

Prague's Sewerage System in the 1930' and the General Sewerage Project (1933–1936)

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Abstract

Prague's sewerage system was built at the end of the era of the monarchy in the united town that Prague was transformed into. The system was soon overloaded, and was not able to remove all the sewage produced by the citizens.

To deal with this hygienic threat, the city council and the management of the wastewater services undertook several actions to build a new system or improve the existing system. The most ambitious and extensive measure was the general project carried out between 1933 and 1936.

The project was invented to resolve the problem once and for all by introducing new ideas and cut out the problem of placing a new sewage plant instead of the old one. For the present-day observer it also offers a range of spectacular and interesting ideas on urban wastewater treatment.

Keywords: sewerage, sewage plant, Máslo-Douda project, Řež, competition, projects, Dorr, Čistá půda, Roztoky.

1 Introduction to the problem

On January 1st 1922 Greater Prague was formed. The cities of Prague and their surroundings were made into a single capital city. Amongst other problems (administrative or technical), the city council was faced by the problem of providing adequate treatment for the sewage discharge by citizens in the whole city. At that time, the city was using the prewar Prague system, which had only been extended and improved within the limits of prewar technology.

1.1 Original sewerage

The sewerage system in prewar Prague was successfully finished in 1906 after almost 20 years of construction. It covered 88 509 km² of settled area, and all the sewage was drained to central sewage plant in Bubeneč, near the Imperial Island (Císařský ostrov).

This sewage plant used a mechanical system for treating the sewage. The wastewater was delivered to the plant, where it passed through first line of filters, the coarse racks (česle). This procedure removed the coarse trash – wood, old cloth and remnants of food. The next phase removed the sand from the water. Due to the dirty streets, the water was full of sand, it would have been wasteful not to recycle the water.

The grid chambers (lapač písku) were pools 34 m in length and 6 m in depth with a slightly sloping bottom. The water passed slowly through it and heavier sand sank to the bottom, from where it was collected and taken away for disposal.

Then water passed through the fine racks and finally into the primary clarifiers (usazovací nádrž), where the final sludge was separated. The water was

then discharged into the river and the sludge into the sludge drying bed (in winter) and into a sludge barge (in summer).

1.2 Limitations of the old sewerage system

The sewerage and the treatment plant were designed for only 500 000 people with 120 l of sewage per day and person. When the capital city of Prague was established, the numbers of users and the area that was covered rose dramatically.

In 1929, when the possibility of building a new system was raised, the area to be covered was about 172 104 km² and there were more than 600 000 users of the system. Besides the late 19th century technology, which was not able to deal with amount of sewage discharged by all the citizens, the sludge and the pollution of the river were major problems. The amount of the sludge gradually rose to a level of more than 250 m³ per day, and dealing with this huge amount was becoming problematic. The second problem was that the river was slowly losing its self-cleaning ability, and thus the old sewage plant was also losing its main pillar.

1.3 Project in 1929

In 1929, first attempts were made to prevent the city falling into serious hygienic trouble. Ing. E. Máslo and Ing. V. Douda were asked to set up a project for a new sewage plant, fully compatible with the old canalization system. They submitted their proposal for authorization in 1929.

Both engineers set out to locate the sewage plant outside the city precincts, in order not to subject the

citizens to the smell of the sludge and to be able to handle this valuable agricultural product better and more comfortably. The riverbank by the village of Řež, about 11 km from the old sewage plant was chosen as the best location. The new plant was designed to clean the water in the old way. The treatment was only mechanical, because the advanced biological methods were still controversial. Mechanical methods were also much cheaper.

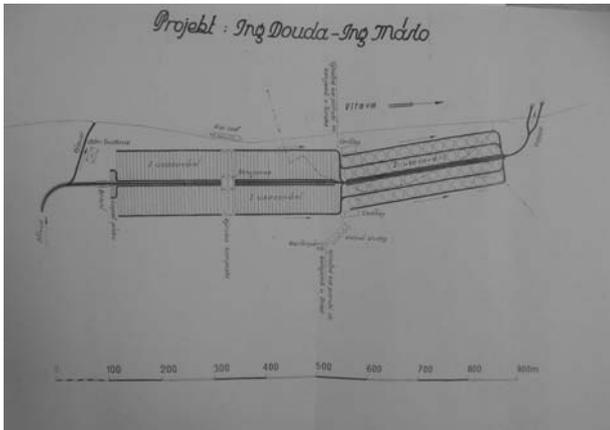


Fig. 1: Picture of the original “Máslou-Douda” project

While the Douda-Máslo project was passing through the authorization procedures, Ing. Zika, the chief of Prague’s sewers, introduced new projects to build sewage plants with biological purification either in Řež or on Imperial Island.

