# “NPO POLYCELL”
## JOINT-STOCK COMPANY

*Meeting your drill fluid service needs*







**PRODUCTION OF REAGENTS AND COMPOSITE MATERIALS**



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Founder of JSC “NPO “Polycell”, Cand. Sc. in Geology and Mineralogy

Polycell Scientific and Production Association Joint-Stock Company was established in 2006 to meet the needs of leading Russian oil, gas and service companies in chemical reagents and materials for building gas, gas condensate and oil wells of various complexity in all regions of the Russian Federation. The idea to create the company belonged to specialists with many years of drilling experience.

Combining practical knowledge with the scientific potential of chemical scientists allowed us to create a company capable of providing oil and gas companies with a full range of reagents, while guaranteeing a deep understanding of oilfield problems.

JSC “NPO “Polycell” carries out its production activities at two own sites with well-developed infrastructure. The total area comprises 6,500 m². Over the years JSC “NPO “Polycell” has become a large-capacity production facility with annual sales volume exceeding 45 thousand tons. Starting from 2014, we have been selling drilling reagents to the markets of Turkmenistan, Serbia, Vietnam, Kazakhstan and Belarus.

GUARANTEED HIGH QUALITY OF PRODUCED REAGENTS AND MATERIALS THROUGH CAREFUL PRODUCTION PROCESS CONTROL: INPUT CONTROL OF RAW MATERIALS, COMPLIANCE WITH PROCESS PARAMETERS AND QUALITY CONTROL OF FINISHED PRODUCTS.




Continuous search for new solutions, flexible individual approach to each customer, combined with investment in the development of production and a responsible approach to the production and sale of manufactured products pose JSC “NPO “Polycell” as a steadily developing organization with a firm standing in the market of drilling reagents and materials, optimistic about the future.

**V.I. Nozdrya**

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# THE COMPANY TODAY:

- MODERN HIGH-TECH PRODUCTION OF REAGENTS AND MATERIALS FOR WELL CONSTRUCTION
- SUPPLYING CONCENTRATES AND READY-MADE DRILLING PROCESS FLUIDS
- SUPPLYING REAGENTS BY TRUCK AND RAIL
- SERVICE SUPPORT OF DRILL FLUIDS, REMEDIAL CEMENTING AND WELL WORKOVERS
- SUPERVISING
- INTEGRATED SCIENTIFIC LABORATORY
- TRAINING AND ANALYTIC CENTER



# CHEMICAL REAGENTS FOR WATER-BASED DRILLING FLUIDS

Water-based drilling fluids are the most common type of flush liquids. They have a number of evident advantages: low cost, relative simplicity of preparation and adjustment of technical properties, relatively low contaminating and toxic effect of flush liquid components and drilling waste.

The product range of JSC «NPO «Polycell» includes all main chemicals for preparation and adjustment of technical characteristics of water-based drilling fluids.

## ▶ STABILIZING REAGENTS, REGULATORS OF FILTRATION AND RHEOLOGICAL PROPERTIES

JSC «NPO «Polycell» produces carboxymethylcellulose with different degrees of basic substance substitution (CMC and PAC series) and different degrees of polymerization (low-viscosity and high-viscosity reagent grades). In addition, the company supplies a heat-resistant and salt-resistant CMC-TS grade, modified starch and dextrin for drilling, xanthan biopolymer, reagents based on saponified tall oil pitch (Smolopolymer Series), lignin derivatives (FCL, FLS, Oxyl, thinners based on phosphonic acid derivatives, humate reagents (PolyRGM and PolyTSHCHR), acrylic polymers (PAA series).

## ▶ LUBRICATING, ANTI-SEIZE AND ANTI-MUDBALL ADDITIVES

To improve lubricating properties of drilling fluids, JSC «NPO «Polycell» offers high-performance lubricating reagents (in liquid form – SMEG, Polyecolub, Glital, MultiLube; in dry form – Mican-40, Silange), and Polyantifric reagent is offered for seizure prevention. To prevent generation of mudballs under drilling conditions in the sections of active clay occurrence, JSC «NPO «Polycell» offers to use Polydegland anti-mudball additive.

## ▶ CLAY SWELLING INHIBITORS

Clay and shale swelling organic inhibitors are used to increase wellbore stability, improve lubricating and anti-seize properties of drilling fluids, stabilize rheological characteristics of the flush liquid and contribute to the efficiency of cleaning system elements.

## ▶ FOAM SUPPRESSANTS

The line of foam suppressants from JSC «NPO «Polycell» is represented by specially selected compositions based on simple polyethers. Foam suppressants are manufactured in both liquid and dry (powder) forms.

## ▶ COLMATANTS

Complex colmatage fillers from JSC «NPO «Polycell» are used to prevent and control lost circulation of the drilling fluid. The composition of colmatants is selected in such a way that the product contains materials of different nature (flaky, fibrous, granular), the particle size of produced grades ranges from 0.6 mm to 30 mm. It is possible to produce colmatage fillers according to specific technical requirements of the customer, with set technical properties.





## CMC-9L
## CMC-9M
## CMC-9H

CARBOXYMETHYLCELLULOSE

TECHNICAL SPECIFICATIONS
TY 2231-047-97457491-2011

Carboxymethylcellulose is used in the oil and gas industry as a fluid loss reducer for water-based drilling fluids.

| Parameter | CMC-9L | CMC-9M | CMC-9H |
|---|---|---|---|
| Appearance | white to cream fibrous or powdery material | | |
| Mass content of moisture, %, NMT | 10,0 | | |
| Effective viscosity of 1% aqueous solution, mPa*s | NMT 20 | 20-30 | NLT 30 |
| Static filtration index of freshwater drill fluid with the addition of 0.3% reagent, cm³/30 min, NMT | 10,0 | 10,0 | – |
| Static filtration index of saline drilling fluid with the addition of 2.0% reagent, cm³/30 min, NMT | – | – | 10,0 |
| Effective viscosity of 1% aqueous CMC solution, mPa*s, w/salt content:<br>- 40 g/L<br>- 400 g/L | – | – | <br>25,0<br>35,0 |

### ▶ APPLICATION

Carboxymethylated cellulose facilitates formation of a thin, dense filtration crust, reducing filtrate penetration into the formation. The effect of the reagent on the rheological characteristics is determined by the product grade. CMC 9L has a minimal thickening effect, CMC 9H increases the viscosity of drilling fluids. The thermal stability of the reagents is 120°C.

### ▶ TREATMENT

Approximate reagent consumption is 5-15 kg per 1 m³ of drilling fluid.

### ▶ PACKAGING

CMC is packed into 25 kg polypropylene bags with polyethylene liner.

## CMC-TS

HEAT AND SALT RESISTANT REAGENT

TECHNICAL SPECIFICATIONS
TY 2231-034-9745491-2010

CMC-TS heat and salt resistant reagent is a product of cellulose etherification with modifying additives, designed to regulate structural-rheological and filtration parameters of all types of water-based drilling fluids. CMC-TS reagent has increased heat and salt resistance compared to standard carboxymethylated cellulose.

| Parameter | Standard |
|---|---|
| Appearance | fibrous material or powder |
| Mass content of moisture, %, NMT | 10,0 |
| pH of 1% aqueous solution | 8,0 - 12,0 |
| Static filtration index of a model drilling fluid before thermostatic control, cm³/30 min, NMT | 10,0 |
| Static filtration index of a model drilling fluid after thermostatic control at 130°C for 8 hours, cm³/30 min, NMT | 12,0 |

### ▶ APPLICATION

The reagent effectively regulates fluid loss of drilling fluids, including when drilling under conditions of high temperatures and high salinity, giving drilling fluids optimal structural and rheological properties.

### ▶ TREATMENT

Approximate reagent consumption is 5-15 kg per 1 m³ of drilling fluid.

### ▶ PACKAGING

CMC-TS is packed into 25 kg polypropylene bags with polyethylene liner.

# PAC-L

LOW-VISCOSITY POLYANIONIC CELLULOSE

TECHNICAL SPECIFICATIONS
TY 2231-032-97457491-2010

# PAC-H

HIGH-VISCOSITY POLYANIONIC CELLULOSE

TECHNICAL SPECIFICATIONS
TY 2231-033-97457491-2010

PAC-H and PAC-L polyanionic cellulose is designed to reduce filtration and regulate rheological properties of process fluids used for drilling and workover of oil and gas wells.

| Parameter | PAC-L | PAC-H |
|---|---|---|
| Appearance | white to brown or gray loose powder | white to brown or gray loose powder |
| Mass content of moisture, %, NMT | 10,0 | 10,0 |
| pH of 1% aqueous solution, NLT | 8,0 | 8,0 |
| Twist angle of the rotational viscometer spring at 600 rpm, 1% aqueous solution, deg. | NLT 40 | NMT 40 |
| Static filtration index of freshwater drill fluid with the addition of 0.3% polymer, $cm^3$/30 min, NMT | 8,0 | 8,0 |

## APPLICATION

PAC-L is used to reduce filtration of drilling fluids without significant change in their rheological characteristics.
PAC-H can be used not only to regulate filtration parameters, but also to regulate viscous properties of drilling fluids.
Polyanionic cellulose is characterized by higher heat and salt resistance as compared to standard carboxymethyl cellulose.

## TREATMENT

Fluids treated by polyanionic cellulose (PAC-L and PAC-H) retain their properties in case of prolonged exposure to temperatures up to 120°C.
Approximate reagent consumption is 5–20 kg per 1 $m^3$ of drilling fluid.

## PACKAGING

The reagent is packed into 25 kg polypropylene bags with polyethylene liner.

# CMS-DRILL

STARCH

TECHNICAL SPECIFICATIONS
TY 2231-031-97457491-2010

CMS-DRILL carboxymethylated starch is designed to reduce filtration and stabilize freshwater process fluids used for drilling and workover of oil and gas wells.

| Parameter | Standard |
|---|---|
| Appearance | white to brown or grayish loose powder |
| Mass content of water, %, NMT | 10,0 |
| pH of 1% aqueous solution, NLT | 10,0 |
| Static filtration index of freshwater drilling fluid with the addition of 0.5% reagent, $cm^3$/30 min, NMT | 8,0 |

## APPLICATION

CMS-DRILL starch is readily soluble in fresh water. The reagent effectively reduces drill fluid filtration when used at temperatures up to 120 °C.

## TREATMENT

Recommended consumption of CMC-DRILL starch reagents is approximately 5-30 kg per 1 $m^3$ of drilling fluid.

## PACKAGING

CMS-DRILL starch is packed into 25 kg polypropylene bags with polyethylene liner.





# PolySR

STARCH REAGENTS

TECHNICAL SPECIFICATIONS
TY 2262-035-97457491-2010

PolySR starch reagent is designed for regulation of filtration characteristics and stabilization of process fluids used in drilling.
The range of starch reagents includes the following grades:

**PolySR-F** with increased resistance to Ca and Mg salts;

**PolySR-K** which effectively reduces the filtration value;

**PolySR-D** with reduced viscosity properties;

**PolySR-O** – is an organophilic starch with hydrophobic properties.

| Parameter | PolySR-F | PolySR-K | PolySR-O | PolySR-D |
|---|---|---|---|---|
| Appearance | white to yellow loose powder | | | |
| Mass content of moisture, %, NMT | 12,0 | | | |
| Viscometer reading at 600 rpm<br>- In 40 g/L saline solution, NMT<br>- In 400 g/L saturated saline solution, NMT | 18<br>20 | | | – |
| Filtration index, $cm^3$<br>- In 40 g/L saline solution, NMT<br>- In 400 g/L saturated saline solution, NMT | 10<br>10 | | | |
| pH of 1% aqueous solution | – | | | NMT 8 |

## APPLICATION

Various grades of PolySR starch reagent are easily dispersed in fresh water, seawater, and saline water. The reagents enable regulation of the process fluid parameters at temperatures up to 120 °C.

## TREATMENT

Recommended consumption of PolySR product is approximately 5-30 kg per 1 $m^3$ of drill fluid.

## PACKAGING

PolySR starch reagents is packed into 25 kg polypropylene bags with polyethylene liner.

# SMOLOPOLYMER

TECHNICAL SPECIFICATIONS
TY 2458-004-97457491-2007

Smolopolymer additive for drill fluids is used to stabilize filtration, regulate rheological parameters, improve lubricating and inhibiting properties of water-based drilling fluids.

| Parameter | Standard |
|---|---|
| Appearance | yellowish-gray to black loose powder |
| Mass fraction of sieve residue with 15 mm mesh size, %, NMT | 5 |
| Static filtration index, $cm^3$/ 30 min., NMT | 6,0 |

## MAIN FUNCTIONS OF SMOLOPOLYMER REAGENT IN DRILLING FLUIDS:

- effectively reduces filtration of drilling fluids without significantly increasing the viscosity value;
- normalizes and maintains wellbore stability;
- effectively inhibits clay shale swelling;
- ensures stability of argillites;
- improves the lubricating properties of drilling fluids.

## TREATMENT

Approximate reagent consumption is 5 to 30 kg per 1 $m^3$ of drilling fluid.

## PACKAGING

Smolopolymer additive for drilling fluids is packed into 25 kg polypropylene bags with polyethylene liner.

# POLYTEMP

POLYMER REAGENT

TECHNICAL SPECIFICATIONS
TY 2458-075-97457491-2012

Polytemp polymer reagent is designed to stabilize and reduce fluid loss of water-based drilling process fluids at high temperatures from 150 to 200 °C. The following grades are available:

**- Polytemp (up to 150 °C),**
**- Polytemp-200 (up to 200 °C) и**
**- Polytemp-T (thermostable rheology modifier for use in water-based fluids).**

| Parameter | Polytemp | Polytemp-T | Polytemp-200 |
|---|---|---|---|
| Appearance | white to dark brown powder | | white to yellow-white powder |
| Mass content of moisture, %, NMT | 10,0 | | 8,0 |
| Value of filtration reduction of clay suspension with addition of 3% reagent, %, NLT | 60 | – | 50 |

## APPLICATION

Polytemp polymer reagent is used as a filtration reducer and stabilizer of technical characteristics when drilling deep, intentionally deviated and sub-horizontal wells as part of freshwater, lime-gypsum, salt and weighted water-based drilling fluids. When used on its own, Polytemp-T acts as a high-performance liquefier and thermal stabilizer for high-temperature drilling fluids.

## TREATMENT

Consumption amounts to 5-15 kg/m³ in freshwater fluids and up to 15-30 kg/m³ in salt fluids.

## PACKAGING

Polytemp polymer reagents are packed into 25 kg polypropylene bags with polyethylene liner.

# FCL

**FERROCHROMOLIGNOSULFONATE**

TECHNICAL SPECIFICATIONS
TY 2454-028-97457491-2010

Ferrochromolignosulfonate (FCL) is designed to regulate rheological characteristics of process fluids with increased content of solid phase that are used for drilling and well workover, as a heat-resistant downhole filtration reducer.

| Parameter | Standard |
|---|---|
| Appearance | yellow to brown loose powder |
| Mass content of moisture, %, NMT | 10,0 |
| pH of 1% aqueous solution, NLT | 3,0 |
| Liquefaction index, %, NLT | 40 |

## APPLICATION

FCL is an effective dispersant in all drilling fluid systems under alkaline pH conditions. The negatively charged lignosulfonate ion interacts with the positively charged edges of clay particles, thus preventing their aggregation. Introducing FCL in alkaline aqueous solution minimizes high-temperature gelation of clay drilling fluids. Introduction of dry FCL ensures secondary control of fluid loss and a good oil dispersant. Effective as a liquefier at temperatures of up to 150°C.

## TREATMENT

The reagent consumption is determined by many factors: temperature, salinity and colloidal phase content. Approximate reagent consumption is 5–17 kg per 1 m³ of drill fluid.

## PACKAGING

FCL reagent for drilling fluids is packed into 20-25 kg polypropylene bags with polyethylene liner.





# FLS

**FERROLIGNOSULFONATE**

TECHNICAL SPECIFICATIONS
TY 2458-018-97457491-2009

FLS (ferrolignosulfonate) reagent produced by JSC «NPO «Polycell» is used to reduce viscosity and gel strength of water-based drilling fluids with high colloidal phase content. The reagent retains its technological properties under conditions of high downhole temperatures (up to 130 °C). The reagent composition additionally includes a foam suppressant to reduce foaming activity. The product does not contain chromium and is therefore recommended for use in environmentally sensitive areas, including offshore. The product belongs to Hazard Class 4.

| Parameter | Standard |
|---|---|
| Appearance | light yellow to light brown loose powder |
| Mass content of moisture, %, NMT | 10 |
| pH of 1% aqueous solution, NLT | 4,0 - 5,0 |
| Mass fraction of water insoluble substances at 25 °C, %, NMT | 3,0 |
| Degree of reduction in rheological parameters of the fluid under test before thermostatic control, %, NLT<br>– Effective viscosity ($\eta_a$)<br>– YP<br>– $GS_1$<br>– $GS_{10}$ | <br><br>65<br>85<br>80<br>80 |
| Degree of reduction in rheological parameters of the fluid under test after thermostatic control at 130 °C/8h, %, NLT<br>– Effective viscosity ($\eta_a$)<br>– YP<br>– $GS_1$<br>– $GS_{10}$ | <br><br>55<br>70<br>70<br>70 |

## TREATMENT

Approximate reagent consumption is up to 15 kg per 1 m³ of drilling fluid.

## PACKAGING

FLS reagent for drilling fluids is packed into 20-25 kg polypropylene bags with polyethylene liner.

# POLYRHEOTIN

TECHNICAL SPECIFICATIONS
TY 2458-099-97457491-2013

Polyrheotin is a homogeneous solution of specially selected complex salts designed to reduce the viscosity characteristics of drilling fluids with a high solid phase content.

| Parameter | Standard |
|---|---|
| Appearance | colourless to light brown liquid |
| Density, kg/m³ | 1100 - 1300 |
| Liquefaction index, %, NLT | 50 |
| pH | 3,5 - 7,0 |

## APPLICATION

Polyrheotin is an effective dispersant in drilling fluid systems of various densities. Prevents thickening of weighted drilling fluids with preservation of their filtration characteristics, facilitates accident-free running of casing strings. As the reagent is chromium-free, it may be widely used in environmentally sensitive areas.

## TREATMENT

Approximate reagent consumption is 2.5–5 kg per 1 m³ of drilling fluid.

## PACKAGING

Polyrheotin is supplied in 1100 kg plastic cubic tanks or 40 kg plastic canisters.

# POLYPHOSCOR

LIQUEFYING AGENT

TECHNICAL SPECIFICATIONS
TY 2458-087-97457491-2013

Polyphoscor is an acid-containing liquefying agent for fresh and low-salinity drilling fluids, designed to reduce and stabilize their rheological properties and viscosity.

| Parameter | Standard |
|---|---|
| Appearance | white loose powder |
| pH of 1% aqueous solution, NMT | 4,0 |

## ▶ APPLICATION

Polyphoscor is an effective heat-resistant liquefier for water-based drilling fluids, it can be used to bind water hardness ions.

## ▶ TREATMENT

Approximate reagent consumption is 1–2 kg per 1 m³ of drilling fluid.

## ▶ PACKAGING

Polyphoscor liquefying agent is packed into 25 kg polypropylene bags with polyethylene liner.

# PolyRGM

REAGENT

TECHNICAL SPECIFICATIONS
TY 2454-036-97457491-2010

PolyRGM humate reagent is used as a stabilizer for treatment of water-based drill fluids to reduce filtration rates, improve rheological properties and increase inhibitory properties of fluids.
PolyRGM reagent is represented by the following grades, differing in composition, properties and scope of application:

– **PolyRGM reagent** is designed for freshwater drilling fluids;
– **PolyRGM-F reagent** is designed for drilling fluids of various salinity degree;
– **Liquid PoliRGM-F** is a reagent designed to stabilize the engineering properties and reduce filtration in water-based drilling fluids.

| Parameter | PolyRGM | PolyRGM-F | PolyRGM-F (liquid form) |
|---|---|---|---|
| Appearance | light gray to black powdery substance | | dark brown to black liquid |
| Static filtration index of 20% reagent aqueous suspension, cm³, NMT | 8,0 | – | – |
| pH of 1% aqueous suspension of the reagent | 9,0 - 12,0 | | – |
| Value of filtration reduction of saline clay suspension with addition of 3% reagent, %, NLT | – | 50 | – |
| Density, g/cm³, NMT | – | – | 1,050 |

## ▶ APPLICATION

PolyRGM reagent is a liquefier and filtration reducer for clay wash liquids at increased temperatures. Addition of 1% PolyRGM simultaneously reduces drilling fluid filtration and rheological characteristics of the drilling fluid.

## ▶ TREATMENT

Approximate reagent consumption is 8–30 kg per 1 m³ of drilling fluid.

## ▶ PACKAGING

PolyRGM humate reagent for drilling fluids is packed into 25 kg polypropylene bags with polyethylene liner. Liquid PolyRGM-F is packed into 200 kg metal or plastic drums or 30 kg canisters.





# POLYPHOSPHOTIN

LIQUEFYING AGENT

TECHNICAL SPECIFICATIONS
TY 2458-097-97457491-2013

Polyphosphotin is designed to reduce the viscosity characteristics of water-based drilling fluids. The product is particularly effective in drilling conditions characterized by a high buildup of colloidal clays.

| Parameter | Standard |
|---|---|
| Hydrogen value (pH), NMT | 8,0 |
| Liquefying ability, %, NLT | 40 |

## ▶ APPLICATION

Polyphosphotin is an effective liquefier for water-based drilling fluids.

## ▶ TREATMENT

Approximate reagent consumption is 1–2 kg per 1 m³ of drilling fluid.

## ▶ PACKAGING

Polyphosphotin is packed into 25 kg polypropylene bags with polyethylene liner.

# PolyTSHCHR

REAGENT FOR DRILL FLUIDS

TECHNICAL SPECIFICATIONS
TY 2454-042-97457491-2010

PolyTSHCHR is a composite reagent for treatment of freshwater, saline and clay-free drilling fluids to obtain aerated fluids of reduced density and construct wells in sections prone to lost returns.

