CEMENTING ADDITIVES

NRG

INTERNATIONAL CHEMICALS TRADING

Fluid Loss Control Additives

NRG-FLOSS 304

SYNTHETIC FLUID LOSS AND GAS MIGRATION CONTROL ADDITIVE

PRODUCT DESCRIPTION

Fluid loss control agents are used in well cement compositions to reduce the fluid loss from the cement compositions to permeable formations or zones into or through which the cement compositions are pumped. Fluid loss and gas migration control additive NRG-FLOSS 304 makes the process of cementing oil and gas wells technological and reliable. NRG-FLOSS 304 effectively reduces the filtration rate in the field condition and increses the stability of cement system.

BENEFITS

- Effectively reduces the filtration loss of cement slurry.
- Works consistently at both low and high temperatures.
- Secondary effect is gas migration control, can be considered as a replacement for latex.
- Salt-resistant and can be used in systems with NaCl up to 18%.
- Does not affect the strength set of cement stone.
- Compatible with all types of dispersants and the best efficiency can be achieved.

CHEMICAL COMPOSITION

NRG-FLOSS 304 is a synthetic copolymer of AMPS (2-acrylamido-2-methylpropanesulfonic acid).

PHYSICAL PROPERTIES

Appearance:
NRG FLOSS 304 P (powder type) - white to cream powder.
NRG FLOSS 304 L (liquid type) - viscous liquid with a yellow tinge.
Solubility in water: completely soluble, limited by final viscosity.

RECOMMENDATIONS FOR USE

NRG-FLOSS 304 is fully synthetic product and effective in a wide BHCT temperature range from 32°F to 410°F. Typical dosages for powder type from 0.2 to 1.0% by weight of cement, depending on the required filtration and rheology parameters.

PACKAGING AND STORAGE

NRG-FLOSS 304 P is packed in bags of 50 lb (22.68 kg), NRG-FLOSS 304 L - IBC 275 gal.
The product should be stored in a dry warehouse away from heating appliances and direct sunlight.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
Before using and applying the product in the laboratory or in the field, be sure to read the MSDS.

NRG INTERNATIONAL CHEMICALS
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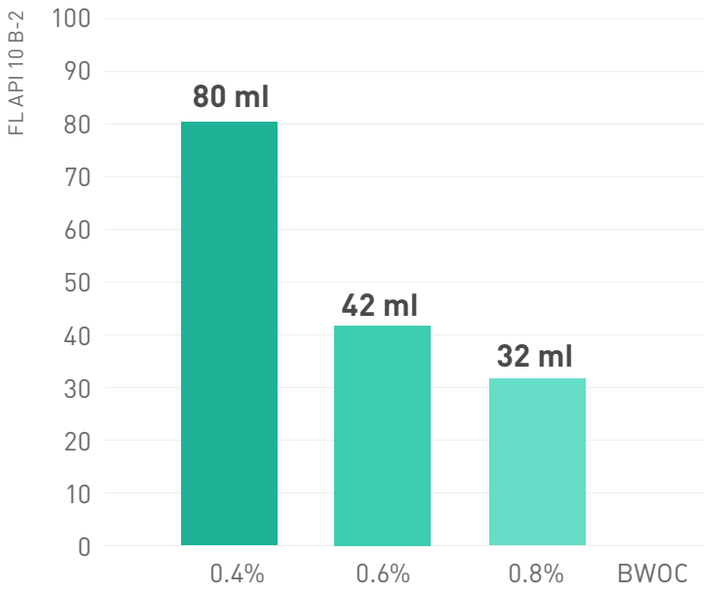
Fluid Loss Control Additives

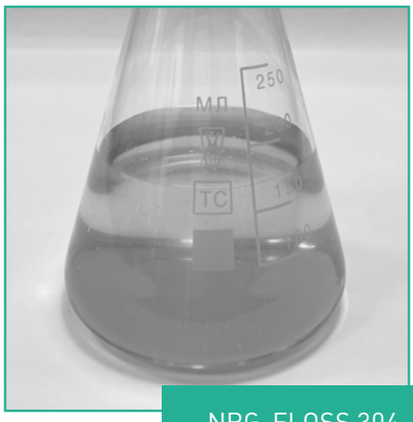
NRG-FLOSS 304

PROVIDES EXCELLENT FLUID LOSS CONTROL



The graph shows a decrease in the filtration loss of cement slurry with a density of 16 ppg (1.92 g/cm^3) at BHCT 150°F (65°C) with an increase in the dosage of the NRG-FLOSS 304-P product from 0.4% to 0.8% bwoc

NRG-FLOSS 304 - P
Fine White Powder



NRG-FLOSS 304 - L
Viscous Liquid

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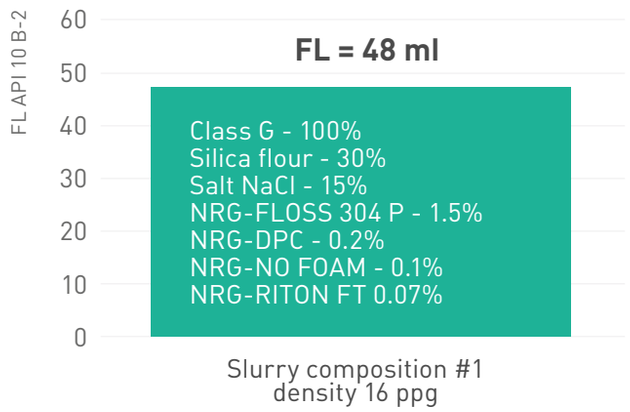
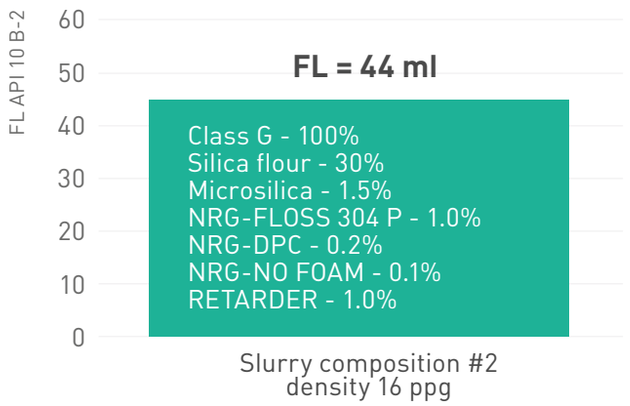
Fluid Loss Control Additives