This dualism in planning came about because the planning of these complicated systems took years, and in the meantime the technology was advancing very rapidly. The originally proposed technology was outdated before the project reached the construction stage.

Zika’s project introduced the problem of how to manage all projects to meet the rising demands of the citizens for a clean river. The new sewage plant on Imperial Island was cheaper, but the authorization process was already running and some land in the neighborhood of Řež had already been bought for the new sewage plant.

2 Competition

As the result, the city council held a competition to resolve the question of the best location for a new sewage plant and to introduce new ideas. The competition was announced on May 2nd, 1933, and the deadline was March 15th, 1934. The competition was open only to citizens of Czechoslovakia.

A commission was nominated by the city council and comprised 17 members and 2 experts. During the standing time of the commission, 2 members died and others were nominated to replace them. The committee finally consisted of the fol-

lowing members: Ing. B. Bartošek, Ing. O. Cvrk, MUDr. J. Čančík, Ing. V. Douda, Ing. A. Ernest, Ing. K. Holinka, Ing. V. Krouza, Ing. T. Mrkvan, Ing. A. Nový, MUDr. L. Procházka, PhDr. F. Schulz, Ing. Arch. V. Prokop, Ing. Dr. J. Racek, arch. F. Šimáček, Ing. E. Thoma, Ing. F. Topinka, Ing. B. Vondráček, Ing. Dr. V. Vrbenský, Ing. R. Žižka.

The rules of the competition set several conditions:

- The average amount of sewage per day was 129 l in 1927 and 118 l in 1929. The Máslou-Douda project set a value of 160 l.
- The number of users in the period between 1940 and 1960 would rise from 1 mil. to 1.6 mil. In 1929 there were only 601 000 users.
- The treated sewage should contain not more than 250 mg of dry sludge. Mud taken within cleaning process must not rot, sand from the sand pool must not contain more than 10 % of dry residue, sludge from the sedimentation tank should not contain more than 91 % of water.
- The location of the new sewage plant must not offend hygienics and aesthetics. It could be located in a populated area but the hygienic measures would have to be more accurate and stricter.
- The new sewage plant was required to treat all sewage from the city.

Each project was evaluated in terms of:

- location
- technical elaboration of the project
- hygiene
- system economy
- chemical processes
- agricultural interest
- mechanical processes
- influence on the river
- space for improvings
- cost

3 The projects

Fifteen projects were submitted before the deadline. Finally, only 13 were admitted and 2 were rejected because they did not comply with the conditions. However, they were so interesting that the committee also screened them.

I have categorized the projects into four groups. I will deal with the three projects, in greater detail. However, I will also consider projects that were assessed as non-competitive because they did not deal with all problems and were not selected to carry out the project.

3.1 Projects locating the plant on Imperial Island

Projects located on Imperial Island, where the old treatment plant was, relied on modern treatment procedures without creating a bad smell or hygienic trou-

bles, which would have prevented the construction of a sewage plant inside the city limits. The sludge, a major cause of bad smell, would be pumped to a place located somewhere outside the city.

However, the Island was not an uncontroversial location. First, the state regulation committee was planning to use the Island as a well-located recreation area. Second, the river in this place was already very dirty, and locating the plant there would cause even more pollution inside the city. Third, the regulation of the river meant that there was not a sufficient stream there, and regular floods were a constant threat.

Four of the projects located the sewage plant on the island: “Ostrov”, “Zdraví”, “Zdraví všem” and “Čistý vzduch”. Only two of them were adjudged worthy to be bought – “Ostrov” (15 000 Kč) and “Zdraví všem” (10 000 Kč). All of them suffered from being located on the island. Although this location was not banned, it prevented the projects from being selected for implementation.

