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SOLUTION STUDY, REGARDING THE REHABILITATION OF A WATER SUPPLY SYSTEM FROM A URBAN AREA

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Abstract: Environmental investments represent an important contribution to the solution of economic and social problems in Romania: to the protection of health, the improvement of the quality of life and the stimulation of economic development. To contribute to the development of the regions, Romania must make significant investments in the environmental infrastructure, especially in the water, waste, and air quality sectors. The completion of the work will substantially contribute to improving the level of hygiene and comfort of the population and to the protection of the environment. This will be achieved by increasing safety in operation and the possibility of ensuring, by the water - canal operator, some quality services in accordance with Romanian and EU legislation. The article presents a solution to improve the operating conditions of the water supply system to ensure optimal living conditions for the population served, in the context of compliance with European directives and national regulations in force and adaptation to climate change.

Keywords: water supply, operation, pump station

1. INTRODUCTION

As a member country of the European Union, Romania had to improve its quality and access to water / wastewater infrastructure, by ensuring water supply and sewerage services in localities with over 2000 equivalent inhabitants. This was to be done simultaneously with the establishment of efficient regional structures for management of water/wastewater services. In the studied urban area, future water needs in 2025 are expected to vary between 95-190 l/day including domestic, commercial, institutional, and industrial consumption - the rate is like the current consumption model because it is estimated that most consumers have already reduced consumption at the required level.

The technically permissible water losses vary between 35% and 60%. General losses are expected to be reduced between 22% to 33% by 2025, and are projected to remain below the value allowed by legislation, which is 15% or 35%, depending on the network type, until the end of the analysed period (2042). For new distribution networks (under 5 years old), it is estimated that the water losses will not exceed 15% of the distributed water volume. In the existing networks where renovations and/or expansions are carried out, water losses can be up to 35 %. Higher losses are considered abnormal and require the adoption of appropriate measures. [1,2,3,4,5,6]

2. CASE STUDY

a) Current situation

The water supply of the municipality of Lugoj, (Fig.1) is provided by water from deep sources (boreholes), numbering 29, and a surface source, the Timiș River, downstream of the city. The water is processed in the three water treatment plants of the city which are, at the same time, also pumping stations, as follows:

• Water plant no. 1, located on Tapiei street, treats water collected from 22 drilled wells with a flow rate Q= 100 l/s Water plant no. 1 treats a total of 100 l/s.

• Water plant no. 2, located downstream from Lugoj municipality, on the industrial platform on Calea Timisoarei, NR 151, treats a water flow Q= 180.6 l/s captured from the Timiș river.

• Water plant no. 3 located in Honoriciului streets, V. Babeș street no. 2, treats a water flow Q= 32 l/s, captured from 7 drilled wells. The treatment involves disinfection with chlorine gas.

Currently, in the studied area, there is a distribution network on Salcâmului and Livezilor streets, which is made of PEHD PN16, D=125 mm, L= 2730 m, and has 84 connections, Fig.2.

On Livezilor street, the public drinking water supply network is functioning poorly, due to the development of the area but also due to the large difference in level, of approximately 117 m. The water is transmitted to consumers through a pumping station that operates permanently at a pressure of 12, 5 bars, periodically causing damage to the distribution network. The pumping station being technically and morally outdated, Fig.3.

In the studied area, the distribution network is located on the side of the roads, in the green space or on the sidewalks and is made of PEID, PN 10 and PN 6 with diameters of 125 mm. In Fig.3 it can be observed that pipeline 1-3 operates with pressures much higher than those recommended, that is, with pressures between 12.5-6.0, which leads to periodic breakdowns on this pipeline. It should be noted that on this section there are connections with the houses.