**PolyTSHCHR-1 reagent** is designed for preparation of clay-free drilling fluids;

**PolyTSHCHR-2 reagent** is designed for treatment of freshwater and saline clay suspensions.

| Parameter | PolyTSHCHR-1 | PolyTSHCHR-2 |
|---|---|---|
| Appearance | dark brown to black fibrous material, white inclusions are permissible | |
| Static filtration index of 10% reagent aqueous suspension, cm³, NMT | 6,0 | 10,0 |
| pH of 1% aqueous suspension of the reagent, NLT | 9,0 | |
| Mass fraction of sieve residue with 5 mm mesh size, %, NMT | 5 | |

## ▶ APPLICATION

PolyTSHCHR reagent reduces drilling fluid density, facilitates foam formation and stabilization. When applied, the reagent ensures reduction in the density of the flush liquid to 0.9 g/cm³ and below, thus reducing the probability of lost return when passing fissured and complicated sections. In addition to its foam-forming action, PolyTSHCHR is an effective colmatant, which also helps prevent lost returns.

## ▶ TREATMENT

When preparing a clay-free drilling fluid, PolyTSHCHR consumption is ~ 70-100 kg per 1m³ of fresh or saline water. Reagent consumption when used as an additive in clay fluid is ~10-30 kg per 1m³.

## ▶ PACKAGING

PolyTSHCHR reagent for drilling fluids is packed into 20 kg polypropylene bags with polyethylene liner.

# BIOXAN

BIOPOLYMER

TECHNICAL SPECIFICATIONS
TY 2458-025-97457491-2010

Bioxan biopolymer is a high-molecular weight basic structure-forming agent with high rheological characteristics. It features thickening ability at low concentrations, aqueous solutions exhibit thixotropic and pseudoplastic properties.

| Parameter | Standard |
|---|---|
| Appearance | white to gray loose powder |
| Twist angle of the rotational viscometer spring at 600 rpm, deg., NLT | 30 |
| Nonlinearity index, NMT | 0,45 |
| Brookfield Viscosity at 1.5 rpm, cP, NLT | 1950 |
| Mass content of moisture, %, NMT | 13,0 |
| pH of 0.5% aqueous solution, NLT | 6,0 |
| Presence of starch, guar, or their derivatives | absence |

## APPLICATION

Bioxan biopolymer is used to regulate the structural and mechanical properties of drilling fluids. It significantly increases the cutting-carrying capacity of the flush liquid, provides well cleaning when drilling intentionally deviated and horizontal sections and when exposing productive formations. It prevents drilling sludge from settling in static. The reagent can be used in most types of water-based fluids over a wide range of pH, salinities and temperatures.

## TREATMENT

Approximate reagent consumption is 2–15 kg per 1 m³ of drilling fluid.

## PACKAGING

Bioxan biopolymer is packed into 25 kg polypropylene bags with polyethylene liner.

# PAA-L

LOW-MOLECULAR WEIGHT POLYMER

TECHNICAL SPECIFICATIONS
TY 2216-026-97457491-2010

# PAA-H

HIGH-MOLECULAR WEIGHT POLYMER

TECHNICAL SPECIFICATIONS
TY 2216-027-97457491-2010

PAA polymers are used to stabilize process fluids used for drilling and workover of oil and gas wells. Besides, PAA-L low-molecular weight polymer is used to reduce filtration, PAA-H high-molecular weight polymer is used as flocculant and thickener of drill fluids.

| Parameter | PAA-L | PAA-H |
|---|---|---|
| Mass content of moisture, NMT | 10,0 | |
| pH of 0.5% aqueous solution, NLT | 6,0 | |
| Static filtration index of freshwater drill fluid with the addition of 0.5%, cm³/30 min, NMT | 10,0 | – |
| Twist angle of the rotational viscometer spring at 600 rpm, 0,5% aqueous solution, NLT | – | 40 |





## APPLICATION

PAA reagents are used to regulate filtration and rheological characteristics of flush liquids, reduce the intensity of solid phase build-up during drilling, and improve lubricating properties. In secondary oil production, PAA additives reduce the mobility of water injected into the formation, which facilitates better displacement of oil from porous rocks and enhanced oil recovery.

## TREATMENT

Approximate reagent consumption is 5-25 kg per 1 m³ of drilling fluid for PAA-L reagent and 0.5-5 kg per 1 m³ of drilling fluid for PAA-H reagent.

## PACKAGING

PAA polymer is packed into 25 kg polypropylene bags with polyethylene liner.

# POLYBACCIDE

TECHNICAL SPECIFICATIONS
TY 2458-092-97457491-2013

The reagent is a multifunctional bactericide designed for use in the oil and gas industry to prevent bacterial decomposition of organic components of water-based drilling fluids. There are several grades of Polybaccide reagent available:

**Polybaccide**
prevents bacterial decomposition of organic components of water-based drilling fluids caused by cellulose-fermenting, aerobic and anaerobic bacteria. Effective against blue-green algae and microscopic fungi. It suppresses the activity of sulfate-reducing bacteria that cause corrosion of equipment.

**Polybaccide-M**
has fungicidal and bactericidal action against Gram-positive and Gram-negative bacteria. The reagent prevents biogrowth.

| Parameter name | Polybaccide | Polybaccide-M |
|---|---|---|
| Appearance | colourless to light brown liquid | |
| Density, g/cm³ | NLT 1.000 | |
| Hydrogen value pH of 1% aqueous solution | NLT 8.5 | |

## TREATMENT

The reagent is added to the drilling fluid when it is prepared. The concentration for initial treatment is 0.3 kg/m³. During the drilling process, it is necessary to periodically treat the drilling fluid. Polybaccide produces no adverse effect on drilling fluid parameters.

## PACKAGING

Polybaccide multifunctional bactericide is packaged into 200 kg steel drums or 30 kg canisters.

# SMEG

LUBRICATING ADDITIVE

TECHNICAL SPECIFICATIONS
TY 2458-007-97457491-2007

SMEG lubricating additive for drilling fluids is a mixture of vegetable and mineral oils (including used oils) modified with glycols and other technological components.

| Parameter | CMEG-1 | CMEG-3 | CMEG-4 | CMEG-5 | CMEG-6 |
|---|---|---|---|---|---|
| Appearance | yellow to black liquid | | | | |
| Reduction of friction coefficient in model clay suspension, %, NLT | 40 | 45 | 60 | 50 | 60 |
| Reduction of friction coefficient in model weighted clay suspension, %, NLT | not regulated | | 50 | 45 | 55 |
| Reduction of friction coefficient in model saline clay suspension, %, NLT | not regulated | | 40 | not regulated | |

## APPLICATION AND TREATMENT

For optimal results, SMEG is added to the drilling fluid directly through the cycle. To achieve the required effect, the lubricating additive consumption is 0.5-2%. SMEG reagent is compatible with all types of drilling fluids. SMEG lubricating additive is available in several modifications depending on the purpose and composition:

- SMEG-1 is a mixture of mineral distillate and residual base oils. Special modifying additives are introduced in the reagent to improve its performance characteristics. SMEG-1 reagent is effective in freshwater clay suspensions characterized by moderate solid phase content;
- SMEG-3 is a composition of vegetable oils and their distilled hydrolysis products. The reagent is most effective in inhibited biopolymer fluids;
- SMEG-4 is a composition of higher fatty acids of vegetable origin, residual base oils and special modifying additives designed for water-based drilling fluids;
- SMEG-5 is a multi-purpose lubricating additive that effectively improves lubricating properties of weighted drilling fluids prepared both on fresh and high-mineralized water;
- SMEG-6 reagent is a multi-purpose lubricating additive that can be used in all types of drilling fluids, including non-aqueous based fluids. Treatment of drilling fluids with SMEG-6 significantly reduces the probability of drilling tool and/or casing seizure. The reagent can be used as a component of anti-seize oil bath fluids. The SMEG reagent shall meet the requirements and standards specified in the table below.

## PACKAGING

SMEG lubricating additive is supplied in 170-200 kg steel drums (depending on the grade).

# POLYECOLUB

LUBRICATING ADDITIVE

TECHNICAL SPECIFICATIONS
TY 2458-044-97457491-2011

Polyecolub lubricating additive is a composite material based on natural and synthetic oils. It is used in all types of water-based drilling fluids. Polyecolub reagent is non-toxic, does not pollute the environment, does not adversely affect the drilling fluid characteristics.

| Parameter | Standard |
|---|---|
| Appearance | brown to black liquid |
| Density, kg/m³, NMT | 980 |
| Reduction of friction coefficient in model clay suspension, %, NLT | 40 |
| Funnel viscosity according to VZ-4 viscosimeter, s, NMT | 60 |

## TREATMENT

For optimal results, the lubricating additive is fed to the drilling fluid directly through the cycle. Approximate lubricant consumption is 5–20 kg per 1 m³ of fluid.

## PACKAGING

Polyecolub lubricating additive is supplied in 180 kg steel drums.





# MICAN-40

MULTIFUNCTIONAL LUBRICATING ADDITIVE

TECHNICAL SPECIFICATIONS
TY 5725-005-97457491-2007

Mican-40 lubricating additive is designed to provide lubricating properties of drilling process fluids, it is used during drilling and when preparing a wellbore for running a casing string.

| Parameter | Standard |
|---|---|
| Appearance | gray powder |
| Reduction of friction coefficient in model clay suspension, %, NLT | 15 |

## APPLICATION

Designed for use as additives in drilling process fluids in a wide range of clay phase content, weighting agents and salinity. Lubricating additives ensure effective reduction of friction coefficient and do not adversely affect the properties of drilling fluids. The reagent has colmatage properties. For optimal results, it is added to the drilling fluid directly through the cycle.
To achieve the required effect, the lubricating additive consumption is 0.5-2%. Mican-40 reagent is compatible with all types of drilling fluids. It is used for treatment during pulling-and-running operations, and its efficiency increases at higher concentrations.

## PACKAGING

Mican-40 lubricating additive is packed into 25 kg polypropylene bags with polyethylene liner.

# SILANGE

LUBRICATING ADDITIVE

TECHNICAL SPECIFICATIONS
TY 2458-002-97457491-2007

Silange lubricating additive for drilling fluids is designed to improve lubricating and anti-seize properties of process fluids during drilling, as well as during wellbore preparation for pulling-and-running operations. Silange lubricating additive for drilling fluids is a bulk product, a mixture of liquid lubricating additives with finely dispersed sorbent. It is effective in weighted drilling fluids with high solid phase content and colloidity.

| Parameter | Standard |
|---|---|
| Appearance | gray to brown loose material |
| Reduction of friction coefficient in model clay suspension, %, NLT | 50,0 |
| Reduction of friction coefficient in model weighted clay suspension, %, NLT | 30,0 |

## APPLICATION

It ensures improvement of lubricating properties of the drilling fluid, has a reinforcing effect on clay rocks, does not have an adverse impact on drilling fluid parameters. Approximate consumption of Silange lubricant is 5-10 kg during drilling and 10-30 kg when preparing the borehole for running casing strings, per 1 m³ of drilling fluid.

## PACKAGING

Silange lubricating additive for drill fluids is packed into 25 kg polypropylene bags with polyethylene liner.

# POLYANTIFRIC

TECHNICAL SPECIFICATIONS
TY 2458-088-97457491-2013

The reagent is used to prevent tool running complications during well construction under challenging geological conditions, as well as for salvage operations (as a component of anti-seize bath fluids). Polyantifric reagent is a composition of distilled products of hydrolysis of vegetable oils and special modifying additives. The reagent consists of products of natural origin, does not contain petroleum derivatives, belongs to Hazard Class 4.

| Parameter | Standard |
|---|---|
| Appearance | light brown to dark brown liquid |
| Density, kg/m³, NLT | 900 |
| Reduction of the friction coefficient in clay suspension, %, NLT | 60 |
| Reduction of the seizure coefficient in clay suspension, %, NLT | 80 |

## APPLICATION

To increase efficiency, it is suggested that the reagent is added directly inside the drilling tool during connection making (up to 30 liters per operation).

## TREATMENT

Recommended reagent content in the drilling fluid: up to 10 kg per cubic meter. When used in such quantities, Polyantifric ensures reduction of the friction torque in drilling fluids by 60% and reduction of the seizure torque by 80%. The additive performance depends on many factors (amount of solid and colloidal phase, drilling fluid salinity, pH value, etc.).

## PACKAGING

Polyantifric anti-seize additive is supplied in 30 kg plastic canisters or 190 kg steel drums (as agreed with the customer).

# POLYDEGLAND

TECHNICAL SPECIFICATIONS
TY 2458-112-97457491-2015

Polydegland anti-mudball additive reduces adhesion of clay particles to metal surfaces of the drill string, reduces mudball formation on the bit and BHA elements, increases mechanical drilling speed. Using Polydegland anti-mudball additive increases lubricating properties of the flush liquid.

| Parameter | Standard |
|---|---|
| Appearance | light yellow to brown liquid |
| Density, kg/m³ | 1000 - 1200 |
| pH, NLT | 6,0 |

## APPLICATION

The product is used to prevent mudball formation when passing shale sections.

## TREATMENT

The reagent is added directly into the drill pipe during connection making, or into a circulation tank. Approximate reagent consumption: 1-5 kg per 1 m³ of the fluid.

## PACKAGING

Polydegland anti-mudball additive is supplied in 30 kg plastic canisters.





# GLITAL

TECHNICAL SPECIFICATIONS
TY 2458-006-97457491-2007

The GLITAL lubricating additive is a composition of partially neutralized natural higher fatty acids, glycols, and special additives that enhance the inhibition of clay material swelling. The lubricant disperses readily in water-based drilling fluids due to the presence of an effective emulsifier in its formulation. During storage, the formation of dense or viscous sediment is acceptable (the presence of sediment is normal for this type of lubricant). This sediment consists of interaction products of the lubricant components, is an integral part of the product, and can be used in the drilling fluid without any restrictions. It is recommended to mix the GLITAL lubricating additive thoroughly before introducing it into the drilling fluid. The GLITAL reagent shall meet the requirements and standards specified in the table below.

| Parameter | Standard |
|---|---|
| Appearance | liquid, light brown to black, sediment is allowed |
| Reduction of metal-metal friction coefficient at 1% additive dosage, %, NLT | 50,0 |
| Density, g/cm³, NMT | 1,0 |

## APPLICATION AND TREATMENT

For optimal results, GLITAL is added to the drilling fluid directly in the circulation cycle. The dosage of the lubricating additive to achieve the desired effect is 0.5–3%. GLITAL is compatible with all types of drilling fluids.

## PACKAGING

The GLITAL lubricating additive is poured into clean, dry steel drums conforming to GOST 13950, Type 1, or GOST 6247, with a capacity of 100–200 dm³.
Other types of packaging ensuring a sealed container may be used upon agreement with the customer. The container should be filled to no more than 90% of its capacity.

# MultiLube

TECHNICAL SPECIFICATIONS
TY 20.59.59-200-97457491-2025

MultiLube is a high-performance lubricant composed of partially neutralized natural higher fatty acids. Its enhanced lubricity reduces downhole friction forces and torque on the drill string. By reducing the friction coefficient of the drilling fluid to the maximum degree, MultiLube improves the rate of penetration and reduces wear on moving equipment parts. Effective in fresh, salt-saturated, and weighted drilling fluids, it disperses well due to a blend of effective emulsifiers. It also does not affect rheological properties of the drilling fluids.

| Parameter | Standard |
|---|---|
| Appearance | liquid, light brown to black. sediment is allowed |
| Reduction of metal-metal friction coefficient at 1% additive dosage, %, NLT | 70,0 |
| Density, g/cm³, NMT | 1,0 |

## APPLICATION AND TREATMENT

Recommended lubricant dosage: 0.5–3%. The specific dosage is determined by the actual drilling conditions (length of the open hole section, deviation from vertical, type of drilling fluid and formation, bottom hole assembly configuration, etc.).

## PACKAGING

The MultiLube high-performance lubricating additive is supplied in plastic or steel drums of 200 kg.

# POLYECOL

TECHNICAL SPECIFICATIONS
ТУ 2458-021-97457491-2010

Polyecol is a reagent of combined effect, designed to improve lubricating and anti-wear properties of water-based drilling fluids and to inhibit clay shale swelling. The reagent's inhibitory effect is evaluated by the change in the rheological characteristics of model clay suspensions before and after introduction of the inhibitor, as well as before and after thermal aging. Polyecol clay shale swelling inhibitor is a composition based on polyglycols. The reagent is used as an additive to water-based drilling fluids from freshwater to high-mineralized when drilling clay deposits, including drilling at high downhole temperatures (up to 130 °C).

| Parameter | Standard | |
|---|---|---|
| Appearance | brown to black liquid | |
| Density, kg/m³ | 1000-1200 | |
| pH, NLT | 8,0 | |
| Inhibitory ability: | before thermostatic control | after thermostatic control |
| - reduction of apparent viscosity, %, NLT | 40 | 25 |
| - reduction of yield point, %, NLT | 50 | 45 |
| - reduction of static shear stress in 1 minute, %, NLT | 60 | 55 |
| - reduction of static shear stress in 10 minutes, %, NLT | 50 | 30 |

## PROPERTIES

Polyecol reagent ensures effective inhibition and stabilization of the exposed deposits, prevents swelling and destruction of clays and shales. Due to its high inhibitory ability and surface-active properties it stabilizes the rheological properties of the fluid even under intense drilling conditions. Approximate consumption of Polyecol reagent is 5-20 kg per 1 m³ of drilling fluid.

## PACKAGING

Polyecol is supplied in 200 kg steel drums.

# POLYECOSIL

TECHNICAL SPECIFICATIONS
ТУ 2458-045-97457491-2011

Polyecosil is a composition based on a complex of rapidly dissolving inorganic silicates. The reagent is available in three grades: Polyecosil-N, Polyecosil-S, Polyecosil-K

**Polyecosil-N** is sodium salt of metasilicic acid, available in dry and liquid forms;

**Poliekosil-K** is potassium salt of silicic acid;

**Polyecosil-S** is a premix used as an aqueous solution for uniform distribution in process fluids.

| Parameter | Polyecosil-N | Polyecosil-S | Polyecosil-N | |
|---|---|---|---|---|
| Appearance | white powder | white to gray powder | white powder | colorless to yellow liquid, a slight sediment may be present |
| Bulk density, kg/m³, NLT | 0,5 | – | 0,85 | – |
| pH of 1% aqueous solution, NLT | 10,0 | – | 10,0 | – |
| Working fluid density, kg/m³ | – | 1,400 | – | 1,150 |
| pH of the working solution, NLT | – | 10,0 | – | 9,0 |

## APPLICATION

Polyecosil is designed for preparation of low-clay and clay-free silicate drilling process fluids. Polyecosil ensures production of silicate drilling fluids with optimal rheological, filtration and lubricating properties for drilling wells in sections of highly active clay rocks. Using Polyecosil reagent prevents intensive clay dispersion and excessive drilling fluid volumes, improves wellbore stability and cementing quality.

## TREATMENT

Recommended reagent content in the drill fluid: 5-7 kg in 1 m³.

## PACKAGING

Polyecosil reagent is packed into 25 kg polypropylene bags with polyethylene liner.





# POLYASPHATIN

TECHNICAL SPECIFICATIONS
ТУ 2458-114-97457491-2015

Polyasphatin is a clay swelling inhibitor, liquid asphalt, prevents hydration and dispersion of rocks, features properties of a stabilizer and viscosity reducer of freshwater and saline drilling fluids.

| Parameter | Standard |
|---|---|
| Appearance | light yellow to black liquid, slight precipitation during storage is allowed |
| Density at 20 ºC, kg/m³, NLT | 1120 |
| Twist angle of the rotational viscometer spring at 600 rpm, deg., NLT | 40 |
| pH, NLT | 8,0 |

## APPLICATION

Polyasphatin reagent is used for well construction in sections of active colloidal clays to prevent the growth of rheological characteristics and strengthen the bore hole walls. Using the reagent provides control over the growth of filtration characteristics and viscosity of drilling fluids under drilling conditions with high content of colloidal clay phase.

## TREATMENT

Recommended concentration of the reagent in the drilling fluid is from 10 to 30 kg/m³. Actual concentration of the reagent depends on the type of clay rock, bit diameter and mechanical drilling advance rate, and the desired level of inhibition.

## PACKAGING

Polyasphatin is supplied in 200 kg steel drums.

# POLYTEXOL

TECHNICAL SPECIFICATIONS
ТУ 2458-104-97457491-2015

Polytexol is designed for stabilization of unstable clay shale formations, it prevents their sloughing, significantly improves lubricating properties of drilling fluids and reduces fluid loss at high temperatures and pressure, ensures creation of a thin and strong filtration crust. Polytexol is a composite material based on sulfonated derivatives of bitumen and naturally occurring resins. Polytexol is used both in freshwater and saline flush liquids.

| Parameter | Polytexol-1 | Polytexol-2 |
|---|---|---|
| Appearance | homogeneous black powder | |
| pH of 1% aqueous solution, NLT | 8,0 | |
| Mass fraction of loss on drying, %, NMT | 25,0 | |
| The value of filtration reduction of clay suspensions at a reagent content of 3%, and a pressure drop of 0.7 MPa, %, NLT | 45 | 40 |

## TREATMENT

The drilling fluid is treated using standard equipment (clay mixers, hydro funnels, etc.). Approximate Polytexol reagent consumption: 10 – 40 kg/m³.

## PACKAGING

Polytexol reagent is packed into 25 kg polypropylene bags with polyethylene liner.

# POLYAMINAL

TECHNICAL SPECIFICATIONS
TY 2458-091-97457491-2013

Polyaminal reagent is an amine-type liquid inhibitor used to prevent swelling of water-sensitive clay formations on contact with drilling fluids or water-based well-killing fluids.

**Polyaminal** stabilizes clay shale formations, prevents their hydration, helps improve stability of the bore hole walls, and reduces the likelihood of mudball formation.

