duced between the consoles and the layer formation. The layer formation integration had been introduced, having researched the layer's and the consoles' formation and behavior specific features and their peculiarities, that was allowed us to be estimated the main reservoir's characteristics of the layers' formation loading zones. The consoles had not been had the corresponding grid to speed up the necessary calculation, and they were described by the equations of the elasticity theory. As a result, the deformation form changing, the wave nature of the load distribution, especially, the specific features and the peculiarities of the layers' delaminated sections areas, their order in the layers formation, the deformation and the precipitation formation at the sections layers during the disintegration have easily been tracked and monitored.

It should be considered not only some elements' destruction of the system (e.g. the cross fracture, the delamination), in order to be, more precisely and accurately, described the constantly changing system, but also their mobility increase, due to the varying loads. Therefore, the «elements' change forming» term is used, sometimes instead of the «destruction» term, which should not be confused with the system's change forming. It was not quite enough the computer model for the precise and accurate assessment of the system's state change, and we have already used the very simple scale – tested model from the photo–elastic material, that made it possible the experiment's quality to be tracked and monitored.

Then, the tightening weight in the computer model, having simulated the overlying rocks, has been replaced by the half plane (e.g. the rocks imitation up to the ground surface) with the corresponding half plane and the overhead console interaction equations. Thus, having had the relatively small program code and, therefore, correspondingly, the good possibilities of the programming errors and the challenge's logic solving well – placed control, we have got the chance to be concentrated on the form changes fixation program (e.g. the destructions) of the various types, when we had to be compared the damages' types and, moreover, to be found the universal estimate for the high – priority selection of one of them for each calculating cycle [5], and also the special automatic correct program for the form change and the calculation continuation just in the new state, having dropped the given report into the data files.

So, the stress non – linear increase fixation is taken its place only, when the system is collected the elements' form changes of the minimum level and is became relatively free (e.g. it is quite impossible to be prevented such violations, due to the need of the management enormous efforts), and the prevention attempts are trying to be avoided the fact, that if they are occurred in the other areas. Then, the stresses are reduced, and the system, as it is sought to be repeated the previous state, although at the new level. So, the areas, where there have been the discontinuities, are closed up again, which is repeated several times. Since, the statistic solution is practically allowed to be simulated the system tendency to the oscillations. We will note, that the logic challenges loss should not be occurred in the computer applied researches, and, moreover, the form changes in some areas of the destruction will have to be securely fixed, recorded and explained. So, the phenomenon process model should be constructed, having reflected «the common sense» [5], and the mixed and the ambiguous results to be explained by the known physical principles and the analogies, so the fixed some delaminations could be explained by the stresses wave spreading, having obtained firstly in the simplified, and then, in the solid – state model, and, finally, in the fixed state under the mining conditions.

Thus, the mechanic principles are practically allowed us to be extended the geo-mechanical system behavior and for the other ones, for example, the construction systems, which still is not taken into account at the designing.

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MODELLING PROCESSES WASHING, WEIGHING, AND DEPOSITION OF SOLID FRACTIONS IN SLITS

Turkin A.A., Sibinina T.F.

Krasnoyarsk state agrarian university, Krasnoyarsk, e-mail: turkin@achinsk.ru

Behavior of solid fraction in water environment depends on their form (pebble, sand, silt) and dynamics of natural processes of sanding in slits. Washing, weighing, and deposition often takes place with usage of facilities that are designed for water-selection with a large hydrodynamic strike.

Studying these processes can be realized via carrying out several stages of theoretic analysis.

We examine dynamics of washing, weighing, or depositions fractions without considering their interactions. We select the following basic parameters:

– inner parameters (size of fractions);

– outer parameters (pressure, temperature, and density of an environment);

– initial parameters (initial concentration of fractions according to their types in areas of slit);

– output parameters (final concentration of fractions according to their types in areas of slit).

Using three linear parameters (length *a*, width *b*, and thickness *c*, *a b c*) of fractions (specifically, their average values according to the three outlined types of fractions) as inner parameters proves to be irrational as, first of all, it complicates the model, increasing its dimension (three parameters instead of one), and, secondary, it doesn't define a form of fractions.