NRG-FLOSS 304

EXCELLENT EFFICIENCY IN SALT-SATURATED SYSTEM AND AT HIGH TEMPERATURES

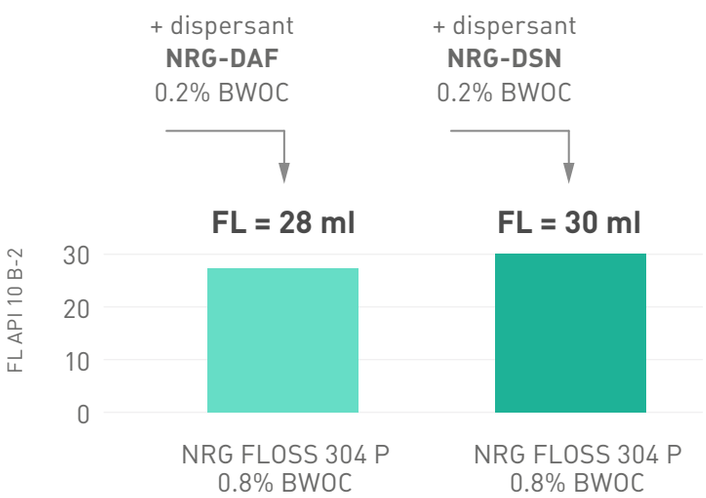


Fluid loss control test at 185°F (85°C) performed with NRG FLOSS 304-P in the presence of a salt content (sodium chloride), as indicated in the following composition #1. The test result shows a good filtration control of the FL product even with a NaCl content of up to 15%



Fluid loss control test at 392°F (200°C) performed with NRG FLOSS 304-P at high temperatures, as indicated in the following composition #2, shows efficiency of fluid loss controll additive.

COMPATIBLE WITH DISPERSANTS OF VARIOUS CHEMICAL NATURE



Fluid loss control test at 140°F (60°C) performed with NRG FLOSS 304-P in the presence of different chemical types of dispersants

The test result shows a compatibility of fluid loss control additive with dispersants

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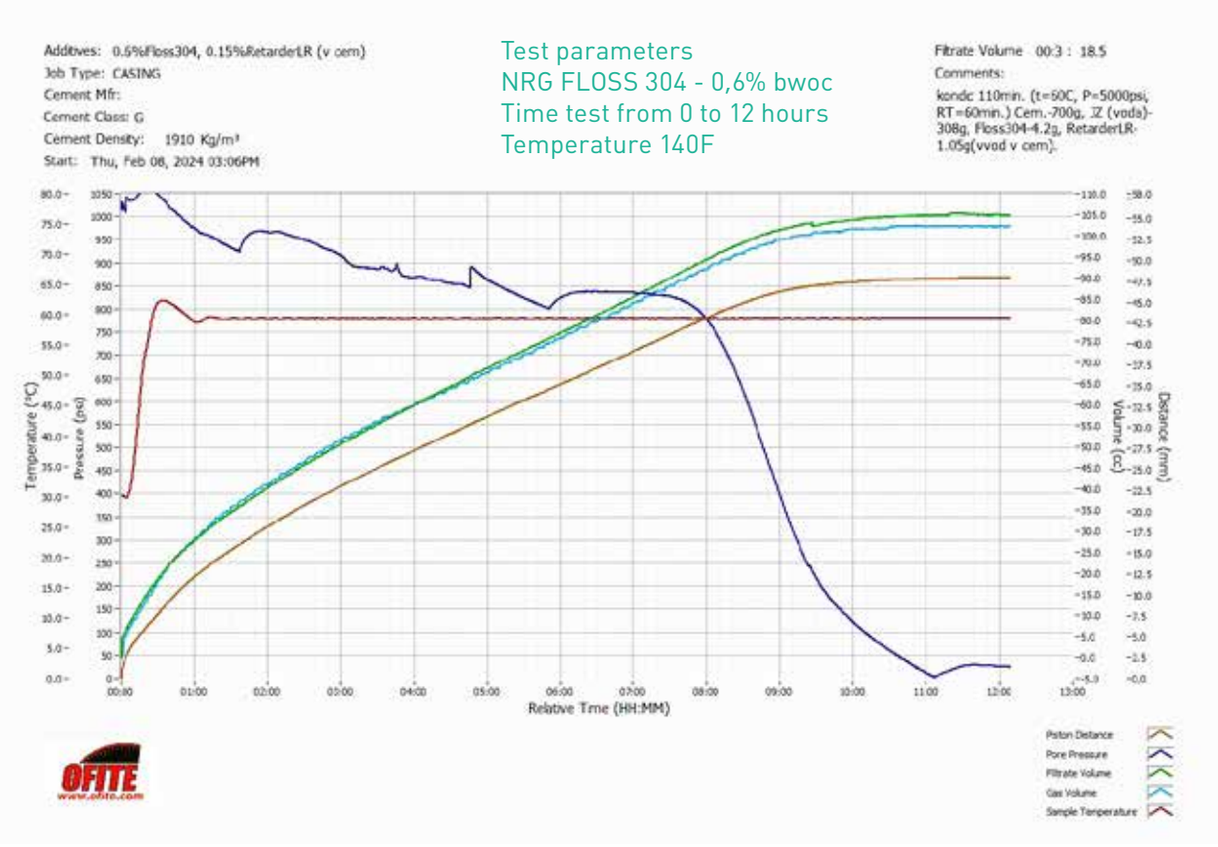
Fluid Loss Control Additives

NRG-FLOSS 304

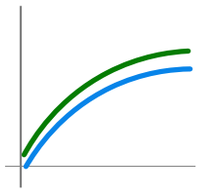
PROVIDES GAS MIGRATION CONTROL ALTERNATIVE REPLACEMENT FOR LATEX SYSTEMS

Gas migration tester OFITE 120-57 and testing procedure allows real-time measurement of gas migration during the critical period during cement setting, i.e. during its transition from liquid to solid state, when gas penetration is most likely



The Gas Volume graph line and the Filtrate Volume graph line go together.

There are no sharp jumps characteristic of flashing cement slurry with gas.



Test passed.
No migration.

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Fluid Loss Control Additives

NRG-FLOSS 500

FLUID LOSS AND GAS MIGRATION CONTROL ADDITIVE

PRODUCT DESCRIPTION

Fluid loss control agents are used in well cement compositions to reduce the fluid loss from the cement compositions to permeable formations or zones into or through which the cement compositions are pumped. Fluid loss additive NRG-FLOSS 500 makes the process of cementing oil and gas wells technological and reliable. NRG-FLOSS 500 effectively reduces the filtration rate in the field condition and increses the stability of cement system. The secondary effect from using fluid loss additive NRG-FLOSS 500 is control of gas migration.

