Tongxiang Xiaoying Pollution Control Technology Co.,Ltd

Large dropout well plugging technology research and application

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The main contents.

With the completion of project evaluation index

Law and technology in Changqing oilfield well leakage

Study of a new polymer plugging plugging agent performance principle and technology

Changqing Oilfield gel ZND application

Conclusions and suggestions

Tongxiang Xiaoying Pollution Control Technology Co.,Ltd

With the completion of project evaluation index

The content of the contract	Completion of the project
Changqing Oilfield large leakage well drilling well leakage treatment technology research	Research in recent years, Changqing Oilfield large well leakage and its treatment measures, analysis of the Luohe formation, Liujiagou formation and Yanchang Formation of serious lost circulation characteristics and reasons, summed up the Changqing Oilfield large leakage wells;
A study on the principle and the plugging technology of new polymer plugging agent performance characteristics, plugging	The performance characteristics, the new polymer plugging agent of plugging, plugging formula principle and field application technology, summarizes the selection of gel ZND plugging technology treatment of Changqing Oilfield large leakage well principle;
Tests of 3 wells, the promotion and application of the 5-6 wells	New polymer gel ZND processing large leakage in 16 wells in Changqing Oilfield, a total of 22, 14 times, 2 times and 8 times of failure, effective, plugging success rate greater than 63.6%. Sealing principle of gel slug "large leakage and provides a new idea for the Changqing Oilfield, gel ZND plugging technology development on this basis to solve a lot of Changqing Oilfield with the original bridge plug and cement slurry is not blocked up or the bridge plug and cement slurry to spend a lot of time and a large leakage plugging agent well plugging, plugging in some of the original invalid large leakage well plugging saw the effect of Changqing Oilfield, shortening the drilling cycle, reduce drilling costs.
The main evaluation index	
Fractured leakage, the same leakage layer a plugging success rate reached 50%, plugging success, Xifeng Luohe layer with a drain layer repeated leakage of not more than 2 times;	
Plugging success, the same leakage layer repeated leakage of not more than 2 times;	
Leakage layer bearing capacity to meet the density of 1.30g/cm3 drilling fluid does not leak;	
To establish a set of mature plugging technology	

Law and technology in Changqing oilfield well leakage

Xifeng oilfield Luohe large leakage well characteristics:

The formation fracture pressure is very low, the leakage pressure is about 2.0MPa;

Leakage of cement layer and the cement plug of poor quality, along with drilling fluid erosion leakage easily occur repeatedly, resulting in leakage layer is difficult to decide the position, increase the difficulty to the preferred sealing technology, also increase the risk for plugging construction.

Law and technology in Changqing oilfield well leakage

Changqing oilfield well leakage characteristics

Xifeng oil leakage has the following characteristics:

The large leakage occurred mainly in the Luohe River, Luohe formation leakage layer development horizontal fracture and vertical fracture, variability of the degree of fracture development and fracture leak channels leads to large leak plugging no rule; leakage layer fully exposed or partially exposed, simple bridge plug plugging slurry is difficult to improve the rupture of formation pressure bearing ability, regardless of irrigation much mud, static liquid level beginning in 180 ~ 200 meters.

Leaky aquifer, in the cementing process, the formation water and cement replacement fast, cement slurry cannot reside in the cracks, under the function of the pressure difference with the active formation water flow away, resulting in cement bond quality without cement plug or the formation of difference, water slurry wellbore leakage often have cement plug layer. The drain layer, sometimes not, drill into the drain layer is lost, increased the difficulty of plugging

Law and technology in Changqing oilfield well leakage

Zizhou block Liu formation leakage characteristics

Well leakage and block strong relevance, leakage is generally Liujiagou formation for all the wells in Yu 58 well around well leakage;

With the regional ground elevation and strong relevance, compared to the same block, the higher altitude, Liu Jia Gou well leakage in drilling is more serious;;

Leakage and earlier well plugging leakage is more serious, more difficult;

Leakage easily repeatedly, drill rod mud plugging and most of them can be squeezed light pressure is over 1.0MPa, the extrusion plugging can build cycle, and the restoration of drilling, but 10-24 hours later the same well leakage.

Static sealing can build cycle, leakage, using static 3-5 hours plugging slurry pump can return, drilling cycle burst and leakage.

Just enter the leak plugging measures taken, plugging effect is good, once the formation of good leakage passage, and then plugging is more difficult.

Law and technology in Changqing oilfield well leakage

Yanchang formation well leakage characteristics

Yanchang Formation of regional pressure difference between micro crack, bearing ability is poor, prone to differential pressure of well leakage. The mud density is too high, the wellbore fluid column pressure greater than the formation pressure bearing ability, or the operation of drilling speed is too fast, hard putting, may lead to exciting excessive pressure induced prolonged group of well leakage, for the development of large leakage, the leakage treatment more difficult.

Law and technology in Changqing oilfield well leakage

Changqing Oilfield common leak plugging method

Plugging while drilling

Micro bubble drilling leakage

Drilling fluid extrusion

Leakage rate greater than 10m3/h well, well leakage after timely light pipe drilling, drilling fluid extrusion plugging measures taken.

Squeeze cement

Study of a new polymer plugging plugging agent performance principle and technology

The gel plugging mechanism

Two ways of plugging:

Strength of plugging agent is greater than P mud materials (including static and dynamic pressure).

The pressure drop required P mud leakage less than a P plugging agent moves (plugging agent is a completely isolated from the relationship between formation fluid and wellbore plug, it is moving resistance structural fluid great).