**Polyaminal P** inhibits hydration and swelling of clays and clay shales, prevents further dispersion of drilled clay rocks.

| Parameter | Polyaminal | | Polyaminal P |
|---|---|---|---|
| Appearance | colourless to light yellow liquid | | brown to black liquid |
| Density, kg/m³ | 1050-1100 | | 1050-1150 |
| pH, NMT | 9,0 | | 8,5 |
| Inhibitory ability: | before thermostatic control | after thermostatic control | – |
| - Degree of apparent viscosity reduction, %, NLT | 70 | 70 | |
| - Degree of yield point reduction, %, NLT | 80 | 80 | |
| - Degree of gel strength reduction after 1 minute, %, NLT | 80 | 80 | |
| - Degree of gel strength reduction after 10 minutes, %, NLT | 80 | 80 | |

## ▶ APPLICATION

There are no application restrictions for this reagent. It can be used in all types of water-based drilling fluids. It enables partial and in some cases complete elimination of the use of Kcl. A key feature of the Polyaminal P reagent is its ability to chemically bind colloidal clay and render it inactive. The technical result of its application is a significant reduction in the MBT value and prevention of rheological parameter increases when drilling through clay intervals.

## ▶ TREATMENT

Approximate consumption of Polyaminal reagent is 5 - 20 kg per 1 m³ of process fluid.

## ▶ PACKAGING

Polyaminal is supplied in 200 kg steel drums or 1000 kg plastic cubic tanks.

# AminoBur

TECHNICAL SPECIFICATIONS
TY 20.59.59-202-97457491-2025.

AminoBur is used to control the rheological and filtration properties of drilling fluids. It reduces the rate of solids build-up during drilling and improves wellbore stability in clay formations. AminoBur is a high-molecular-weight, water-soluble amine-type polymer. It is produced in liquid and powder forms. The liquid forms are AminoBur-20 and AminoBur-25; the powder form is designated AminoBur.

| Parameter | AminoBur | AminoBur-20 | AminoBur-25 |
|---|---|---|---|
| Appearance | powder, white to light yellow | homogeneous liquid, yellow to black | |
| Density, g/cm³ | – | NLT 1,000 | |
| Bulk density, kg/m³ | 450-750 | – | |
| Hydrogen value pH, units | NMT 8,0 | | |

## ▶ PROPERTIES

The AminoBur reagent is used for drilling intervals with a high content of active clays. Its application allows for control of the Methylene Blue Test (MBT) value of the drilling fluid.

## ▶ PACKAGING

Polypropylene bags with polyethylene liners, 25 kg each (for the AminoBur powder product). Metal drums, 200 kg each (for the AminoBur-20 and AminoBur-25 liquid products).





# POLYFLOC

TECHNICAL SPECIFICATIONS
TY 2458-069-97457491-2012

The Polyfloc drilling reagent is a component of drilling fluids used for intervals with a high content of colloidal clays. The reagent is resistant to high temperatures and salinity (from calcium and magnesium salts), and effectively flocculates clay and shale materials. Furthermore, the Polyfloc drilling reagent provides low fluid loss, including under High-Pressure, High-Temperature (HPHT) conditions. Polyfloc K grade is a colored oleophilic liquid used in the regeneration technologies for spent non-aqueous drilling fluids.

| Parameter | Polyfloc | Polyfloc - 20 | Polyfloc - 25 | Polyfloc K | Polyfloc Plus-25 | Polyfloc Plus-100 | Polyfloc Plus-30 |
|---|---|---|---|---|---|---|---|
| Appearance | homogeneous liquid, yellow to black | | | oily liquid, blue or green shades | powder, white to light yellow | | liquid, yellow to brown |
| Density, g/cm³ | NLT 1,00 | | | NMT 1,00 | – | – | 0,86-0,90 |
| Bulk density, kg/m³ | – | | | – | 450-750 | 300-500 | – |
| Hydrogen value pH | NMT 8,00 | | | – | NMT 8,00 | | – |
| Twist angle of the rotational viscometer spring, deg., NMT:<br>- 600 rpm<br>- 300 rpm | – | | | <br>18<br>19 | – | | |

## ▶ APPLICATION

A key feature of the Polyfloc reagent is its ability to chemically bind colloidal clay and render it inactive. The technical result of its application is a significant reduction in the MBT value and prevention of rheological parameter increases when drilling through clay intervals. The reduction of the Methylene Blue Test (MBT) value in the drilling fluid occurs through the neutralization of the excess negative charge on dispersed clay particles. This process deactivates the colloidal phase, substantially reducing its impact on the rheological properties. In practice, this means that the viscosity of the drilling fluid remains almost unchanged or increases only marginally when drilling intervals with colloidal clays, even under conditions of high solids build-up and inefficient solids control equipment performance.

## ▶ PACKAGING

The drilling reagent in powder form is packaged in 25 kg polypropylene bags with polyethylene liners.
The drilling reagent in liquid form is packaged in 200-liter steel drums.
Polyfloc-K is supplied in 1,000 L IBC totes.

# POLYDEFOAM

FOAM SUPPRESSANT

TECHNICAL SPECIFICATIONS
TY 2637-023-97457491-2010

Polydefoam foam suppressants are specially selected silicone-based compositions designed to prevent and eliminate foaming of drilling and process fluids during well construction.Several grades of foam suppressants are available:
**Polydefoam** is a foam suppressant for freshwater polymer clay and weighted drilling fluids;
**Polydefoam-M** is a foam suppressant with improved defoaming properties for weighted drilling fluids;
**Polydefoam plus** is an all-purpose foam suppressant. The reagent is a composition of specially selected components in mineral oil.

| Parameter | Polydefoam | Polydefoam-M | Polydefoam plus |
|---|---|---|---|
| Appearance | white to yellow liquid | | brown to black liquid |
| Defoaming capacity index, %, NLT | 95 | | |

## APPLICATION

Polydefoam series foam suppressants are designed to suppress foam that is caused by the use of surfactants. Polydefoam series foam suppressants have no noticeable effect on drilling fluid parameters. The efficiency of the foam suppressant is determined by viscosity and temperature of the drilling fluid, concentration of the foaming agent and other factors.

## TREATMENT

Approximate consumption of Polydefoam series foam suppressants: 0.5-1 kg per 1 m³ of freshwater polymer clay drill fluid and 1.5-2 kg per 1 m³ of weighted drill fluid.

## PACKAGING

Polydefoam foam suppressant is supplied in 180-190 kg steel drums (depending on the grade) or in 30 kg plastic canisters.

# POLYDEFOAMER

FOAM SUPPRESSANT

TECHNICAL SPECIFICATIONS
TY 2458-039-97457491-2010

Polydefoamer foam suppressant is an oil-based composition designed to prevent foaming and suppress foam in freshwater polymer-clay and moderately weighted saline drilling process fluids.

| Parameter | Standard |
|---|---|
| Appearance | light yellow to brown liquid |
| Defoaming capacity index, %, NLT | 95 |

## APPLICATION

Polydefoamer foam suppressant is designed to suppress foam caused by the use of lignosulfonate reagents. The defoaming properties of Polydefoamer reagent persist after several freezing - thawing cycles.

## TREATMENT

Approximate consumption of Polydefoamer foam suppressant is 0.5–1 kg per 1 m³ of freshwater polymer clay drilling fluid and 1.5–2 kg per 1 m³ of saline drilling fluid.

## PACKAGING

Polydefoamer foam suppressant is supplied in 190 kg steel drums or in any other packaging as agreed with the customer.





# POLYDEFOLUB

FOAM SUPPRESSANT

TECHNICAL SPECIFICATIONS
TY 2458-051-97457491-2012

Polydefolub foam suppressant is a composite material based on natural oils and organosilicon compounds, It is available in liquid and powdered form. Polydefolub foam suppressant is designed to suppress foam formed in drill fluids with increased solid phase content, when using lubricants based on vegetable and mineral oils, hydrocarbons, as well as to reduce air entrainment in cement slurries.

| Appearance | white to dark yellow loose powder | yellow to dark brown liquid |
|---|---|---|
| Defoaming capacity index, %, NLT | 90 | |

## APPLICATION

Approximate consumption of Polydefolub foam suppressant is 0.5-1 kg per 1 m³ of drilling fluid.

## PACKAGING

Polydefolub foam suppressant is packed into 25 kg polypropylene bags with polyethylene liner. Polydefolub liquid foam suppressant is supplied in 190 kg steel drums.

# KF, KF-C, KF-R, K-O.

COMPOSITE COLMATAGE FILLERS FOR DRILLING FLUIDS (COLMATANTS)

TECHNICAL SPECIFICATIONS
TY 5725-008-56864391-2007

Colmatage fillers (colmatants) effectively plug permeable formations and are used to prevent and control lost circulation. The product is available in several grades, which differ based on the component materials used:
The grade designation for colmatants produced by JSC "NPO"Polycell" indicates the material composition.

- KF Series: colmatants based on fractionated mica (phlogopite).
- KF-C Series: colmatants based on fractionated mica with the addition of fibrous materials (e.g., peat, asbestos).
- KF-R Series: acid-soluble, fractionated ground seashell.
- K-O Series: fractionated ground nutshell.

| Parameter | | KF | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 0,125 | 0,63 | 1 | 2 | 3 | 5 | 10 | 30 |
| Mass fraction of sieve residue, %, NMT: | 30 mm | – | – | – | – | – | – | – | 10,0 |
| | 10 mm | – | – | – | – | – | – | 10,0 | – |
| | 5 mm | – | – | – | – | – | 10,0 | – | – |
| | 3 mm | – | – | – | – | 10,0 | – | – | – |
| | 2 mm | – | – | – | 10,0 | – | – | – | – |
| | 1 mm | – | – | 10,0 | – | – | – | – | – |
| | 0,63 mm | – | 10,0 | – | – | – | – | – | – |
| | 0,125 mm | – | – | – | – | – | – | – | – |
| Mass content of moisture, %, NMT | | 5,0 | 5,0 | 5,0 | 5,0 | 5,0 | 5,0 | 5,0 | 5,0 |

| Parameter | | KF-C | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 0,125 | 0,63 | 1 | 2 | 3 | 5 | 10 | 30 |
| Mass fraction of sieve residue, %, NMT: | 30 mm | – | – | – | – | – | – | – | 10,0 |
| | 10 mm | – | – | – | – | – | – | 10,0 | – |
| | 5 mm | – | – | – | – | – | 10,0 | – | – |
| | 3 mm | – | – | – | – | 10,0 | – | – | – |
| | 2 mm | – | – | – | 10,0 | – | – | – | – |
| | 1 mm | – | – | 10,0 | – | – | – | – | – |
| | 0,63 mm | – | 10,0 | – | – | – | – | – | – |
| Mass content of moisture, %, NMT | | 20,0 | | | | | | | |

| Parameter | | Standard | | | |
|---|---|---|---|---|---|
| | | KF-1R | KF-3R | KF-5R | KF-30R |
| Mass fraction of sieve residue, %, NMT: | 30 mm | – | – | – | 10,0 |
| | 5 mm | – | – | 10,0 | – |
| | 3 mm | – | 10,0 | – | – |
| | 1 mm | 10,0 | – | – | – |
| Solubility in 15% HCl solution, %, NLT | | 85 | | | |

| Parameter | | Standard | | |
|---|---|---|---|---|
| | | K-1/O | K-3/O | K-5/O |
| Mass fraction of sieve residue, %, NMT: | 5 mm | – | – | 10,0 |
| | 3 mm | – | 10,0 | – |
| | 1 mm | 10,0 | – | – |
| Mass content of moisture, %, NMT | | 15,0 | | |





## ▶ APPLICATION

The grade and concentration of the colmatant to be used is determined in accordance with the specific drilling conditions and depends on the diameters of bores (bits and drill-bit bumpers).

## ▶ TREATMENT

To prevent lost returns and filtration losses of the drilling fluid, it is recommended to use complex colmatage fillers in the amount of 5-20 kg per 1 m³ of the drilling fluid. To eliminate lost returns of drilling fluid that already occurred, increase the rate of delivery to 30-50 kg/m³. The filler concentration can be increased to control lost circulation through the drill pipes.

## ▶ PACKAGING

Complex colmatage fillers are packed into 25 kg polypropylene bags with polyethylene liner.

# POLYSMOLOBLOCK

OIL-SOLUBLE COLMATANT

TECHNICAL SPECIFICATIONS
TY 20.59.59-178-97457491-2020

Polysmoloblock reagent is an oil-soluble material that is used for lost circulation control in sections of productive formations. The reagent facilitates formation of a strong filtration crust and is dissolved by formation hydrocarbon fluid at the stimulation treatment stage, which makes it possible to bring the well on to stable production without taking additional measures to clean the downhole formation area.
Two grades of the reagent are available, which differ in fractional composition.

| Parameter | Polysmoloblock | Polysmoloblock K |
|---|---|---|
| Appearance | light yellow to dark brown powder | |
| Softening temperature, °C | 75-145 | |
| Mass fraction of sieve residue, %, NMT:<br>- 0.3 mm<br>- 1.0 mm | 10,0<br>not regulated | not regulated<br>10,0 |
| Oil solubility, %, NLT | 90,0 | |

## ▶ APPLICATION

Using Polysmoloblock oil-soluble colmatant allows to solve a number of technical problems:
- the material has low density, so there is no increase in drill fluid density when the colmatant content is increased. This property of Polysmoloblock reagent is especially important when controlling lost circulation that has already occurred;
- Polysmoloblock reagent softens at downhole temperatures, increasing the plasticity of the material, so the reagent colmatages microcracks more effectively as compared to standard fillers;
- the reagent facilitates reduction of the filtration value, in some model solutions the filtration value is reduced by 50%;
- using Polysmoloblock reagent significantly improves lubricating properties of the drill fluid, allows to significantly reduce the content or completely abandon lubricants during construction of horizontal sections;
- the reagent improves the quality of productive formation exposure, due to dissolution of the colmatant by hydrocarbon fluid the process of bringing the well on to stable production is optimized.

## ▶ PACKAGING

Polysmoloblock reagent is packed into 25 kg polypropylene bags with polyethylene liner.

# POLYPLUG

REAGENT

TECHNICAL SPECIFICATIONS
TY 2458-043-97457491-2010

Reagent fillers of Polyplug series are designed for prevention and elimination of lost returns of the drilling fluid. Polyplug reagent fillers consist of fibrous (lignocellulosic fibers, fibers of mineral origin and basalt fibers) and flaky materials of organic origin, granular mineral fillers and polymeric modifiers of natural and synthetic origin. They ensure reinforced filling of pores, cracks and caverns and accelerated claying of the forming screen.

| Parameter | 063 | 1/2 | 1, K1 | 3, K3 | 5,K5 | 10 | 6A | B 10 | B 30 |
|---|---|---|---|---|---|---|---|---|---|
| Appearance | gray to black bulk, fibrous material | | | | | | | | |
| Mass fraction of sieve residue, %, NMT: | | | | | | | | | |
| 0,63 mm | 10,0 | | | | | | | | |
| 1,0 mm | | | 10,0 | | | | 75,0 | | |
| 2,0 mm | | 10,0 | | | | | | | |
| 3,0 mm | | | | 10,0 | | | | | |
| 5,0 mm | | | | | 10,0 | | | | |
| 10,0 mm | | | | | | 10,0 | | 50,0 | |
| 30,0 mm | | | | | | | | | 10,0 |
| Mass content of moisture, %, NMT | 45,0 | | | | | | 2,0 | 25,0 | |

The particle size (granulometric composition) of the reagent can be tailored to customer specifications.

## ▶ APPLICATION

Polyplug Series reagent fillers effectively plug permeable formations and produce minimal impact on the rheological properties of the drill fluid.

**Polyplug grade K** colmatants are composite materials additionally containing pine nut shell.

**Polyplug grade 6A** colmatant is a material of mineral origin which consists of the finest flexible fibers.

**Polyplug series B** colmatants are fractionated fibrous materials of mineral origin. The colmatant is completely soluble in hydrofluoric acid and can be used in the area of productive formations.

The reagent filler is evenly distributed throughout the entire volume of the process fluid without floating up or settling to the bottom.

## ▶ TREATMENT

To prevent lost returns and filtration losses of the drilling fluid, it is recommended to use Polyplug reagent fillers in the amount of 5-20 kg/m³. To eliminate lost returns of drilling fluid that already occurred, increase the rate of delivery and add the reagent fillers in the amount of 40-60 kg/m³. Polyplug is effective as the main filler of viscoelastic muds (VEM) injected into the well as blocking packs to control lost circulation of the drilling fluid. Polyplug grade 6A and grade B fibrous colmatants are effectively used to fight lost returns in fissured sections and high intensity lost returns. Polyplug series colmatants with particle size less than 3 mm can be used when the BHA is equipped with a downhole motor and MWD.

## ▶ PACKAGING

Polyplug reagent grades 0.63–10 are packed into 17 kg polypropylene bags with polyethylene liner, grades K1–K5, 6A are packed into 20 kg polypropylene bags with polyethylene liner, grades B10, B30 are packed into 7–7.5 kg polypropylene bags with polyethylene liner.



# REAGENTS AND MATERIALS FOR OBM

Currently, oil-based muds (fluids) are becoming increasingly common. Using this type of flush liquids ensures preservation of permeability of productive reservoirs, increase of wellbore stability in the sections of clay and chemogenic rocks and reduction of well construction time due to a significant increase in mechanical drilling speed.

The product range of JSC «NPO «Polycell» includes all main reagents and materials for non-aqueous based fluids. Using JSC «NPO «Polycell» reagents enables drilling under challenging geological conditions at downhole temperatures above 100°C.

## POLYOILCHECK STAB

EMULSIFIER

TECHNICAL SPECIFICATIONS
ТУ 2458-071-97457491-2012

Polyoilcheck Stab emulsifier is designed for creation and stabilization of emulsion drill fluids. Several grades of the emulsifier are available.

| Parameter | | DT | KD | RT | TS | BN |
|---|---|---|---|---|---|---|
| Appearance | | brown to dark brown liquid sediment is allowed | | | | light yellow to dark brown liquid |
| Electrical breakdown voltage of model emulsion, V | before thermostatic control | NLT 400 | not regulated | | | not regulated |
| | after thermostatic control, 100 °C, 24 hours | not regulated | | NLT 400 | | not regulated |
| Density, g/cm³, NMT | | 1,020 | | | | 1,000 |

### APPLICATION

Polyoilcheck Stab emulsifiers are designed for:

- Polyoilcheck Stab DT is for preparation of invert emulsions, recommended for use at downhole temperatures below 100 °C.
- Polyoilcheck Stab KD is a stabilizer of complex ether-alcohol emulsions of the Polyeconol-Flora system.
  Ensures reduction of drilling fluid viscosity characteristics while maintaining the aggregative stability of the emulsion. Besides, using the reagent facilitates regeneration of spent oil-based mud emulsions by increasing efficiency of the purification system elements.
- Polyoilcheck Stab RT, Polyoilcheck Stab TS are meant for stabilization of heat-resistant invert emulsions, can be used at temperatures above 100°C.
- Polyoilcheck Stab BN is an effective emulsifier for stabilization of first-order emulsions (“oil-in-water” type).

### TREATMENT

Emulsifier concentration ranges from 5 to 25 kg/m³ depending on the required properties of the final emulsion, drilling fluid composition, temperature, and other factors.

### PACKAGING

Emulsifier concentration ranges from 5 to 25 kg/m³ depending on the required properties of the final emulsion, drilling fluid composition, temperature, and other factors.





## POLYEMULSAN

COMPOSITION

TECHNICAL SPECIFICATIONS
ТУ 2458-066-97457491-2012

Polyemulsan is a mixture of olefin oligomerization products and mineral distillate and residual oils. The grade of Polyemulsan composition is determined by the kinematic viscosity.

| Parameter name | Polyemulsan | Polyemulsan-R | Polyemulsan-D |
|---|---|---|---|
| Kinematic viscosity at 40 °C, mm²/s, NMT | 5,0 | 4,5 | 3,5 |
| Appearance | light yellow to dark brown liquid | | |
| Flash point (open crucible), °C | not below 100 | | |
| No-flow point, °C | not above minus 45 | | |
| Aniline point, °C | not above 70 | | |
| Density at 20±2 °C, kg/m³ | 800–900 | | |

### APPLICATION

Polyemulsan composition is designed for preparation of invert emulsion drilling fluid used for drilling intentionally deviated wells, for well finishing, for exposing productive formations, for sidetracking.Using invert emulsion drilling fluid prevents swelling of clay shales and facilitates preservation of natural permeability of productive formations.

### PACKAGING

Polyemulsan composition for drilling emulsion preparation is supplied in 1000-litre cubic tanks.

## POLYOLEOGEL

ORGANOBENTONITE

TECHNICAL SPECIFICATIONS
ТУ 2458-070-97457491-2012

Polyoleogel organobentonite is a universal gelling agent for hydrocarbon-based fluid systems. Several grades of the material are available:
**Polyoleogel** is designed for base oils with low kinematic viscosity and a high aniline point.
**Polyoleogel-K** is for base oils containing aromatic compounds.
**Polyoleogel-B** is a rheology modifier for drilling fluids, modified without the use of quaternary ammonium salts.

| Parameter | Polyoleogel | Polyoleogel-K | Polyoleogel-B |
|---|---|---|---|
| Appearance | light gray to yellow powder | | |
| Stability coefficient of organobentonite (oleogel) suspension, % v/v, NLT | 80 | 50 | not regulated |
| Mass fraction of loss on drying, %, NMT | 5,0 | 5,0 | 20,0 |

### APPLICATION

Polyoleogel is used for drilling in challenging geological conditions and for penetrating the productive formations of deep wells with bottom-hole temperatures ranging from 10 to 100 °C. Polyoleogel organobentonite is compatible with other components of the Polyemulsan system.

### PACKAGING

Polyoleogel organobentonite is supplied in 25 kg polypropylene bags with polyethylene liners.

