

MATERIAL COMPOSITION AND TECHNOLOGICAL PROPERTIES OF USEFUL FOSSILE

For the preparation of drilling fluids, finely dispersed plastic clays with a minimum sand content are used, which can form a viscous, non-settling suspension with water.

The quality indicators of clay raw materials and clay powder used for the preparation of drilling fluids are limited by the regulatory documents:

- GOST 25795-83 "Clay raw materials in the production of clay powders for drilling fluids";
- TU 39-044-74 "Clay raw materials" (production of drilling mud from clay powders for the oil industry).

The bentonite clays of the West Kasantau deposit, by analogy with the clays of the Kasantau deposit, which is a direct continuation, are represented by montmorillonite (67.1–80.6%), hydromica (7.3–18.9%), kaolinite (1.8–8, eight%). In addition to clay minerals, the clay contains light minerals, represented by quartz (1.9%), rock fragments (0.6%), feldspars (0.5%), glauconite (0.4%), gypsum (0.1 %) and minerals of the heavy fraction, represented by limonite and hematite (0.16%), magnetite and ilmenite (0.03%), zircon (0.02%).

The chemical composition of bentonite clays, determined from 69 sectional samples (text annex 12), is characterized by the following indicators (table 4.1).

Chemical composition of bentonite clays of the West Kasantau deposit

Table 4.1

Components	Content , %						
	By ditches and pits			By wells			Avarage deposit
	by samples from-to	By workings from-to	average	by samples from-to	By workings from-to	average	
1	2	3	4	5	6	7	8
SiO ₂	53,6-61,4	54,7-56,3	56,16	53,1-58,4	53,1-56,27	55,78	56,0
Al ₂ O ₃	12,3-18,3	14,8-16,0	15,76	14,4-18,1	15,5-18,1	16,22	15,96
Fe ₂ O ₃	2,3-6,1	3,3-4,9	3,95	3,1-5,9	4,1-5,9	4,54	4,20
CaO	1,7-3,0	1,7-2,3	2,09	1,7-2,8	1,7-2,36	2,10	2,10
MgO	1,4-3,1	1,6-2,04	1,97	1,3-2,8	1,4-2,05	1,94	1,96
TiO ₂	0,3-0,9	0,36-0,68	0,52	0,3-0,9	0,47-0,72	0,61	0,59
P ₂ O ₅	0,1-0,5	0,2-0,4	0,29	0,2-0,45	0,25-0,34	0,31	0,30
K ₂ O	1,4-2,7	1,93-2,6	2,27	1,6-2,9	2,02-2,8	2,21	2,24
Na ₂ O	1,6-2,6	1,7-2,1	1,96	1,7-2,7	1,8-2,3	1,96	1,96
SO ₃	0,4-2,0	0,78-2,0	0,87	0,7-1,9	0,9-1,45	1,23	1,05

1	2	3	4	5	6	7	8
CO ₂	0,3-3,2	0,77-1,57	1,12	0,3-0,9	0,46-0,8	0,61	0,91
H ₂ O	1,5-3,4	2,18-3,1	2,4	2,0-3,06	2,3-2,8	2,51	2,46
MnO	0,0-0,04	0,01	0,01	0,0-0,05	0,0-0,04	0,02	0,02
FeO	0,2-0,55	0,3-0,48	0,35	0,2-0,75	0,23-0,46	0,41	0,37
other	8,6-11,8	9,84-11,6	10,11	8,35-11,7	8,73-10,37	9,41	9,81

Harmful impurities in clays that impair the stability of the solutions are gypsum, sand, limestone. From the table below it follows that bentonite clays are characterized by a low (53.6-61.4%) silica content, which indicates an insignificant admixture of sand in clays. The CaO content is also characterized by low values - 1.7-2.3%, an average of 2.10%, indicating a low content of carbonate fragments in bentonite clays. A small content in clays 80z (0.4-2.0%) indicates a slight admixture of gypsum.

With significant fluctuations in the contents of the chemical components in individual samples, the average contents over the surface, to a depth and in the whole in the field are close.

Regularities of the variability of the chemical composition of bentonite clays are neither marked nor along the strike. The useful stratum is a single technological type.

The granulometric composition of bentonite clays (text annex 13) is determined by 22 group samples composed of the remains of sectional ordinary samples taken in ditches and boreholes.

The clay granulometric composition is characterized by the following indicators:

Granulometric composition of bentonite clays of the West Kasantau deposit

Table 4.2

Fractions , mm	Content, %				
	By ditch		By wells		Average deposit
	From-to	Average	From-to	Average	
1	2	3	4	5	6
more 1,0	-	-	-	-	-
0,1-1,0	0,05-0,39	0,19	0,10-0,31	0,18	0,18
0,01-0,1	2,06-5,12	3,99	3,42-5,20	4,44	4,23
less 0,01	94,76-97,89	95,82	94,63-96,53	95,39	95,58
including 0,001- 0,01	39,17-45,62	42,96	39,96-46,00	43,61	43,31
less 0,001	49,21-55,92	52,86	49,42-54,74	51,78	52,27
degree of dispersion , %	48,11-58,81	55,16	51,79-57,80	54,28	54,69

Bentonite clays are characterized by low sand content (0.1-1.0 mm) - 0.05-0.39% and silt (0.01-0.1 mm) - 2.06-5.20% fractions and high content clay component (less than 0.01 mm) - 94.76-96.53%. In the clay component, the colloidal fraction (less than 0.001 mm) prevails (49.21-55.92%). Highly dispersed clays - degree of dispersion of 48.41-58.81%, average for the deposit is 54.69%.

