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COMPARISON OF THE HYDRAULIC CALCULATIONS TABLES NETWORKS SEWERAGE

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The article has analyses the calculations of the networks sewerage, made the calculated tables of different authors. There has been shown the possibility of reducing the capital costs for materials and construction of networks sewerage. There have been proposed a more economically expedient table.

Keywords: sewerage, hydraulic calculation, wastewater, diameter, pipes.

General problem statement. Wastewaters affect the sanitary condition of cities and towns. A feature of the sewerage network is: gravity movement mode. For normal operation of the sewage network must correctly calculations by which determine the size of the pipe, slope, speed and filling pipe. The hydraulic calculations are considered by some of scientific works [1–2, 4–6, 8, 9].

The purpose of this analysis is to search for possible technical solutions that allow the rational designing of and reconstruction of sewage system.

Main part. A gravity sewer network is design to incomplete filling. The purpose of hydraulic calculation is the selection of pipe diameters, slopes and defining the network marks the trays and the depth of laying pipe. In practice, the hydraulic calculation of sewer networks is performed using the calculation tables.

The appearances of modern materials pipes and standard documents require changes in hydraulic calculation table [1, 2]. The issue of hydraulic calculation received much attention, but not compared the different methods and tables for calculation. There are no accurate recommendations for the use of certain tables. Therefore there is a need to study this problem.

For practical calculations take the town, this situated on the territory of Ukraine (Fig.1).