# POLYOILCHECK HYDROPHOB

OIL-WETTING AGENT

TECHNICAL SPECIFICATIONS
TY 2458-073-97457491-2012

The oil-wetting agent is a product based on derivatives of aliphatic, aromatic and unsaturated fatty acids used as a highly effective additive for invert emulsion drilling fluids. The reagent helps reduce the rheological characteristics of oil-based fluids, control the filtration value, as well as the resistance of weighted fluids to contamination by drilled rocks.

| Parameter | Polyoilcheck Hydrophob | Polyoilcheck Hydrophob ABR | Polyoilcheck Hydrophob GS |
|---|---|---|---|
| Appearance | light brown to black oily viscous liquid | | light brown to dark brown liquid, precipitation is allowed |
| Density at 20 ºC, kg/m³ | 800-1000 | 750-980 | 1100-1300 |
| Acid value, mg KOH/g, NMT | 25 | not regulated | |
| Determination of model emulsion stability | absence of separated water | | not regulated |

## APPLICATION

The additive is used when the invert emulsion is heavily contaminated with solids, or when formation water enters the well and viscosity may potentially increase due to water-wetted solid particles. The product ensures water-repellent treatment of any water-wetted particles and their excellent wettability and compatibility with mineral and synthetic oils.

## TREATMENT

The working concentration of the reagent varies from 3.0 to 14.0 kg/m³.

## PACKAGING

The product is supplied in 180–200 kg metal drums (depending on the grade).

# POLYOILCHECK FILTER

FILTRATION REDUCER

TECHNICAL SPECIFICATIONS
TY 2458-072-97457491-2012

Polyoilcheck Filter filtration reducer is a composition of high-molecular weight synthetic polymer and natural organic materials.

| Parameter | Polyoilcheck Filter | Polyoilcheck Filter-E | Polyoilcheck Filter-RG | Polyoilcheck Filter GS | | Polyoilcheck Filter ASF |
|---|---|---|---|---|---|---|
| Appearance | light brown to black liquid | | yellow to dark brown liquid | brown to black liquid | brown to black powder | brown to black powder |
| Density at 20 ºC, kg/m³ | 0,8-1,000 | 0,9-1,050 | 1000-1300 | 0,850-0,1000 | – | not regulated |
| Bulk density, kg/m³ | – | | | | NLT 300 | |
| Mass content of water (humidity), %, NMT | – | | | | 8,0 | 5,0 |





## APPLICATION

A small amount of a filtration reducer can create a thin, elastic filtration crust and reduce the filtration index to minimum values.

**Polyoilcheck Filter** is used to control the filtration value of emulsion solutions, including during well construction under conditions of high downhole temperatures.

**Polyoilcheck Filter-E** is an enhanced-performance material that provides an HPHT filtration value below 3 ml/30 min.

**Polyoilcheck Filter RG** is a composite reagent designed to regulate the filtration value of emulsion drilling eco-fluids “Polybur-Turbo” and “Polyeconol”.

**Polyoilcheck Filter GS** differs from Polyoilcheck Filter reagent by the presence of natural organic materials in its composition, which contribute to additional reduction of filtrate volume and form a thinner and stronger filtration crust.

**Polyoilcheck Filter ASF** is a fine solid hydrocarbon material (a shiny brittle variety of asphaltite) that is well compatible with mineral oils. The reagent effectively reduces the filtration value in oil-based fluids.

## TREATMENT

Recommended reagent content: 2.5 – 17 kg/m³.

## PACKAGING

The product is supplied in 200-litre metal drums or polypropylene bags with polyethylene liner, 25 kg each.

# POLYOILCHECK VIS

VISCOSITY REGULATOR

TECHNICAL SPECIFICATIONS
TY 2458-074-97457491-2012

Polyoilcheck Vis viscosity regulator is used to increase the structural and rheological characteristics of oil-based muds without increasing their density.

| Parameter | Polyoilcheck VIS | Polyoilcheck VIS - A | Polyoilcheck VIS - AT | | Polyoilcheck VIS - SD |
|---|---|---|---|---|---|
| Appearance | light yellow to dark brown liquid | | light yellow to dark brown liquid | gray to dark gray powder | yellow to dark brown liquid |
| Density, kg/m³ | NMT 1,10 | 0,83 - 0,88 | 0,81 - 0,88 | – | 0,88 – 0,95 |
| Bulk density, g/cm³ | – | | | 0,4 - 0,6 | – |
| Water content, %, NMT | – | | | 4,0 | – |
| Twist angle of the rotational viscometer spring at 600 rpm, NMT | – | | | | 200 |

## APPLICATION

Using the additive allows to reduce time, material and transportation costs for chemical treatment of fluids. Using the reagent helps reduce the filtration characteristics of oil-based muds.The viscosity regulator retains its efficiency over a wide temperature range.
The reagent is available in four grades:

- **Polyoilcheck VI**S is a multi-purpose thickening additive for oil-based drill fluids.
- **Polyoilcheck VIS – A, Polyoilcheck VIS – AT** is a thickening additive for the Polybur Turbo system.
- **Polyoilcheck VIS – SD** is a thickening additive for “Polyeconol-Flora” drill eco-fluid.

## TREATMENT

Typical concentrations of viscosity regulators range from 1.7 to 17.0 kg/m³ depending on the type of oil phase, desired properties of the final emulsion and other factors.

## PACKAGING

The product is supplied in 200 L metal drums.

# POLYOILCHECK RHEO

TECHNICAL SPECIFICATIONS
TY 20.59.59-155-97457491-2017

Polyoilcheck RHEO is an effective liquefier and solid phase dispersant in oil-based muds and is used to reduce rheological characteristics in OBM with high solid phase content.

| Parameter | Standard |
|---|---|
| Appearance | brown to black oily liquid |
| Density, g/cm³ | 0,800 – 1,000 |
| Acid value, mg KOH/g, NMT | 15,0 |

## APPLICATION

Using Polyoilcheck RHEO reagent ensures the necessary rheological characteristics of drilling fluids under conditions of significant solid phase build-up without changing the oil/water ratio. The viscosity regulator retains its efficiency in a wide temperature range and can be used under challenging geological conditions at temperatures above 100°C. Polyoilcheck RHEO reagent exhibits emulsifying properties, thus its use increases aggregative stability of the emulsion and can lead to a reduction in emulsifier consumption.

## TREATMENT

Typical viscosity regulator concentration in the range of 0.5 to 10.0 kg/m3 depends on solid phase content, required degree of liquefaction, temperature and other factors.

## PACKAGING

The product is supplied in 200 L metal drums.

# POLYSTAB

EMULSIFIER FOR DIRECT EMULSIONS

TECHNICAL SPECIFICATIONS
TY 20.59.59-182-97457491-2022

PolyStab emulsifier is designed for creation and stabilization of direct emulsions for drilling oil and gas wells. The emulsifier is available in two grades, which differ by their pour point value.

| Parameter | PolyStab | PolyStab BN |
|---|---|---|
| Appearance | blue to dark green liquid | light yellow to dark brown liquid |
| Density, g/cm³, NMT | 0,950 | 1,000 |
| No-flow point, °C, not higher than | +5 | not regulated |

## APPLICATION

PolyStab emulsifier is designed for stabilization of first-order emulsions (“oil-in-water” type), including systems with high salinity of the water phase. Emulsions stabilized by the PolyStab emulsifier maintain their stability when drilling in conditions with bottom-hole temperatures up to 100 °C.

## TREATMENT

Emulsifier concentration ranges from 5 to 25 kg/m³ depending on the required properties of the final emulsion, drilling fluid composition, temperature and other factors.

## PACKAGING

The product is supplied in 200 L metal drums.



# DRILL FLUID SYSTEMS AND CONCENTRATES

JSC «NPO «Polycell» offers ready-made drilling fluid systems and concentrates, which are developed for specific technical requirements. Drilling fluid systems are quite versatile, and their technical properties can vary over a relatively wide range.

Using ready-made systems and concentrates of drilling fluids allows to significantly reduce labour costs and time for preparation and processing of drilling fluids; no special equipment is required for preparation of fluids. The described drilling fluids are characterized by high stability, their technical properties do not change significantly over time; Polybur-Turbo and Polyeconol-Flora systems are inert to the drilled rocks, and the fluids can be used repeatedly if required by the production needs.

## POLYECONOL

SYSTEM

TECHNICAL SPECIFICATIONS
ТУ 2458-085-97457491-2012

Polyeconol is a series of environmentally safe drilling fluid systems based on ethers and alcohols.

**«Polyeconol-Aqua»**
is a composition with high inhibiting and lubricating properties used as a component of water-based drilling fluids.

**«Polyeconol-Quartz»**
is a concentrate for preparation of process fluids for well construction, providing increased cement stone adhesion.

| Parameter | Aqua | Quartz |
|---|---|---|
| Appearance | colourless to dark brown liquid | brown to dark brown liquid |
| Density, g/cm³, NMT | 1,27 | 1,24 |
| Hydrogen value (pH) of the aqueous solution of the composition, pH units | NMT 11 | NLT 9 |

Polyeconol Aqua-TR is a two-component system in which component 1 is a dry composition (structure-forming agent, filtration regulator and other modifying additives), and component 2 is a composition of liquid drilling fluid components (clay swelling inhibitor, hydrate formation inhibitor and other special components).

| Parameter name | Component 1 | Component 2 |
|---|---|---|
| Appearance | dark brown to black fibrous material, white inclusions are permissible | colourless to dark brown liquid |
| Density, g/cm³, NMT | not regulated | 1,200 |
| Hydrogen value (pH) of the aqueous solution of the composition, pH units, NMT | not regulated | NMT 11 |
| Mass content of moisture, % | NMT 30,0 | not regulated |
| Bulk density, kg/m³ | NLT 250 | not regulated |

### ▶ APPLICATION

Polyeconol system is used for well construction under challenging geologic conditions. The Polyeconol range of products uses materials of natural origin and belongs to Hazard Class 4 according to GOST 12.1.007 (1,2).

### ▶ PACKAGING

Polyeconol system components are supplied in packaging as agreed with the customer.





## POLYECONOL-FLORA

SYSTEM

TECHNICAL SPECIFICATIONS
ТУ 2458-085-97457491-2012

**Polyeconol-Flora** is a multi-purpose emulsion drilling fluid for well construction in all types of rocks, resistant to various types of aggression. The drilling fluid can be used under conditions of low reservoir pressure.

**Polyeconol-San** is a composition for regulation of rheology and density of Polyeconol-Flora emulsion drilling fluid during drilling, a composition for well development.

| Parameter | Polyeconol-Flora | Polyeconol-San |
|---|---|---|
| Appearance | dark brown to black liquid | yellow to brown liquid |
| Density, g/cm³, NMT | 0,93-0,97 | 0,9 |
| Weight ratio: oleophilic medium/hydrophilic phase | 80/20 | oleophilic liquid |
| Funnel viscosity, s | 50-80 | not regulated |
| Plastic viscosity | 20-35 | |
| $GS_{1/10'}$, dPA | 28-48/38-72 | |
| YP, dPA | 60-120 | |
| Electrical breakdown voltage, V, NLT | 700 | |
| Filtration index, cm³/30 min, NMT | 4 | |

### ▶ APPLICATION

Polyeconol system is used for well construction under challenging geological conditions. This drill fluid system is used for well construction at the Chayanda OGCF. The Polyeconol range of products uses materials of natural origin and belongs to Hazard Class 4 according to GOST 12.1.007 (1,2).
Technological advantages of the Polyeconol-Flora system:

- Stable drilling fluid properties over a wide range of temperatures and densities;
- Ability to adjust rheological characteristics and density over a wider range as compared to emulsion OBM without significantly altering aggregation stability;
- The easily collapsible colloidal system requires low pressure to restore circulation after process downtime, which reduces the likelihood of lost returns;
- Increased resistance against solid phase contamination (including with water-soluble salts) and formation water;
- The solid phase content is low (up to 3%), which contributes to higher mechanical drilling speed;
- The organophilic components of Polyeconol-Flora system are characterized by high flash point values (above 100°C), the likelihood of fire is minimized;
- It ensures a high level of permeability recovery in productive formations.

### ▶ PACKAGING

Polyeconol system components are supplied in packaging as agreed with the customer.

## PolyGUM

TECHNICAL SPECIFICATIONS
ТУ 20.59.59-176-97457491-2020

PolyGUM is designed for preparation of low density drilling fluids, it is used for exposing fissured sections with abnormally low reservoir pressures.
PolyGUM composite reagent is a multi-component composition.

Characteristics of drilling fluids prepared using PolyGUM composite reagent.

| | |
|---|---|
| Density, kg/m³ | 840-900 |
| Funnel viscosity, s | 30–80 |
| Plastic viscosity | less than 25 |
| YP, dPa | 40 - 90 |
| Gel strength ($GS_{10''/10'}$), dPa | 25-60/50-120 |
| Filtration, cm³/30 min | NMT 6 |
| pH | 8-10 |

The principal advantages of the developed low density fluid system as compared to the currently used flush liquids are:
- high efficiency of drilling sludge transportation with minimal rheological characteristics of the fluid;
- minimal thermal biodestruction of the fluid and its components, which reduces the cost of subsequent additional treatment of fluids during drilling and storage.

PolyGUM used as the main component of the low density fluid system provides more intensive air entrainment, and faster and more significant reduction of drill fluid density. Combined with structure-forming polymers and surfactants included in the system, PolyGUM particles are suspended in the entire volume of the aerated liquid and contribute to formation of a more stable and stable structure of low-density fluid.

# POLYECONOL-WASSER

SYSTEM

TECHNICAL SPECIFICATIONS
ТУ 2458-085-97457491-2012

Polyeconol-Wasser is a concentrate for preparation of highly inhibited drilling fluid system designed for drilling of nominal diameter well bores in active clays and argillites, in terrigenous and chemogenic sections under conditions of variable pore pressure, high temperatures and AHRP, it is a composition of glycols, anionic polymers of natural origin and organic amines. The reagent does not contain petroleum derivatives. Polyeconol-Wasser concentrate contains only heat-resistant components, the reagent withstands the heating test at 120 °C without significant changes in technical properties. A distinctive feature of the reagent is its low no-flow point: the reagent remains fluid at temperatures below minus 30 °C. A distinctive feature of the drilling fluid is its high degree of inhibition of clay material swelling, which allows to reduce the risks of complications during construction of intentionally deviated and horizontal sections in the areas of colloidal clay occurrence. Polyeconol-Wasser drilling fluid only contains materials prepared from raw materials of natural origin.

| Parameter | Standard |
|---|---|
| Appearance | brown to black liquid |
| Density, g/cm³ | 1,17-1,23 |
| Twist angle of the rotational viscometer spring at 600 rpm, deg., NLT20 | 20 |

Technological characteristics of the drilling fluid prepared with Polyeconol-Wasser at the Kharasaveyskoye field

| | |
|---|---|
| Density, g/cm³ | 1,24±0,03 |
| Funnel viscosity, s | 40-60 |
| Filtration, ml/30 min | NMT 4 |
| Crust friction coefficient | less than 0.15 |
| Plastic viscosity, cPs | NMT 25 |
| YP, dPa | 70-140 |
| $GS_{10''/10'}$, dPa | 20-50/40-100 |
| pH | 9-11 |

## ▶ APPLICATION

Polyeconol-Wasser drilling fluid is prepared by diluting Polyeconol-Wasser (concentrate) with technical water and adding special modifying additives. Recommended content of Polyeconol-Wasser reagent (concentrate): 310-530 kg/m³.

## ▶ PACKAGING

Polyeconol system components are supplied in packaging as agreed with the customer.

# POLYBUR-TURBO SYSTEM

SYSTEM

TECHNICAL SPECIFICATIONS
ТУ 2458-108-97457491-2015

Polybur-Turbo non-aqueous based drilling fluid system is used for exposure of productive formations and well construction under challenging geological conditions.

| Parameter | Standard |
|---|---|
| Appearance | brown to black oily liquid |
| Density at 20 °C, g/cm³, NMT | 0,9 |
| Plastic viscosity, mPa·s, NMT | 30 |
| Filtration, cm³/30 min, NMT | 5 |





**Component 1** of Polybur-Turbo composition (base) is a drilling fluid with specified technical characteristics, used as a flush liquid when drilling wells under ALRP conditions.

**Component 2** of Polybur-Turbo composition (liquefier) is used to reduce rheological characteristics of the flush liquid (Polybur-Turbo – base). The working concentrations of the component are determined by the viscosity requirements of the flush liquid, solid phase content, oil/water volume ratio, and other factors.

Component 2 – Polybur-Turbo (liquefier)

| | |
|---|---|
| Appearance | Light yellow to brown oily liquid |
| Density at 20 °C, g/cm³, NMT | 0,9 |
| Twist angle of the rotational viscometer spring at 600 rpm, NMT | 20 |

## ▶ APPLICATION

Polybur-Turbo system components are inert with respect to the drilled rock, including water-soluble salts, colloidal clays, gypsum-anhydrites. Using the Polybur-Turbo system ensures drilling of nominal diameter well bores in salt and argillite sections, ensures high-quality cleaning of the wellbore from the drilled rock.

## ▶ PACKAGING

Polybur-Turbo is supplied in 1000-litre cubic tanks or in rail tank containers as agreed with the customer.

# CPDM

COLLOIDAL-POLYMER DRY MIX

TECHNICAL SPECIFICATIONS
ТУ 2458-008-97457491-2007

CPDM colloidal-polymer dry mixes are two-component compositions designed for preparation of colloidal-polymer drilling fluids both in fresh and saline water.

Characteristics of colloidal-polymer fluids prepared on the basis of CPDM mix.

| | |
|---|---|
| Density, kg/m³ | 1030 – 1440 |
| Funnel viscosity, s | 30 – 80 |
| Filtration, cm³/30 min | 2,0 – 5,0 |
| Gel strength ($GS_{1/10}$), dPa | 14/19 – 57/71 |
| Hydrogen value pH, units | 6,7 – 7,0 |
| Plastic viscosity, mPa·s | 10 – 50 |
| Ultimate yield point, dPa | 48 – 96 |

CPDM-R grade is a composite hydrophobic material used to prevent differential seizures of drilling tools and casing strings. In addition to pronounced anti-seize properties, CPDM-R reagent can be used as a colmatage additive to prevent lost returns.

CPDM-R composition characteristics

| Parameter | CPDM-R 1 | CPDM-R 0.5 |
|---|---|---|
| Appearance | gray to black powder, white inclusions are allowed | |
| Sieve residue:<br>- 1 mm<br>- 0.5 mm | NMT 10% | NMT 10% |
| Solubility in 15% HCl solution, %, NLT | 80 | |
| Seizure torque reduction, %, NLT | 70 | |

## ▶ APPLICATION

Colloidal-polymer drilling fluids based on CPDM series reagents are used during well construction to expose carbonate deposits, including under conditions of abnormally low reservoir pressures and by sidetracking horizontal wellbores.

## ▶ TREATMENT

The recommended consumption of reagents for preparation of 1 m³ of drilling fluid is 55-75 kg. CPDM-R reagent consumption is determined by drilling conditions, the recommended content of the reagent in drilling fluid is up to 10 kg per 1 m³ of drilling fluid.

## ▶ PACKAGING

The reagents are supplied in polypropylene bags, a small bag containing the specified amount of activator modifier reagent is additionally placed in the bag with CPDM grade.

# POLYFORM

SYSTEM

TECHNICAL SPECIFICATIONS
TY 2458-152-97457491-2016

Polyform is a concentrate for preparation of highly inhibited drilling fluid system for drilling of nominal diameter well bores in active clays and argillites, in terrigenous and chemogenic sections under conditions of variable pore pressure, high temperatures and AHRP. It is a composition of organic polymers which does not contain petroleum derivatives. It is available in dry (powder) and liquid form.

| | | |
|---|---|---|
| Appearance | Light to dark brown liquid | Light yellow to dark brown powder |
| Hydrogen value pH | NLT 6,0 | NMT 7,0 |
| Density at 20 °C, g/cm³, NLT | NLT 1,15 | – |
| Water content, %, NMT | – | 7 |

## APPLICATION

A process fluid based on Polyform concentrate is as good as hydrocarbon systems in its inhibiting properties. It does not contain clay powder in the formulation, and as a result it does not form a hard-to-remove clay filtration crust on the walls of the well, which minimizes the risk of seizure and contributes to the quality of well casing. It has a low filtration index value. Polyform minimizes the risk of mudball formation. The high value of density and thermal stability of the fluid without the solid phase preconditions its wide use under AHRP conditions.

## TREATMENT

The process liquid is prepared by diluting Polyform concentrate with water and treating it with a calculated amount of polymers and humate reagent.

## PACKAGING

Polyform is supplied in 1000-litre plastic cubic tanks and in 25 kg bags.

# POLYOIL DIRECT

SYSTEM

TECHNICAL SPECIFICATIONS
TY 20.59.59-183-97457491-2022

The Polyoil-Direct drilling fluid is a direct emulsion of a hydrocarbon phase (10–30%) and a polymer-based (70–90%) mineral water solution. Stable emulsion is achieved using direct emulsifiers of the PolyStab series. The Polyoil-Direct system is inert to all types of drill cuttings and formation water. The use of Polyoil-Direct ensures wellbore stability, provides good lubricity and anti-bit-balling properties, and preserves the permeability of productive zones. Polyeconol-Direct is characterized by high inhibiting capacity (>60%), resistance to salts, gypsums, and aggressive formation waters. Thermal stability is up to 100 °C. Drilling fluid characteristics

| | |
|---|---|
| Density at 20 °C, kg/cm³ | 0,9-1,1 |
| Funnel viscosity, s | 25-85 |
| Plastic viscosity, mPa·s | 14-50 |
| Yield point, Pa | 15-25 |
| Gel strength, dPa 1min/10min. | 19/48-28/95 |
| LPLT filtration, mL/30 min. | 3-5 |
| Filter cake thickness, mm, NMT | 0,5 |
| pH of the solution | 10-11 |

The Polyoil-Direct system is complemented by a tailored suite of reagents, inhibitors, stabilizers, and emulsifiers. The dispersion medium is analogous to the Polyemulsan and Polybur Turbo bases. The addition sequence and mixing times are specified in the drilling fluid program.

## PACKAGING

Packaging for the components of the Polyoil-Direct system is agreed upon with the customer.



# REAGENTS AND MATERIALS FOR WELL CEMENTING

JSC «NPO «Polycell» produces micronized cement of various grades for special applications. This product is characterized by high penetration ability, stability, low fluid loss and shrinkage.

