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Аннотация: *В статье анализ программ гидравлического расчета системы городского водоснабжения современные крупные городские системы водоснабжения требуют особых условий эксплуатации, контролируют распределение водотоков в разветвленных и протяженных трубопроводных сетях с учетом состояния трубопроводов*

Ключевые слова: *Программа Epanet; Дарси-Вейсбах; Хейзен-Уильямс; коэффициент расходов; коэффициент сопротивления; расход воды.*

ANALYSIS OF COST ALLOCATION IN THE WATER SUPPLY SYSTEM

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Annotation The article analyzes the programs of hydraulic calculation of the urban water supply system modern large urban water supply systems require special operating conditions, control the distribution of watercourses in branched and extended pipeline networks, taking into account the condition of pipelines.

Key words: Epanet program; Darcy-Weisbach; Hazen-Williams; expense ratio; resistance coefficient; water consumption.

Introduction: Hydraulic models of water supply systems are used to improve the efficiency of management and development of water supply networks in cities. The current level of computing technology and special programs allows for prompt mathematical calculations and the display of modeling results in tabular and graphical form, and the monitoring and control of technological processes. The Epanet computer program allows for the modeling of the hydraulic regime in a pressure water supply network with pumping stations, reservoirs, and shut-off and control valves. Developed by the US Environmental Protection Agency in the late 1990s, Epanet has been used for almost 15 years by technologists and designers around the

world to calculate water supply networks. This program has a graphical interface and provides ample opportunities for analyzing the distribution of water supply network flows (Fig. 1). In an existing or designed water supply system, the program determines the pressure at dead-end points of the network, pumping stations, and pressure tanks, and the water flow rate in any section of the network.

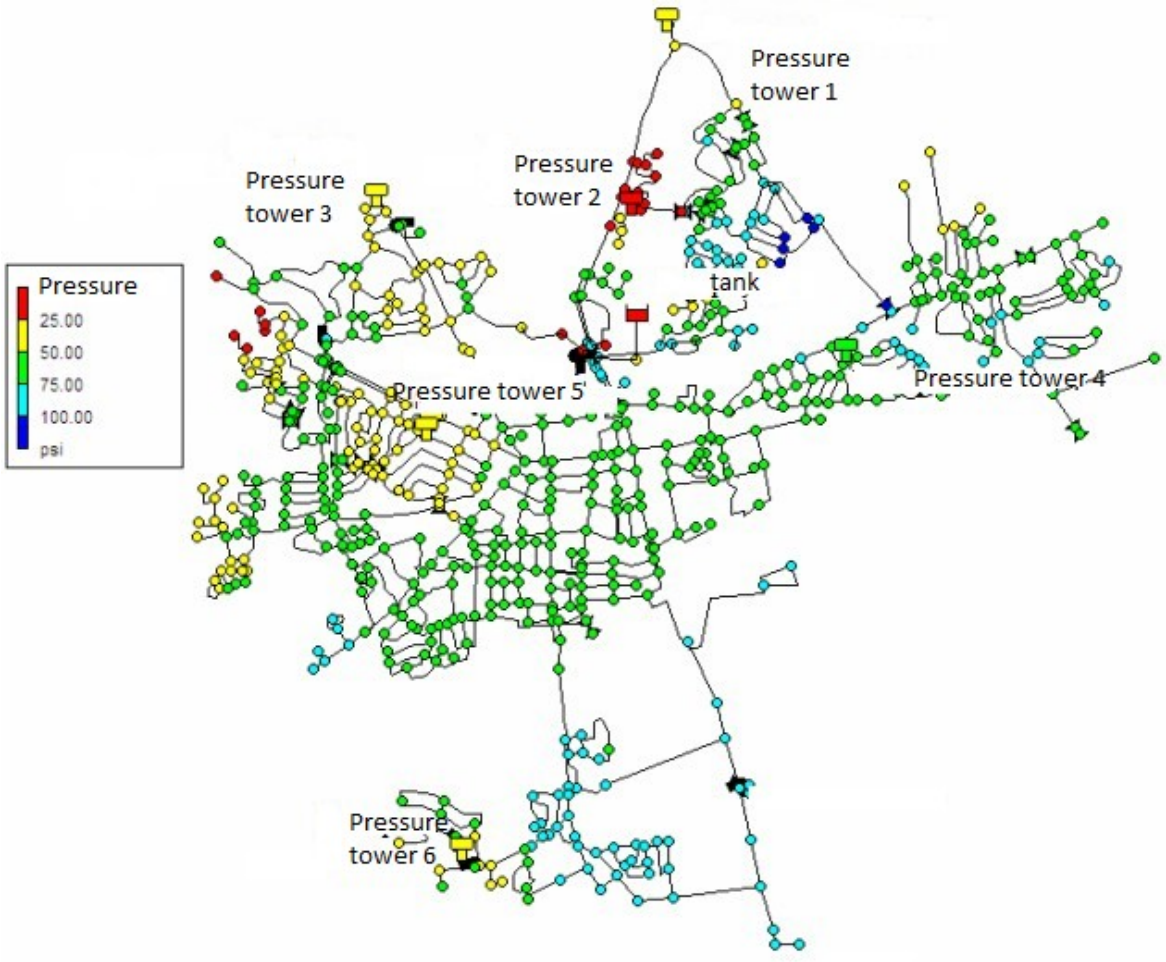

Figure 1. Model of pressure distribution in the urban water supply system

The Epanet program is designed for hydraulic analysis of pressure pipe networks, as well as for modeling the processes of changing chemical compounds in water.