BENEFITS

- Effectively reduces the filtration of cement slurry.
- Does not affect the thickening time of the cement slurry and the timing of the strength of the stone.
- Performs the function of a gas micgration control agent, preventing and blocking the migration of interplastic fluids, by reducing the time of phase transition.
- Increases the sedimentation stability of the cement composition.
- Remains effective in the presence of high concentrations of sodium and calcium chlorides.
- Compatible with most dispersants and all types of cements.

CHEMICAL COMPOSITION

NRG-FLOSS 500 is a copolymer of AMPS (2-acrylamido-2-methylpropanesulfonic acid).

PHYSICAL PROPERTIES

Appearance: white powder.
Solubility in water: completely soluble, limited by final viscosity.
Molecular weight: 80 000 – 100 000.

RECOMMENDATIONS FOR USE

NRG-FLOSS 500 is functional in a wide BHCT temperature range from 0 to 200°C (392°F). Recommended dosages range from 0.2 to 1.0% by weight of cement, depending on the required filtration and rheology parameters. It's possible to add an additive both into the cement directly and into the mixing water. For very high temperatures should be increased the dosage of fluid loss control agent up to 1%, and in cement designs typically included 25 to 40% additional crystalline silica to help prevent loss of compressive strength and an increase in permeability.

PACKAGING AND STORAGE

NRG-FLOSS 500 is packed in bags of 22.68 kg (50 lb).
The product should be stored in a dry warehouse away from heating appliances and direct sunlight.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
More detailed information is contained in the safety data sheet for the product.

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Fluid Loss Control Additives

NRG-FLOSS 600

FLUID LOSS AND GAS MIGRATION CONTROL ADDITIVE

PRODUCT DESCRIPTION

Fluid loss control agents are used in well cement compositions to reduce the fluid loss from the cement compositions to permeable formations or zones into or through which the cement compositions are pumped. Fluid loss additive NRG-FLOSS 600 makes the process of cementing oil and gas wells technological and reliable. NRG-FLOSS 600 effectively reduces the filtration rate in the field condition and increses the stability of cement system. The secondary effect from using fluid loss additive NRG-FLOSS 600 is control of gas migration.

BENEFITS

- Effectively reduces the filtration of cement slurry.
- Does not affect the thickening time of the cement slurry and the timing of the strength of the stone.
- Performs the function of a gas micgration control agent, preventing and blocking the migration of interplastic fluids, by reducing the time of phase transition.
- Increases the sedimentation stability of the cement composition.
- Remains effective in the presence of high concentrations of sodium and calcium chlorides.
- Compatible with most dispersants and all types of cements.

CHEMICAL COMPOSITION

NRG-FLOSS 600 is a copolymer of AMPS (2-acrylamido-2-methylpropanesulfonic acid).

PHYSICAL PROPERTIES

Appearance: white powder.
Solubility in water: completely soluble, limited by final viscosity.
Molecular weight: 100 000 – 120 000.

RECOMMENDATIONS FOR USE

NRG-FLOSS 600 is functional in a wide BHCT temperature range from 0 to 200°C (392°F). Recommended dosages range from 0.2 to 1.0% by weight of cement, depending on the required filtration and rheology parameters. It's possible to add an additive both into the cement directly and into the mixing water.

PACKAGING AND STORAGE

NRG-FLOSS 600 is packed in bags of 22.68 kg (50 lb).
The product should be stored in a dry warehouse away from heating appliances and direct sunlight.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
More detailed information is contained in the safety data sheet for the product.

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Fluid Loss Control Additives

NRG-FLOSS 110

FLUID LOSS CONTROL VISCOSIFIER

PRODUCT DESCRIPTION

NRG-FLOSS 110 is a fluid loss control agent, which effectively reduces filtration in fresh and unsaturated systems. NRG-FLOSS 110 is recommended for use in the cementing processes of oil and gas wells. The product is functional in the temperature range from 50°F to 212°F.

BENEFITS

- Reduces free water and system's separation:
  high-viscosity grade HV is recommended for use in lightweight cement and spacer system.
- Slows down the setting time of the cement slurry, which has a positive effect at elevated temperatures.
- Gives sedimentation stability by increasing viscosity.
- Tolerant to unsaturated systems.

CHEMICAL COMPOSITION

NRG-FLOSS 110 is an additive based on cellulose esters of various degrees of viscosity
(LV - low-viscosity, MV - medium-viscosity and HV - high-viscosity).

PHYSICAL PROPERTIES

Appearance: white to cream powder.
Solubility in water: completely soluble, limited by final viscosity.

RECOMMENDATIONS FOR USE

NRG-FLOSS 110 is effective at dosades from 0.05 to 1.0% bwoc depends on required viscosity of slurry and grade of NRG-FLOSS (LV, MV, HV).

Grade of product	Lead Slurry	Tail Slurry	Spacer
NRG FLOSS HV	0.2 - 0.7%	0.04-0.15%	0.2 - 2.0%
NRG FLOSS MV	0.4 - 1.0%	0.05 - 0.3%	-
NRG FLOSS LV	-	0.1-0.4%	-

PACKAGING AND STORAGE

NRG-FLOSS 110 is packed in bags of 55 lb (25 kg).
The product should be stored in a dry warehouse away from heating appliances and direct sunlight.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
More detailed information is contained in the safety data sheet for the product.

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Fluid Loss Control Additives

NRG-FLOSS 217

SYNTHETIC FLUID LOSS AND GAS MIGRATION CONTROL ADDITIVE

PRODUCT DESCRIPTION

Fluid loss control agents are used in well cement compositions to reduce the fluid loss from the cement compositions to permeable formations or zones into or through which the cement compositions are pumped. Fluid loss and gas migration control additive NRG-FLOSS 217 makes the process of cementing oil and gas wells technological and reliable. NRG-FLOSS 217 effectively reduces the filtration rate in the field condition and viscosity of cement slurries.

BENEFITS

- Effectively reduces the filtration loss of cement slurry.
- Dispersing effect to improve rheological behavior and reduce viscosity of cement slurries.
- Temperature range application from 32 up to 356°F (180°C) BHCT.
- Applicable in fresh water and salt water.
- Provides short thickening transition period and helps to control gas migration.
- Compatible well with other additives includes lignosulfonate based retarder.
- Soluble in cold water, dry or water mixed when applied and water quality is not required.

CHEMICAL COMPOSITION

NRG-FLOSS 217 is a grafted copolymer of AMPS (2-acrylamido-2-methylpropanesulfonic acid).

PHYSICAL PROPERTIES

Appearance: brown to black powder.
Solubility in water: completely soluble, limited by final viscosity.