The partition mechanism of gel plug

Aiming at the difficulty of cracks, caves malignant leakage plugging, plugging method on the basis of second, has successfully developed oilfield plugging with special gel ZND, the plugging material into the drain layer can automatically stop the flow, and full of leaking cracks, caves, and difficult to be mixed with the oil, gas, water, formation energy cut off the stratum fluid and wellbore fluid "gel slug", so that the plug has enough start pressure and greater than the pressure of mud column and formation fluid pressure difference to achieve the purpose of plugging.

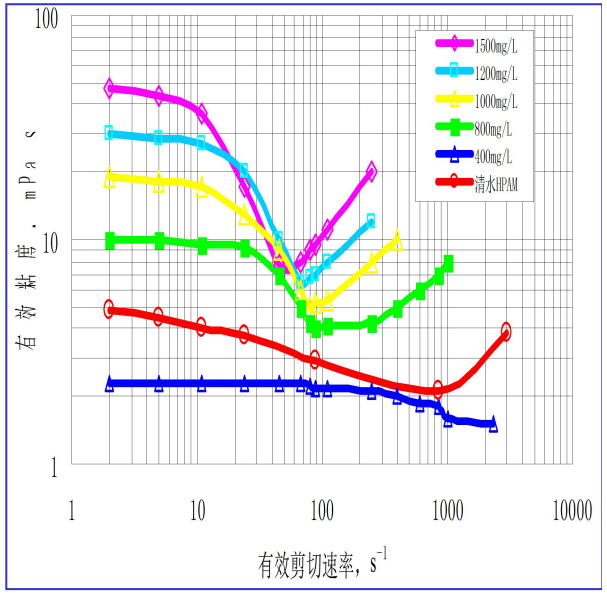
Study on the performance of ZND gel

(1) the main characteristics of gel ZND

2)strong shear thinning characteristics: about 7s-1 or static, the formation of strong intermolecular ligation, viscosity reached tens of thousands (1 30000) mPa.s, 1000s-1) can shear thinning viscosity, up to 100 50mPa.s. At the same concentration, the viscosity of the gel ZND than other commonly used polymer materials with high viscosity oil.

The viscoelastic fluid has good elasticity, and high proportion: to throat swelling, occupy and fill the cavity space, can form the slug formation fluid and wellbore is completely cut off. After standing to make the mobile must overcome elasrtic resistance enough.

3) the fluid and other solid materials (such as bridge plug, cement, soil particles moved...) Mixed without affecting the characteristics of fluid.

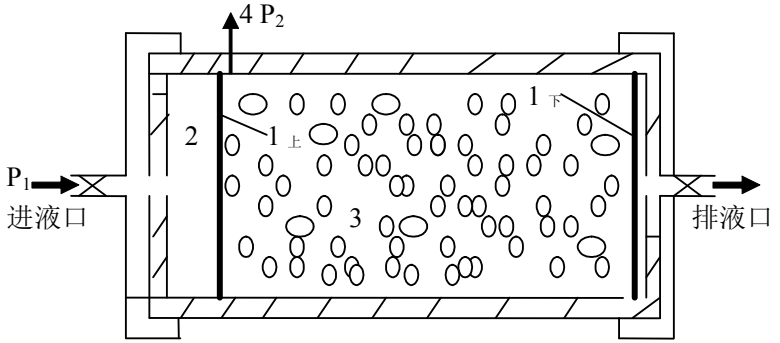


Study of a new polymer plugging plugging agent performance principle and technology

1)Study on the gel plugging mechanism

2)Simulation of hole leakage loss

The drain layer can be filled with different particle size of glass beads, steel ball, gravel simulation void formation leakage, pressure measurement device (0 ~ 3MPa), the simulation results greatly enhances the reliability, moreover the device can also be heating simulation of leak layer temperature.



1－隔板（开有圆孔），2－过渡段，3－孔洞性漏层模拟段，4－测压孔

孔洞性地层漏失模拟

Study of a new polymer plugging plugging agent performance principle and technology

Gel slug drainage

Gravel size composition (I) filling simulation leakage layer drainage rate test data

test result / gel strength ;	sponginess ;	Drainage rate	Resistance to water penetration ability
0.8%ZND-2	34.01%	99.34%	strong
1.0%ZND-2	34.72%	99.49%	
1.2%ZND-2	34.37%	99.64%	
1.5%ZND-2	35.11%	99.67%	

The gel ZND drainage rate more than 99%, completely removing the fluid in the hole.

Study of a new polymer plugging plugging agent performance principle and technology

Gravel size composition (II) filling simulation
leakage layer drainage rate test data

test result / gel strength	sponginess ;	Drainage rate	Resistance to water penetration ability
0.8%ZND-2	33.82%	99.23%	strong
1.0%ZND-2	34.11%	99.43%	
1.2%ZND-2	33.77%	99.52%	
1.5%ZND-2	34.05%	99.57%	

Study of a new polymer plugging plugging agent performance principle and technology

Gravel size composition (I) filling simulation leakage layer test data

Starting pressure gradient gel slug

test result / gel strength ;	sponginess ;	sponginess ;	Resistance to water penetration	up pressure , Pa	Starting pressure Gradient, KPa/m
0.8%ZND-2	34.01%	99.34%	strong	2157	4.156
1.0%ZND-2	34.72%	99.49%		2401	4.626
1.2%ZND-2	34.37%	99.64%		2753	5.304
1.5%ZND-2	35.11%	99.67%		2847	5.486

