SOFTWARE FOR CALCULATION OF LIQUID FLUID LEAKAGE CHARACTERISTICS FOR RESERVOIRS OF VARIOUS GEOMETRIC SHAPES

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ABSTRACT
Determination of liquid fluid leakage characteristics for reservoirs of different shapes is very important in engineering practice. For sizing and calculation of reservoirs used in various industrial systems it's often necessary to determine the reservoir volume, time of leakage, speed and fluid flow. The determination of the above characteristics may be easy in some cases, but sometimes it may be complicated, especially in cases of reservoirs of variable crros – section.
This paper presents the basic characteristics of computer created program that allows the calculation of reservoir volume, time of leakage, speed and fluid flow in dependence of time. The majority of existing programs used for resolving these problems give as an output characteristic only the time of the fluid leakage from reservoir. On the contrary, the created program posseses a special quality, which lays in the fact that it calculates the above characteristics in dependence of time and gives the appropriate graphical presentations.
Therefore, the created computer program represents a significant contribution to hydraulic calculations of reservoirs. Also, it can be used as a subprogram in general program for reservoir and complex industrial system calculations, as well as a special program for calculation of fluid leakage characteristics. Another convenience of the presented software lays in the significant reduction of time needed for calculation the reservoir and industrial system characteristics.
The software was created in Microsoft Visual Basic 6.0 Enterprise Edition.
Keywords: leakage of fluid, reservoir, computer program.

1. INTRODUCTION

Intensive development of science and technology in recent decades has initiated the intensive development in process of designing and calculating the reservoirs. Modern techniques and technology allow to design and compute various reservoir design characteristics in short time, which significantly reduces the costs of project implementation.

The methodological design and calculation of reservoirs can be realized in several ways. A wide variety of analytical, numerical and experimental methods are used in the process of reservoir design. Usually these methods define reservoir constructive characteristics in function of the leakage time, speed, and flow of fluids. This problem is significantly more difficult in case of reservoirs with variable crros – section. Therefore, it is now increasingly used numerical methods and computer programs for calculation of fluid leakage and reservoir design characteristics. This allows the extensive and cost-effective experimental research projects to be avoided, which consequently reduces time for the project implementation.

All of the aforementioned created a need for creating a simple, cheap and efficient computer program for determining the characteristics of liquid fluid leakage for reservoirs of various geometric shapes. The program that was created using Microsoft Visual Basic 6.0 Enterprise Edition represents a part of the program or subprogram for calculation of constructive characteristics of reservoirs. Basic characteristics of this program are presented in this paper.

2. MAJOR FEATURES AND STRUCTURE OF PROGRAM

General characteristics of the computer program that defines and calculates reservoir, leakage time, speed and flow of liquid fluids, which determine the most constructive characteristics of reservoirs, are given in Figure 2.1. The algorithm of the main program is based on eight subprograms which allow the calculation of leakage features of liquid fluid for reservoirs of various geometric shapes.
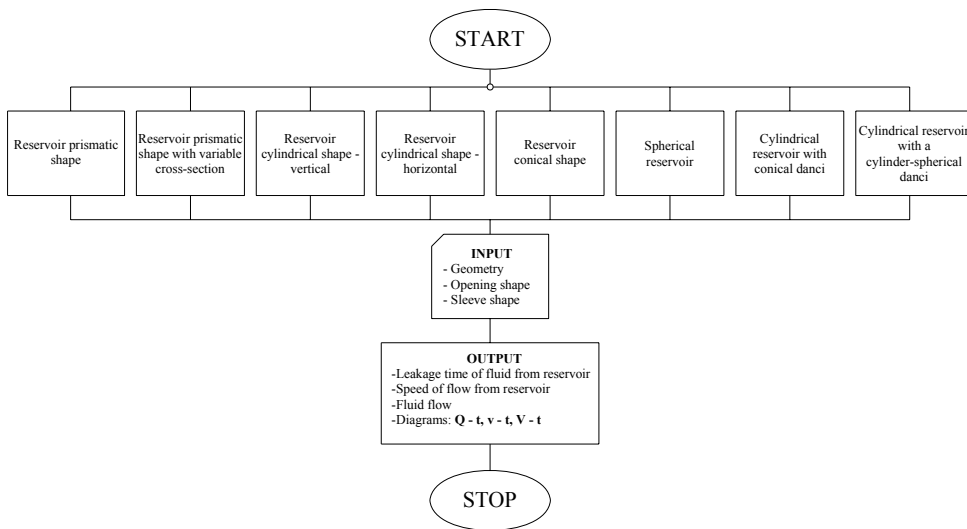

Figure 2.1. Simplified structure of the algorithm of computer program for determining the characteristics of liquid fluid leakage for reservoirs of various geometric shapes