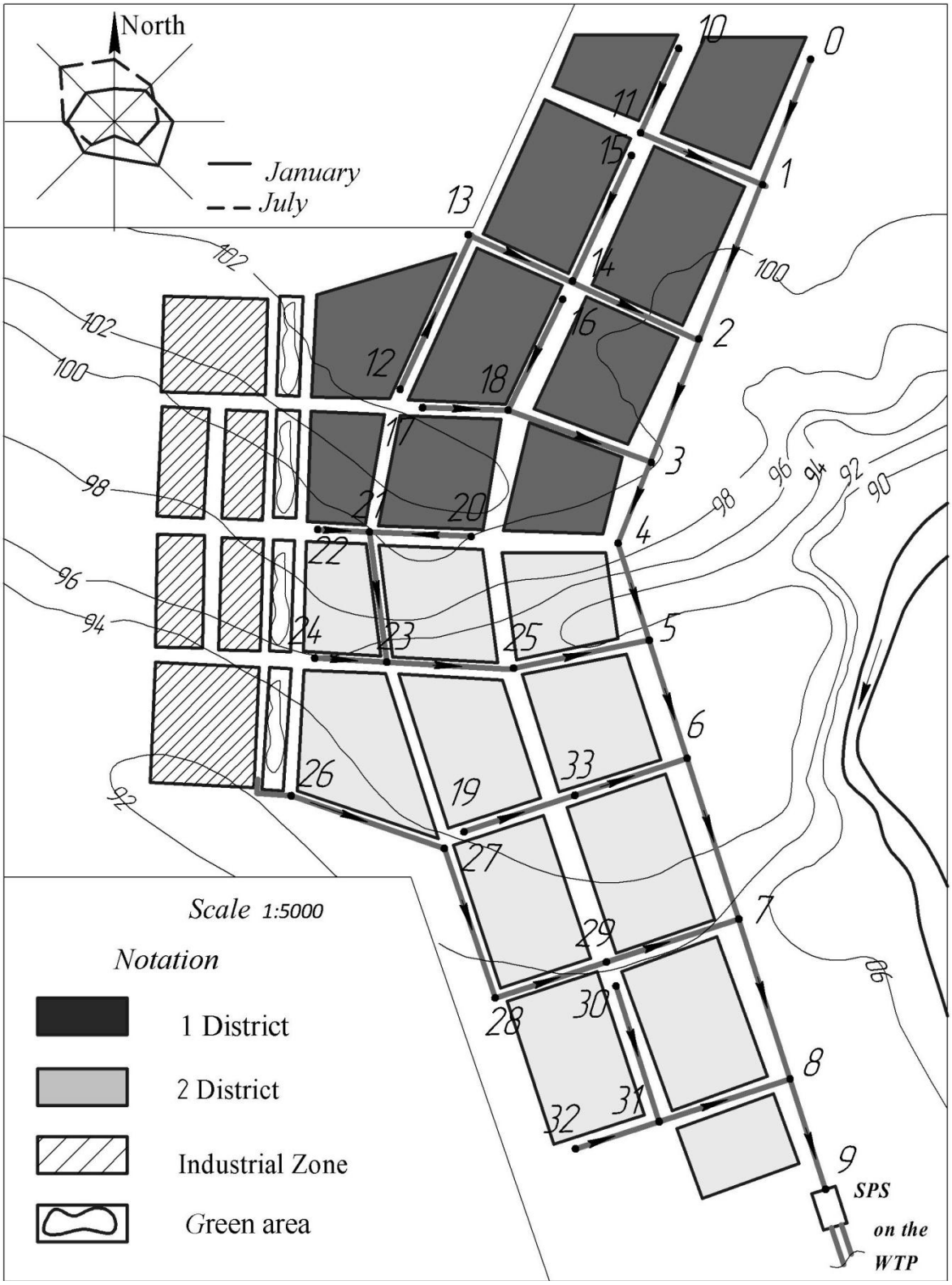

Fig. 1. Sewerage networks plan of the town

Town consists of 2-regions that differ in the number of inhabitants and the degree of improvement [3]. Sewage system is separate. Domestic and industrial

waste water discharged into a sewer network. The main collector transports wastewater to the main sewage pumping station ***(SPS)***, then to the Wastewater Treatment Plant ***(WTP)***. Tracing the sewage network is made on the plan of the town.

Hydraulic calculation of sewerage networks is made using Microsoft Excel. All sewer networks are calculated three times at different tables [4, 5, 6]. As a result of hydraulic calculation pipe diameters, slopes and defining the network marks the trays and the depth of laying pipe are identified for the sewer network of the town.

Comparison variants calculation on the example of the main collector 0-9 shown in Table 1, where diameters (**d**), slopes of networks (**i**) and the average depth laying of the pipe (**h**).

Table 1– Comparison variants calculation

number plots	**[6]**			**[4]**			**[5]**		
	d,mm	**i**	**h,m**	**d,mm**	**i**	**h,m**	**d,mm**	**i**	**h,m**
0-1	250	4	1.922	250	5	1.922	200	5	2.128
1-2	315	3,2	3.718	350	3	4.016	315	3.2	4.177
2-3	400	2,5	5.070	400	3	5.253	450	2.2	5.524
3-4	500	2	5.593	500	2	5.756	500	2	5.940
4-5	500	2	3.173	500	2	3.415	560	1.8	3.547
5-6	500	2	3.903	600	2	4.302	630	1.6	4.260
6-7	630	1,6	3.394	700	1.5	3.689	630	1.6	3.672
7-8	800	1,3	5.727	800	1.3	5.828	800	1.2	6.264
8-9	800	1,3	4.910	900	1.1	5.089	900	1.1	5.524

The optimum diameters of the pipe with respect to the calculation of the three options are greyed.

When using tables [5] for small discharge diameter on the plot 0-1 received the least in comparison with [4] and [6]. However, with increasing discharge of waste water in the plots 2-3, 4-5, 5-6 and 8-9 diameters are greatest. The

maximum diameter pipes reached 900 mm, and the depth of laying the network in point 8 reached 6.34 m.

When using tables [4] laying depth is slightly smaller, but in some plots (0-1, 1-2, 5-6, 6-7, 8-9) piping diameters are necessary larger than the other two calculations.

When using tables [6] laying depth is less than in the previous two cases, the system will be fully function at smaller diameters. This, in turn, affects the economic feasibility of using the system, calculated according to these tables.

Polyethylene pipes are much more resistant to wear than concrete, ferroconcrete and plastic pipes. So now is to give preference to polyethylene pipes. When laying pipes from polymeric materials hydraulic calculation should be carried out on tables [6].

Conclusions

1. Table [4] should be used when the drainage system being projected with ceramic, concrete or of ferroconcrete pipes.

2. Table. [5] are calculated using formulas of uniform motion of liquid with using a roughness coefficient for plastic pipes. Thus the tables should be used when designing the network of sewage pipes of plastic

3. The diameters and the depth laying of the pipe in the calculation of the tables [6] are lower than in the previous two calculations. And the system is functioning normally.

4. The tables should be taken when calculating the sewage system to be built out of corrugated plastic pipe company «KORSIS» and it affects their economic advantage.

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