RECOMMENDATIONS FOR USE

NRG-FLOSS 217 is fully synthetic product and effective up to 356°F (180°C) BHCT. Typical dosage is from 0.5 to 1.0% by weight of cement, depending on the required filtration and rheology parameters. For high temperature and salt saturated system the loading of NRG FLOSS 217 coulb be increase up to 1.5% bwoc.

In addition, NRG-FLOSS 217 shows a dispersing effect, it is necessary to take into account the content of the dispersant or the rheological properties of the cement system as a whole.

PACKAGING AND STORAGE

NRG-FLOSS 217 is packed in bags of 55 lb (25 kg).
The product should be stored in a dry warehouse away from heating appliances and direct sunlight.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
Before using and applying the product in the laboratory or in the field, be sure to read the MSDS.

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Retarders

NRG-RETARDER LR

LIGNOSULFONATE RETARDER FOR LOW TEMPERATURES

PRODUCT DESCRIPTION

The principal objective of well cementing operations is to formulate a cement that is pumpable for a time sufficient for placement in the annulus, develops strength within a few hours after placement and remains durable throughout the well's lifetime. Using NRG-RETARDER LR for low circulating temperatures up to 176°F (80°C), allows to extend the time during which a cement slurry is pumpable.

BENEFITS

- Effectively delays the thickening time (TT) of the cement slurry.
- Compatible with all cement classes.
- Helps reduce water filtration in combination with fluid loss additives.
- Predicted correlation of the dosage and TT.
- As a positive secondary effect reduces the viscosity of the cement slurry.
- Available in dry and liquid forms.

CHEMICAL COMPOSITION

NRG-RETARDER LR is a mixture of modified lignosulfonates.

PHYSICAL PROPERTIES

Appearance: yellow to brown powder.
Solubility in water: soluble.

RECOMMENDATIONS FOR USE

NRG-RETARDER LR is effective at dosages from 0.10 to 0.80% by weight of cement. The choice of the optimal concentration depends on the temperature of use and the composition of the cement slurry. It's possible to add the product both into the cement directly and into the mixing liquid.

PACKAGING AND STORAGE

NRG-RETARDER LR is packed in bags of 55 lb (25 kg).
The product should be stored in a dry warehouse away from heating appliances and direct sunlight.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
Before using and applying the product in the laboratory or in the field, be sure to read the MSDS.

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Retarders

NRG-RETARDER LR

EFFECT OF RETARDER ON THICKENING TIME AND FLUID LOSS CONTROL

Parameter	Slurry #1	Slurry #2	Slurry #3
Components			
Cement G class	100%	100%	100%
Water	44%	44%	44%
Fluid loss NRG FLOSS 600	0.6% BWOC	0.6% BWOC	0.6% BWOC
Dispersant NRG DPC	0.1% BWOC	0.1% BWOC	0.1% BWOC
Retarder NRG-RETARDER LR	**-**	**0.1% BWOC**	**0.2% BWOC**
Slurry Density	16 ppg	16 ppg	16 ppg
API Fluid Loss (doubled)	46 ml	44 ml	46 ml
Temperature	149°F (65°C)	149°F (65°C)	149°F (65°C)
Thickening Time			
Consistency 30 Bc	**1 h 27 min**	**2 h 34 min**	**4 h 31 min**
Consistency 70 Bc	1 h 39 min	2 h 43 min	4 h 45 min
Consistency 100 Bc	1 h 41 min	2 h 44 min	4 h 48 min

The test result shows that using product NRG-RETARDER LR allows to increase the Thickening Time. The dosage step of 0.1% bwoc increases the predictability of the use of the retarder obtaining the necessary TT for cementing.

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Retarders

NRG-RETARDER LMR

LIGNOSULFONATE RETARDER FOR LOW AND MIDDLE TEMPERATURES

PRODUCT DESCRIPTION

The principal objective of well cementing operations is to formulate a cement that is pumpable for a time sufficient for placement in the annulus, develops strength within a few hours after placement and remains durable throughout the well's lifetime. Using NRG-RETARDER LMR for low and moderate circulating temperatures up to 248°F (120°C), allows to extend the time during which a cement slurry is pumpable.

BENEFITS

- Effectively delays the thickening time (TT) of the cement slurry.
- Compatible with all cement classes.
- Helps reduce water filtration in combination with fluid loss additives.
- Predicted correlation of the dosage and TT.
- As a positive secondary effect reduces the viscosity of the cement slurry.
- Available in dry and liquid forms.

CHEMICAL COMPOSITION

NRG-RETARDER LMR is a mixture of modified lignosulfonates.

PHYSICAL PROPERTIES

Appearance: brown powder.
Solubility in water: soluble.

RECOMMENDATIONS FOR USE

NRG-RETARDER LMR is effective at dosages from 0.10 to 0.70% by weight of cement. The choice of the optimal concentration depends on the temperature of use and the composition of the cement slurry. It's possible to add the product both into the cement directly and into the mixing liquid.

PACKAGING AND STORAGE

NRG-RETARDER LMR is packed in bags of 44 lb (20 kg).
The product should be stored in a dry warehouse away from heating appliances and direct sunlight.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
Before using and applying the product in the laboratory or in the field, be sure to read the MSDS.

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Retarders

NRG-RITON FT

ORGANIC RETARDER FOR MODERATE TEMPERATURES

PRODUCT DESCRIPTION

The principal objective of well cementing operations is to formulate a cement that is pumpable for a time sufficient for placement in the annulus, develops strength within a few hours after placement and remains durable throughout the well's lifetime. Using NRG-RITON FT for low and moderate circulating temperatures up to 266°F (130°C), allows to extend the time during which a cement slurry is pumpable.

BENEFITS

- Effectively delays the thickening time (TT) of the cement slurry.
- Additionally reduces the viscosity of the cement slurry.
- Workable in a temperature range up to 266°F (130° C).
- Easily and fully soluble even in cold water.
- Cost-effective for the formulation of cement composition due to low dosages.

CHEMICAL COMPOSITION

NRG-RITON FT is a mixture of salts of organic acids.

PHYSICAL PROPERTIES

Appearance: fine white to beige powder.
Solubility in water: fully soluble.

RECOMMENDATIONS FOR USE

NRG-RITON FT is effective at low dosages from 0.02 to 0.50% by weight of cement. The choice of the optimal concentration depends on the temperature of use and the required thickening time. Increased dosages should be used at higher temperatures.

At temperatures below 194°F (90°C), the product dosage step is 0.05% bwoc. Recommendations for dosages of less than 0.1% bwoc, it is preferable to add the additive to the liquid before mixing with cement.

PACKAGING AND STORAGE

NRG-RITON FT is packed in bags of 55 lb (25 kg).
The product should be stored in a dry warehouse away from heating appliances and direct sunlight.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
Before using and applying the product in the laboratory or in the field, be sure to read the MSDS.