Study of a new polymer plugging plugging agent performance principle and technology

test result / gel strength	spongines s ;	spongin ess ;	Resistan ce to water penetrat ion	up pressure , Pa	Resistance to water penetration
0.8%ZND-2	33.82%	99.23%	strong	3356	6.466
1.0%ZND-2	34.11%	99.43%		5134	9.892
1.2%ZND-2	33.77%	99.52%		7817	15.062
1.5%ZND-2	34.05%	99.57%		9013	17.366

Study of a new polymer plugging plugging agent performance principle and technology

Starting pressure gradient gel slug

Gravel size composition (III) filling simulation leakage layer test data

test result / gel strength	spongin ess	Drainag e rate	Resistan ce to water penetrat ion	up pressure , Pa	Starting pressure, Gradient, KPa/m
1.5%ZND-2	34.21%	99. 73%	strong	13783	25.29

Gel with anti dilution capability is very strong, the drainage rate was more than 99%, can gel slug formation in the drain layer, formed by the gel Saijing after 2~3 hours, the measured gel slug of starting pressure, and starting pressure gradient of a gel slug.

Gel slug can indeed produce a starting pressure gradient in the drain layer.

Study of a new polymer plugging plugging agent performance principle and technology

(3) Gel slug formation conditions and control methods

Through the experiment, and concludes the conditions for the formation of gel slug and slug formation control method.

The necessary condition for the formation of the partition type slug:

Gel (LCM) should have the anti water dilution ability good, hard and mixed with water, gel properties to drain fluid layer in the;

Gel (LCM) should have good viscoelasticity, gel roared expansion, exhaust leak fluid layer in the pores;

Gel (LCM) flow resistance should be big, can remain in the drain layer.

Control method of separating type slug formation:

The use of higher concentration gels

Calcium and magnesium ions decreased the content of ZND gel sub prepared water

Soon after the first slow injecting gel into the drain layer (operation)

Study of a new polymer plugging plugging agent performance principle and technology

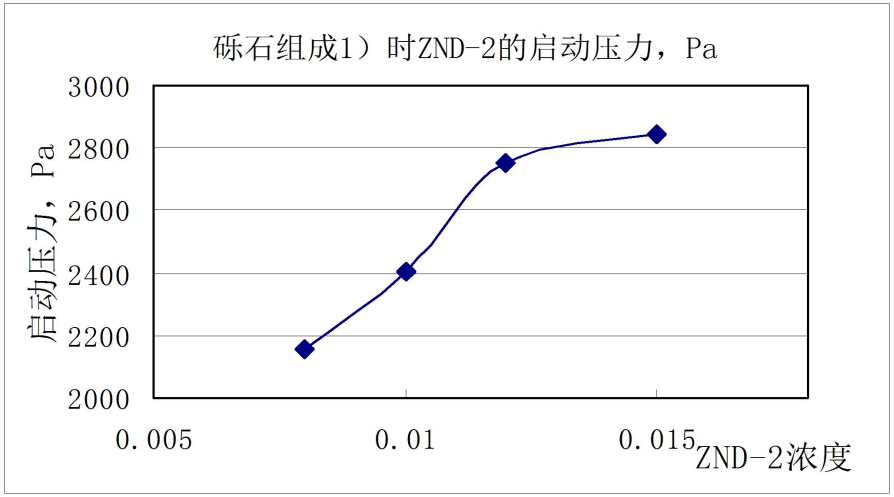
（4）Study on Plugging Gel slug

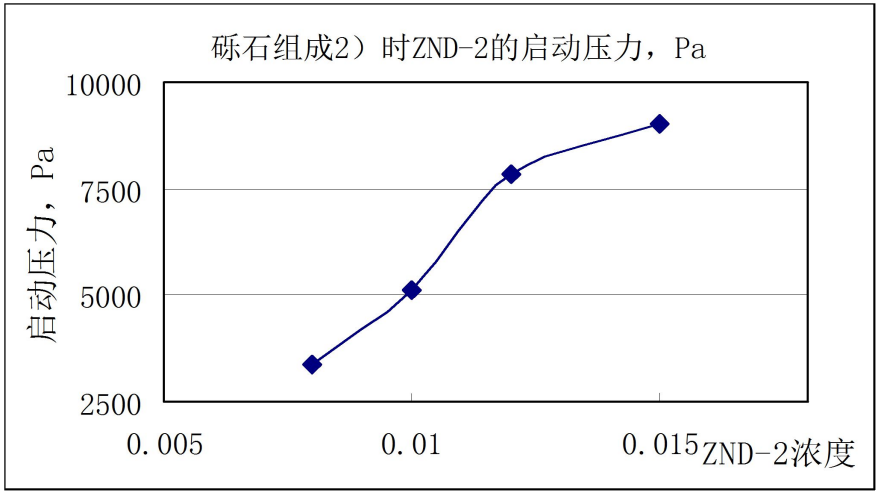
Start the research on the influence factors of pressure gradient

