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**Smagulov Zh.K., Myrzakhmetova A.Zh., Maksutova A.M.
Inspection of the engineering infrastructure of Satpaev**

*EA Buketov Karaganda State University
(Karaganda, Kazakhstan)*

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Abstract

The purpose of the inspection was a modernization and development of water supply and water disposal systems in Satpaev. Materials of comprehensive examination are the basis for the real research: definition of physical and corrosion wear of reinforced concrete and metal designs; actual sizes of cross sections of elements of designs; drawing up repair lists and assessment of operational suitability. It is shown that technical condition of buildings and constructions is efficient on condition of carrying out capital repairs. Further, timely carrying out maintenance and also the observance of rules of technical operation of designs are necessary. Recommendations about system recovery of water supply and water disposal of the city are made.

Keywords: survey of the water supply network, equipment, engineering communication.

The Republic of Kazakhstan adopted a program for the modernization of housing and communal services until 2020. The program provides for the development and adoption of measures for the modernization of communal infrastructure. The program will restore more than 81 thousand km of engineering networks, up to 50% of communications are subject to renewal. In Satpaev, network wear is 80%. The modernization and development of water supply and water removal systems in Satpaev are offered In work. The following problems are being solved:

1. Providing a practical implementation of the system approach in the reconstruction of old and construction of new water management systems and water supply and sanitation facilities.
2. Expect a clear direction of subsequent design developments from the condition of meeting the requirements for an integrated approach when reconstructing centralized water supply systems and local wastewater systems (septic tanks), taking into account all water users.
3. Obtain preliminary basic baseline data for the development and improvement of the regulatory legal framework in the field of water supply and sanitation regulation.
4. Put a variant of reconstruction and construction of water supply and sanitation systems, taking into account the efficient and cost-effective operation of facilities in the future.

5. When developing and comparing options, take into account the requirement on the investment attractiveness of the water sector and the maximum involvement of private capital in financing water supply and sanitation facilities.
6. Consider the maximum use of groundwater potential for providing the population with drinking water.
7. Offer designers several options for technical and technological solutions for water supply and wastewater systems for in-depth calculation and the adoption of a final design solution that would meet the increased quality characteristics.
8. To show on a concrete example the calculation of the effectiveness of creating and implementing a monitoring system for the state of the water supply and sanitation sector, including the quality of groundwater and surface water.
9. To link the account of water consumption and water disposal with tariff formation to ensure profitable operation of the operating organization.
10. Calculate the estimated and recommended long-term and cost-effective tariffs for the purpose of guaranteed return on investment.
11. Show the difference between the existing level of water losses during transportation to the consumer, before and after reconstruction of water supply and sanitation systems. Compare the results with evidence-based regulatory sources.

The work considers a complex of water and sewerage facilities in Satpaev and provides for the reconstruction and construction of the following facilities:

1. Reconstruction Eskulinskiyi water-fence, consisting of 25 wells.
2. Reconstruction of the 2nd stage pump station UVS-1
3. Reconstruction of the 2nd stage pump station UVS-3.
4. Reconstruction of pump station of fresh water of Satpaev.
5. Reconstruction of the 2nd stage pump station of Zhezkazgan (Krestovskiy).
6. Reconstruction of a pumping station for water pumping in 63 quarters.
7. Reconstruction of a pumping station for pumping water 74 quarters.
8. Tanks of clean water at the site of the NN of the 2nd rise of the UVS-1, UVS-2, UVS-3, and Krestovsky.
9. Reconstruction of the prefabricated reservoir portion of Karabulak wells and the western portion of Eskulinskiyi Water intake to pumping station of 2nd lifting UVS -1.
10. Reconstruction of prefabricated collectors from wells of Eastern Section Eskulinskiyi Water intake to the 2nd stage pump station UVS -1.
11. The building of a new water conduit from Wells Eskulinskiyi water intake to NA 3 A 820 mm length of 95.795 km.
12. Reconstruction of water pipeline from the pumping station of the 1st stage pump station on Kengir reservoir D 1020 mm, a length of 14.420 km from separation on two threads: one - D 630 mm, a length of 8.720 km before NA fresh water, other - A 820 mm length of 8.940 km before NA2- the 2nd stage pump station Krestovsky.
13. Reconstruction of two threads of the water pipeline D630, D820 and D400mm with a total length of 5.82 km from the pumping station of the 2nd stage pump station Krestovsky to third stage pump station.
14. Reconstruction of the water channel from the National Assembly "Freshwater" to the third climbing D400mm, length 3.3 km.
15. Reconstruction of existing water supply networks, the length of 339.0 km.
16. Construction of new main and distributing water supply networks for the estimated period until 2025, with a length of 148 km.

17. Reconstruction of a sewage pumping station quarter 66 of Satpaev.
18. Reconstruction of a sewage pumping station quarter 74 of Satpaev.
19. Reconstruction of the main sewage pumping station on the street Ulytauskaya.
20. Reconstruction of existing sewer networks, the length of 272 km.
21. Construction of new sewerage networks for the estimated period until 2025, with a length of 175,310 km.
22. Construction of SPS № 1.
23. Construction of SPS №. 2.
24. Construction of SPS №3.
25. Construction of SPS №4.
26. Reconstruction CBS from extension 30000 m³ / day.
27. Construction of the WOS.