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Dispersants

NRG-DPC

HIGHLY EFFECTIVE LOW-DOSAGE DISPERSANT

PRODUCT DESCRIPTION

Dispersant NRG-DPC is used primarily to lower the frictional pressures of cement slurries while they are being pumped into the well. Converting frictional pressure of a slurry, during pumping, reduces the pumping rate necessary to obtain turbulent flow for specific well conditions, reduces surface pumping pressures and horsepower required to pump the cement into the well, and reduces pressures exerted on weak formations, possibly preventing circulation losses. NRG-DPC is a highly effective polymer-based dispersant.

BENEFITS

- Highly effective at low dosages.
- Compatible with all classes of cements and additives.
- Shows the secondary effect of slowing down the thickening time of the cement slurry.
- Can be injected both into the dry cement and into the mixing liquid.
- Exhibits a synergistic effect when used in combination with fluid loss control additives.

CHEMICAL COMPOSITION

NRG-DPC is a synthetic polymer based on polycarboxylate esters.

PHYSICAL PROPERTIES

Appearance: light cream colored powder.
Solubility in water: soluble.

RECOMMENDATIONS FOR USE

NRG-DPC is functional in a wide temperature range from 32°F to 302°F (150°C). The typical dosages of the product range from 0.05 to 0.5% by weight of cement.

PACKAGING AND STORAGE

NRG-DPC is packed in bags of 55 lb (25 kg).
The product should be stored in a dry warehouse away from heating appliances and direct sunlight.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
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Dispersants

NRG-DPC

EFFECT OF DISPERSANT ON RHEOLOGY, THICKENING TIME AND FLUID LOSS CONTROL

Parameter	Slurry #1	Slurry #2	Slurry #3
<u>Components</u>			
Cement G class	100%	100%	100%
Water	44%	44%	44%
Fluid loss NRG FLOSS 600	0.6% BWOC	0.6% BWOC	0.6% BWOC
Dispersant NRG-DPC	**-**	**0.1% BWOC**	**0.2% BWOC**
Slurry Density	16 ppg	16 ppg	16 ppg
API Fluid Loss (doubled)	54 ml	50 ml	44 ml
Temperature	185°F (85°C)	185°F (85°C)	185°F (85°C)
<u>Rheology</u>			
PV	90 cP	93 cP	85.5 cP
YP	12.5 lbf/100ft2	15.8 lbf/100ft2	7.1 lbf/100ft2
<u>Thickening Time</u>			
Consistency 30 Bc	1 h 24 min	1 h 53 min	2 h 30 min
Consistency 70 Bc	1 h 35 min	2 h 06 min	2 h 38 min
Consistency 100 Bc	1 h 41 min	2 h 08 min	2 h 40 min

The test result shows that using product NRG-DPC allows to improve rheology behaviour of cement slurry and to achieve better properties in fluid loss control and TT regulation.

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Dispersants

NRG-DAF

DISPERSANT
RHEOLOGY MODIFIER

PRODUCT DESCRIPTION

NRG-DAF is a dispersant which provides the viscosity decrease and allows to form the turbulent flow at lower pumping rates.

BENEFITS

- Effective viscosity reduction.
- Fluid loss control improvement.
- Early compressive strenght build-up.
- Can be used in fresh and salty cement systems.

CHEMICAL COMPOSITION

NRG-DAF is a synthetic polymer based on acetone formaldehyde derivatives.

PHYSICAL PROPERTIES

Appearance: red brown powder.
pH: 8.0-12.0.
Bulk density: 450-650 kg/m^3.
Solubility in water: soluble.
Moisture content: less 10%.

RECOMMENDATIONS FOR USE

NRG-DAF is recommended to use in wide range of cement slurry densities and at temperatures up to 302°F (150°C). The working dosages of the product range from 0.1 to 0.6% by weight of cement.

PACKAGING AND STORAGE

NRG-DAF is packed in bags of 55 lb (25 kg) bags.
The product should be stored in a dry warehouse away from heating appliances and direct sunlight.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
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Dispersants

NRG-DSN

DISPERSANT
RHEOLOGY MODIFIER

PRODUCT DESCRIPTION

NRG-DSN is a dispersant which provides the viscosity decrease and allows to form the turbulent flow at lower pumping rates.

BENEFITS

- Effective viscosity reduction.
- Increases the setting time of the cement slurry.
- Optimal cost with its good functionality.
- Compatible with most additives for well cementing.

CHEMICAL COMPOSITION

NRG-DSN is a synthetic polymer based on naphthalene derivatives.

PHYSICAL PROPERTIES

Appearance: brown powder.
Solubility in water: soluble.

RECOMMENDATIONS FOR USE

NRG-DSN is recommended to use in wide range of cement slurry densities and at temperatures up to 212°F (100°C). The working dosages of the product range from 0.2 to 0.8% by weight of cement.

PACKAGING AND STORAGE

NRG-DSN is packed in bags of 55 lb (25 kg). The product should be stored in a dry warehouse away from heating appliances and direct sunlight.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
More detailed information is contained in the safety data sheet for the product.

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website: www.nrg-int.com, email: info@nrg-int.com

Spacers and Pre-flush Agents

NRG-WP SPACER

DRILLING MUD REMOVING SPACER

PRODUCT DESCRIPTION

NRG-WP SPACER is a gelling agent used in the preparation of rheological spacer compositions. The product is designed for optimal separation of flushing fluids and complete displacement of drilling mud. NRG-WP SPACER allows you to effectively prepare the wellbore before cementing and improve the quality of well construction.

BENEFITS

- Excellent retention of the ultimate shear stress.
- The ability to regulate the density of the solution by including weighting additives (barite, hematite, etc.)
- High load-bearing and displacing capacity.
- Applicable up to 176°F (80°C).
- Does not contain hazardous materials.

CHEMICAL COMPOSITION

NRG-WP SPACER is a complex mixture of several components: gelling agents, dispersants and stabilizers.

PHYSICAL PROPERTIES

Appearance: grey powder.
Solubility in water: fully hydrated.

RECOMMENDATIONS FOR USE

NRG-WP SPACER is effective at dosages from 10 to 50 kg per 1000 liters of water. The optimal concentration is selected under laboratory conditions and depends on the type of drilling fluid used and the contact time.

PACKAGING AND STORAGE

NRG-WP SPACER is packed in bags of 55 lb (25 kg). The product should be stored in closed undamaged packaging, in covered dry storage areas away from sunlight, heating devices and sources of moisture.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
More detailed information is contained in the safety data sheet for the product.