The carbonate content of bentonite clays over the surface varies from 6.4 to 9.2%, on average 7.84%, to a depth of 6.4 to 10.0% on average 8.20%. On average, the carbonate content of the deposit is 8.04% (text annex 13), which makes it possible to classify them as low limestone.

The physico-mechanical properties of bentonite clays are determined by 8 monoliths selected in the experimental quarry and wells No. 13 and No. 14 (text annex 14) and are characterized by the following indicators (table 4.3):

**Physico-mechanical properties of bentonite clays of the West Kasantau deposit
Values of indicators**

Table 4.3

Indicators, unit	By surface		By depth		Average by deposit
	By monoliths, from-to	Average	By monoliths, from-to	Average	
1	2	3	4	5	6
Bulk density, g / cm ³	1,88-1,91	1,89	1,87-1,90	1,89	1,89
Density, g / cm ³	2,70-2,76	2,73	2,69-2,75	2,73	2,73
Natural humidity,%	5,20-10,60	8,63	9,93-11,60	10,-99	9,51
Porosity,%	30,41-33,54	31,72	26,86-32,59	29,84	31,02
Hygroscopic humidity,%	2,3-3,0	2,64	2,96-4,0	3,46	2,95
Plasticity number	50,7-58,2	54,30	50,5-54,1	52,40	53,61
Compressive strength in natural state, MPa	2,42-3,66	2,95	2,87-3,62	3,24	3,06

The table shows that the physico-mechanical properties of bentonite clays in the near-surface part and at a depth are close to each other, which indicates the absence of a weathering zone.

The volumetric mass of clays, determined under laboratory conditions (1.87-1.91 g/cm³) is close to that determined in field conditions (1.89 t/m³), which confirms the accuracy of the performed determinations and allows us to accept the volumetric mass for reserves calculation - 1.89 t/m³.

By the number of plasticity (50.5-58.2), bentonite clays belong to the group of highly plastic materials. When the clays are saturated with water, they become soaked.

To establish the suitability of bentonite clays for the preparation of drilling fluids in OME GGP "Uzbekneftgasgeologia", a full analysis of the physico-mechanical properties of the solutions prepared on

the basis of clay deposits both in the natural form and with the addition of 6% reagent K-4 to the solution in 2 laboratory and technological samples taken in wells No. 16 and No. 20 and 1 in a semi-factory test taken in an experimental quarry (text applications 15, 16). Studies were conducted at a temperature of solutions of 20 ° and 80 ° C. Clay consumption was 100 kg per 1 m solution. The output of the mud at a viscosity of 25 seconds ranges from 9.5 to 10.0 m³ / t. In terms of the yield of the clay solution, bentonite clays, in accordance with GOST 25795-83, belong to the grade B-4 (norm 8.0-11.5 m³ / t). For clays of grade B-4, the mass fraction of the sand fraction should not exceed 6.0%. Performed the test content in the sand fraction of the solution is 0.14%. Bentonite clays of the West Kasantau deposit meet the requirements of GOST 25795-83 and, in accordance with TU 39-044-74, belong to grade 1. The main physico-mechanical properties of drilling muds prepared on the basis of bentonite clays of the West Kasantau deposit are given in Table 4.4 below.

Table 4.4

Physico-mechanical properties of drilling fluids					
	Parameters of solutions by samples				
	LT-1		LT-2		HALF FACTORY
	20°	80°	20°	80°	20°
1	2	3	4	5	6
	Solution (clay + water)				
Specific weight, g / cm ³	1,07	1,05	1,07	1,06	1,07
Viscosity, sec	25	25	25	25	25
Water loss, cm ³	23	26	20	24	24
The thickness of the peel, mm	2	3	3	4	3
Hydrogen indicator , pH	7	7	7	7	7
Static shear stress, mg / cm ² after 1 min					
after 10 min	18,86	21,99	17,64	18,77	10
The stickiness of the clay crust, g / cm ³	0,57	0,66	0,45	0,59	0,50
	Solution (clay + water+K-4)				
Specific weight, g / cm ³	1,09	1,07	0,06	0,04	
Viscosity, sec	26	28	21	23,2	
Water loss, cm ³ / s	3	4	2	3	
The thickness of the peel, mm	0,5	0,5	0,5	0,5	
Hydrogen indicator , pH	8	8	8	8	
Static shear stress, mg / cm ² after 1 min	9,07	10,05	6,95	7,78	
after 10 min	16,54	12,93	14,21	20,64	
The stickiness of the clay crust, g / cm ³	10,46	0,36	0,36	0,53	

The main indicator of the quality of the mud, limited by TU 39-044-74, is the specific gravity of the solution.