In addition, ready-made compositions with specified technical properties (Polycem Light, Polycem Mix, Polycem MC, Polycem Frost, Polycem Gypsum) and special fillers (lightening additive ZTO-7, Polycem Microsilic, Polycem ARM) are produced. The product range of JSC «NPO «Polycell» includes all basic modifying additives for backfilling slurries (plasticizing, expanding, stabilizing additives, fluid loss reducers, additive for prevention of gaseous fluid migration behind the casing, setting time retarders, foam suppressants). For preparation of buffer liquids, JSC «NPO «Polycell» offers concentrates characterized by high washing ability that can also be used for wellbore preparation after using oil-based muds. Group all cementing reagents into four groups:

1) Ultracement and compositions based on it (item 4.1);
2) Special fillers (item 4.2);
3) Modifying additives for backfilling slurries (item 4.3);
4) Concentrates for buffer liquid preparation (item 4.4).

## POLYCEM LIGHT

LIGHTWEIGHT BACKFILLING COMPOSITIONS

TECHNICAL SPECIFICATIONS
ТУ 5732-150-97457491-2015

Polycem Light lightweight backfilling compositions are made by mixing Ultracement micronized cement with lightening and special additives and are designed for casing cementing, lost circulation control and remedial cementing in oil and gas wells at temperatures from 0 to 110 °C under ALRP conditions.

Advantages of backfilling slurries based on Polycem Light compositions:

- low thermal conductivity of cement stone;
- low permeability of cement stone due to the addition of micronized cement;
- high strength, easily adjustable thickening time of the backfilling slurry;
- formation of shrinkage-proof cement stone.

Backfilling compositions may additionally contain a colmatage additive, in which case the letter “K” is added to the marking.

| Parameter | Polycem Light-1<br>Polycem Light-1K | Polycem Light-2<br>Polycem Light-2K | Polycem Light-3<br>Polycem Light-3K |
|---|---|---|---|
| Water-to-cement ratio | 0,7-1,0 | 0,7-1,0 | 0,7-1,2 |
| Backfilling slurry density, kg/m³ | 1000-1100 | 1100-1200 | 1200-1350 |
| Spreadability, mm, NLT | 170 | 170 | 170 |
| Fluid loss, %, NMT | 2,5 | 2,5 | 2,5 |
| Thickening time until 30 Vs, min, NLT | 90 | 90 | 90 |
| Compressive strength of cement stone after 48 h, NLT | 1,0 | 1,5 | 1,5 |

### ▶ APPLICATION

**Polycem Light-1 -** for backfilling slurries with density from 1000 to 1100 kg/m³.
**Polycem Light-2 -** for backfilling slurries with density from 1100 to 1200 kg/m³.
**Polycem Light-3 -** for backfilling slurries with density from 1200 to 1350 kg/m³.

### ▶ PACKAGING

Polycem Light lightweight backfilling compositions are packed in specialized soft big bags.





## ULTRACEMENT

MICRONIZED CEMENT

TECHNICAL SPECIFICATIONS
ТУ 5739-019-56864391-2010

JSC «NPO «Polycell» produces and supplies superfine cement (construction, backfilling, special-purpose) similar to Microdur microcement. The following grades of Ultracement micronized cement are commercially produced:
Ultracement-15,
Ультрацемент-10,
Ultracement-7,
Ultracement-5,
Ultracement-TS.
The Ultracement-TS grade is a high-temperature composition based on micronized cement with the addition of micronized quartz sand. Ultracement-TS is designed for use in challenging geological and technical conditions. The material maintains its performance characteristics at application temperatures up to 150 °C.

| Parameter | Ultracement-15 | Ultracement-10 | Ultracement-7 | Ultracement-5 | Ultracement-TS |
|---|---|---|---|---|---|
| Fineness of grinding, mass fraction of particles larger than: | | | | | |
| -15 μm, %, NMT | 15 | n.r. | n.r. | n.r. | n.r. |
| -10 μm, %, NMT | n.r. | 10 | n.r. | n.r. | 10 |
| - 7 μm, %, NMT | n.r. | n.r. | 10 | n.r. | n.r. |
| - 5 μm, %, NMT | n.r | n.r. | n.r. | 10 | n.r. |
| Average (median) particles size, μm, NMT | 7,0 | 5,0 | 4,0 | 3,0 | 5,0 |
| Water-to-cement ratio | 0,80 | 0,95 | 1,05 | 1,2 | 1,00 |
| Cement slurry density, kg/m³ | 1460–1560 | 1440–1540 | 1420–1520 | 1400–1500 | 1460–1540 |
| Cement slurry spreadability, mm, NLT | 250,0 | 250,0 | 250,0 | 250,0 | 250,0 |
| Fluid loss, cm³, NMT | 2,0 | 2,0 | 2,0 | 2,0 | 2,0 |
| Thickening time at 22 °C, min, NLT | 240,0 | 240,0 | 240,0 | 240,0 | 240,0 |
| Compressive strength of cement stone at 22 °C after 24 h, MPa, NLT | 3,0 | 2,5 | 2,0 | 1,5 | 1,0 |
| Compressive strength of cement stone at 100 °C and 40 MPa after 24 h, NLT | not regulated | | | | 10 |

### ▶ APPLICATION

Ultracement is a backfilling material designed to eliminate complications during drilling, current repair and workover of oil and gas wells in the following cases:

- for elimination of behind-the-casing flows in the annular space;
- for cementing of highly permeable and poorly stable moistened host rocks;
- to restore the strength of loosened cements;
- for vertical and horizontal waterproofing of underground structures;
- for injection soil consolidation.

Ultracement is supplied to the workover area as an aqueous suspension or in a transporting agent (polyglycols, diesel fuel), or injected using collar injectors, whereby microcement penetrates into thin pores and cracks. Microcement suspension has a high mobility comparable to that of water even at minimum W/C ratio. The penetration capacity of the suspension is comparable to that of disperse-free binders. Ultracement, depending on the grade of the initial cement raw material, hardens in a wide temperature range, is resistant to aggressive media, has no shrinkage. Ultracement provides significant advantages when used as an additive to backfilling cement when placing cement plugs and casing cementing. Introduction of 20% Ultracement in the formulation of a backfilling slurry provides an increase in slurry stability, a significant increase in the early strength of cement stone and its adhesion to metal and rocks, even at low temperatures.

### ▶ PACKAGING

Micronized cement is packaged in 900 kg big bags or in 25 kg lined polypropylene bags.

# POLYCEM MIX

BACKFILLING COMPOSITION

TECHNICAL SPECIFICATIONS
TY 5732-151-97457491-2015

Fine cement compositions are used for construction and workover of wells, strengthening soil masses, reinforced concrete and masonry structures. Polycem Mix is made by mixing Ultracement micronized cement and special additives. Polycem Mix is available in several grades:

**-Polycem Mix-S** is intended for use in construction;

**- Polycem Mix-U** is a reinforced fine composition intended for control catastrophic lost returns using special devices for elimination of large cavities;

**- Polycem Mix-B** is a thixotropic and acid-soluble composition used for injection reinforcement of soils and foundations;

**-Polycem Mix-T** is a thixotropic and acid-soluble composition for drilling fluid lost circulation control;

**- Polycem Mix-AT** is a fine composition for casing cementing and placing cement plugs during construction of oil and gas wells under conditions of AHRP and high temperatures;

**- Polycem Mix-I** is a lightweight heat-insulating composition.

| Parameter | Polycem Mix-S | Polycem Mix-U | Polycem Mix-B | Polycem Mix-T | Polycem Mix-AT | Polycem Mix-I |
|---|---|---|---|---|---|---|
| 1. Water-to-cement ratio | 1,0 | 0,45-0,50 | 0,9 | 1,7-2,0 | 0,42-0,50 | 0,65 |
| 2. Spreadability, mm, NLT: | | | | | | |
| - after 5 s; | – | – | – | 160 | 180 | 180 |
| - after 5 min; | 250 | – | 250 | – | – | – |
| - after 60 min; | – | – | 240 | – | – | – |
| - after 360 min; | 230 | – | – | – | – | – |
| 3. Marsh funnel viscosity, sec, NMT | | | | | | |
| - after mixing; | 50 | – | – | – | – | – |
| - after 360 min | 70 | – | – | – | – | – |
| 4. Funnel viscosity according to VZ-4 viscosimeter, sec, NMT | | | | | | |
| - after 5 min; | – | – | 60 | – | – | – |
| - after 360 min | – | – | 50 | – | – | – |
| 5. Fluid loss, %, NMT | | | | | | |
| - after 2 h; | 1 | 1 | 2 | 2 | 2 | 0,8 |
| - after 6 h. | 1 | – | – | – | – | – |
| 6. Setting start time, min, NMT | – | 480 | – | – | – | – |
| 7. Compressive strength of cement stone after 24 h, MPa, NLT | | | | | | |
| - at 22 °C | 1,0 | 5,0 | 1,0 | – | – | – |
| - at 60 °C | – | – | – | – | – | 8,0 |
| - at 80 °C | – | – | – | 0,7 | 5,0 | – |
| 8. Bending strength of cement stone after 48 h at 22 °C, MPa, NLT | – | 1,5 | – | – | – | – |
| 9. Thickening start time*, min, NLT | | | | | | |
| -T= 80 °C | – | – | – | – | 90 | – |
| -T= 22 °C | – | 60 | – | 60 | – | 90 |

Thickening time, if necessary, is determined with the addition of chemical reagents – setting retarders

## ▶ PACKAGING

Polycem Mix is packed in specialized big bags or in propylene bags with polyethylene liners.





# POLYCEM MC

BINDING COMPOSITION

TECHNICAL SPECIFICATIONS
TY 2458-109-97457491-2015

Polycem MC composition is designed to eliminate lost return areas in highly permeable fissured and fissure-cavernous reservoirs. In order to regulate the rate of hardening, when grouting Polycem MC, an activator and/or setting retarder is added to the technical water. Thickening and setting times of the composition can be adjusted in a wide range from 15 minutes to 5 hours (if necessary). Cement stone is destroyed during acid treatments. The composition can be used for remedial cementing in salt and brine-manifesting areas, as well as when using flush liquid with high salinity.

| Component 1 | | |
|---|---|---|
| Appearance | gray to brown loose material | |
| Spreadability of water suspension with density of 1700-1750 kg/m³ on KR-1 cone, cm, NLT | 180 | |
| Component 2 (setting retarder) | | |
| Appearance | component 2.1 | component 2.2 |
| | white crystalline powder | |
| pH of 1% aqueous solution | NMT 2 | NLT 7 |
| Activator Polycem MC | | |
| Appearance | white crystalline hygroscopic powder | |
| pH of 1% aqueous solution | NLT 6 | |

## ▶ APPLICATION

Polycem MC composition is used for preparation of backfilling compositions, which, being injected into lost return zones in highly permeable fissured and fissure-cavernous reservoirs, after a certain time, irreversibly harden and reliably control lost circulation of drill fluid and cement slurry. When it is necessary to dissolve the formed pill, 10% hydrochloric acid solution is used. The backfilling slurry based on Polycem MC is injected in a standard way using a cementing unit. The injection and squeezing volume is calculated based on the actual depth and conditions of the complication that occurred.

## ▶ PACKAGING

The product is packed in polypropylene bags with polyethylene liners or in big bags as agreed with the customer.

# POLYCEM FROST

BACKFILLING COMPOSITION (FOR LOW POSITIVE AND SUB-ZERO TEMPERATURES)

TECHNICAL SPECIFICATIONS
TY 5732-083-97457491-2012

Polycem Frost is a backfilling material based on high-strength gypsum and backfilling Portland cement with special additives, designed for casing cementing in permafrost sections. The Polycem Frost TI grade is characterized by a low thermal conductivity coefficient (not exceeding 0.2 W/m·K).

| Parameter | Polycem Frost | Polycem Frost TI |
|---|---|---|
| Mass fraction of No.008 sieve residue, %, NMT | 12,0 | 10 |
| Backfilling slurry density | 1820-1850 | 1450-1550 |
| Fluid loss, ml, NMT | 1,4 | 1,0 |
| Spreadability, mm, NLT | 180 | 220 |
| Thickening time, min | NLT 60 | 180-210 |
| Compressive ultimate strength of cement stone after 24 h, MPa, NLT | 3,0 | 3,0 |
| Frost resistance coefficient of cement stone, relative units, NLT | 0,8 | 0,9 |

## ▶ APPLICATION

Polycem Frost backfilling cement is intended for cementing wells with temperatures from minus 8 °C to plus 20 °C. Operational advantages of Polycem Frost material are as follows:
- technologically acceptable thickening and setting times at negative and low positive temperatures, which can be easily adjusted by changing the setting retarder dosage;
- rapid strength gain of cement stone at low temperatures;
- low heat generation during hydration;
- high frost and water resistance of cement stone;
- high sedimentation stability of backfilling slurries.

## ▶ PACKAGING

Polycem Frost is packed in big bags or polypropylene bags with polyethylene liners.

# POLYCEM GYPSUM

COMPOSITION

TECHNICAL SPECIFICATIONS
TY 2458-055-97457491-2012

Polycem Gypsum composition is a two-component system based on high-strength backfilling gypsum with reinforcing additives and setting retarder.

| Parameter | Standard |
|---|---|
| Polycem Gypsum composition, component 1 | |
| Appearance | white to gray powder |
| Setting times, min | initial setting – not earlier than 4.5<br>final setting – not later than 20 |
| 0.2 mm sieve residue | NMT 1.0 |
| Polycem Gypsum composition, component 2 | |
| Appearance | white to yellow powder |
| pH of 10% aqueous solution | 7-9 |

Note: Component 2 is added to the base mix immediately prior to injection into the well. Component 2 consumption is 0.3% w/w to component 1.

## ▶ APPLICATION

Polycem Gypsum is used as a backfilling material for elimination of high-intensity lost returns of flush liquids in low-temperature sections and permafrost areas during drilling and workover of oil and gas wells; as well as for eliminating string leaks and restoring the tightness of the cement stone, as well as waterproofing under certain conditions.

## ▶ TREATMENT

The technology for controlling catastrophic lost returns using Polycem GYPSUM backfilling composition consists in preparation of mixing liquid using a retarder additive in the amount of 3,5-5 kg/m³ depending on the necessary time of the start of thickening. Polycem Gypsum slurry is prepared in a mixing and mediating unit with the W/S ratio = 0,7. After complete mixing, the density of the slurry should be between 1500–1550 kg/m³. The slurry is then pumped through the pipe space to the desired section at equilibrium. Then the tool is raised to a safe depth, and flushing is started in the volume of 2-3 m³, then the well is closed for 3-4 hours for the mixture to harden. After maintenance is completed, the wellbore is flushed and pressure-tested to the pressure expected during further construction, then drilling continues.

## ▶ PACKAGING

Polycem GYPSUM is packed into 25 kg polypropylene bags with polyethylene liner.

# ZTO-NPO

ACTIVE MINERAL ADDITIVE

TECHNICAL SPECIFICATIONS
TY 2163-006-56864391-2007

ZTO-NPO active mineral additive is represented by silica natural materials (gaize, rottenstone, diatomites) from various deposits. Natural materials are crushed, dried, and classified to produce finished products.

| | |
|---|---|
| Mass fraction of silicon dioxide $SiO_2$, %, NLT,<br>including active $SiO_2$, %, NLT | 75<br>40 |
| Mass fraction of No.008K sieve residue, %, NMT | 10 |
| Bulk density, g/cm³, NMT | 900 |
| Compressive ultimate strength*, t-test, NLT | 2,07 |
| End of cement paste setting* with ZTO-7 additive, days, NMT | 7 |
| Water resistance*, withstands, days, NLT | 3 |
| Expansion* of sample cylinders, mm, NMT | 15 |
| Mass content of moisture, %, NMT | 10 |

* The marked parameters are determined once a year at the consumer's request.

## ▶ APPLICATION

ZTO-NPO additive provides increase of strength and resistance of cement stone to salts and aggressive media, reduction of cement slurry density to 1350 kg/m³. The material is used as an additive in backfilling and construction cements up to 30%.

## ▶ PACKAGING

Silica natural materials are packed in 600 kg big bags.





# POLYCEM MICROSILIC

TECHNICAL SPECIFICATIONS
TY 20.59.59-174-97457491-2019

Polycem Microsilic is used as an additive in construction and backfilling cements. It is available in two grades:
Polycem Microsilic-K and
Polycem Microsilic-R.

| Parameter | Polycem Microsilic-K | Polycem Microsilic-R |
|---|---|---|
| Appearance | gray fine powder | white to gray fine powder |
| Mass fraction of silicon dioxide ($SiO_2$), %, NLT | 85,0 | 95,0 |
| Mass content of moisture, %, NMT | 10,0 | 3,0 |
| Bulk density, kg/m³, NMT | 350 | 800 |
| Sieve No. 0063 residue, %, NMT | 3,0 | 3,0 |

## ▶ APPLICATION

Adding Polycem Microsilic-K in the amount of up to 25% contributes to a stronger and more durable cement stone. Using the material improves compressive strength, bonding strength, wear resistance and significantly increases permeability of microcement. Polycem Microsilic-R is used as a mineral additive in the amount of up to 30% in backfilling and construction cements. Polycem Microsilic-R additive is used as a filler to improve the strength characteristics and heat resistance of the cement mixture.

## ▶ PACKAGING

Polycem Microsilic is packed in polypropylene bags with polyethylene liners or in big bags.

# POLYCEM ARM

TECHNICAL SPECIFICATIONS
TY 2458-079-97457491-2012

Polycem ARM is an acicular wollastonite filler for cementing slurries.

| Parameter | Standard |
|---|---|
| Appearance | white to gray powder |
| Mass content of moisture, %, NMT | 5,0 |
| Mass fraction of 0,063 mm sieve residue, %, NMT | 5,0 |
| pH of 1% suspension in distilled water, NLT | 7,0 |

## ▶ APPLICATION

Polycem-ARM reinforcing additive is used in backfilling and construction cements to increase: strength, crack resistance and frost resistance. Introduction of the additive increases water, heat and corrosion resistance of cement stone, reduces its shrinkage. The additives have no effect on the technological properties of cement slurries.

## ▶ TREATMENT

Polycem-ARM is introduced in dry form when preparing backfilling and construction cement slurries. Recommended consumption of the reagent is 50 to 200 kg per 1 ton of cement.

## ▶ PACKAGING

Polycem-Arm additive is packed into 25 kg polypropylene bags with polyethylene liner.

# POLYCEM PLAST

PLASTICIZER

TECHNICAL SPECIFICATIONS
TY 2458-063-97457491-2012

Composite additives to cement slurries, based on carboxylates and mixtures of sodium salts of polymethylene naphthalene sulfoacids of different molecular weight, with modifying additives of lignosulfonic acid salts and other organic and inorganic substances.
Besides their general plasticizing effect, Polycem Plast grades have the following properties:

- **Polycem Plast-1 -** reduces water;
- **Polycem Plast-2 -** increases strength;
- **Polycem Plast-3 -** regulates the kinetics of hardening.

The material is produced in the form of powder and in the form of aqueous solution.

| Parameter | Polycem Plast-1 | | Polycem Plast-2 | | Polycem Plast-3 | |
|---|---|---|---|---|---|---|
| | powder | solution | powder | solution | powder | solution |
| Appearance | white to light yellow, gray powder | colourless to yellow liquid | yellow to light brown microgranules | yellow to dark brown liquid | yellow to light brown microgranules | ellow to dark brown liquid |
| Bulk density, kg/m³, NLT | 400 | – | 600 | – | 500 | – |
| Density, kg/m³, NLT | – | 1140 | – | 1150 | – | 1160 |
| Hydrogen value (pH) of 5% aqueous solution, NLT | 5,0 | | | | | |

## APPLICATION

Plasticizing additives are intended for use in cementing processes of oil, gas condensate and gas wells as part of backfilling slurries in order to regulate their rheological properties, reduce hydraulic resistance of the cement slurry when pumped into the annular space, reduce pumping and squeezing pressure. The additives can also be used in other types of concrete and cement slurry mixtures when manufacturing concrete and reinforced concrete structures for civil, industrial, transportation and other types of construction.

## TREATMENT

The additives are introduced into the slurry mix in the form of aqueous solution together with the mixing water. The consumption of additives is determined based on preliminary selection of the cement slurry mixture composition. Recommended additive content (to dry cement weight):
- **Polycem Plast-1:** 0.1–0.5%;
- **Polycem Plast-2:** 0.2–0.7%;
- **Polycem Plast-3:** 0.5–1%.

## PACKAGING

Polycem Plast plasticizing additives to cement slurries are packed into 25 kg polypropylene bags with polyethylene liners. Liquid material is supplied in 200-litre drums, plastic canisters of various volumes.

# POLYCEM STAB

STABILIZING ADDITIVE

TECHNICAL SPECIFICATIONS
TY 2458-078-97457491-2012

Polycem Stab additive is designed for treatment of cement slurries in technological processes of well casing in order to increase their sedimentation stability, reduce setting time, increase the strength of cement stone and its adhesion to metal and rocks.

| Parameter | Polycem Stab | Polycem Stab U |
|---|---|---|
| Appearance | light yellow to light brown powder | milky to gray colored, sediment is allowed |
| Bulk density, kg/m³ | 800 – 850 | not regulated |
| Mass content of water, %, NMT | 5 | not regulated |
| Fluid loss of a backfilling slurry with Polycem Stab additive, cm³, NMT | 2 | 2 |
| Density, g/cm³, NLT | not regulated | 1,3 |

## APPLICATION

The additive is designed for cementing oil, gas condensate and gas wells at low, normal and moderate temperatures. The recommended temperature range of application is 15-100 °C.

## TREATMENT

Approximately, Polycem Stab additive content is 0,5-1,0 % to the dry cement weight for normal density backfilling slurries and up to 2,0 % to the cement weight for lightweight backfilling slurries.

## PACKAGING

Polycem Stab is packed into 25 kg polypropylene bags with polyethylene liner.