The EPANET software package allows you to determine the quality of water for a certain period, select a strategy for managing the state of water in the network, select a water supply source, change the operating modes of pumping stations, reservoirs, water treatment and water purification. (Fig. 2).

In hydraulic modeling, there are no restrictions on the size of the water

distribution network. The software package allows you to calculate pressure losses using the Darcy-Weisbach, Hazen-Williams or Chezy-Manning formulas. Local pressure losses are determined in the pipeline and in the branches and control wells, which allows you to clarify the hydraulic calculation. At any time, the concentration of chemical elements in the water supply network is determined. Bentley watergems allows you to carry out hydraulic calculations and analysis of the urban water supply network to study the movement of water flows in the developed water supply and sanitation system, reduce energy consumption.

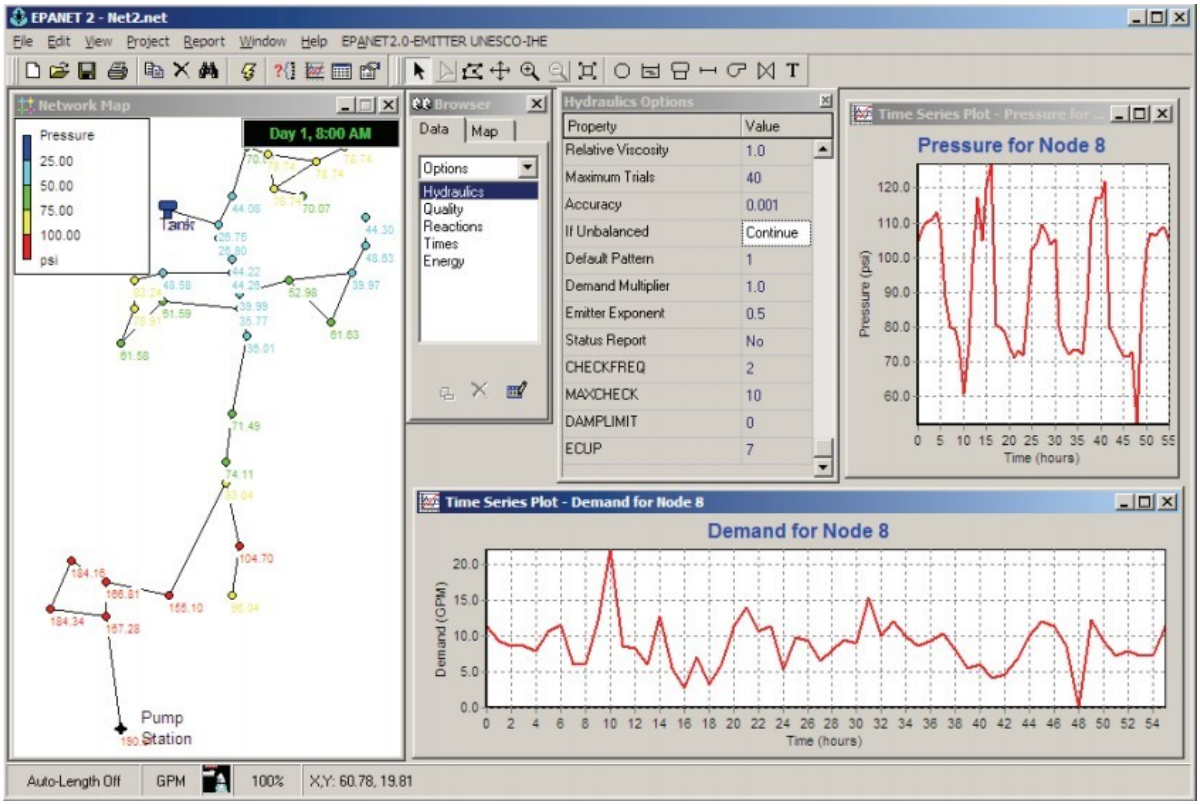

Figure 2. epanet graphical desktop

An important feature of the program is the ability to simulate the operation of pumps with a frequency drive, calculate energy consumption and operating costs

Pressure losses in water supply networks are determined by the formulas: according to the Darcy-Weisbach, Hazen-Williams, Chezy-Manning formulas, it is assumed that pressure losses occur with uniform flows in pipelines. The Darcy-Weisbach formula is used for all liquids and for all flow modes, local pressure losses

in water pipes and for determining pressure losses along the length of the network.

To determine pressure losses by analyzing the listed formulas, a general formula is used:

$$h_L = A \cdot q^B$$

where is the pressure loss, q is the flow coefficient (volume/time), a is the resistance coefficient, B is the flow rate index.

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