Influence of leakage of reservoir physical start-up pressure on gel slug

Gel slug plugging capability

1) start-up pressure gradient influence factors

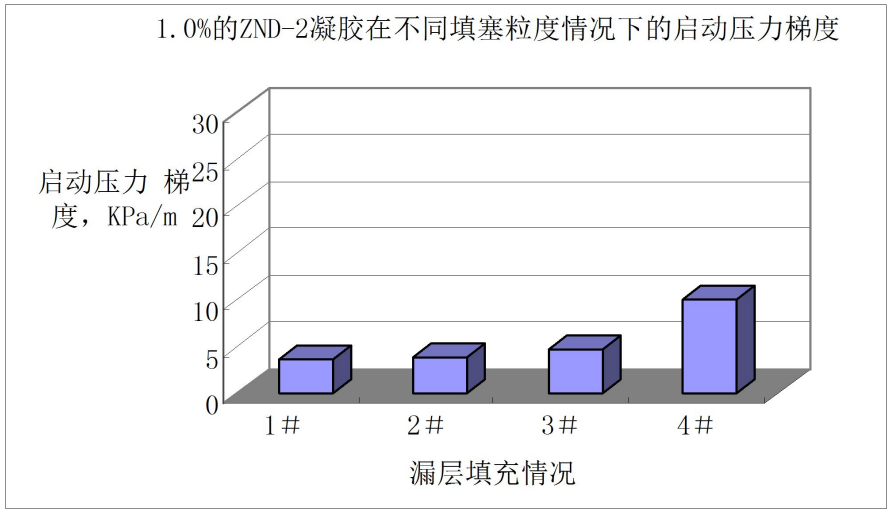


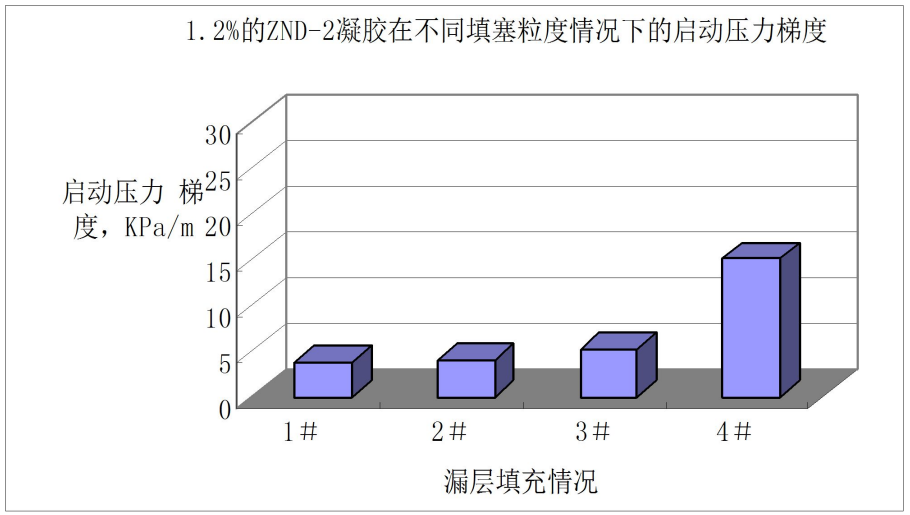


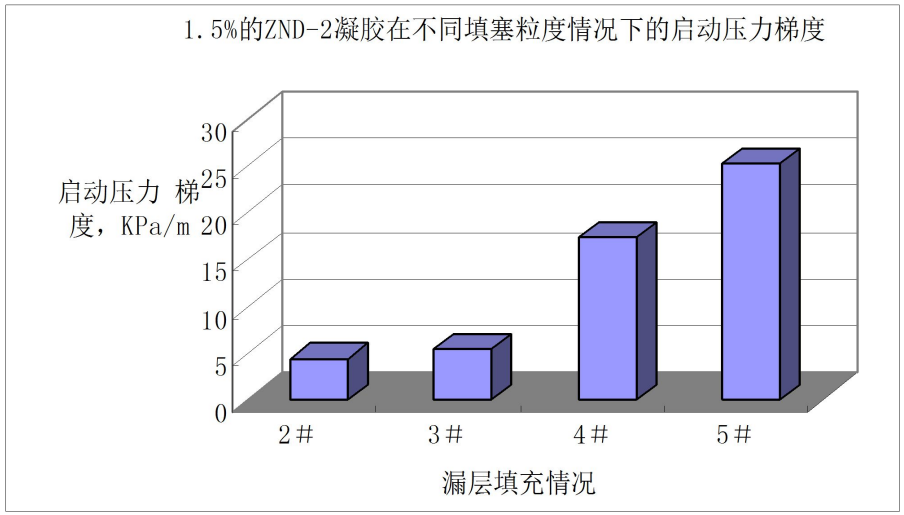
The gel concentration, the starting pressure is greater, but by the pumping effect。

Study of a new polymer plugging plugging agent performance principle and technology

2) of leakage reservoir start-up pressure on gel slug







The simulation leakage aperture layer filled by No. 1 and No. 4 is gradually reduced, always keep the serious leakage degree, from figure three figure, at the same concentration, with the drain layer porosity decrease, gel slug initiation pressure and starting pressure gradient. Plugging Gel slug is greatly affected by the drain layer conditions. Reduce the size of holes will start pressure gradient gel slug, the holes became smaller (larger than 0.2mm) starting pressure gradient is greater.

3) blocking ability

The experimentally measured pure gel slug start-up pressure gradient is up to 25.29KPa/m, can only be effective to 1100m about malignant leakage leakage pressure to improve the equivalent density of 0.2g/cm3, rely on the gel itself is difficult to greatly improve the leak layer confined, but special gel can be combined with conventional plugging materials (cement paste, bridge etc.) use, give full play to efficacy of conventional lost circulation plugging material.

4) gel ZND and conventional bridge plug plugging agent

The bridge plug plugging agent for compound plugging agent (containing fine fiber, crude fiber length 5-50mm, width 2mm, 1-3mm particles), bridge plug plugging agent dosage of 5%. Gel add bridge plug plugging agent can greatly improve the sealing ability.