# POLYCEM GASBLOCK

ADDITIVE

TECHNICAL SPECIFICATIONS
TY 2458-065-97457491-2012

PolycemGasblock is a reagent based on synthetic sulfated polymers, designed to reduce filtration of backfilling solutions and prevent formation fluid migration behind the casing.

| Parameter | Standard |
|---|---|
| Appearance | white to gray powder |
| Bulk density, kg/m³ | 300 – 550 |
| pH of 1% aqueous solution | 7 – 9 |

## APPLICATION

The additive is designed for use in technological processes of oil, gas condensate and gas well casing, in order to effectively reduce cement slurry filtration. It slows down the increase in the ultimate gel strength of backfilling slurries, thus contributing to the transfer of hydrostatic pressure to the downhole. At the end of the period of slow increase in the ultimate gel strength it causes rapid setting of the cement slurry, preventing gas penetration into the space behind the string.The reagent does not have the effect of slowing down the setting time of cement slurry, retains operation capability at temperatures up to 210 °C and does not thicken the slurry. The additive is effective with salt-saturated cement slurries (salts of univalent and polyvalent metals).

## TREATMENT

The additives are introduced into the dry cement mix. When required, the additives may be introduced into the backfilling slurry mixing water. The consumption of additives is determined based on preliminary selection of the cement slurry mixture composition. Approximate dosages: 0.3 - 0.5% of dry cement weight to effectively reduce the filtration index and 0.6 - 0.8% of dry cement weight to prevent migration of formation fluids through the cement stone.

## PACKAGING

Polycem Gazblock additive for reducing fluid loss and gas permeability of cement stone is packed into 25 kg polypropylene bags with polyethylene liner.

# POLYCEM PF

FILTRATION REDUCER

TECHNICAL SPECIFICATIONS
TY 2458-076-97457491-2012

A synthetic polymer-based fluid loss additive for cementing slurries.

| Parameter | PF-50 | PF-100 | PF-150 | PF-200 |
|---|---|---|---|---|
| Appearance | white to light gray powder | | light brown powder | white or light gray powder |
| Bulk density, g/cm³ | 0,6 – 0,8 | | | 0,3 – 0,5 |
| Cement slurry fluid loss, cm³/30 min, with reagent dosage 0.4% of cement weight, NMT | 60 | 80 | 100 | 50 |

## APPLICATION

The additive is designed for use in technological processes of oil, gas condensate and gas well casing, in order to effectively reduce cement slurry filtration. Depending on the grade of the additive, it can be used at temperatures from 15 to 200 °C.

## TREATMENT

The additives are introduced into the dry cement mix. When required, the additives may be introduced into the mixing water. The consumption of additives is determined based on preliminary selection of the cement slurry mixture composition. Approximate dosages: 0,3–0,8% of dry cement weight to effectively reduce the filtration index.

## PACKAGING

Polycem PF filtration reducer is packed into 25 kg polypropylene bags with polyethylene liners.

# POLYCEM DR

EXPANDING ADDITIVE

TECHNICAL SPECIFICATIONS
ТУ 2458-077-97457491-2012

The additive is a finely ground mixture consisting of special inorganic components controlling the backfilling slurry shrinkage during hardening, providing expansion in the plastic and hardened state.

| Parameter | Polycem DR-50 | Polycem DR-100 |
|---|---|---|
| 0.08 mm sieve residue, % | from 5 to 35 | |
| Linear expansion of water curing cement stone samples:<br>- After 48±2 hours at a temperature of 22±2°C, NLT<br>- After 24±2 hours at a temperature of 50±2°C, NLT<br>- After 24±2 hours at a temperature of 75±2°C, NLT | <br>0,3<br>0,5<br>– | <br>–<br>0,3<br>0,5 |
| Moisture content, %, NMT | 2,0 | 2,0 |

## ▶ APPLICATION

Polycem DR expanding additive is intended for introduction into backfilling slurries to obtain expanding backfilling material. The additive ensures volumetric expansion of cement stone of backfilling slurries during cementing of oil and gas wells with temperature up to 100 °C.

## ▶ TREATMENT

Approximate dosage is up to 10% of cement weight for Polycem DR-50 grade and up to 20% of cement weight for Polycem DR-100 grade.

## ▶ PACKAGING

Polycem DR is packed in big bags or polypropylene bags with polyethylene liners.

# POLYCEM STP

SETTING RETARDER

TECHNICAL SPECIFICATIONS
ТУ 2458-064-97457491-2012

The Polycem STP additive is used to extend the setting and hardening times of cement.

| Parameter | Polycem STP-1 | | Polycem STP-2 | Polycem STP-3 | Polycem STP-4 | Polycem STP-5 |
|---|---|---|---|---|---|---|
| Appearance | white to yellow powder | colorless to light brown liquid | light yellow to brown loose powder | white powder | white to cream loose powder | white to brown or gray loose powder |
| Bulk density, g/cm³ | 0,4 – 0,6 | – | 0,55 – 0,80 | 0,90 – 1,15 | – | – |
| Density at 25 °C | – | 1,06 – 1,20 | – | | | |
| Mass content of water, %, NMT | 7,5 | – | – | 3,0 | 10,0 | 10,0 |
| pH of Polycem STP aqueous solution | 5,5 – 7,5 | – | 7,0 – 10,0 | 6,5 – 9,0 | 4,0 – 7,0 | not more than 5 |
| pH of liquid STP-1 | – | 4,0 – 7,0 | – | | | |

## ▶ APPLICATION

The additive is designed for treatment of backfilling slurries in technological processes of well casing in order to slow down their setting. Scope of application of the additives:

- Polycem STP-1 is a highly effective all-purpose setting retarder operating in a wide range of temperatures and having an additional plasticizing effect;
- Polycem STP-2 is a setting retarder optimized for use with micronized cements at temperatures up to 150 °C;
- Polycem STP-3 is a setting retarder for gypsum and gypsum-cement backfilling slurries;
- Polycem STP-4 is a setting retarder with virtually no effect on the strength of cement stone;
- Polycem STP-5 is used for concreting massive structures without cold joints to slow down heat generation.

## ▶ TREATMENT

The additives are introduced into the dry cement mix. When required, the additives may be introduced into the backfilling slurry mixing water. The consumption of additives is determined based on preliminary selection of the cement slurry mixture composition (0,1-0,5%).

## ▶ PACKAGING

Polycem STP is packed into 25 kg polypropylene bags with polyethylene liners.





# POLYCEM DEFOAM

FOAM SUPPRESSANT

TECHNICAL SPECIFICATIONS
ТУ 2458-081-97457491-2012

Polycem Defoam foam suppressant is intended for prevention and elimination of air entrainment when preparing cement backfilling slurries. The reagent is available both in liquid and powder form.

| Appearance | White powder | White to brown liquid |
|---|---|---|
| Bulk density, g/cm³ | 90 | – |
| Foam suppression ability, %, NLT | 95 | 95 |

## ▶ APPLICATION

Introduction of plasticizing and other modifying additives when preparing cement slurries is often accompanied by increased air entrainment and, as a consequence, a decrease in the cement slurry density. Treatment of cement slurry with Polycem Defoam reagent restores the true slurry density.

## ▶ TREATMENT

Polycem Defoam is introduced into cement slurry in the amount of 0.5-2 kg per 1m³. The added reagent has no effect on the rheological and filtration parameters of the slurry.

## ▶ PACKAGING

The reagent is packed into 25 kg polypropylene bags with polyethylene liner or in 190 kg metal drums.

# POLYCEM PB

BUFFER COMPOSITION

TECHNICAL SPECIFICATIONS
ТУ 2458-061-97457491-2012

The reagent is a powdery mixture of structure-forming agents, special surfactants, plasticizers and other additives.

| Parameter | Polycem PB-S | Polycem PB-SM |
|---|---|---|
| Appearance | light brown to black powder | |
| Funnel viscosity of buffer liquid without weighting agent, s, NLT | 22 | 20 |
| Buffer liquid static filtration index, ml/30 min, NMT | 20 | 25 |

## ▶ APPLICATION

The composition is designed for buffer liquid preparation in order to separate the backfilling slurry and the drilling fluid that are different in composition and density, to ensure effective displacement of drill fluid from the cementing section and clean the wellbore from clay crust during cementing of oil and gas wells. Using Polycem PB compositions ensures:

- separation of drilling fluid and backfilling slurry during cementing;
- possibility of buffer liquid weighting up to 2300 kg/m³;
- no sedimentation plugs formed when mixing buffer liquid with weighted drilling fluid, and no buffer liquid filtrate penetration into productive formations;
- effective displacement of drilling fluid from the wellbore; hydrophilization of the pipe surface and improved adhesion between the cement stone and the string.

## ▶ TREATMENT

The buffer liquid is prepared by dissolving a calculated amount of Polycem PB in technical water. Approximate amount of additive is 70-100 kg/m³.

## ▶ PACKAGING

Polycem PB composition for buffer liquid preparation is packed in big bags or polypropylene bags with polyethylene liner.

# POLYCEM SM-1

BUFFER COMPOSITION

TECHNICAL SPECIFICATIONS
TY 2458-060-97457491-2012

Polycem SM-1 composition is designed for use in oil and gas industry in technological processes of well casing and workover as a washing buffer liquid for wellbore preparation before cementing.
Polycem SM-1 is a concentrated aqueous solution of surfactants and modifying additives.

| Parameter | Standard |
|---|---|
| Appearance | dark-brown liquid, slight sediment during storage is allowed |
| Composition density, g/cm³ | 1,33–1,38 |
| pH of 1% aqueous solution | 11,0–13,5 |

## APPLICATION

The washing liquid prepared on the basis of Polycem SM composition serves as a reliable separating buffer between backfilling slurries and drilling fluids that are different in composition and density. It displaces the drilling fluid from the cementing section, destroys and removes the clay and hydrocarbon film from the surface of the wellbore walls and casing pipes, ensuring good adhesion between the cement stone and the contacting surfaces. Thus, high-quality cementing of wells is ensured, their tightness increases, and the likelihood of behind-the-casing flows is dramatically reduced.

## TREATMENT

Washing buffer liquid is prepared by adding a calculated amount of concentrated Polycem-SM-1 composition to the required amount of technical water. Optimal amount of additive is 5-10 kg/m³.

## PACKAGING

Polycem SM-1 composition for washing buffer liquid preparation is packed into 30-litre canisters or 200-litre drums.

# POLYCEM SM-OBM

WASHING BUFFER

TECHNICAL SPECIFICATIONS
TY 2458-054-97457491-2012

Polycem SM-OBM is a composition of surfactants. The material is used for wellbore conditioning prior to cementing, after the use of hydrocarbon-based drilling fluids.

| Parameter | Standard |
|---|---|
| Appearance | light yellow to dark brown liquid, slight precipitation during storage is allowed |
| Density at 20 °C, g/cm³ | 1,06–1,11 |

## APPLICATION

Washing liquid prepared on the basis of Polycem SM-OBM effectively destroys and removes the clay and hydrocarbon film from the surface of the wellbore walls and casing pipes, which allows to improve the quality of well casing due to increased adhesion.

## TREATMENT

Washing buffer liquid is prepared by adding a calculated amount of concentrated Polycem SM-OBM composition to the required amount of technical water. Approximate reagent consumption: 5-10 kg/m³.

## PACKAGING

Polycem SM-OBM is packed into 30-litre canisters or 200-litre drums.



# WATER INSULATING AND BACKFILLING COMPOSITIONS

During well construction, a number of complications may occur due to mining and geological phenomena. These include lost returns (lost circulation), gas, oil and water shows, and wellbore instability.

In order to prevent and fight brine and water shows, as well as to control lost circulation of process fluids (drilling fluids and backfilling slurries) and leakiness of the annular space, JSC «NPO «Polycell» offers a line of water-insulating and backfilling compositions.

Group all materials into two groups:

- Polymer compositions (item 5.1);
- Reagents for controlling catastrophic lost returns (item 5.1).

## POLYGEL-ASM

REAGENT

TECHNICAL SPECIFICATIONS
ТУ 2458-038-97457491-2010

Polygel-ASM reagent is used during repair-and-renewal operations related to reinforcement of downhole formation area and prevention of water permeability of the cement stone and lateral rocks.
The reagent is available in two grades: Polygel-ASM-KZ and Polygel-ASM-JS.

| Parameter | Polygel-ASM-KZ | | | Polygel-ASM-JS | | |
|---|---|---|---|---|---|---|
| | Component-1 | Component-2 | | Component-1 | | Component-2 |
| Appearance | opalescent liquid | colourless liquid | white crystalline powder | opalescent liquid | white to gray crystalline powder | colourless to dark yellow clear liquid |
| Density, g/cm³, NMT | 1,26 | 1,20 | – | 1,20 | – | 1,20 |
| pH | 8,0–11,0 | 5,0–8,5 | 7,5–9,0 | NLT 10 | – | NMT 2 |
| Silicon dioxide concentration, % wt. | NLT 18 | – | | | | |
| pH of the 1% aqueous solution | – | | | | 10,0 | – |

### APPLICATION

Due to its properties Polygel-ASM is recommended for the following works:
- restoration of casing string tightness with low injection capacity;
- waterproofing of individual formations with low injection capacity;
- restoration of the cement stone tightness;
- elimination of annular pressures.

### TREATMENT

After mixing, Polygel-ASM-KZ liquid two-component reagent is a low-viscosity thin liquid with high penetration ability. The reagent is designed for injection under pressure into thin joints and hairline cracks of rocks to limit water inflow, strengthen sand formations and restore tightness of cement stone behind the casing string in a wide range of temperatures from +5°C to +120°C. Polygel-ASM-JS is used as a water-insulating composition for remedial cementing of oil or gas wells, waterproofing of foundations during construction of buildings, strengthening of soils.

### PACKAGING

Polygel-ASM powdery components are packed into 25 kg polypropylene bags with polyethylene liners. Polygel-ASM liquid components are transported in 30 kg plastic canisters.





## POLYGEL-KSM

REAGENT

TECHNICAL SPECIFICATIONS
ТУ 2458-046-97457491-2011

Polygel-KSM reagent is used for waterproofing and elimination of cement stone leakiness during workover of oil, gas and gas condensate wells at oilfields and underground gas storage facilities.

| Parameter | Polygel-KSM | | Polygel-KSM-NE | |
|---|---|---|---|---|
| | component 1 (gel-forming agent) | component 2 (cross-linker) | component 1 (gel-forming agent) | component 2 (cross-linker) |
| Appearance | gray powder | white powder | gray powder | transparent liquid, a water-insoluble sediment is allowed |
| pH, NMT | 3,0 | | 2,0 | |

### APPLICATION

Polygel-KSM is a water- and gas-insulating material and is designed to eliminate complications during drilling, workover and repair-and-renewal operations of oil and gas wells in the following cases:
- water bed isolation;
- elimination of behind-the-casing flows;
- sealing and strengthening of destroyed cementing areas;
- volumetric waterproofing;
- hardening (gelation) of water lenses and pools in productive structures.

### TREATMENT

Polygel-KSM reagent consists of two dry powder components (supplied in separate packages). Both components are mixed and suspended in water (in the ratio of 1:3-1:4) at optimum temperatures of 20–40 °C with constant stirring for 2–3 hours. During the regulated periods (6 to 24 hours) Polygel-KSM exists as a solution with a high penetration capacity. The reagent is pumped into the workover area and kept under pressure for 24 hours, after which the fluid turns into a stable gel and irreversibly plugs voids and cracks. When hardening water-containing underground lenses, the composition is delivered in a concentrated form in an anhydrous conveying agent. Volumetric gelation occurs on contact with water. The resulting gel has good adhesion and is resistant to aggressive media. To reduce the time required to prepare gelling composition and to obtain a high-strength pill, Polygel-KSM-NE grade of the reagent is introduced. The cross-linker (component 2) for Polygel-ASM-NE grade is supplied in liquid form.

### PACKAGING

The product is supplied in 25 kg polypropylene bags with polyethylene liners. Component 2 of Polygel-ASM-NE grade is supplied in 30 kg canisters or 200 kg drums.

## POLYBLOCATOR-COMBI

COMPOSITION FOR LOST CIRCULATION CONTROL

TECHNICAL SPECIFICATIONS
ТУ 2458-113-97457491-2015

Polyblocator-Combi for lost circulation control is a specially selected composition of colmatants, cements and special regulating additives. The process mixture is packed into 0.5-litre cylindrical plastic containers.

| Parameter | Standard |
|---|---|
| Bulk density, kg/m³, NLT | 5 |
| Mass content of water (humidity), %, NMT | 1000 |

### APPLICATION

Plastic containers with Polyblocator-Combi composition for lost circulation control are introduced into an open borehole from the mouth. After lowering the BHA, as the tool rotates, the plastic containers collapse, the composition comes in contact with water and irreversibly hardens to form a solid ridge.

### PACKAGING

Plastic containers are packed into big bags.

# POLYTAN

POLYMER MATERIAL

TECHNICAL SPECIFICATIONS
TY 2458-025-56864391-2012

Polytan polymer material is used to eliminate leaks in the annular space, secure oil and gas well casings in the area of permafrost rocks, eliminate caverns and water shows, as well as to seal and fill wet cracks in concrete, masonry and brick structures; seal expansion joints; waterproof reinforced concrete structures subject to dynamic loads; consolidate soils.

| Parameter | Politan-CEM | | Politan-Screp | | Polytan | | Polytan-I |
|---|---|---|---|---|---|---|---|
| | component 1 | component 2 | component 1 | component 2 | component 1 | component 2 | |
| Appearance | transparent liquid, yellow colour is allowed | dark brown liquid | dark brown liquid | pale yellow transparent liquid | yellow transparent liquid | gray-beige liquid | yellow viscous liquid |
| Dynamic viscosity at 25 °C, mPa·s | 300-400 | 3500-4000 | 150-300 | 500-750 | 500-1100 | 1500-2000 | NMT 3000 |
| Component 1/component 2 ratio (w/w) | 1/1,13 | | 2/1 | | 1/1 | | — |
| Life time to slump loss at 20 °C, min | NLT 60 | | NLT 3 | | NLT 40 | | NLT 5 (in a thin layer on contact with moist air) |
| Foaming coefficient (volume increase ratio) | NLT 3 | | 1 | | 1 | | up to 17 |

Polytan polymer insulating material is available in four grades:

- **Polytan-CEM** is used as a substitute for traditional backfilling materials during well construction in permafrost rock sections;
- **Polytan-Screp** is used for workovers to restore permeability of oil and gas well reservoirs in order to increase their hydrocarbon debit and reduce the water;
- **Polytan** is used to eliminate leaks in the annular space during remedial cementing on oil and gas wells;
- **Polytan-I** is used to eliminate caverns and water shows when constructing oil and gas wells, as well as to seal and fill wet cracks in concrete, masonry and brick structures; seal expansion joints; waterproof reinforced concrete structures subject to dynamic loads; consolidate soils.

## ▶ TREATMENT

After pumping, Polytan material contacts water contained in the well, cures with a multiple increase in volume due to the gas released during the reaction, forming a solid porous mass. This forms a durable, strong, and elastic sealed joint with a closed porous structure. Before use, Polytan reagent is kept for 12 hours in a warm room at +10–15 °C. The required amount of the reagent is determined by calculation.

## ▶ PACKAGING

Polytan polymer material is packed into 30 kg canisters.





# POLYGEL KOK

POLYMER MATERIAL

TECHNICAL SPECIFICATIONS
TY 2458-153-97457491-2016

Polygel KOK polymer material is used for isolation of through casing string defects and re-sealing of their joints. The material is a two component composition consisting of a main component and a hardener. Affected by component 2, silicon organic polymeric component 1 of the Polygel KOK composition forms a fixed solid rubber-like gel in the entire volume. Polygel KOK reliably restores cementing by curing throughout the entire volume and providing long-term gas and water-tight effect due to high adhesion to metal, sufficient strength and flexibility.

| Parameter | Standard |
|---|---|
| Appearance | Component 1: clear to white liquid<br>Component 2: yellow liquid |
| Funnel viscosity of the material according to VZ-1 viscosimeter, 5.4 mm jet, at 20 °C, min | 9 - 14 |
| Viability (time of slump loss) at 20 °C, min | 30 - 120 |

## ▶ APPLICATION

Component 1 of the Polygel KOK material is mixed with Component 2 in the required ratios. The ready-made composition is poured into the annular space of the well mouth using a funnel or a pump.

## ▶ PACKAGING

Component 1 and component 2 of the Polygel KOK material are packed into 5 kg plastic buckets, other type of packaging is possible by agreement with the consumer.

# POLYEXPAN

GEL-FORMING REAGENT

TECHNICAL SPECIFICATIONS
TY 2216-024-97457491-2010

Polyexpan gel-forming reagent is designed for works on control of high-intensity lost returns and waterproofing in wells. It is a composition of polymers with reinforcing and modifying additives.

| Parameter | Polyexpan | Polyexpan-M |
|---|---|---|
| Appearance | white to gray loose material | |
| Mass content of water, %, NMT | 10 | |
| Twist angle of the rotational viscometer spring at 600 rpm, aqueous solution with 0.5% Polyexpan reagent mass fraction, deg., NLT | 30 | |
| Mass fraction of 0.1 mm sieve residue, %, NMT | — | 50 |

Polyexpan reagent can be produced as suspension in a conveying liquid.

## ▶ APPLICATION

Polyexpan reagent, getting into the workover area and contacting water, polymerizes and forms a strong cross-linked gel within 3-6 hours. This leads to irreversible plugging of pores and cracks. The resulting gel has high adhesion to the rock surface. After polymerization, the material is resistant to aggressive media.

## ▶ TREATMENT

Average consumption of Polyexpan reagent is 0,3-0,5 tons per operation.

## ▶ PACKAGING

The product is supplied in 25 kg polypropylene bags with polyethylene liners.