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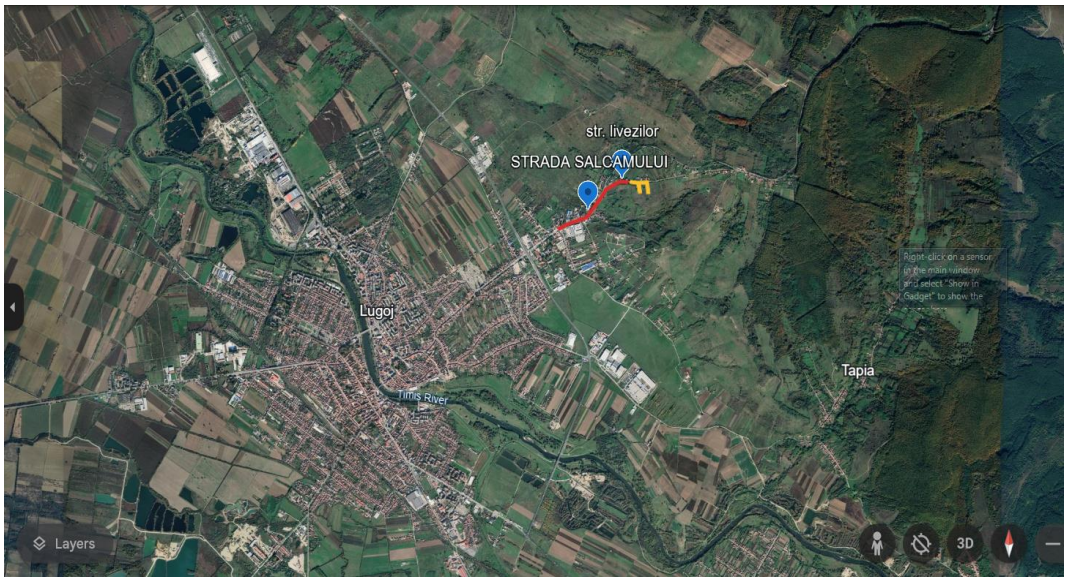