Therefore, in order to simplify the structure of formulas, we introduce a generalized parameter that links all three parts it. Using an arithmetical mean diameter does not prove effective as it doesn't reflect forms of fractions:

$$\overline{dar} = \frac{a+b+c}{3}. \quad (1)$$

Using average geometric diameter is more informative than (1) from this point of view:

$$\overline{dg} = \sqrt[3]{abc}. \quad (2)$$

A method to decrease sanding in slits.

In order to decrease sending of silts, we select a facility of water raise with a less dynamic characteristic, since a sharp change in speed of water flow to a slit causes washing and weighing of solid fractions.

Obviously, sizes of (1) and (2) equal only in case when fractions have a form of a ball or a cube that can't be found in natural conditions. For the given values of *a, b, c* diameter $\overline{dg}$ will be less in comparison to $\overline{\alpha}_{ar}$, as a fraction form alter from the ball.

Below we provide even more informative parameter, compared to (2), that is equal to ball volume in diameter:

$$\overline{deb} = \sqrt[3]{6V/\pi} = 1{,}24\sqrt[3]{V} \quad (3)$$

where *V* is a fraction volume.

We study an index that is equal to the area of round that if formed of a diametrical section that are formed of the average (width *b*) and the smallest (thickness *c*) size:

$$\overline{d_{eq}} = \sqrt{4S_{ds/\pi}} = 1{,}12\sqrt{Sds}, \quad (4)$$

where S_{ds} is the area of a fraction's diametrical sector that is normal to its biggest size (length *a*).

Formula (4) is introduced in order to describe an equal size (diameter) of pebble and gravel. To use it, we carried out measurement of *a, b, c*, calculation of S_{ds}, and calculation according to (4) that gave us the following results: gravel – d_{eq} = 0,5–1,5, pebble – d_{eq} = 1,6–2,5 mm. Pebble and gravel can move within the flow in a suspended condition, and description of this motion requires studying flow around a fraction. Therefore, geometry of sand fractions of this type should be described as equal to round (or a ball, according to (30)) in size that considers not only parameters, but also a form of fractions.

When studying sand fractions, we can consider so called sieve size that is the smallest size of a sieve cells, though which fractions have been sifted. Geometric characteristics of sand, slit, and clay fraction groups were defined via sieve analysis and definition of sieve size (for large-grain sands $\overline{d}_c = 0{,}5–2{,}5$, average-grain – $\overline{d}_c = 2{,}5–0{,}5$, small-grain – $\overline{d}_c = 0{,}12–2{,}5$ мм). Starting with thin-grain sand fractions, it is necessary to use washing of fractions

Apart from reserves, fractions of pebble and sand must be also characterized by a coefficient of form. There are many suggestions and recommendations on defining this coefficient in bibliographic sources on studying various fractions (soil, seeds, grain, etc). Works of J. McKnown and J. Malaiky [1] suggest imaging all three sizes of a fraction as half-axis of ellipses: $a_1 = a/2$; $b_1 = b/2$; $c_1 = c/2$, in which the corresponding projection is fit. Then, the coefficient of form will look as:

$$C_{f1_1} = \frac{a_1}{\sqrt{b_1 c_1}}. \quad (5)$$

Its further development is expressed for coefficients [2] as:

$$C_{f2} = \frac{c}{\sqrt{ab}}; \quad C_{f2} = \frac{b_1}{c_1}; \quad C_{f1} = \frac{a+b}{2c}. \quad (6)$$

The simplest formula of C_{f1} (6) contains parameter *a*; actually, a length (the biggest size or an elongation) only directs a fraction in case it tears off, weighs, descends, deposits, while geometric sector of the smallest and an average parameters plays the key part in these processes.