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Cement Extenders

NRG-G300

ALUMOSILICATE CENOSPHERES

PRODUCT DESCRIPTION

Cenospheres G-300, with a particle size of 300 microns, are lightweight, alumosilicate microspheres enhance the cement slurry's properties, improving its density and reducing overall weight. G-300 cenospheres contribute to cement's compressive strength, minimize fluid migration, and enhance thermal insulation. Their use in oil well cementing helps optimize the cement formulation, ensuring reliable and efficient wellbore integrity while meeting the stringent demands of the oil and gas industry.

BENEFITS

- Exhibits excellent results in problems related to water-based density adjustment.
- Increases slurry yield to improve cement volume.
- Provides a stable, light-weight, heat-insulating, rapidly hardening cement material.
- Enhances the rheological properties of drilling fluids.

CHEMICAL COMPOSITION

G-300 hollow alumosilicate cenospheres contain alumina, quartz and hematite.

PHYSICAL PROPERTIES

Appearance: solid grey powder.
True density: 0.75-0.85 g/cm^3.
Moisture: less 0.5% by mass.
Particle size: 100-300 μm - 70-90%.

RECOMMENDATIONS FOR USE

The optimal concentration is selected under laboratory conditions and depends on the formulation of cement slurry or drilling fluid system. When using the cenospheres, it is necessary to consider the increased water consumption.

PACKAGING AND STORAGE

G-300 is packed in FIBC or big bag of 1100 lbs or 500 kg. The product should be stored in closed undamaged packaging, in covered dry storage areas away from sunlight, heating devices and sources of moisture.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
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Spacers and Pre-flush Agents

NRG-D-SURF

LIQUID PRE-FLUSH ADDITIVES

PRODUCT DESCRIPTION

NRG-D-SURF is an effective two-component washing composition for preparing the wellbore before cementing, drilled using oil based drilling fluids. The product is used to displace hydrophobic drilling fluid and to change the type of wettability of the borehole surface from hydrophobic to hydrophilic.

BENEFITS

- High cleaning capacity.
- Microemulsion based on the two-component NRG-D-SURF system changes the wettability of the surface of the walls of the well to hydrophilic and contributes to the effective removal of the hydrocarbon film from the surface of the rock and column.
- Fully compatible with drilling and cementing systems.

CHEMICAL COMPOSITION

NRG-D-SURF A and B components are a mixture of specially selected surfactants.

PHYSICAL PROPERTIES

NRG-D-SURF A
Appearance: transparent viscous liquid.
Solubility in water: soluble.

NRG-D-SURF B
Appearance: transparent viscous liquid.
Solubility in water: soluble.

RECOMMENDATIONS FOR USE

NRG-D-SURF composition is effective when loading each of the components from 1.0 to 4.0% of the volume of water (the recommended dosage of the components is 2% each). The optimal concentration is selected under laboratory conditions and depends on the type of drilling fluid used and the contact time. Reagents must be added to the buffer solution at the minimum speed of the mixer to avoid foaming.

PACKAGING AND STORAGE

NRG-D-SURF is packed in plastic cans with a capacity of 8 gal (30 liters) or IBC drums 275 gal (1000 liters). The product should be stored in a dry warehouse away from heating appliances and direct sunlight.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
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Elasticizers

NRG-ELAST M

CEMENT MODIFIER, ELASTICIZER

PRODUCT DESCRIPTION

Elasticizer NRG-ELAST-M is a special material that is used as an additive for cement in order to give elasticity and reduce cracking during deformations after solidification. The product is recommended to be used in the construction of oil and gas wells as a component of cement system, especially in the intervals where hydraulic fracturing or perforation operations are planned. The introduction of NRG-ELAST-M makes it possible to increase the resistance of cement stone to impact bending loads.

BENEFITS

- Gives elasticity to cement stone.
- Improves the structural and mechanical properties.
- Allows to reduce the Young's modulus to 5 GPa and below.
- Increases resistance to cracking and improves adhesion.

CHEMICAL COMPOSITION

Elasticizer NRG-ELAST-M is a mixture of copolymers of butadiene and styrene.

PHYSICAL PROPERTIES

Appearance: dark powder with white inclusions.
Solubility in water: not soluble.

RECOMMENDATIONS FOR USE

NRG-ELAST-M is workable in a wide temperature range up to 302°F (150°C).
It's effective when loading from 5% by weight of cement. The optimal dosage of the elsticizer is selected in the laboratory as part of the cement system formulation.

PACKAGING AND STORAGE

NRG-ELAST-M is packed in bags of 55 lb (25 kg) or FIBC. The product should be stored in closed undamaged containers, in covered dry storage space away from heating devices and sources of moisture. After the package has been opened, it should be carefully closed to avoid contamination of the product.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
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Lost Circulation Materials

NRG-LCM GLASS

LOST CIRCULATION MATERIAL

PRODUCT DESCRIPTION

NRG-LCM GLASS is a lost circulation material, it'a recommended to use in the processes of drilling and cementing wells in the presence of highly permeable or weak, prone to hydraulic fracturing horizons of the well in order to prevent leakage of the borehole and maintain the circulation of the technological solution, ensuring the design height of cement lifting behind the column.

BENEFITS

- Effective lost circulation material for technological fluids.
- Can be used in drilling and cementing operations.
- Improves the strength properties of cement stone (for bending).
- Compatible with any class of cement in the oil and gas industry.
- Does not affect the thickening time of the cement slurry.
- Non-toxic, environmentally friendly.
- 100% pure material without impurities.
- Enhances the effect of other LCM products.

PHYSICAL PROPERTIES

Appearance: white rigid fiber.
Length of fibers: from 3 to 12 mm.
Solubility in water: insoluble.

RECOMMENDATIONS FOR USE

NRG-LCM GLASS is effective at dosages from 0.5 kg to 5.0 kg/m^3 of solution, depending on the existing or expected absorption intensity.

PACKAGING AND STORAGE

NRG-LCM GLASS is packed in bags weighing up to 66 lb (30 kg). Bags are formed into a pallet. The product should be stored in closed undamaged packaging, in covered dry storage areas away from heating devices and sources of moisture.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
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Free Water Control Additives

NRG-FFC

ANTI-SETTLING ADDITIVE

PRODUCT DESCRIPTION

As a remedy to the cement slurry overdispersion and free water problem, an anti-settling additive NRG-FFC, known as free water control additive, uses in the cement formulation. NRG-FFC helps particles and solids in the slurry to remain suspended. The product helps overcome the potential for fluid to develop at the top of a slurry column or on the high side of deviations in a highly deviated well or a horizontal wellbore.