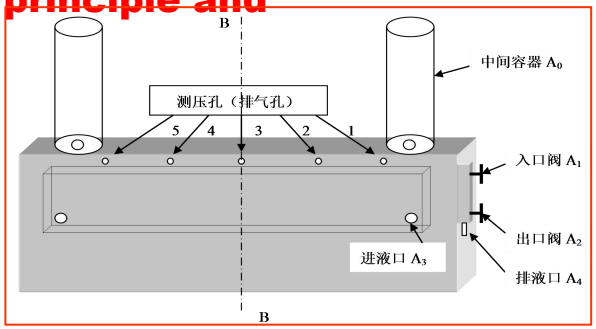
The bridge plug plugging agent is added compared with pure gel plugging gel plugging

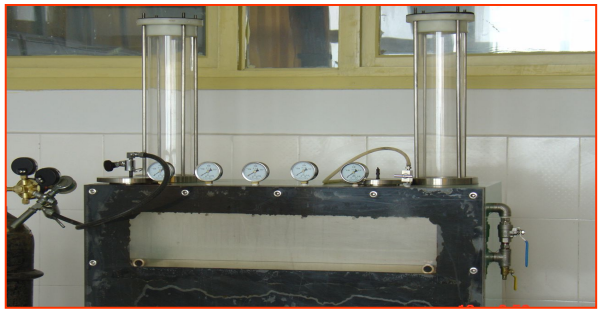
test result / gel strength ,	sponginess	Drainage rate	Resistance to water penetration	up pressure ; , KPa	Starting pressure Gradient, KPa/m
1.5%ZND-2	34.21%	99. 73%	strong	13.783	25.29
1.2%ZND-2+5% Composite bridge plug plugging agent	33.97%	99.36%	strong	28.574	52.54
1.5%ZND-2+10% Expanded granular	34.17%	--	--	178.273	327.11

Study of a new polymer plugging plugging agent performance principle and technology

(2) fractured leakage

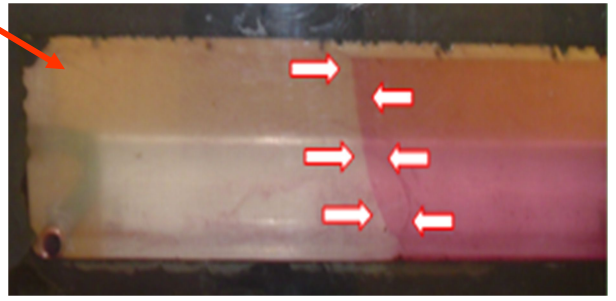
The experimental device: the device can crack simulation of wide w=2 5mm, maximum crack size is w × L705mm × H (variable).



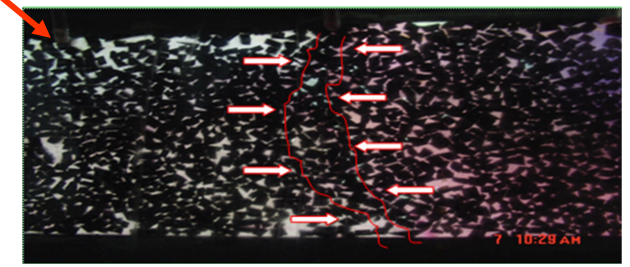


Pure gel slug formation in cracks

Gel slug formation in wide cracks in 2mm simulation.



The pure gel filled cracks formed in the fracture - pore formation in the slug: gel in the simulation of the crack width of 3mm filled 3mm skeleton thick formation fracture - pore slug formation conditions.



Gel not with red water cracks in the mix, not thinning; piston forward, completely out of water; forming a gel plug.

Study of a new polymer plugging plugging agent performance principle and technology

The starting pressure gradient of the pure gel in fissures

The starting pressure gradient of ZND gel 1.2% test in the 3mm in the crack:

Pi ≤ 14.65 KPa/m. The equivalent crack in the long 10M 3MM WIDE by <30 gel can be leakage pressure 1.5MPa.

ZND gel fracture - pore measured 1.2% experiment (crack width of 3mm filled 3mm thick skeleton) starting pressure gradient:

Pi ≤ 0.0189 MPa/m equivalent crack in the long 10M 3MM WIDE by <30 gel can be leakage pressure 1.9MPa.

Study of a new polymer plugging plugging agent performance principle and technology

Gel ZND plugging technology

Construction formula

Formula: One :ZND gel: 1.0~1.5%ZND-2 (or ZND-1) + water;

Formula Two: 0.8~1.2%ZND-2 (or ZND-1) + other commonly used plugging agent mixture;

Formula Three: first note 1.0~1.5%ZND-2 (or ZND-1) gel, follow the cement slurry or fiber cement

Formula four: first note bridge plug or rubber particles after the injection of 1.0~1.5%ZND-2 (or ZND-1) gel, follow the cement slurry or fiber cement.

Formula one or two is suitable for cracks, holes and leakage pressure smaller malignant leakage or leakage layer, containing a large amount of water leakage, leakage pressure below 2MPa.

Scheme three or four is mainly used for the leakage slightly larger pressure difference of malignant leakage or leakage layer containing a large amount of water leakage, leakage pressure fracture type, big hole, cave or spray leakage coexisting malignant leakage.

Study of a new polymer plugging plugging agent performance principle and technology

Gel ZND plugging technology

Gel preparation and preparation work before construction requirements

Gel preparation tank ready

Connected with the gel preparation tank and water pipelines.

The sampling site water, indoor sample test in accordance with the construction of concentration

Pre construction preparation, injection test

Gel plugging construction

Large lost leakage layer, drill down to the drain layer on top of 30-50 meters above the leaking layer; longer or unclear position, in return a case, drill down to the drain layer central. Two cases of drill string should be light pipe, first of all is to ensure construction safety, second is to prevent the polymer plugging slurry in bit nozzle cut chain, the gelling ability to reduce system.

