického semináře 42, Prague 1-Malá Strana. An operating pair of rotary converters produces direct current for trams from alternating current. Remarkable are the arms of Prague capital above the substation (left), and a table with a lamp of the supervising engineer (right; Prague City Archives, Collection of Photographs, sign. VIII 1433).

Fig. 13. Jindřich Eckert, 1900-1901: The power station (previously converter station) in Karlov at New Town between Ke Karlovu and Sokolská Streets. The photographer stands with his back at No. 460, Ke Karlovu 11; behind the power station is the house No. 1806, Sokolská 24, Prague 2-New Town, which over time lost its gable with a balustrade. According to aerial photographs, the power station was demolished in 1945 at the latest (Prague City Archives, Collection of Photographs, sign. VIII 1430).

Fig. 14. Jindřich Eckert, 1900–1901: The interior of the power station in Karlov at New Town, furnished as a converter station. There are three rotary converters producing direct current from alternating current for trams around Wenceslas Square. Interesting details are the gantry crane used to repair rotary converters and especially the switches of individual power sections of tram lines (Prague City Archives, Collection of Photographs, sign. VIII 1431).

Fig. 15. Prague 7-Holešovice, No. 1340, plot No. 2335, Štvanice island, hydroelectric power station on a postcard from the First World War (author's private collection).

Fig. 16. Prague 7-Holešovice, No. 1340, plot No. 2335, Štvanice island, hydroelectric power station, current state (photo by author, 2019).

Fig. 17. Ervěnice Power Station, cadastre of the deserted village of the same name, plot No. 635/1, today Most-Komořany cadastre, Most distr., on a 1926 postcard. On the right the engine room hall, behind it a boiler room and at the very back the mining tower of the Hedvika pit. To this day, only the former administrative building No. 376, cadastre Most-Komořany has been preserved (author's private collection).

Fig. 18. Ervěnice Power Station, cadastre of the deserted village of the same name, plot No. 635/1, today cadastre of Most-Komořany, Most distr. Steam single-body turbine of Škoda Works with an output of 21,000 kW (in the foreground) and a Škoda generator with an output of 15,000 kW (in the background) of the Ervěnice power station on a 1926 photograph (author's private collection).

Fig. 19. Ústí nad Labem, plot No. 3455/9, Střekov hydroelectric power station on a 1938 postcard. View from the northwest (private collection of the author).

Fig. 20. Ústí nad Labem, plot No. 3455/9, Střekov hydroelectric power station. Current state, view from the north (photo by author, 2016).

Fig. 21. Vrané nad Vltavou, plot No. 135/1, hydroelectric power station after its completion on a 1938 postcard, view from the southwest (author's private collection).

Fig. 22. Vrané nad Vltavou, plot No. 135/1, hydroelectric power station. Current state, view from the northeast (photo by author, 2019).

Fig. 23. Prague 1-Hradčany, plot No. 279/1, engine room of the funicular railway to Petřín. Ward-Leonard Drive system from 1931, which drives the funicular to Petřín to the present day (photo by author, 2011).

Fig. 24. Prague 5-Smíchov, plot No. 5042/2, Strakonická, distribution 3 kV transformer station at the entrance for trucks to Smíchov port, neglected at present (photo by L. Špaček, 2001).

Fig. 25. Jindřich Eckert, 1900–1901: 3 kV switching station on Josefské Square (today Náměstí Republiky). It served as a switch-on station for public lighting and a waiting room for the electric tram until 1929, when it was demolished (Prague City Archives, Collection of Photographs, signed XII 584).

Fig. 26. Prague 5-Hlubočepy, plot No. 883/8, the former converter station of the Barrandov Film Studios. Rotary converter with an output of 500 kW from the František Křížík firm preserved to the present day (photo by author, 2019).

Fig. 27. Prague 2-New town, No. 2026, Ke Karlovu 5, building of the Institute of Mathematics and Physics, Charles University. Motor-dynamo in the attic of the MFF UK in Karlov (photo by author, 2018).

Translation by Linda Foster