Each of the four projects proposed the same treatment process. After the mechanical processes, traditionally a system of screens and grit chambers, there was a biological process in aeration tanks. The sludge was then left for some time in the final clarifiers and was finally transported through pipelines to sludge drying beds somewhere outside the city.

Table 1: Survey of the projects in the Island group

| Project | Creator | Price |
|--------------|---|---------------|
| Ostrov | Ing. J. Staněk Ing. J. Ledvinka Ing. G. Novák Ing. V. Maděra Ing. V. Hoffmann | 91 mil. Kč |
| Zdraví | L. Bill a Comp. Dr. K. Skorkovský | 48.8 mil. Kč |
| Zdraví všem | Ing. E. Zejda | 290 mil. Kč |
| Čistý vzduch | Lanna comp. | 436.5 mil. Kč |

3.2 Projects in Roztoky

The projects in this group located the new plant in Roztoky. The group contains the projects: “Roztoky” and “Praze ku zdu”. Both projects involved both mechanical and biological water treatment. The system was almost the same as in the group of plants on the Island. The differences were in the details. Since the “Roztoky” project won the third prize, and will be discussed later, I will write only about the second project.

“Praze ku zdu” was interesting in the way it planned to use the old sewage plant. It proposed coarse cleaning in Bubeneč and only water without

garbage would be floated down to Roztoky. The sludge disposal was also different. The sludge would be transported immediately by train and by barge. This was the main problem that prevented the project from winning. However, the project contained good ideas and was bought for 15 000 Kč.

Table 2: Survey of the projects in the Roztoky group

| Project | Creator | Price |
|--------------|----------------|-------------|
| Praze ku zdu | Ing. J. Gregor | 347 mil. Kč |

3.3 Projects next to the Labe

Third group contains projects planning to discharge their sewage into another river than the Vltava, into the Labe. These projects are “Spád” and “Druhá řeka”. Both of them planned to use long tunneled pipelines to get the sewage from Prague to the sewage plants (16 km for “Spád” and 16.7 km for “Druhá řeka”, about 14 km underground). Both projects also proposed a natural biological treatment process, as biological ponds were planned next to the sewage plants. The mechanically treated water would be released into these natural pools and would be cleaned naturally.

Due to the locations, these projects had problems mostly with the incoming pipelines and with the river Labe itself, which has a slower water speed than the Vltava. In addition, it would have been really difficult and expensive to construct such long pipelines.

Table 3: Survey of the projects next to the Labe

| Project | Creator | Price |
|------------|----------------------------------|-------------|
| Spád | Ing. J. Lanč | 157 mil. Kč |
| Druhá řeka | Doc. E. Snížek Ing. B. Belada | 258 mil. Kč |

3.4 Projects with special treatment programmes

The projects in this group proposed some special way to dispose of the sewerage. The “Hygiena 3” project located the plant next to Drahaňská rokla. After mechanical cleaning of the sewage, the sludge was to be coagulated by an electrolytic process on 27 600 electrodes. However, this treatment method was considered too expensive. Nevertheless, ideas put forward in the project were so interesting that city bought the project for 5 000 Kč.

The “Závlaha” project proposed three sewage plants, including the old plant in Bubeneč, and also one subsidiary sewage plant, where preliminary filtration treatment would be done. Then the sludge would be transported by pipeline (18.92 km long, the longest in all the projects) to the main plant near to the village of Veltrusy, where it would be deposited on drying

would be moved to sludge drying beds near the villages of Drasty and Tursk.

The project was awarded second place and prize 45 000 Kč. It was adjudged the most precise and well planned, but it was also one of the most expensive projects and therefore did not meet the financial requirements of the competition.