Changqing Oilfield gel ZND application

The test in 3 wells

Liu 67-72 well using new polymer plugging agent ZND-2 plugging 1 times, 1 times of successful.

West 30-1 well using new polymer plugging agent ZND-2 plugging 2 times, 1 times effective, 1 failed.

West 30-2 well using new polymer plugging agent ZND-2 plugging 5 times, 3 times, 1 times effective, 1 failed.。

The direct use of 1.0~1.2%ZND-2 plugging success 3, fail 1 times, 1.5%ZND-2+ accelerated cement plugging success 1 times, 0.75~1%ZND-2+2~5% bridge plug agent plugging effect.

Brief introduction of ZND plugging of gel

Liu 67-72 well in 1629 meters when leakage occurs, mud density 1.02~1.03g/cm3 the leakage level, maximum depth of 200 meters, the bridge pulp bridging material particle size 3~5mm, cementing plug nine plugging saw only a certain effect, the liquid level inside the well have increased (171 meters, 70 meters, 50 meters, 29 meters the gel), ZND-2 plugging, light pipe to drain layer on top of 100, pump (pump after its first,) 37 party 1.2%ZND-2 gel, returning about 2 mud in the construction process, and then for water 12 square, have 6 hours of quiet early plugging, pump for 15 minutes, and returned to normal, normal drilling, plugging success

Changqing Oilfield gel ZND application

West 30-1 well for the large fractured aquifer leakage, no effective treatment measures both at home and abroad, the well has used bridge slurry, cement slurry, slurry + bridge intelligent ZND plugging agent, cement + plugging agent compound plugging and plugging method 37 invalid (including cement injection 12 times), total loss plugging bridge pulp 500, cement 175 tons, eventually lead to useless wellbore.

West 30-1 well two times by gel ZND plugging condition

Model	Sealing solutions	Plugging condition	result
1	1.1-1.2% ZND-2 + quick setting cement slurry	Reaming to 996 meters or so lost, light drill down to 925 meters, equipped with 2 tank intelligent gel plugging agent (a total of 22 bags of ZND-2) is injected into well immediately after the injection of thixotropic cement 14 tons (sixth), 11 m3 without mortar, preflush, for water of 6.5 m3, the drilling fluid level 70 m, up 30 minutes from the wellhead injection slurry 1.5 m^3. Down to the 900 m pump back to normal, but without cement plug. From 930 meters to drill cement plug, reaming to 967 meters do not return.	Sealed 920 meters -978 meters, has obtained the certain effect
2	1.0-1.1%ZND-2+ quick setting cement slurry	Reaming to 996 meters or so lost, light drill down to 925 meters, equipped with 2 tank intelligent gel plugging agent (a total of 22 bags of ZND-2) is injected into well immediately after the injection of thixotropic cement 14 tons (sixth), 11 m3 without mortar, preflush, for water of 6.5 m3, the drilling fluid level 70 m, up 30 minutes from the wellhead injection slurry 1.5 m^3. Down to the 900 m pump back to normal, but without cement plug. From 930 meters to drill cement plug, reaming to 967 meters do not return.	invalid

Changqing Oilfield gel ZND application

West 30-2 well using new polymer plugging condition

serial number	Sealing solutions	Plugging condition	result
4	1%ZND-2+2.7%The bridge plug agent, 0.75%ZND-2+5%The bridge plug agent,	The light pipe under 1000 meters deep, with intelligent gel plugging slurry 30 party,1%ZND-2+2.7% bridge plug agent, into the wells did not return; 16:30 with intelligence Gel plugging slurry to 20 party, 0.75%ZND-2+5% bridge plug agent, pump 2-3 Square mud returns, lower plunger device closure of annulus, intermittent small reductions in crowded plugging Mud 15 party, the stand pipe pressure 5Mpa, basic in 2 - 3Mpa Stop the pump can be regulated, 1.6-1.8Mpa, don't fall for 3 minutes	Effect No obvious
5	1.5%ZND-2+Quick setting cement slurry	The three were made of 40 party, the 30 party, the 30 party 1.5%ZND-2, light drill Rod to 1043 meters to pump into the well without recurrent slurry	Success
		Drilling to 994 meters squeeze thixotropic cement, cement 12.5T+ pure 1T thixotropic agent,Cement slurry density (1.85, 1.65, 1.75, 7) for water, for the last 2 .Square water mud returns, drilling mud filling, up to 520 meters in the Kelly In the wellhead squeeze mud about 2. 20:00 began drilling cementing plug, drill cement Plug slurry water system. Cement plug column is 940-1070 meters. 21 3:00 Drill cement plug, down to the bottom (1158 m) to open the pump mud returns are Often, restoration of normal drilling.	