# POLYBLOCK

REAGENT

TECHNICAL SPECIFICATIONS
TY 2458-037-97457491-2010

Polyblock reagent is a chemically cross-linked polymer material with granule size from 0,1 to 5 mm. Particles of the Polyblock reagent, getting into cracks and pores and contacting water and aqueous solutions, swell and multiply in size, reliably isolating the lost return area. Polyblock-K is a loose fractionated material obtained by grain extrusion and heat treatment. The colmatant contains an acid-soluble reinforcing filler.

| Parameter | Polyblock | Polyblock-K1 | Polyblock-K3 | Polyblock-K5 |
|---|---|---|---|---|
| Appearance | yellow to brown loose material | | | |
| Mass fraction of sieve residue, %, NMT: | | | | |
| 1 mm | | 5 | | |
| 3 mm | | | 5 | |
| 5 mm | 5 | | | 5 |
| Mass content of water, %, NMT | 5,0 | 15,0 | | |

## APPLICATION

Polyblock reagent is designed to control lost circulation of flush liquids and water shows during construction of oil and gas wells at oilfields and underground gas storage facilities. The reagent is transported to the lost return areas in anhydrous hydrocarbon liquids.

## PACKAGING

Polyblock reagent is packed into 25-30 kg polypropylene bags with polyethylene liners.

# POLYCARBOBLOCK

TECHNICAL SPECIFICATIONS
TY 2458-105-97457491-2015

Polycarboblock composition can be used to control lost circulation of flush liquids in sections of productive formations, for non-damaging well control of wells prone to high filtration rate of the main killing fluid, as well as for temporary conservation of wells when running downhole equipment. Four grades of the material are available:
- **Polycarboblock V** is a water-based organo-mineral blocking composition with delayed action. It is used for temporary blocking of the downhole area of productive deposits during killing under ALRP conditions, as well as for control of high-intensity lost returns;
- **Polycarboblock R** is a cross-linked water-based gel with an acid-soluble combined filler;
- **Polycarboblock U** is a non-aqueous based organo-mineral blocking composition with accelerated action;
- **Polycarboblock P** is a cross-linked non-aqueous based gel with high adhesion to solid surfaces (liquid packer).

| Parameter | Polycarboblock V | | Polycarboblock R | | Polycarboblock U | | Polycarboblock P | |
|---|---|---|---|---|---|---|---|---|
| | component 1 | component 2 | component 1 | component 2 | component 1 | component 2 | component 1 | component 2 |
| Appearance | white to gray powder | light yellow crystalline powder | white to gray powder | white crystalline powder | gray to light brown crystalline powder | white to gray powder | white to gray loose material | light yellow to brown liquid |
| Mass content of water, %, NMT | 2,0 | | | | | | 10,0 | |
| Product density, g/cm³, NLT | – | | | | | | | 1,0 |

## APPLICATION

The density of the blocking composition is regulated by introduction of an acid-soluble filler. Gel destruction can occur upon interaction with acidic compositions or on a prolonged basis after 48 hours without additional treatments. The reagent is transported to the lost return areas in inert liquids.

## PACKAGING

Polycarboblock reagent is packed into 25–30 kg polypropylene bags with polyethylene liners. Component 2 of Polycarboblock P composition is shipped in 30 kg canisters or in other containers as agreed with the customer.





# PolyTGP

BACKFILLING DRY MIX

TECHNICAL SPECIFICATIONS
TY 2458-010-97457491-2007

PolyTGP backfilling dry mix is intended for preparation of backfilling compositions for control of lost return areas in highly permeable fissured and fissure-cavernous reservoirs. The composition is acid-soluble and can be used in the section of productive formations to control lost circulation.

| Parameter | PolyTGP | PolyTGP-S | PolyTGP-B | PolyTGP-U |
|---|---|---|---|---|
| Component 1 | | | | |
| Appearance | gray to brown loose material | | | |
| W/S (mixing liquid and dry material ratio) | 1,4 | 1,18 | 1,26 | 0,375 |
| Solution density, kg/m³, NLT | 1300 | 1700 | 1350 | 1450 |
| Spreadability of suspension on KR-1 cone, mm, NMT | 250 | | | 200 |
| Component 2 | | | | |
| Appearance | light yellow crystalline powder | | | |
| Density of 55% aqueous solution of the composition, kg/m³ | 1300 - 1350 | | | |

Four grades are available:
- **PolyTGP** is recommended for use in wells with normal and abnormally low reservoir pressure and temperature up to 90 °C when drilling wells using aqueous and saline fluids;
- **PolyTGP-S** is recommended for use in wells with abnormally high reservoir pressure and high reservoir temperature;
- **PolyTGP-B** is used for temporary blocking during well killing;
- **PolyTGP-U** can be used with water and oil-based drill fluids.

## APPLICATION

PolyTGP backfilling dry mix is used for preparation of backfilling compositions by dissolving Component 1 in fresh or saline aqueous solutions followed by mixing with Component 2 solution above the area or directly in the lost return area. After the solutions are mixed in the lost return area, it irreversibly hardens after a certain time and forms a pill with a plastic strength exceeding 30 kPa. This way, the lost return of drill fluid or cement slurry is reliably controlled. The amount of prepared backfilling composition is determined by the thickness of the exposed lost return area and hydrodynamic characteristics of the absorbing section.

## PACKAGING

PolyTGP backfilling dry mixture is packed into 25 kg polypropylene bags with a polyethylene liner containing the calculated amount of Component 2.

# POLYFIBER

REINFORCING FILLER

TECHNICAL SPECIFICATIONS
TY 2458-058-97457491-2012

Polyfiber is used as a filler in all types of fluids to create the primary framework of the backfilling composition to prevent and control lost returns of flush liquids. The reinforcing filler is used as a modifier of cement compositions. Polyfiber is a modified polymer fiber. Depending on the fiber length, Polyfiber-3, Polyfiber-6, and Polyfiber-12 are available.

| Parameter | Polyfiber-3 | Polyfiber-6 | Polyfiber-12 |
|---|---|---|---|
| Average fiber diameter, μm | 20–30 | | |
| Fiber length, mm | 3±10% | 6±10% | 12±10% |

## APPLICATION

Once in the cracks, Polyfiber fibers deposit on the burrs and irregularities of the rock walls, creating a mesh structure to hold finer fillers that form an impermeable barrier. When used in cement compositions, Polyfiber improves vibration resistance, water resistance, frost resistance, impact resistance of the cement stone. As the fibers block concrete capillaries, water permeability and water absorption of the concrete are reduced, compressive and bending strength is increased.

## PACKAGING

Polyfiber reinforcing filler is packed into 15 kg polypropylene bags with polyethylene liner.

# POLYFILTROL

BACKFILLING MATERIAL

TECHNICAL SPECIFICATIONS
TY 2458-048-97457491-2011

Polyfiltrol is a backfilling composition based on fibrous material with various inorganic modifying additives. It is used in the oil and gas production industry to control medium- and high-intensity lost returns during well drilling, and to reduce formation injection capacity during waterproofing works.

| Parameter | Standard |
|---|---|
| Appearance | gray to brown loose material |
| Filtration time, s, NMT | 300,0 |

## APPLICATION

Polyfiltrol backfilling material is designed for isolation of absorbing formations of pore reservoirs, control lost return areas of mixed fissure-pore type and flow channels in the cement stone behind the casing. It can be used to plug perforation channels prior to placing cutoff cement plugs.

## TREATMENT

Polyfiltrol is mixed with technical water or salt solution to obtain a suspension with a high solid phase content, which is characterized by high values of instantaneous filtration. Approximate working concentration of the reagent starts from 30%. The suspension is pumped through the pipe space directly into the lost return area with the annular space sealed.

## PACKAGING

Polyfiltrol backfilling material is packed into 25 kg polypropylene bags with polyethylene liner.



# REAGENTS AND MATERIALS FOR REMEDIAL CEMENTING AND WELL WORKOVERS

Well workover is a set of operations related to restoring functional capability of casing strings, cement ring, downhole area, elimination of accidents, as well as running and pulling equipment for separate operation and pumping; shut-off packers, shut-off valves, gas lift equipment.

Remedial cementing during well workovers is performed to block the movement paths of extraneous water into the well production facility and to isolate separate formations and watered sections from it. JSC «NPO «Polycell» produces and supplies reagents and materials for well workover and remedial cementing (RC).

## POLYAEROGEL

TECHNICAL SPECIFICATIONS
TY 2458-131-97451491-2015

PolyAerogel is designed for killing and drilling gas wells with abnormally low reservoir pressures. The reagent is a two-component material. Component 1 (gel-forming agent) can be produced as oil pulp (PolyAerogel grade R) or as powder (PolyAerogel grade B). To kill wells under conditions of high downhole temperatures (up to 120 °C), it is proposed to use a heat-resistant modification of PolyAerogel-TS reagent.

**Gel-forming agent**

| Parameter name | PolyAerogel-R | PolyAerogel-B | PolyAerogel-TS |
|---|---|---|---|
| Component 1 | | | |
| Appearance | light yellow to dark brown suspension, sediment is allowed | white to yellow fine powder | white to gray loose powder |
| Density at 20 °C, g/cm³ | 1,020 – 1,100 | – | – |
| Viscosity of 1% aqueous solution according to Brookfield viscometer, cPs | – | NLT 3000 | NLT 4000 |
| Component 1.1 (bactericide) | | | |
| Appearance | colourless to light brown liquid | | |
| pH of 1% aqueous solution | 8,0 – 11,0 | | |
| Density at 20 °C, g/cm³ | 1,100 – 1,200 | | |
| Component 1.2 (foaming agent) | | | |
| Appearance | Not required | colourless to yellowish clear oily liquid | |
| pH of 1% aqueous solution | | 6,0 – 8,0 | |
| Density at 25 °C, g/cm³ | | 1,000 – 1,100 | |

**Cross-linker**

| Parameter | PolyAerogel-R | PolyAerogel-B | PolyAerogel-TS |
|---|---|---|---|
| Appearance | colourless to yellow liquid | | green to dark green liquid |
| Density at 20 °C, g/cm³ | NMT 1.200 | | NLT 1.000 |

### ▶ APPLICATION

The components are mixed directly in the delivery line along with nitrogen during well killing operations. When the components are mixed, a polymer cross-linked foam with a density of 450-800 kg/m³ is formed.

### ▶ PACKAGING

The material is packaged as agreed with the supplier.





## PolyAversol

TECHNICAL SPECIFICATIONS
TY 2458-102-56864391-2014

PolyAversol reagents are designed to inhibit the processes of scaling, corrosion and hydrate formation.
The reagent is available in four grades:

**PolyAversol TV** is a scaling inhibitor;

**PolyAversol ME** is a corrosion and hydrate formation inhibitor;

**PolyAversol BR** is a high temperature corrosion inhibitor designed for saline killing fluids that do not contain a solid phase;

**PolyAversol BN** is an oxygen absorber to be used in high density brines;

**PolyAversol F** is a scaling inhibitor designed to prevent carbonate deposits at all stages of the oil production process, as well as to protect oilfield equipment from scaling, to provide high anti-scale activity in heat exchangers, oil thermal dehydration and desalting units, in water treatment systems.

**PolyAversol SU** is an acid aggression inhibitor used to protect the surface of equipment and pipelines.

| Parameter | PolyAversol TV | PolyAversol BR | PolyAversol BN | PolyAversol ME | PolyAversol F | PolyAversol SU |
|---|---|---|---|---|---|---|
| Appearance | white crystalline powder | colourless crystals | powder, white to light yellow | colourless to dark brown liquid | light yellow liquid | light yellow to black liquid |
| Density at 20 °C, g/cm³, | – | | | NMT 1,1 | 0,9 – 1,3 | NMT 0,95 |
| pH of 5% aqueous solution | 4,0 – 5,5 | 4,5 – 6,5 | 8,0 – 10,0 | – | NLT 2,5 | – |
| Protective effect for St3 grade steel in $CaBr_2/ZnBr_2$ solution at 100 °C, %, NLT | – | NLT 80 | – | | | |
| Calcium carbonate sedimentation inhibition efficiency, %, at 100 mg/l dosage, NLT | – | | | | NLT 70 | – |
| No-flow point, °C | – | | | | | not above minus 30 |

### ▶ APPLICATION

Scaling and corrosion inhibitors are used to protect equipment from possible aggressive effects of various fluids during construction and operation of oil and gas wells. The reagents have excellent adsorption characteristics towards the equipment surface and are able to adsorb not only on the surface of crystal nuclei, but also on metal surfaces. The reagents effectively prevent corrosion caused by both downhole environment (acidic gas content) and process fluid composition (acidic solution). The resulting thin film inhibits access of oxygen to the metal surface, so the rate of metal corrosion is reduced without adverse effects on other process parameters of the acidic composition.

### ▶ TREATMENT

Approximate consumption of the reagent is 10-30 kg per 1 m³ of process fluid.

### ▶ PACKAGING

PolyAversol TV, BR and BN are packed into 25 kg polypropylene bags with polyethylene liner, PolyAversol ME, F, SU – into 200-litre metal drums.

# PolyIsolite

POLYMER COMPOSITION

TECHNICAL SPECIFICATIONS
TY 2458-093-97457491-2013

PolyIsolite polymer composition is used to eliminate leaks in string heads and threaded joints as well as casing shoes of oil and gas wells. A heat-resistant grade, PolyIsolite-VT, is produced for the conditions of high downhole temperatures (up to 185 °C). PolyIsolite reagent is a multi-component system:

**Component 1** is a polymer solution in an organic solvent;

**Component 2** is a hardener;

**Component 3** (for Polyisolite-VT) is an accelerator.

| Parameter | PolyIsolite | PolyIsolite-VT |
|---|---|---|
| Component 1 | | |
| Appearance | yellow to dark brown liquid | pale yellow to dark brown viscous liquid |
| Density, kg/m³ | – | NLT 1050 |
| Funnel viscosity according to VZ-4 viscosimeter, at 20 °C, s | NMT 40 | – |
| Component 2 | | |
| Appearance | light yellow to dark brown liquid A, greenish coloration is allowed | colourless to yellow clear liquid |
| Density, kg/m³ | NMT 1100 | NLT 1050 |
| Funnel viscosity according to VZ-4 viscosimeter, at 20 °C, s | NMT 40 | |
| Component 3 | | |
| Appearance | – | nolight yellow to dark brown clear liquid |
| Density, kg/m³ | | NMT 1000 |

## APPLICATION

For PolyIsolite, the composition is prepared by mixing the main component with the hardener in 2:1 volumetric ratio immediately before pumping. For PolyIsolite-VT reagent, the ratio of main component to hardener is 100:70 (by weight). The accelerator consumption is selected in the laboratory depending on the temperature and ranges from 0 to 0,5%.

## TREATMENT

Explosive packers and bailing tubes that are run downhole on the logging cable are used to avoid accidents when sealing threads and a leaky production casing. When repairing column heads, small-sized high-pressure pumping units are used. After treatment, the pumping equipment is flushed with a special solvent.

## PACKAGING

PolyIsolite polymer composition is supplied in 100-, 200-litre steel drums or in 30-, 40-litre polypropylene canisters.





# PolySAA

REAGENT

TECHNICAL SPECIFICATIONS
TY 2458-067-97457491-2012

PolySAA reagent is a composition of high-performance surfactants represented by the grades:

**PolySAA-VN** (hydrophilic non-ionogenic surfactant);

**PolySAA-RIR** (oil-soluble surfactant emulsifier);

**PolySAA-MN** (oil-soluble non-ionogenic surfactant emulsifier);

**PolySAA-MG** (oil-soluble anionogenic surfactant oil-wetting agent);

**PolySAA-K -** polyelectrolyte-based composition with a high ionization degree, increasing the inhibitory properties of wash liquids;

**PolySAA-US -** composition of oleophilic surfactants in a hydrocarbon solvent.

| Parameter | PolySAA-VN | PolySAA-RIR | PolySAA-MN | PolySAA-MG | PolySAA-K | PolySAA-US |
|---|---|---|---|---|---|---|
| Appearance | colourless to yellowish clear oily liquid | light yellow to dark brown oily liquid | clear yellow to brown oily liquid | light brown to dark brown viscous liquid | colourless to yellow homogeneous liquid without foreign inclusions | light yellow to dark brown oily liquid |
| Density, g/cm³ | 0,950–1,100 | 0,800–1,000 | 1,010–1,030 | 0,750–0,950 | NLT 1,000 | NMT 1,000 |
| pH of 1% aqueous solution | 6,0–8,0 | – | | | 4,0–8,0 | – |
| pH of a 1% hydroalcoholic emulsion | – | | 6,0–8,0 | – | | |
| Boundary tension 0.1% wt. PolySAA in distilled water at the boundary with kerosene TS-1 mN/m, NMT | 6 | – | | | | |
| Boundary tension 0.1% wt. PolySAA in kerosene TS-1 at the boundary with water, mN/m, NMT | – | 5 | 8 | 20 | – | |
| Water solubility | + | – | – | – | + | – |

## APPLICATION

PolySAA-VN reagent decreases the boundary tension at the hydrocarbon-water interface, increases the mixture mobility, increases the degree of substitution of hydrocarbon with water and increases the strength of the resulting cement stone. It is used to prepare hydrocarbon suspensions of Ultracement-5 grade microcement.
**PolySAA-RIR** reagent decreases surface tension at the hydrocarbon-water interface and is used as an emulsifier-stabilizer of invert (reverse) emulsion fluids.
**PolySAA-MN** reagent is used as an emulsifier for production of reverse emulsion backfilling slurries.
**PolySAA-MG** reagent is used as a dispersant, reduces hydrocarbon-cement ratio of cement hydrocarbon suspensions, increases mixture mobility. It is used to prepare hydrocarbon suspensions of Ultracement-5 grade microcement.
**PolySAA-K** reagent is used in flush liquids under conditions of intense colloidal phase build-up.
**PolySAA-US** reagent is used as part of diesel-bentonite mixtures to limit water inflow during remedial cementing. The reagent allows to increase the fluidity of suspensions due to the changed boundary tension at the interface.

## TREATMENT

PolySAA reagent is used as a surfactant when preparing suspensions and emulsions. Reagent consumption can vary from 0.1 to 0.25% for PolySAA-VN and PolySAA-MN when preparing hydrocarbon suspensions of microcements or cements, for emulsifiers such as PolySAA-RIR and PolySAA-MN – from 1.5 to 5.0%.

## PACKAGING

PolySAA reagent is supplied in 200-litre metal drums or in plastic canisters of various volumes.

# PolyRC

PROCESS FLUID

TECHNICAL SPECIFICATIONS
ТУ 2458-089-97457491-2013

PolyRC process fluid is used as a buffer liquid during repair-and-renewal operations and remedial cementing in oil and gas wells, it is a mixture of organic solvents and special additives.

| Parameter | PolyRC NF | PolyRC NF-A | PolyRC NF-AC | PolyRC NF-AS | PolyRC NF-D |
|---|---|---|---|---|---|
| Appearance | colourless liquid without sediment | colourless to light yellow liquid without sediment | colourless to dark brown liquid without sediment | colourless to light yellow liquid without sediment | colourless to light yellow liquid without sediment |
| Density, g/cm³ | 0,720 – 0,890 | 0,820 – 0,900 | 0,820-1,120 | 0,820 – 0,880 | 0,850 – 0,950 |
| Water solubility | not soluble | | | partially soluble | |
| Twist angle of the rotational viscometer spring at:<br>- 600 rpm, NMT<br>- 300 rpm, NMT | <br>15<br>10 | <br>12<br>9 | – | <br>10<br>5 | – |

## TREATMENT

- PolyRC NF and PolyRC NF-A compositions are used as buffer liquids to prevent incompatible liquids from mixing.
- PolyRC NF-AC composition is used as a flush liquid for selective isolation, as well as for downhole area cleaning.
- PolyRC NF-AS composition is used as a dehydrating agent during workover operations, during flushing in steam-air injection wells, to prevent mixing of incompatible liquids.
- PolyRC-D composition is used as a liquid for washing the compression equipment and process lines after application of Polytan compositions.

## PACKAGING

PolyRC process liquids are packed into 200-litre metal drums.

# POLYSCREP

POLYMER COMPOSITION

TECHNICAL SPECIFICATIONS
ТУ 2458-086-97457491-2013

Polyscrep polymer composition is designed for repair-and-renewal operations related to reinforcing the downhole formation area to prevent withdrawal of sand in gas and oil wells. A mixture of two components of the Polyscrep composition is used for work, the working composition is prepared immediately before use. POLYSCREP-S grade is used as a making-up composition after treatment of a weakly consolidated reservoir with POLYSCREP composition. Application of POLYSCREP-S leads to increased reservoir strength in the downhole area of the formation, where maximum stresses occur during reservoir fluid production, without significant loss of permeability.

| Parameter | Polyscrep | Polyscrep-S |
|---|---|---|
| Composite 1 | | |
| Appearance | slightly coloured liquid | yellow to dark brown liquid |
| Density, g/cm³, NMT | 1,050 | – |
| Presence of mechanical impurities | absence | |
| Nonvolatile solids content, %, NLT | 30 | – |
| Funnel viscosity, s, NMT | 20 | 40 |
| Component 2 (hardener) | | |
| Appearance | colourless to yellow liquid | light yellow to dark brown liquid, a greenish coloration is allowed |
| Density, g/cm³, NMT | 1,000 | 1,100 |

## APPLICATION

Component 2, in the amount of 3-5% wt, is mixed with Component 1 immediately before well treatment. The ready-made Polyscrep composition is pumped into the productive formation pre-treated with a special PolyRC buffer composition, then the formation is purged with gas.

## TREATMENT

The consumption is between 50 and 200 liters per linear meter depending on the reservoir permeability.

## PACKAGING

Polyscrep polymer composition is supplied in 200-litre metal drums or in plastic canisters.



# CHEMICAL REAGENTS AND SPECIAL-PURPOSE MATERIALS

Special-purpose reagents include compositions for well development and completion, cleaning and treatment of the downhole formation area, permeability restoration of a productive reservoir. Reagents inhibiting hydrate formation, neutralizing acidic fluids and hydrogen sulfide and other components produced by JSC «NPO «Polycell».