Figure 1. Study area

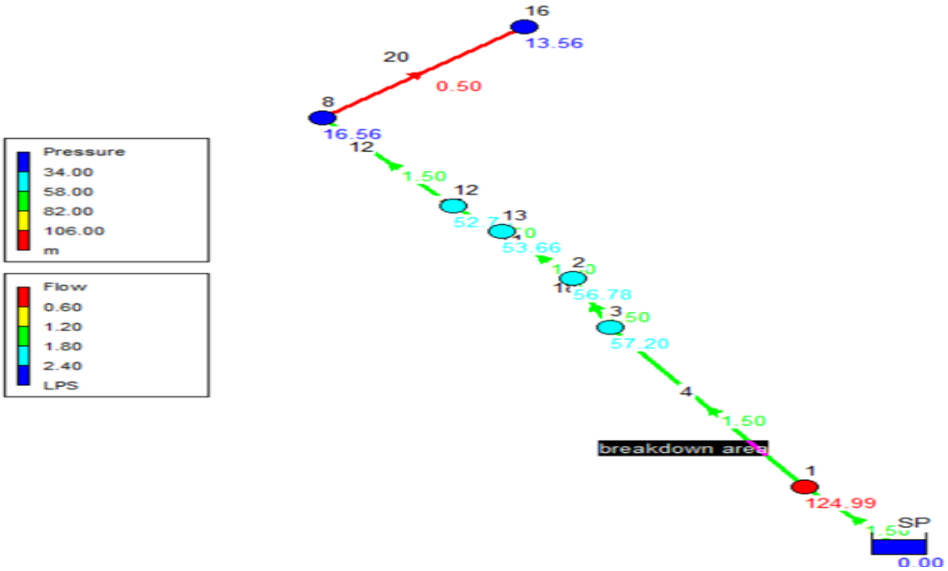

Figure 2. Epanet model for current solution

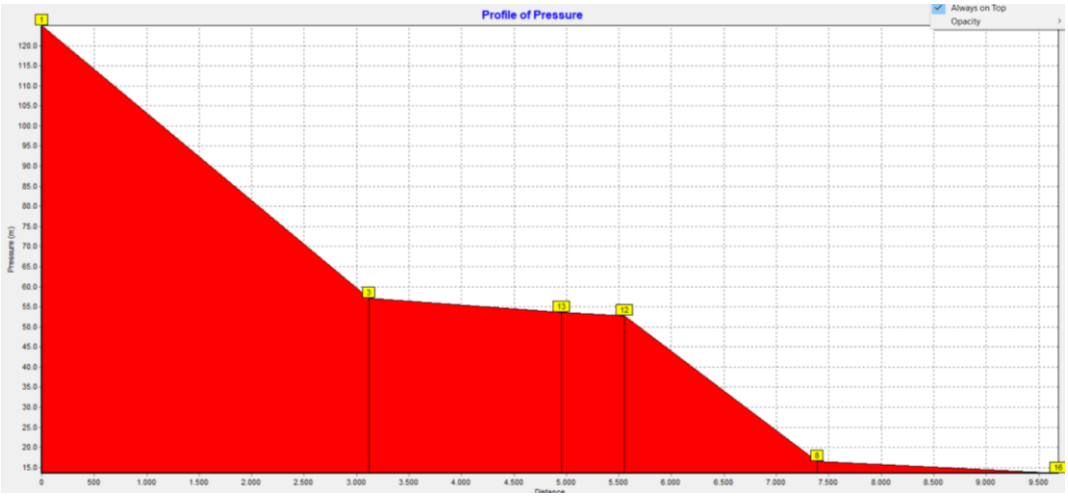

Figure 3 Profil pressure for current solution

b) Propose solution

For the water supply system from the study area, is propose PEID-PN16-PE100 pipes, with diameters of De110 mm and De125 mm. The pipe will be placed on a bed of sand of 10 cm, and a protective layer of sand will be created above them, having 30 cm above the crest of the tube.

The object of study is to find the best solution (technical and economical) for rehabilitation of the existing network and the pumping station, but also the expansion of the water network.

For the optimal operation of the pumping station and the distribution network on Salcamului and Livezilor streets, is propose the following technical solution:

• The connection between the pumping station and the current distribution pipe will be interrupted. The current distribution pipeline is made of PEHD PN16, D=125 mm, L= 2730 m, and has 84 connections.

• A PEHD PN16 adduction pipe, Dn 125 mm, L=1300 m, will be place in parallel with the existing distribution network, which will transport the water from the elevation of 125.0 m to the elevation of approximately 197 m.