Changqing Oilfield gel ZND application

West 30-2 well using gel ZND plugging five times, fifth times with 1.5%ZND-2 plugging, plugging scheme and injection speed setting cement slurry plugging and Southwest Petroleum University proposed anastomosis in three, has achieved the following results in good condition.:

serial number	Sealing solutions	Plugging condition	result
1	The directly use 1.2%ZND-2	Lost after drilling to 870 meters, light pipe to 761 points two preparation, first with the 30 party, the 15 party, pumping Some return, second times with the 15 party, the pump into the 2-3 party to return the squeezing and plugging, the stand pipe pressure maximum 4Mpa，4Mpa, basic between 1 - 2 Mpa, milking plugging slurry, and into the 5 party after drilling water. Drill down To the well depth of 761, 840, 870 meters sectional circulating mud back to normal.	success
2	The directly use 1.0%~1.2 % ZND-2	Drilling to 1022 meters, the leakage of 12-15 / h, first paste with 30 party 1.2%ZND-2, drill To 940 meters into the plugging slurry pump 24, pump 7 minutes mud returns. The drilling tool to760 meters, second times with 15 party 1%ZND-2, pumping 3 minutes to return, plunger device closure of annulus,Squeeze the plugging slurry, standpipe pressure 4Mpa, basic between 1 - 2 Mpa, when the pump is stopped, stand pipe pressure Force is reduced to 0, the plugging slurry milking, and 6 party after drilling for water. Rest for 5 hours, every 1 hours from the wellhead。 Fill a mud, return to normal. Drill down to 760 meters sub cycle, returning to normal.	success
3	The directly use 1.2%ZND-2	To 1,041 m drilling progress took place without a dropout, grab drilled to depth of 1062 meters, from the drilling fluid level in 90 m So, the light down to the depth of drilling and 990 meters square preparation 30 1.2% ZND-2, starting the pump into the well, does not return Out of the mud, and continuous preparation of cans (total 300kg), each about 20 square cans, three cans of a total of about 70 square, between each tank Every one hour pump into the well, the mud has not returned, when observed from the drill drill wet, fluid level at 86 m.	lose

Changqing Oilfield gel ZND application

Experiments in 13 wells (14 wells per time)The program of 1.4%ZND-2+ cement slurry in Zhao 9 well plugging 2 successful, respectively in the delta 22-26, delta 24-25, delta well well well 22-25 and delta 22-23 well plugging 1 times, were successful, in the town of 40-33 well with 1.2%ZND-2 plugging 1 successful, cement mortar used 1.2%ZND-1+ scheme 43-371 well plugging in 82 105 well and the town of effective (capacity recovery 2/3), recovery rate of 4/5 in the town of 40-33 well plugging, using 1.2%ZND-2 in 54-91 well plugging 1 times effective (as long as the ZND-2 glue sealing sealing layer to ensure the normal electrical measurement can be, so not seal well extrusion operation). The drain layer has no repeated leakage blocked, popularization and application of well plugging success 10, effective 4, plugging success rate greater than 71.4%

The new polymer plugging agent applied in Changqing oil field conditions

serial number	Well No:	Sealing solutions	Plugging condition	result
1	Zhou-22-26 well	1.6%ZND-2+cement paste	Drilled to 1720 meters leakage, drilled into the Shiqianfeng Formation Liujiagou formation 50 mtr Meters, to the well drilling 1700 meters deep, into the intelligent gel plugging agent (1.6% ZND-2) 16, well into the 20 party, then the cementing success.	A Success
2	Zhao-9 well	1.4% ZND-2+cement paste	Drilling to 2220 meters (formation: Heshanggou) leakage, drilled to After 2265 meters, light pipe to the well depth of 2120 meters, into the intelligent coagulation with blocking Leakage agent (1.4%ZND-2) 20, shut in well into 20, then directly injected into the mud Plugging success.	A Success

Changqing Oilfield gel ZND application

serial number				result
4	Delta 24-25 well	1.4% ZND-2+cement paste	Drilled to 1803 meters leakage, drilled to 1958 meters, up under the light pipe to the well drilling 1780 meters deep, into the intelligent gel plugging agent configuration (1.4% ZND-2) 16.5 party, shut in well into 20, then direct cementing success.	A Success
5	Delta 22-25 well	1.4% ZND-2+cement paste	Drilled to 1607 meters leakage, drilled to 1720 meters, up under the light pipe to the well drilling 1580 meters deep, into the intelligent gel plugging agent configuration (1.4% ZND-2) 15 party, shut in well into 20 party, not regulated, then direct cementing success. After repeated plugging slurry plugging and cementing.	A Success
6	Delta 22-23well	1.4% ZND-2+cement paste	To well 1848 meters deep leakage, drilled to 1908 meters, up under the light pipe to the well drilling 1893 meters deep, into the intelligent gel plugging agent configuration (1.4% ZND-2 16), seal well into the 20 party, not regulated, after cementing, normal.	A Success
7	Zhen-40-33 well	1.2%ZND-2	Using the 11 clay bridge plug plugging slurry injection and thixotropic cement, 3% speed, 4% speed cement cement 5 cement were not in 1002-1005 meters a cement plug effectively, decided to note sixth cement in sidetracking; lateral drilling out after drilling to 992 meters into the lost, 2 times 4% quick setting cement after drilling to 1107 meters again lost, ZND-2 slurry preparation 3 cans of a total of 60 party injection, third tank into 5 party mud returns to normal, the pump pressure is 3MPa, into the circulation, water polymer drilling, the single pump after 34 seconds to return back to normal, the amount of.	A Success