## PolyRDI

DEVELOPMENT FLUID

TECHNICAL SPECIFICATIONS
TY 2458-129-97457491-2015

PolyRDI development fluid is designed for development and pumping of gas condensate and oil wells under conditions of abnormally low reservoir pressure. PolyRDI development fluid is chemically inert to rocks and compatible with reservoir fluids. The reagent contributes to water-repellent treatment of the reservoir surface and reduction of capillary pressures in the reservoir pores due to reduction of the boundary tension at the “killing fluid - reservoir fluid” interface. PolyRDI composition is stable at high downhole temperatures and maintains fluidity at low negative temperatures. PolyRDI liquid has anti-hydrate properties and provides restoration of the initial permeability of productive formations.

| Parameter | Standart |
|---|---|
| Appearance | light yellow to dark brown liquid |
| Density, kg/m³, NMT | 860 |
| No-flow point, °C, not higher than | minus 45 |
| Flash point (open crucible), °C, not lower than | 90 |

### ▶ APPLICATION

PolyRDI development fluid is supplied with the specified technical characteristics, no additional treatments of the composition are required.

### ▶ PACKAGING

PolyRDI development liquid is supplied in combined medium-tonnage 1 m³ GCUBE IBC containers, 800 kg in each.

## POLYCORRECT

TECHNICAL SPECIFICATIONS
TY 2458-130-97457491-2015

Polycorrect composition is designed for preparation of test-development fluids (without a solid phase), for wells drilled using both aqueous and non-aqueous fluids. Polycorrect composition is resistant to water-soluble salts, including calcium and magnesium, has a low no-flow point (minus 42 °C).

| Parameter | Polycorrect | Polycorrect-R |
|---|---|---|
| Appearance | light to dark brown liquid | light yellow to dark brown liquid |
| Density at 20 °C, g/cm³, NMT | 1250 | 870 |
| pH, NLT | 6,0 | – |
| Flash point (open crucible), °C, not lower than | – | 85 |





### ▶ APPLICATION

It is used for exposing productive strata, killing testing, perforating and conserving oil and gas wells. As compared to brines prepared from water-soluble salts, Polycorrect composition has:
- improved surfactant properties providing preservation of reservoir properties of the productive formation, improvement of reservoir permeability and preservation of well flow rate;
- it does not entail preparation costs (the composition is supplied with specified technical characteristics depending on geological conditions).

### ▶ PACKAGING

Polycorrect is supplied in 1 m³ cubic tanks.

## POLYHYDROSIL

REAGENT

TECHNICAL SPECIFICATIONS
TY 2458-111-97457491-2015

Polyhydrosil polymer reagent is used for water-repellent treatment of sandy reservoirs of the downhole area of production wells. The reagent is a two-component composition consisting of an organosilicon polymer solution in an organic solvent and a hardener. After mixing the components in a certain ratio and pumping into the sand bed, the polymer base of the reagent is chemically adsorbed on the surface of the quartz rock giving it water-repellent properties. The water permeability of the reagent-treated area of the sand reservoir decreases at least twice, while increasing for organic fluids.

| Parameter | Standart |
|---|---|
| **Component 1** | |
| Appearance | pale yellow transparent liquid without impurities |
| Density, g/cm³, NMT | 1,050 |
| Funnel viscosity according to VZ-4 viscosimeter, s, NMT | 15 |
| **Component 2** | |
| Appearance | colourless to light yellow liquid |
| Density, g/cm³, NMT | 1,000 |

### ▶ APPLICATION

Component 1 of Polyhydrosil polymer composition is mixed with Component 2 in the required ratios immediately before application. The well treatment technology provides for compulsory application of a flushing buffer based on PolyRC NF-AS process fluid. The finished composition is pumped after the flushing buffer into the downhole area through the producing string or coiled tubing unit using a pump.

### ▶ PACKAGING

Component 1 of Polyhydrosil material is packed in 30-litre plastic canisters, Component 2 in 5-litre plastic canisters or 1000 ml plastic bottles.

# POLYPRON

ADDITIVE FOR DRILLING FLUIDS

TECHNICAL SPECIFICATIONS
TY 2458-049-97457491

Polypron additive for drilling fluids is designed for removal of the filtration crust on water and oil-based fluids and uniform cleaning of the downhole area after exposure of productive formations. The material is available in four modifications:

**Polypron-1 -** is designed for destruction of filtration crusts of water-based drilling fluids in the temperature range from +15 °C to +90 °C on the basis of dry organic acids, surfactant and auxiliary substances.

**Polypron-2 -** is designed for destruction of filtration crusts of oil-based drilling fluids in the temperature range from +20 °C to +120 °C on the basis of solvents, acids and surfactants.

**Polypron-3 -** is for slowed down destruction of filtration crusts of water-based drilling fluids in the temperature range from +70 °C to +120 °C on the basis of chelating components and auxiliary substances.

**Polypron-4 -** is for slowed down destruction of filtration crusts of water-based drilling fluids in the temperature range from +5 °C to +70 °C on the basis of chelating components and auxiliary substances.

| Parameter | Polypron-1 | Polypron-2 | Polypron-3 | Polypron-4 |
|---|---|---|---|---|
| Component 1 | | | | |
| Appearance | white to cream powder | transparent liquid | transparent liquid | white powder |
| pH<br>– of 1% aqueous solution<br>– of commercial product | 0,1– 2,0 | – | 6,5–8,5 | 4,0–5,0 |
| St3 steel corrosion rate, g/(m²·h), NMT | 3,0 | | 0,2 | |
| Mass content of insoluble marble, %, NMT:<br>– In 9% solution<br>– In commercial product | 5,0 | | 10,0 | 10,0 |
| Component 2 | | | | |
| Appearance | transparent liquid | | brown to black liquid | |
| Density, g/cm³ | 0,9–1,1 | | 1,1–1,3 | |
| pH | – | | 5,0–7,0 | |
| Component 3 (for Polypron-4 grade) | | | | |
| Appearance | for grades 1,2,3 the component is not supplied | | | scales, white granules |
| pH of 1% aqueous solution, NLT | | | | 12 |

## ▶ APPLICATION

Conditions of application, scope, procedure and criteria for evaluation of the performance results, as well as safety standards and requirements to the equipment are set forth in the “Instructions for application of Polypron breaker composition for destruction of filtration crust of water-based and non-aqueous drill fluids”.

## ▶ PACKAGING

Polypron liquid components are packed in 200-litre steel drums, in plastic canisters with volumes up to 40 litres. Polypron bulk components are packed into 25 kg polypropylene bags with polyethylene liner.





# PolyRR

REAGENT

TECHNICAL SPECIFICATIONS
TY 2458-041-97457491-2010

PolyRR clay cake removing reagent is used in technologies eliminating seizure of drilling tools and casing strings. The clay cake removal technology is based on chemical destruction of clay material.

| Parameter | Standart |
|---|---|
| Appearance | white to beige or gray granules or powder |
| pH of 1% aqueous solution, NMT | 4,0 |

Liquid PolyRR reagent is available on request.

## ▶ APPLICATION

The clay cake removal technology involves pumping and installation of an anti-seize bath. The recommended content of PolyPR reagent in the anti-seize bath – NMT 20%. To accelerate dissolution of PolyRR reagent it is allowed to use water preheated to 60 °C. The mechanism of PolyRR reagent effect on the rock is chemical effect on the crystalline lattice of clay material, due to which the structural bonds are weakened, which results in destruction of clay particles. After exposure to PolyRR reagent, clay particles are not capable of compaction, so they are easily removed from under the seized casing.

## ▶ PACKAGING

PolyRR agent is supplied in 25 kg polypropylene bags with polyethylene liners.

# POLYDEEMULSOL

TECHNICAL SPECIFICATIONS
TY 2458-101-97457491-2014

Polydeemulsol reagent is designed to break oil-water emulsions contaminating the productive formation, it helps clean the downhole area from colmatage particles, which ultimately leads to an increase in permeability of reservoir rocks. Polydeemulsol reagent is available in three grades: M, B, E.

| Parameter | Polydeemulsol-M | Polydeemulsol-B | Polydeemulsol-E |
|---|---|---|---|
| Appearance | colourless to light yellow liquid | | |
| Density, kg/m³ | 960–970 | 890–910 | 925–935 |
| Compatibility with distilled water at 20 °C | unlimited | unlimited | unlimited |
| Refraction index ($N_D^{20}$) | 1,400–1405 | 1,410–1,430 | 1,406–1,409 |

## ▶ APPLICATION

The reagent is used when pumping and developing wells, in workover operations to increase permeability of the productive formation and to increase production rates.

## ▶ TREATMENT

Introduction of Polydeemulsol reagent into process fluids does not require specialized equipment.

## ▶ PACKAGING

Polydeemulsol is supplied in 200-litre steel drums or in 30-litre polymer canisters.

# POLYPHOB

OIL-WETTING AGENT

TECHNICAL SPECIFICATIONS
ТУ 2458-068-97457491-2012

Multi-purpose reagent for chemical treatment of drilling fluids in order to improve their structural and mechanical properties during drilling of oil and gas wells and as an additive in backfilling drilling fluids. Several grades of the material are available:

**Addition of Polyphob** to drilling fluids allows to improve their quality while significantly reducing the consumption of traditional materials;

**Polyphob S-1** is an absorbent of acidic gases, corrosion inhibitor, soluble in aqueous and dispersible in hydrocarbon media;

**Polyphob-K** is a reagent of combined effect used as part of killing fluids during well pumping;

**Polyphob BS** is a water-repellent impregnation for concrete which amounts to an aqueous solution of colloidal silicate, water-repellent agent and surfactant.

| Parameter | Polyphob | Polyphob S-1 | Polyphob B-K | Polyphob-BS |
|---|---|---|---|---|
| Appearance | colourless to dark brown liquid a fine precipitation is allowed | mobile liquid, fine phase is allowed in the entire volume or in the form of precipitation | colourless to yellow liquid | opalescent liquid |
| Density at 20 °C, g/cm³ | NLT 1,15 | NLT 1,00 | 0,90 – 1,10 | NLT 1,00 |
| Mass fraction of alkali, % (in terms of NaOH) | 10-25 | – | | |
| Mass fraction of the main substance, %, NLT | – | | 40 | – |
| Hydrogen value pH | 10,0 – 13,0 | | 6,0 – 9,0 | NLT 9,0 |
| Freezing temperature, °C, NMT | – | | minus 20 | – |

## APPLICATION

**Polyphob grade** is used as a clay drilling fluid modifier preventing dispersion and hydration of clays. It reduces and stabilizes viscosity of drilling fluids. Recommended reagent content is up to 10 kg in 1 m³.
**Polyphob S-1** grade is used to neutralize acidic gases, including hydrogen sulfide. It does not significantly affect the technical properties of drilling fluids. Reagent consumption is determined by drilling conditions.
**Polyphob-K** grade is a oil-wetting agent in killing fluids, metal corrosion inhibitor and anti-hydrate additive.
**Polyphob BS** oil-wetting agent composition is used in construction and designed for anti-corrosion protection of concrete of building structures from the effects of weather and climatic factors, aggressive environmental factors and anti-icing chemicals. The composition increases frost resistance, water impermeability, and reduces abrasion of concrete. It is supplied ready for use.

## PACKAGING

Polyphob is supplied in 200-litre steel drums or in polypropylene canisters of various volumes.

# POLYDEHYDRATE

TECHNICAL SPECIFICATIONS
ТУ 20.59.59-179-97457491-2021

Polydehydrate is designed for pumping, workover, killing and well development operations, and is used as a hydrate formation inhibitor. There are several grades available:

**Polydehydrate K** is a kinetic hydrate inhibitor.

**Polydehydrate T** is a thermodynamic hydrate formation.

| Parameter | Polydehydrate-K | Polydehydrate-T |
|---|---|---|
| Appearance | colourless to light brown homogeneous liquid | |
| Density, g/cm³ at 20 °C, NLT | 1,05 | 1,10 |
| Solidification temperature, °C, not higher than | minus 25 | minus 30 |
| Steel corrosion rate in the commercial form of the reagent at 20 °C, mm/year, NMT | 0,010 | 0,015 |

## PACKAGING

Polydehydrate is supplied in 200-litre drums or in canisters of various volumes.





# POLYCARBOSINK

TECHNICAL SPECIFICATIONS
ТУ 2458-106-97457491-2015

Polycarbosink reagent is used to neutralize acidic formation fluids. The reagent is supplied as a fine white powder. The reagent forms insoluble or slightly soluble salts with most anions (phosphates, fluorides, sulphides). The reagent can be used as a hydrogen sulphide scavenger when used as a component in drilling fluids.

| Parameter | Standart |
|---|---|
| Appearance | fine white powder |
| Bulk density, kg/m³ | 300-1300 |
| Mass fraction of water, % | NMT 0,5 |

## TREATMENT

The drilling fluid is treated using standard equipment (clay mixers, hydro funnels, etc.). The reagent is added to the circulation tank.

## PACKAGING

Polycarbosink reagent is packed into 25 kg polypropylene bags with polyethylene liner.

# JS-NPO

$H_2S$ SCAVENGER

TECHNICAL SPECIFICATIONS
ТУ 2123-132-97457491-2015

The $H_2S$ Scavenger is an additive for drilling fluids used when hydrogen sulfide concentration in the gas phase is up to 50% or when saturation of the oil-based fluid reaches up to 5,000 mg/L. It is compatible with all types of drilling fluids. In the drilling fluid, the reagent actively reacts with $H_2S$, forming insoluble compounds and preventing the release of free $H_2S$.

**JS-NPO** $H_2S$ Scavenger (density up to 4.8–4.9 g/cm³) is characterized by a high $H_2S$ absorption capacity.

Reddish-brown powder. Insoluble in both water and oil.

## APPLICATION

The $H_2S$ Scavenger does not affect the key properties of the drilling fluid and can also be used as a weighting agent. It reacts with hydrogen sulfide to form insoluble sulfides or elemental sulfur, depending on pH. As a result, the highly toxic gas is converted into an inert form. The JS-NPO $H_2S$ Scavenger is effective in formulating heavy kill fluids and drilling fluids for controlling $H_2S$ kicks. The JS-NPO $H_2S$ Scavenger has been successfully deployed in the Astrakhan Region.

## TREATMENT

The dosage of the scavenger is calculated based on the predicted concentration of hydrogen sulfide in the formation fluid and the drilling fluid.

## PACKAGING

The JS-NPO $H_2S$ Scavenger is packaged in disposable, flexible Intermediate Bulk Containers (IBCs) with a volume of 1 m³.

# ULTRABARITE

WEIGHTING AGENT

TECHNICAL SPECIFICATIONS
ТУ 20.59.59-201-97457491-2025

The Ultrabarite weighting agent is a low-abrasive, micronized barite. Two product types are produced: hydrophobic and hydrophilic.Ultrabarite is an ultra-fine micronized barite (median particle size D50 less than 3 μm). The hydrophobic grade of Ultrabarite is additionally treated with a hydrophobing agent during grinding.

| Standart | Ultrabarite (hydrophobic) | Ultrabarite |
|---|---|---|
| Appearance | powder, gray to beige | |
| Mass content of water (humidity), %, NMT | 0,5 | |
| Hydrophobicity | passed test | – |
| Specific surface area, cm²/g, NLT | 5000 | |

## APPLICATION

Ultrabarite is used in heavy fluids (density of 2.1–2.3 g/cm³) for the initial drilling of formations with abnormally high formation pressure (AHFP), for killing behind-casing flows, for perforation and well killing under AHFP conditions, as a packer fluid, and as a cushion fluid. Hydrophobic Ultrabarite is suitable for preparing heavy hydrocarbon-based suspensions, while hydrophilic Ultrabarite is used for aqueous-based suspensions.

## PACKAGING

Weighting agents are packaged in 25 kg bags or in disposable flexible Intermediate Bulk Containers (IBCs) with a volume of 1 m³.

# POLYCEM ECOSORB

REAGENT

TECHNICAL SPECIFICATIONS
TY 5731-084-97457491-2012

Polycem Ecosorb is a complex of sorbing organic and mineral substances with an active additive. The reagent is designed for processing drilling waste and contaminated soils containing hydrocarbons using a curing technology to produce artificial crushed stone and sand.

| Parameter | Polycem Ecosorb-1 | Polycem Ecosorb-2 | Polycem Ecosorb-3 |
|---|---|---|---|
| Appearance | gray to dark brown loose material | gray to dark brown loose material | white to gray powder |
| Sorption capacity for petroleum derivatives, g/g of the mixture, NLT | 2,0 | 1,5 | 2,5 |
| Mass content of water, %, NMT | 25,0 | 20,0 | 10,0 |

## APPLICATION

Polycem Ecosorb-1 sorbs and retains petroleum derivatives and moisture, allowing cement and lime to harden contaminated materials.
Polycem Ecosorb-2 is used to produce soils when mixed with drilling sludge and contaminated soils.
Polycem Ecosorb-3 sorbs and retains petroleum derivatives and wastewater and is designed to treat drilling equipment and working sites.

## TREATMENT

Consumption of Polycem Ecosorb-1 or Ecosorb-2 reagent depends on the content of petroleum derivatives and amounts to approx. 100-200 kg per 1 ton of contaminated drilling sludge and soil. Polycem Ecosorb-3 consumption is 5-10 kg per 1 m² of contaminated area.

## PACKAGING

Polycem Ecosorb is packed into 25 kg polypropylene bags with polyethylene liner or in 500-700 kg big bags.

# SUBRIC

BINDING ADDITIVE FOR CONSOLIDATION AND CAKING OF BULK MATERIALS

Subric reagent is a composite binder based on natural polymeric materials. The reagent is available in dry form (as Subric-S) and in liquid form (as Subric-P).

| Parameter | Subric-S | Subric-P |
|---|---|---|
| Appearance | light yellow to brown loose powder | yellow to black viscous liquid |
| Mass content of water, %, NMT | 10 | 35 |
| Density, g/cm³ | – | NLT 1,20 |

## APPLICATION

Subric reagent is characterized by high adhesive ability, is used as a binder in the production of briquettes, granules and pellets from coal screenings, sludge, peat, sawdust, as well as for strengthening loose rocks – sands, argilites and drilling sludges. The reagent is well soluble in water.

## TREATMENT

Approximate consumption of Subric reagent is 5-20 kg per 1 ton of coal powder, peat, wood flour, or sawdust. Reagent consumption depends on the nature and fractional composition of the briquetted material.

## PACKAGING

Subric-S reagent is packed into 25 kg polypropylene bags with polyethylene liners. Subric-P is supplied in 200-litre metal drums or in canisters of various volumes.



# MATERIALS FOR TREATMENT OF HOUSEHOLD AND TECHNICAL WATER

When treating water for the purposes of household and technical water consumption, as well as when treating wastewater of industrial enterprises, most commonly used are filtering facilities and separate units, the main element of which is a layer of granular filter medium. JSC «NPO «Polycell» supplies most common materials for treatment of household and technical water: particularly pure quartz crushed stone and grits, as well as PRZ pyrolusite grits.

## PARTICULARLY PURE QUARTZ CRUSHED STONE AND GRITS

TECHNICAL SPECIFICATIONS
ТУ 4191-001-97159931-2011

Particularly pure quartz crushed stone and grits are used as the filtering medium:
- for single-layer and multi-layer rapid filters and contact clarifiers;
- at household water treatment plants;
- during production of alcoholic and non-alcoholic beverages, food products requiring water treatment;
- to treat swimming pool water;
- to treat boiler water;
- for industrial and wastewater treatment.

| Chemical composition: | |
|---|---|
| - $SiO_2$, %, NLT | 98,5 |
| - $Al_2O_3$, %, NMT | 1,4 |
| - $Fe_2O_3$+$TiO_2$, %, NMT | 0,05 |
| Density, g/cm³ | 2,5–2,6 |
| Bulk density, kg/m³ | 1300–1500 |
| Specific efficiency of natural radionuclides in quartz material Aeff NRN, Bq/kg, NMT | 50 |

Fractional composition: 10-20 mm; 5-10 mm; 2-5 mm; 1.2-2 mm; 0.8-1.2 mm; 0.4-0.8 mm.

### ▶ PACKAGING

Particularly pure quartz crushed stone and grits are packed into 25 kg polypropylene bags and into 1 ton IBCs.

## PRZ

PYROLUSITE GRITS

TECHNICAL SPECIFICATIONS
TY 5711-012-56864391-2009

PRZ pyrolusite grits is designed for specialized water treatment – removal of iron and manganese oxides during filtration of household and industrial water. Iron does not belong to toxic elements, but when it enters the body for a long time, its excess accumulates in the liver in the form of haemosiderin, which destroys liver cells. Besides, iron promotes intensive development of microflora, gives unpleasant taste to water, preconditions the growth of rusty crusts on dishes, electrical appliances, plumbing fixtures. Using the PRZ reagent ensures reduction of iron (≤0.2 mg/l) and manganese (≤0.1 mg/l) content in a wide range of water compositions and properties.

| Mass fraction of manganese dioxide $MnO_2$,%, NLT | 50,0 |
|---|---|
| Mass fraction of basic granulometric class, %, NLT | 85 |
| Mass fraction of particles larger than the upper nominal size, %, NMT | 5 |
| Mass fraction of particles smaller than the lower nominal size, %, NMT | 10 |
| Bulk density, kg/m³, NLT | 1500 |

Main granulometric classes: 0.8-1.2 mm; 0.4-0.8 mm. By its operational properties, PRZ significantly surpasses foreign analogues: Birm Regular and Manganese Greensand.

PRZ filtering material is a complex of natural manganese-containing minerals. When water comes in contact with higher manganese oxides in mineral form, a process of oxidation of ferrous iron takes place converting it into ferric hydroxide ($Fe[OH]_3$), which precipitates. In addition, they provide conversion of bivalent manganese into insoluble manganese dioxide, the precipitate of which is also an active sorbent (ensures hydrogen sulfide neutralization). Quartz sands with high homogeneity of granularity and sphericity are recommended for capturing precipitation of iron hydroxide and manganese dioxide. It is also possible to use other types of filtering materials in combination with PRZ.

### ▶ APPLICATION

PRZ is used in combination with quartz sand. The top layer of the manganese filtration material is installed with a height of 40 to 100 cm depending on the iron content in the water and the performance characteristics of the filters. High strength and density, low consumption of PRZ ensure efficiency of backwashing and its long service life, at least 3 years.

### ▶ PACKAGING

PRZ is packed into 10 and 25 kg polypropylene bags with polyethylene liners.

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