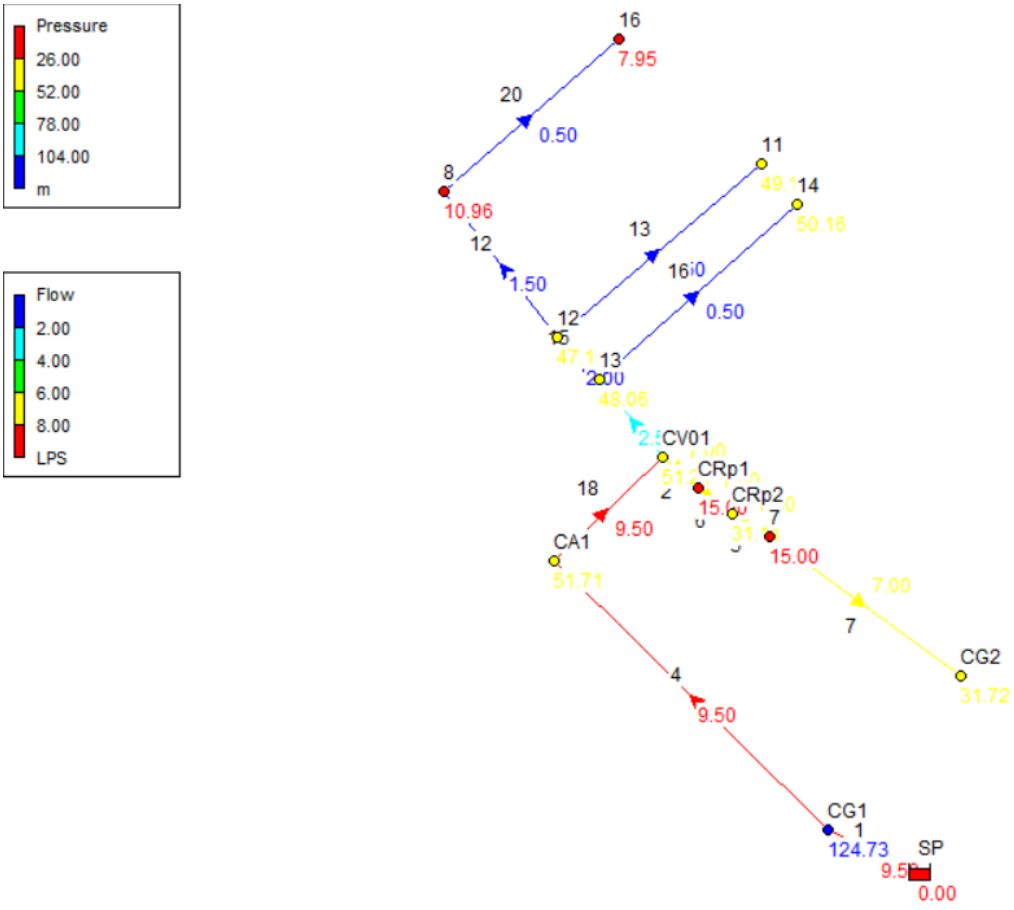

Figure 4. Epanet model for proposed solution.

• At this point, the existing distribution pipe will be intercepted in the proposed valve chamber CV01. The CV01-CG2 pipe will operate gravitationally under pressure. Since it is necessary to install two pressure-break valves, CRp1, CRp2. The section CV1-End of the distribution network will operate by pumping.

• The adduction will operate by pumping using the existing Pumping Station.

The proposed drinking water networks will have a total length of 1540 m arranged as follows:

On Salcamului Street - Livezilor Street

A water adduction will be made:

• PEHD PE 100, PN 16, SDR 11, L=1300 m, D=125 mm. The pumping station will continue to operate at a pressure of 12.5 bar, Fig 4. All existing connections on the existing distribution pipe will be kept. The expansion of the water network will be carried out:

PEHD PE 100, PN 10, with a length of L=240 m, D= 110mm according to the situation plan attached to the documentation

For the pumping station, it is proposed to change the pumps with a system of 2+1 pumps H=140 m, Q=15 l/s.

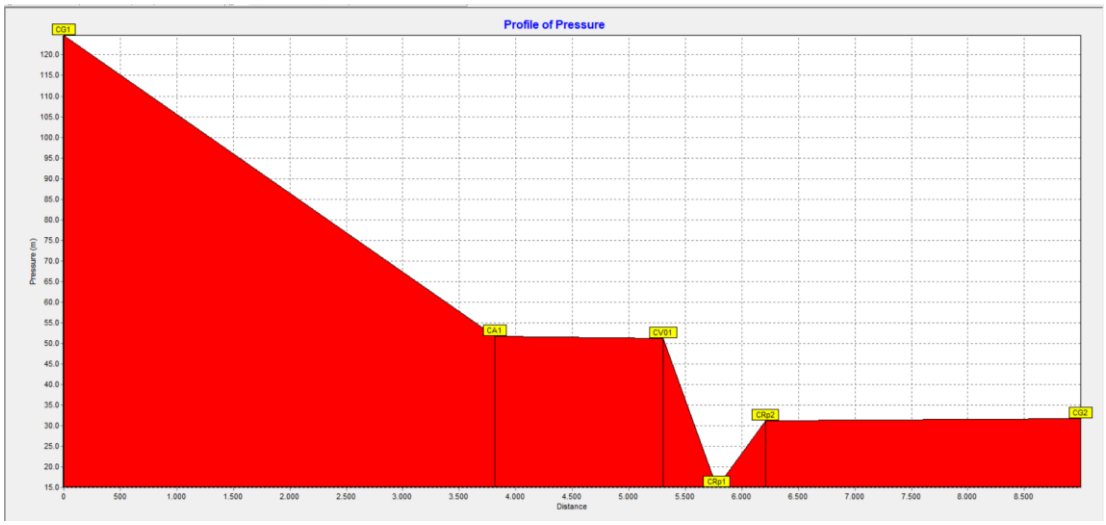

Figure 5. Profil pressure for proposed solution

CONCLUSION

The completion of the work will substantially contribute to improving the level of hygiene and comfort of the population and to the protection of the environment. This will be achieved by increasing safety in operation and the possibility of ensuring by the water - canal operator some quality services in accordance with Romanian and EU legislation. The proposed solution is a solution with low costs because it was only proposed to make a parallel pipeline (on the portion 1-3, Fig. 2) with the role of adduction. The existing pipeline being able to function in optimal parameters, that is, with a pressure below 5.8 bars. And the residents were not affected by the water interruption because the connections to the houses were not interrupted during the execution period. After the execution according to Fig. 4, it can be observed that the pressures are in the range of 3.5-3.0 bars.

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