BENEFITS

- Enhances cement slurry performance through free water control.
- Prevents solids from settling in cement system.
- Increases viscosity and helps to stabilize the cement slurry.
- Mildly retards the setting time of cement stone.
- Excellent solution for spacers to prevent sedimentation of particles.

CHEMICAL COMPOSITION

NRG-FFC is a composition based on polysaccharides.

PHYSICAL PROPERTIES

Appearance: white powder.
Solubility in water: completely soluble, limited by final viscosity.

RECOMMENDATIONS FOR USE

NRG-FFC is used at temperatures up to 212°F (100°C). Recommended dosages range from 0.02 to 0.3% for cement slurries, and from 0.5 to 3.0% for spacer compositions.

PACKAGING AND STORAGE

NRG-FFC is packed in bags of 55 lb (25 kg). The product should be stored in closed undamaged packaging, in covered dry storage areas away from heating devices and sources of moisture.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
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Anti Settling Agents

NRG-ASA 150

SUSPENDING ADDITIVE

PRODUCT DESCRIPTION

NRG-ASA 150 is an anionic guar derivative used as an ati-settling agent for oil and gas industry. The product is developed to reduce free water, sedimentation, and density gradation collectively called slurry instability in cement slurries and hydraulic fracturing fluids to suspend proppant. It provides this stability improvement with varying increases in rheological values depending on the slurry design.

BENEFITS

- High free water and settli ng control in cementing and fracturing fluids.
- Effective for all water & brine-based fluid systems.
- Applied at temperatures up to 302°F (150°C).
- Compatibility with various of oil well cements and additives.

CHEMICAL COMPOSITION

NRG-ASA 150 is a modified guar gum from carboxymethyl hydroxypropyl ether.

PHYSICAL PROPERTIES

Appearance: white to beige powder.
Specific gravity: 2.52.
Moisture: less 10%.
Solubility in water: soluble.

RECOMMENDATIONS FOR USE

The standard NRG-ASA-150 concentration range for correcting cementing slurry instability is 0.1 to 1.5% bwoc which will stabilize slurries from 12 to 22 ppg. Beyond this concentration range, the slurry rheological values are affected to varying degrees.

PACKAGING AND STORAGE

NRG-ASA 150 is packed in 55 lbs (25 kg) bags. The product should be stored in closed undamaged packaging, in covered dry storage areas away from sunlight, heating devices and sources of moisture.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
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Defoaming Agents

NRG-NO FOAM

LIQUID DEFOAMING AGENT

PRODUCT DESCRIPTION

NRG-NO FOAM is a high-quality frost-resistant defoamer designed to prevent foaming and remove already formed foam in drilling fluids, hydraulic fracturing fluids and cement slurries containing polymer additives, fresh or salt water.

BENEFITS

- Effective defoamer for cement and drilling systems.
- Compatible with all classes of cement and additives.
- Prevents the formation and provides rapid removal of already formed foam.

CHEMICAL COMPOSITION

An organic compound made of branched alchocol.

PHYSICAL PROPERTIES

Appearance: clear colorless liquid.
Density at 25°C: 0.80 – 0.95 g/cm^3.
Solubility in water: completely dispersed.

RECOMMENDATIONS FOR USE

NRG-NO FOAM is functional in a wide range of temperatures. Effective dosages from 0.02%. The optimal dosage in the solution is selected in the laboratory, depending on the components used and their tendency to foaming.

PACKAGING AND STORAGE

Defoamer NRG-NO FOAM is packed in plastic cans with a capacity of 30 liters or eurocubes with a capacity of 1000 liters. The product should be stored in closed undamaged packaging, in covered dry storage areas away from heating devices and sources of moisture.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
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Defoaming Agents

NRG-DFA-100

LIQUID DEFOAMING AGENT

PRODUCT DESCRIPTION

NRG-DFA-100 is a high-quality and effective defoamer designed to prevent foaming and remove already formed foam in drilling fluids, hydraulic fracturing fluids and cement slurries containing polymer additives, fresh or salt water.

BENEFITS

- Effective defoamer for cement and drilling systems.
- Compatible with all classes of cement and additives.
- Prevents the formation and provides rapid removal of already formed foam.

CHEMICAL COMPOSITION

An organic compound made of polyesters.

PHYSICAL PROPERTIES

Appearance: colorless liquid.
Density at 25°C: 0.80 – 1.00 g/cm^3.
Solubility in water: completely dispersed.

RECOMMENDATIONS FOR USE

NRG-DFA-100 is functional in a wide range of temperatures. Effective dosages from 0.02%. The optimal dosage in the solution is selected in the laboratory, depending on the components used and their tendency to foaming.

PACKAGING AND STORAGE

Defoamer NRG-DFA-100 is packed in plastic cans with a capacity of 30 liters or eurocubes with a capacity of 1000 liters. The product should be stored in closed undamaged packaging, in covered dry storage areas away from heating devices and sources of moisture.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
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Defoaming Agents

NRG-DFA-150

LIQUID DEFOAMING AGENT FOR LATEX SYSTEM

PRODUCT DESCRIPTION

NRG-DFA-150 is a special designed defoaming agent helps to prevent foaming and remove already formed foam in drilling fluids and cement slurries containing polymer additives, especially latex polymers which tend to create bubbles while mixing.

BENEFITS

- Effective defoamer for cement and drilling systems.
- Compatible with all classes of cement and additives.
- Prevents the formation and provides rapid removal of already formed foam.

CHEMICAL COMPOSITION

NRG-DFA-150 is aqueous composition of polydimethylsiloxane and modified polysiloxane.

PHYSICAL PROPERTIES

Appearance: cloudy liquid.
Solubility in water: disperible and soluble.

RECOMMENDATIONS FOR USE

Effective dosages from 0.05-0.1%. The optimal dosage in the solution is selected in the laboratory, depending on the components used and their tendency to foaming. Should be avoided from freezing, and should be stirred or shaken well before use.

PACKAGING AND STORAGE

Defoamer NRG-DFA-150 is packed in 55 lb (25 kg) plastic drum and 160 kg plastic drums. The product should be stored in closed undamaged packaging, in covered dry storage areas away from heating devices and sources of moisture.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
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Defoaming Agents

NRG-FOAM STOP

POWDERED DEFOAMING AGENT

PRODUCT DESCRIPTION

NRG-FOAM STOP powder defoamer is designed and used to prevent foaming and remove the formed foam in drilling fluids, hydraulic fracturing fluids and cement slurries containing polymer additives, fresh or salt water.

BENEFITS

- Effective defoamer for cement and drilling systems.
- Compatible with all classes of cement and additives.
- Prevents the formation and provides rapid removal of already formed foam.
- Convenient for the preparation of well cementing mixes and premixes.