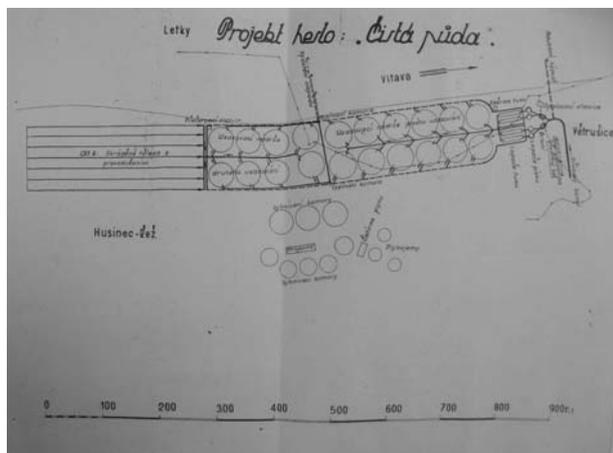


Fig. 3: Picture of the “Čistá půda” winning project

4.3 “Roztoky”

This was one of the group of projects which located their sewage plant in Roztoky. The creators chose this location as the first acceptable place outside the city boundaries. This made the incoming pipelines shorter and cheaper – they were only 7.4 km in length.

The project proposed preliminary treatment of the sewage in the old sewage plant in Bubeneč, where there is a different filter system for the upper and lower area of the city. The pipelines joined up behind the plant and pumped the treated sewage into the primary clarifiers in Roztoky. Aeration was performed in aeration tanks using the HURD system. The digested sludge was to be removed to special drying beds near Zdiby.

Table 5: Survey of the winning projects

| Project | Creator | price |
|------------|---|-------------|
| Dorr | Ing. J. Staněk Ing. J. Ledvinka Ing. G. Novák Ing. V. Maděra Ing. V. Hoffmann | 89 mil. Kč |
| Čistá půda | LANNA comp. | 480 mil. Kč |
| Roztoky | Ing. J. Staněk Ing. J. Ledvinka Ing. G. Novák Ing. V. Maděra Ing. V. Hoffmann | 193 mil. Kč |

The project won third place and received a prize of 20 000 Kč. It was not considered such a carefully made project as the first two, and it did not take into account an appropriate amount of sludge. Nevertheless, it was rated one of the best.

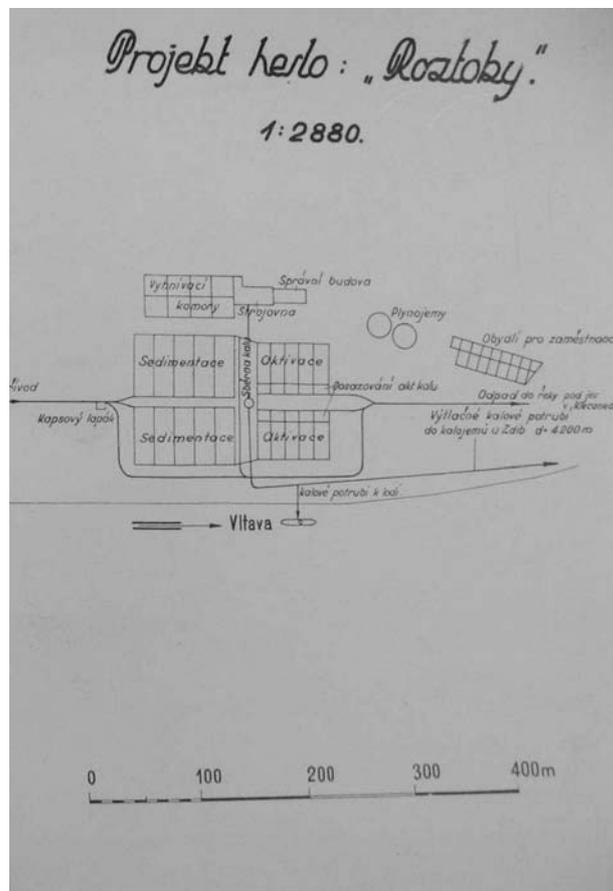


Fig. 4: Picture of the “Roztoky” winning project

5 Conclusion

The results of the competition were announced on May 22nd, 1935 and until 1936 there was a debate on the winning and losing projects.

The winners of the competition have been discussed above. However, the final outcome was a surprise. Although there were three winning projects and another 6 projects were bought for future consideration, none of them was accepted as good enough to replace the original Máslo-Douda project and none of them was successfully constructed.

By the time the competition was completed, the project for a sewage plant in Řež was licensed. The original goals of the competition, bringing in new ideas and designs for a new sewerage system for Greater Prague, were fulfilled, but they were never implemented.

For the record, how did the Máslo-Douda project end up? It, too, was never completed.

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