Figure 2.2. shows the main program interface. Selection of the reservoir geometric shape allows the user to enter the input parameters and calculate the leakage features of liquid fluid in that case.
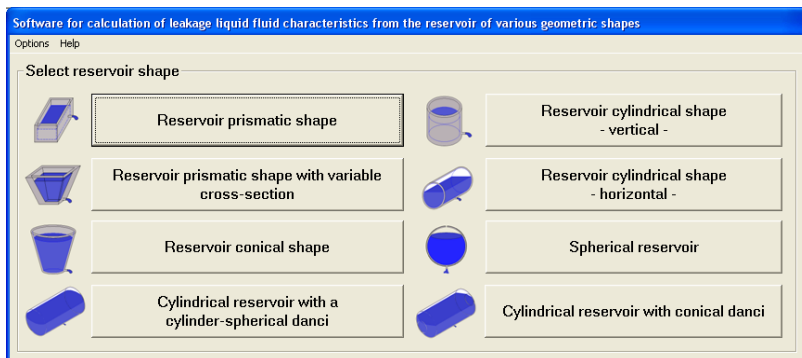

Figure 2.2. The main program interface for determining the characteristics of liquid fluid leakage for reservoirs of various geometric shapes

3. TESTING OF SOFTWARE

After creating this program the test was performed. Figure 3.1. shows the course of the test for a reservoir with variable crros - section i.e. with truncated pyramid shape. After entering the input data, the procedure for calculation of leakage features of liquid fluid from the observed reservoir was initiated.
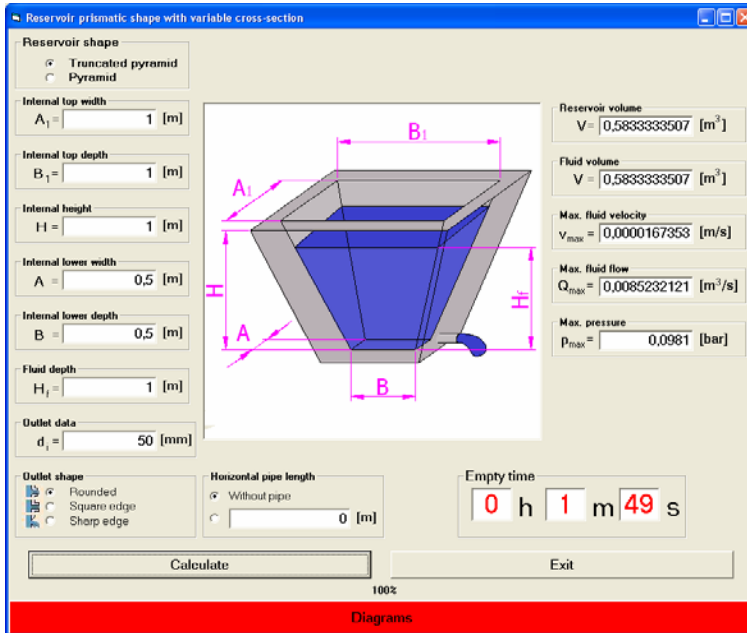

Figure 3.1. The interface of subprogram for test reservoir with truncated pyramid shape

The results of the calculation are obtained almost immediately on the right side of the interface, Figure 3.1. To get diagrams of leakage characteristics, the button Diagrams on the screen provides a new interface that shows three diagrams: Volume-Time, Flow-Time and liquid fluid leakage Speed-Time. These diagrams are shown in Figures 3.2, 3.3. and 3.4.
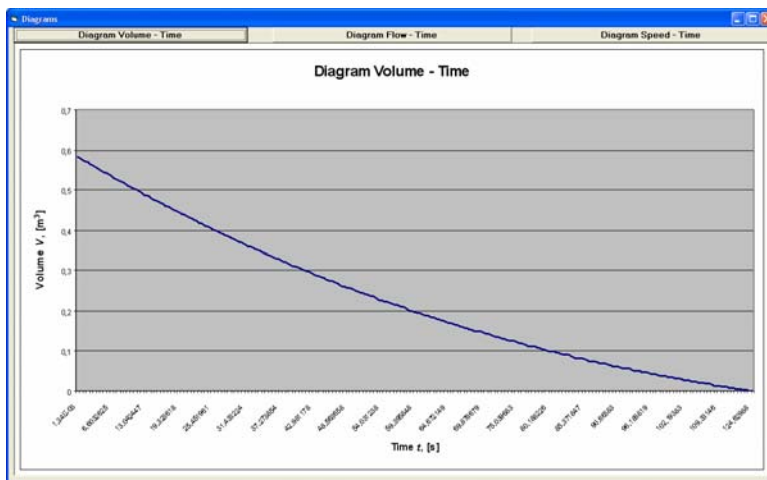

Figure 3.2. Diagram Volume - Time

Figure 3.3. Diagram Flow – Time

Figure 3.4. Diagram Speed - Time

After testing the obtained results were compared to analytical results. Both methods gave consistent results or with a small differences.

4. CONCLUSIONS
Created computer program represents a significant contribution to hydraulic calculations of reservoirs. It can be used as a subprogram in the program for reservoir calculation and complex industrial systems calculations, or can be used as a special program for the calculation of leakage characteristics of fluid from the reservoir. The convenience of this program application is reflected in significant reduction of time needed for calculation of reservoirs and industrial systems characteristics.

5. REFERENCES
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