The scheme of household and drinking water supply is maintained according to the existing scheme with water supply from the reconstructed water intake with the pumping station of I lifting at the Kengir reservoir in Satpaev from the reconstructed water intake at the Eskulinskiyi field. After cleaning and disinfection, the water from the pumping station II of the lift is fed into the city. To improve the quality of water supply in Satpayev and taking into account the development prospects, it is necessary to conduct a complete reconstruction of the existing water supply system. In connection with the development of the city, the project provides for the construction of new main and distribution water supply networks. The verification hydraulic calculation was carried out to determine the throughput capacity of the ring water supply networks for two cases of network operation - passing the calculated water flow to household and drinking needs and to pass the water discharge to firefighting, provided that the existing diameters are preserved. The balance of water consumption is made. The results are shown in the Table 1.

Existing water supply networks are rung low pressure.

The balance of water consumption in Satpaev:

Table 1

Name of the Source	Unit Measurements	First of fall	Estimated period
1	2	3	4
Total water reserves, total	th. m ³ / day.	121.5	171.7
including:			
Kengir Reservoir	th. m ³ / day.	63.0	63.0
Eskulinsk deposit	th. m ³ / day.	58.5	58.5
Stormwater and drainage water storage		-	50.2
Water consumption, total		57.89	63.03
including:			
Household needs	th. m ³ / day.	17.75	20.80
Technical needs	th. m ³ / day.	40.142	42,228

Calculations of water consumption in Satpaev were carried out, taking into account firefighting for 2015-2025. The results are shown in Table 2.

Reconstruction and construction of new main and distribution water supply networks for the future involves the transfer of calculated water (at a rate of 200 liters per person per day).

The design schemes of the city's ring network are made for 2 cases:

- consumption of maximum water consumption;
- on the consumption of maximum water consumption and fire extinguishing.

The creation of an Automated Information Management System for the Technological Process (ACS TP) of the Satpaev water supply is envisaged. ACS TP is designed to implement the functions of monitoring and controlling equipment located at the technological sites of the Satpaev water supply system. The created system will solve the following main tasks:

- automatic collection and prompt presentation in a user-friendly form of necessary and reliable information on the status of equipment of pumping

stations, tank farms and other control facilities at the facilities of the Satpaev water supply and sanitation system.

- formation of a history of changes in technological parameters of different time depths with presentation on color displays and printing in a user-friendly format (digital, graphic, etc.);
- automatic light and sound signaling of the state of all technological parameters, technological equipment, means of regulation and control;
- management of technological processes at sites and water disposal in any of three modes: local, remote, manual (with ARM) and remote-automatic;
- automatic execution of technological interlocks for violations in the operation of equipment and incorrect actions of the operating personnel of the system;
- servicing the requests of technological personnel for providing information on the parameters of technological processes in the system of water disposal and water supply;
- formation of reports (processing, water consumption, consumption of coagulants, etc.);
- maintenance of technological reports;
- keeping a log of actions of technological personnel;
- archiving of technological data;
- diagnostics of the software and hardware complex;
- image of technological equipment, modes of its operation and technological parameters on the monitors of the operator;

To provide access to archival information through graphical tools and standardized programming interfaces;

Provide complete diagnostic information about the status of the control object and controller equipment;

Supplement and change the system without serious technical alterations;

Ensure the reliability of the system by applying the principles of modularity, redundancy and the use of exceptionally reliable components.

Summary data on water consumption in Satpaev and industrial enterprises for 2015-2025.

Table 2.

Name	Watersupply, m3 / day						Watersupply, m3 / hour						Watersupply, l / sec					
	2015			2025			2015			2025			2015			2025		
	Q sr .sut.	Q max .sut.	Q mi n.sut.	Q sr.s ut.	Q m ax.s ut.	Q mi n.sut .	q s r.c h	q m ax.c h	q min. ch.	q sr .ch	q max. ch	q min .ch.	q 0 Wed	q 0 max	q 0 min	q 0 Wed	q 0 max	q 0 min
1	2	3	4	5	6th	7th	8	9	10	ele ven	12	13	14	15	16	17th	18	19
Populati on	136 50	15015	1092 0	16000	176 00	1280 0	56 8.7 5	844. 6	118.3	666 .67	990.0	138.7	158.0	234. 6	32.86	185. 2	275. 0	38. 53
Unacco unted expense s, includin g the needs of small-scale busines s enterpri ses	273 0,0	3003	2184. 0	3200	352 0	2560	17 0,6 25	187. 7	136.5	200	220	160	47.40	52.1	37.9	55.5 6	55.5 6	44. 4

The maintenance and poenie cattle	1365.0	1502	-	1600	1760	-	170,625	187.7	-	200	220	-	47.40	52.1	-	55.56	55.56	-
Total:	17745	19520	13104	20800	22880	15360	910	1220	255	1067	1430	299	253	339	71	296	397	83
Industrial enterprises - total	40142.39	48170.87	36128.15	42228.05	50673.66	38005.25	4181.5	5017.80	3763.35	4398.76	5278.50	3958.88	1161.5	1393.8	1045.4	1221.9	1466.3	1099.7
including:																		
Mining industry	39947.6	47937.12	35952.84	41961.5	50353.8	37765.35	4161.2	4993.45	3745.09	4370.99	5245.2	3933.9	1155.9	1387.1	1040.3	1214.2	1457	1092.8
Manufacturing industry	194.79	233.75	175.31	266.55	319.86	239.90	20.29	24.35	18.26	27.77	33.32	24.99	5.64	6.76	5.08	7.71	9.26	6.94
Total:	57887	67691	49232	63028	73554	53365	5092	6238	4018	5466	6709	4258	1415	1733	1116	1518	1863	1183

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