# Abstract

The study focuses on the accurate description of the gravity filtration process. It has been assumed that the gravity filtration process may be considered based on the general balance equation, which assumes that the mass of the suspension solid phase in the inflow was detained in the gaps of the filtration bed, formed sediment on the bed, formed colmatation barrier in the filtration layer and outflowed with the filtrate. It is a complex, multi-variant process. Depending on the filtration type, it should also be analyzed separately from the cause-and-effect side of the mechanism of the interactions found. The thesis presents and describes the types of gravity filtration (filtration in a porous bed, filtration with an increase in the sediment layer on the bed surface, filtration in a porous bed with an increase in the sediment layer, filtration in a porous bed with a colmatation barrier, filtration in a porous bed with a colmatation barrier and an increase in the sediment layer).

The research was carried out in two stages (the so-called numerical and laboratory), which enabled it to achieve the assumed goals and verify the adopted theses.

In the first so-called numerical stage, the programming environment (LAZARUS) was selected, and the numerical application called BLOFIL was created. The BLOFIL computer program calculates the values and graphically presents selected parameters of the gravity filtration process, particularly colmatation barriers, based on the presented equations of the filtration process. The application has a modular structure, following the example of specialized computer programs. In the first module, input data is entered (e.g. characteristics of the filter bed, characteristics of the suspension sent to the process), and then the program performs unit calculations of selected parameters of the gravity filtration process. Then, they are presented in the form of a table of results. In the next step, the application presents dependency graphs along with a possible approximation of the presented data on the graph. Finally, the program also analyzes the gravity filtration process based on the filtration type coefficient.

In the second so-called laboratory stage, a number of the gravity filtration process tests were carried out in the broadest possible scope. The particle size *fz* ranged from 0.4 to 3.15 mm. The tests were conducted to, among other things, measure the filtration coefficient value according to the variable pressure of the medium method.

The results from laboratory tests were entered into the BLOFIL application, which calculated the values of the result variable parameters, generated graphs and equations of the function approximating measurement points, and finally identified the type of gravity filtration.



**Keywords:**
gravity filtration, colmatation barrier, numerical application, filtration type coefficient, filtration coefficient, bed porosity, solids concentration