Changqing Oilfield gel ZND application

The new polymer plugging agent applied in Changqing oil field conditions

serial number ;	well number	Sealing solutions	Plugging condition	result
8	82105 well	1.2%ZND-1+cement paste	Drilling to 2094 meters, the mud loss back, successively plugging 7 times (table set angle cementing 1 times, 5 times, at the bottom of the well cementing bridge plug 1), were not successful, decided to gel ZND-1+ cement. Pump into the 20 party 1.2%ZND-1 glue, wellhead back drilling fluid; seal well into the ZND-1 glue 5 party; pump pressure up to 5Mpa, 5 minutes down to 0, the cement truck note 13 tons of cement, cement slurry volume 10.6, curing for 8 hours; drilling to 2094 meters short sales phenomenon drill pressure can only add to 3 4T, output to 2/3, continue to drill to drill 2100 meters without pressure, discharge capacity is 2/3.	1 see Effect
9	54-91well	1.1%ZND-2	The well was drilled to 2380 meters (layer 4+5) leakage, leakage volume 5 / hour, taking into account the logging effect, then the intelligent gel hole plugging, plugging process is as follows: drill down to 2426 meters into the 1.1%ZND-2 glue 35, replace the ZND-2 slurry mixing 8 party, open the pump after 15 minutes well mouth mud returns to normal, discharge capacity of 1/2-2/3. When out of the hole from the mouth filled with mud. Due to the well has been drilled, will no longer continue to expose the drain layer, as long as the ZND-2 glue sealing sealing layer to ensure the normal electrical measurement can be, so not seal well pressing operation. From the wellhead to borehole grouting (from last filling 2.5 hours) 4 minutes after the wellhead mud returns. The bottom hole leakage control (without blocking interval of 2.5 hours 15 minutes before grouting slurry to return)	1 see Effect, not Squeeze

The team number	well number	Using the formula	Leakage depth	leakage	Static level, M	Before using the drilling fluid return amount	The amount of drilling fluid return after use
30665	Zhen-43-371	2	1101	Lost	120	Do not return	2/3
30665	Zhen45-40	1	960	Lost	60	Do not return	Normal
30534	Zhen-40-33	2	1001	Lost	150	Do not return	4/5
30529	Zhen -40-35	1	982	20m³/h	15	1/5	Normal
30660A	Zhen-40-34	1	990	18m³/h	10	1/3	Normal

●"The principle of Plugging Gel slug" large leakage and provides a new idea for the Changqing Oilfield, gel ZND plugging technology development on this basis to solve a lot of Changqing Oilfield with the original bridge plug and cement slurry is not blocked up or the bridge plug and cement slurry to spend a lot of time and a large leak plugging agent the problem well plugging, plugging in some of the original invalid large leakage well plugging saw the effect of Changqing Oilfield, shortening the drilling cycle, reduce drilling costs.

●The new polymer ZND plugging technology can solve the Liujiagou and Yanchang Formation of fractured lost leakage, the formation of large leakage provides an effective method for well plugging.Even so, the oversize gel ZND dealing with individual well leakage problems, mainly in the gel strength is not enough, cracks in the starting pressure is too low, need to do in-depth research.

Plugging plugging agent ZND new principle of selecting the program

Summary gel ZND plugging in Changqing Oilfield applications, summarize the selection process Changqing Oilfield gel ZND large dropout principles:

① For large dropout fractured and fluid leakage has not come out and can not be recycled into the well leak

② For the adoption of the above bridge plug plugging poor results in repeated injection of cement in order to effectively seal sealing layer Recurrence serious leakage loss, we can use new polymer gel plugging technology, when dropout less pressure (liquid dropout surface 50 meters) when using pure gel plugging technology, dropout large pressure difference (between the dropout level in the 50-200 m) when using the first injection gel followed by cement plugging technology.

conclusion and suggestion

Conclusion

Research in recent years in Changqing Oilfield large leakage Ii features and treatment measures, analysis of Luohe formation, Liu Jia Gou formation and Yanchang Formation of serious lost circulation characteristics and reasons, summed up the Changqing Oilfield large leakage wells.。

Put forward the new train of thought (pressure gradient makes the heap objects moving more than (P mud - P) pressure gradient generated), practice has proved that the method is feasible, and put forward the "gel" plugging mechanism according to new ideas. The idea for the treatment of large leakage, provides new ideas for plugging large leakage, large leakage well plugging problems along the way.

The performance characteristics, the new polymer plugging agent of plugging, plugging formula principle research and field application technology, summarizes the selection of gel ZND plugging technology treatment of Changqing Oilfield large leakage well principle: ① to leaking cracks of large amount of leakage and drilling fluid has not come out and not the cycle of wells the leakage, to the bridge plug effect is poor, to multiple recurrent severe leakage occurs to cement can effectively seal sealing layer, can be used to model the polymer gel plugging technology, less pressure when leakage (leakage level 50 meters) when using pure gel plugging technology, the leakage of high pressure difference (leakage of liquid in the 50-200 meters) by plugging technology first injected gel behind ZND follow the cement slurry.

New polymer gel ZND processing large leakage in 16 wells in Changqing Oilfield, the total application of 22 well / times, 14 times, 2 times and 8 times of failure, effective, plugging success rate greater than 63.6%. The new polymer ZND plugging technology can solve the Liujiagou and Yanchang Formation of fractured lost leakage, the formation of large leakage provides an effective method for well plugging.

"The principle of Plugging Gel slug" large leakage and provides a new idea for the Changqing Oilfield, it is proved by practice, the idea is feasible in dealing with large leakage, gel ZND plugging technology development on this basis to solve a lot of Changqing Oilfield with the original bridge plug and cement slurry is not blocked up or the bridge plug and the cement slurry to spend a lot of time and plugging agent of large leakage problem well plugging, plugging in some of the original invalid large leakage well plugging saw the effect of Changqing Oilfield, shortening the drilling cycle, reduce drilling costs. Nevertheless, with large gel ZND deal with some well leakage problems, still need to do in-depth research.

Suggestions

Some suggestions for further developing this kind of large fractured aquifer leakage control technology research; further research on improving the performance of anti temperature and gel slug strength, so that the gel plugging technology can be used for total loss plugging.

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Thank you!

Please criticism!