Obviously, coefficient of form should be located in the interval (0, 1), in a limit, in case of a sphere, it should equal 1 (if $a = b = c$), and reach for zero in case of a stretched parallelepiped ($a \geq bc$). Then formulas формулы C_{f1}, C_{f2} and C_{f4} are excluded from the study, as for them $Cf > 1$, and $Cf \to 0$ when $a >> bc$.

When all the mentioned requirements of asymptotic behavior are secured, coefficient of form will correlate hydraulic fineness with size of fraction of different form. Our analysis has shown that this characteristic is secured by a coefficient, calculated with formula:

$$C_f = \left(\frac{\overline{d_e^2}}{bc}\right)^{\alpha}; \ \alpha = 0{,}8, \ \overline{d}_e \text{ according to (4)}, \quad (7)$$

Indexes C_{f1}, and C_{f2} provide an obviously increased coefficient of form. It is linked to the fact that for K_{f4} dependence between fractions is considered linear, and for K_{f1} – according to a square parabola. Their further study shows us that the degree of nonlinearity of hydraulic processes lies between (1) and (2). In (7) it equals $2\alpha = 1{,}6$, in other words, this dependence is described as parabola less than a square one that, obviously, corresponds to the physics of this phenomenon. Really, square parabola naturally considers only the area of diametric direction of a fraction sector flow, and parabola of a less degree considers a fraction's volume as well. Studying these indexes, we can form equations of deposition and washing a separate part of spheric ($Cf = 1$) and non-spheric ($Cf < 1$) form.

Calculating heterogeneity of fractions composition in motion, still and suspended conditions.

We study the very totality of a fraction, when conditions for their motion are placed, flow structure and vertical transition of a fraction (lifting and descending) are formed, fractions are placed in a suspended condition, fraction flow is in turbulence.

Descriptions of fractions are usually based on an assumption that they are formed occasionally, and each size of fraction can be given a provision (weight coefficient). While breaking fractions into definite intervals, for example, via sieving analysis, one can come up with a curve of granulometric composition. This curve is constructed on discreet value of sieving sizes. Besides, there is always a certain function in its form, as we are studying an interval of fraction size. After that we calculate a density and connectivity of fraction flow, speed of free even drop of fractions in a still liquid (water).

Considering these indexes, we have formed equations of deposition and washing of a flow of non-linked fractions of spheric ($Cf = 1$) and non-spheric ($Cf < 1$) form.

Description of fractions' motion in a flow with a suspended condition and constructing diffusion models of dynamics of fraction mixtures with an account of boundary conditions (concentration of suspension at a lower border).

For a stationary case (when concentration of fractions C and coefficient of diffusion Cd do not alter) we have an equation of Frankle type:

$$\omega \frac{\partial C(z)}{\partial z} = \frac{\partial}{\partial z} C_d \frac{\partial C}{\partial z}, \quad (8)$$

where ω is hydraulic size; z is vertical coordinate.

Equation (8) should be supplemented with border conditions at the border $z = 0$, $C(0) = C_0$. In this case its particular solution in terms of constant equality of a substance quality that moves up and down looks as:

$$C = C_0 \exp\left(-\varpi \int_{z_0}^{z} \frac{dz}{K_d}\right). \quad (9)$$

Defining functions C_0 and C_d according to (9), we calculate profile of a substance concentration.

Description of a silt's condition from the point of sanding according to rheological model is represented by integral differential equations of Fredgolm and Volter type of the second order and development of model of identifying cores of creeping and relaxation for a specific silt.

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PROTECTING SLITS FROM DANDING WITH AN ARTIFICIAL FILTER

Turkin A.A.

Krasnoyarsk state agrarian university, Krasnoyarsk, e-mail: turkin@achinsk.ru

Low efficiency of exploitation water-intake slits is linked to deficiencies of their construction and building technology (filers of small diameter, drilling with clay mixture and claying of by-filter area, presence of small-grain sands, insufficient pumping).

In order to establish a required water intake, measures of restoring slits' efficiency are necessary. Decrease in the output of underground water intake can be defined by evacuation of its resources, alteration in parameters of a layer (drying off the most permeable area, an impact of low-permeable rock