

MEASUREMENTS OF THE FILTRATION COEFFICIENT
BY MEANS OF THE PARAMEX METHOD
IN MINE DRAINAGE

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ABSTRACT

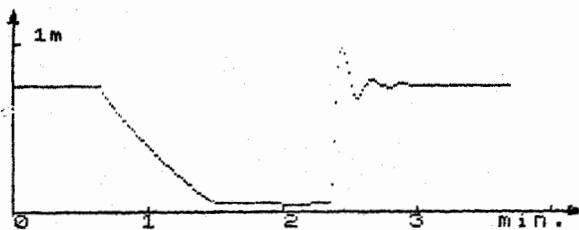
The PARAMEX method enables to reckon the value of the filtration coefficient k and water conductivity T of aquiferous layer by carrying out an experiment in a hydrogeological hole. The cost of measurements by means of the PARAMEX method is only a fraction of the cost of parametric pumping and therefore this method has already found a lot of practical application.

Evaluation of the filtration coefficient k of water-bearing formations is of great importance in many fields connected with water economics. By way of example one may mention: mine drainage, excavations drainage, design and exploitation of ground water intakes, land melioration, or river regulation, canal and dam building. Traditionally filtration coefficient is estimated on the basis of parametric pumping results, because laboratory methods give results loaded with many errors. However, such pumping is expensive and time-consuming, and moreover it cannot be performed in each hydrogeological hole. The PARAMEX method enables to obtain the value k with measurement accuracy comparable with parametric pumping results, at the same time the cost of

research and time needed to perform an experiment are many times lower than the cost and duration of pumping.

An identification experiment carried out by means of the PARAMEX method consists in artificial stimulation of well - aquiferous layer system to free vibration. Such vibration activation may be obtained by forcing in compressed air into a hydrogeological hole sealed from the top /well, piezometer/. It cause that water level lowers in the investigated hole. When equilibrium of pressure is fixed air should be rapidly decompressed. Water level return to the initial state is in process of free vibration. Two characteristic cases of water level motion in a hydrogeological hole are shown in fig.1.

a/



b/

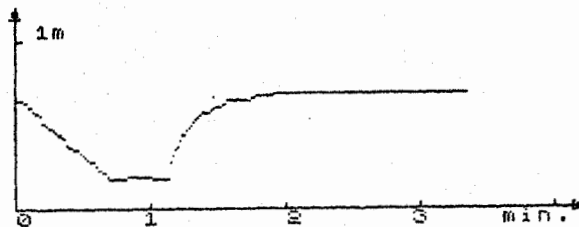


Fig.1. Examples of water level motion in a hydrogeological hole during an experiment by means of the PARAMEX method:
a/ damped vibration b/ aperiodic motion

The special set of measuring devices enables to record water level oscillations /fig.2./. A level indicator probe is placed into a hydrogeological hole so it processes electric signal proportional to water level depression. Then this signal is processed by a depressionmeter /D/ and can be recorded analogue with the help of pen recorder.

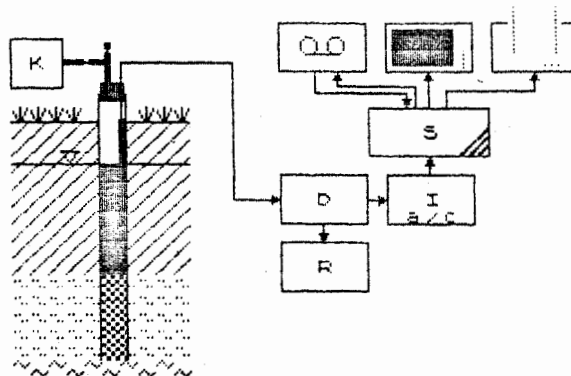


Fig.2. Hydrogeological section of the investigated hole and block diagram of the measuring apparatus:
 K - compressor, D - depressionmeter, R - recorder,
 I a/c - analogue-digital interface, S - microcomputer "SPECTRUM" mating with a cassette recorder, a TV display and a printer

There has also been applied a set of digital registration of measurements in microcomputer operating store. Out of town, the whole set of measuring devices is supplied from a car battery.

Then one should measure water level oscillations recorded after air decompression in a hydrogeological hole. Thanks to application of microcomputer it is possible to take measurements directly after the finish of the experiment, even in ground conditions.

The PARAMEX method imposes certain requirements concerning the construction of a hydrogeological hole. Inside diameter should be

larger than 1.5 inches, but it is recommended that it should not exceed 8 inches. Column of water above the filter must be higher than 2 metres. Hilling in the filter zone should be well-chosen and prepared with great care, and pipe housing must be tight. The PARAMEX method enables to reckon the value of the filtration coefficient of aquiferous layer on a large scale. But practical research indicates that measuring error considerably grows for the value $k < 10^{-7}$ m/s.

The filtration coefficient measurements by means of the PARAMEX method may be used for improvement of hydrogeological identification grade. It is of great importance in case of mine drainage. Especially it concerns strip mines where drainage is carried out on vast areas.

Measurements with the help of the PARAMEX method in all sight-holes in the zone of strip mine drainage contributes to the detailed identification of the filtration parameters variation of aquiferous layer.

References

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