CHEMICAL COMPOSITION

NRG-FOAM STOP is an organic compound made of polyesters.

PHYSICAL PROPERTIES

Appearance: loose cream-colored powder.
Solubility in water: partially soluble.

RECOMMENDATIONS FOR USE

NRG-FOAM STOP product can be used in a wide range of temperatures. It's effective at dosages of 0.1% by weight of cement. The optimal dosage in the formulation is selected in the laboratory, depending on the components used and their tendency to foaming. The product should only be added to a dry mixture with cement.

PACKAGING AND STORAGE

NRG-FOAM STOP is packed in bags of 55 lb (25 kg). The bags are formed into a pallet. The product should be stored in closed undamaged packaging, in covered dry storage areas away from heating devices and sources of moisture.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
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Gas Blocking Agents

NRG-LXL 150

GAS MIGRATION CONTROL STYRENE-BUDATIENE LATEX

PRODUCT DESCRIPTION

NRG-LXL 150 is an emulsion of styrene-butadiene polymers supplied as a milk suspension of very small spherical polymer particles. Latex NRG-LXL 150 is used in well cementing operations as an effective additive to control gas migration during the transition period of cement setting. NRG-LXL 150 dispersion, containing about 45% solids, physically plug small pores in the cement filter cake and act as fluid loss control agent.

BENEFITS

- Excellent gas blocking agent.
- Provides fluid loss control in cement system.
- Improves the adhesive properties of cement stone and reduces its permeability.
- Applied at temperatures up to 302°F (150°C).
- Compatibility with various of oil well cements and additives.
- Free fluid is near to zero.

CHEMICAL COMPOSITION

NRG-LXL 150 is an aqueous dispersion of polymer copolymer made from butadiene, styrene and unsaturated carboxylic acid through emulsion polymerization.

PHYSICAL PROPERTIES

Appearance: milky white viscous liqud (suspension).
Odour: light chemical of rubber.
Solid content: 50%
Solubility in water: dispersed.
Viscosity (Brookfield LV, sp 2 at 30 RPM): less 1000 cps

RECOMMENDATIONS FOR USE

NRG-LXL 150 is a liquid product with typical dosage from 3 to 10% bwos or more. The optimal concentration is selected under laboratory tests and depends on the type of cement system, temperature, required properties of slurry and components inside.

PACKAGING AND STORAGE

NRG-LXL 150 is packed in plastic drums 160 kg. Other packaging according to the consent is possible.
The product should be stored in closed undamaged packaging, in covered dry storage areas away from sunlight, heating devices and sources of moisture.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
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Self-Healing Cement Complex Additive

NRG-SHC

SELF-HEALING CEMENT BASE ADDITIVE

PRODUCT DESCRIPTION

NRG-SHC is a special additive, a composition of chemical components, elaborated for the preparation of self-healing cement. It's designed for the preparation cement compositions required for cementing oil and gas wells under complex geological conditions subjected to stress mechanical loads caused to the cement stone within the drilling process and well operation, inter alia while carrying out the multi-stage hydraulic fracturing with the risk of resulting annular pressure and cross-flows due to the formation of crack channels.

BENEFITS

- Self-recovers under the action of hydrocarbons without any loss in strength parameters while maintaining impermeability of the annulus.
- Increases the adhesive parameters and imparts elastic properties to cement stone, low Young's modulus.
- Eliminates micro-gaps (up to 1000 microns) at cement column/cement rock.
- Prevents the behind-the-casing flow of hydrocarbons (petroleum, oil, gas, gas condensate).
- Minimizes the cost of repair and insulation works and the loss of profit due to production shutdown.
- Increases the serviceable life of the well and its overhaul period.

CHEMICAL COMPOSITION

Thermoplastic block copolymers, special additives.

PHYSICAL PROPERTIES

Physical form: grey powder.
Solubility in water: partially soluble.

RECOMMENDATIONS FOR USE

Can be used at temperatures from low tempetarures up to 392°F (200°C). The recommended effective complex additive concentration is within the range of 10 to 40% by weight of dry cement depending on the required cement slurry properties.

PACKAGING AND STORAGE

The product should be stored in closed undamaged containers, in covered dry storage space away from heating devices and sources of moisture. After the package has been opened, it should be carefully closed to avoid contamination of the product.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
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Lost Circulation Materials

NRG-LCM GLASS

LOST CIRCULATION MATERIAL

PRODUCT DESCRIPTION

NRG-LCM GLASS is a lost circulation material, it'a recommended to use in the processes of drilling and cementing wells in the presence of highly permeable or weak, prone to hydraulic fracturing horizons of the well in order to prevent leakage of the borehole and maintain the circulation of the technological solution, ensuring the design height of cement lifting behind the column.

BENEFITS

- Effective lost circulation material for technological fluids.
- Can be used in drilling and cementing operations.
- Improves the strength properties of cement stone (for bending).
- Compatible with any class of cement in the oil and gas industry.
- Does not affect the thickening time of the cement slurry.
- Non-toxic, environmentally friendly.
- 100% pure material without impurities.
- Enhances the effect of other LCM products.

PHYSICAL PROPERTIES

Appearance: white rigid fiber.
Length of fibers: from 3 to 12 mm.
Solubility in water: insoluble.

RECOMMENDATIONS FOR USE

NRG-LCM GLASS is effective at dosages from 0.5 kg to 5.0 kg/m^3 of solution, depending on the existing or expected absorption intensity.

PACKAGING AND STORAGE

NRG-LCM GLASS is packed in bags weighing up to 30 kg. Bags are formed into a pallet. The product should be stored in closed undamaged packaging, in covered dry storage areas away from heating devices and sources of moisture.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
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Chemical Extenders

NRG-SMA

CHEMICAL FILLER FOR FREE WATER CONTROL

PRODUCT DESCRIPTION

NRG-SMA is used as a chemical filler in cement compositions, in order to obtain lightweight cements and accelerate the strength gain of cement stone. Gives the cement slurry a gel-like structure, which helps to reduce water separation (free water control) and stabilize the dispersed phase.

BENEFITS

- Effectively copes with the control of free water.
- Stabilizes the dispersed phase and reduces the formation of sediment.
- Allows to increase the water-cement ratio and achieve low densities of cement slurry.
- Compatible with other fillers for obtaining lightweight solutions.

CHEMICAL COMPOSITION

The product is an anhydrous sodium salt of silicic acid.

PHYSICAL PROPERTIES

Appearance: white powder or granules.
Solubility in water: soluble.
Corrosion activity: when wetted with water or at high moisture.

RECOMMENDATIONS FOR USE

The recommended concentration of the additive is 0.3-3.0% by weight of dry cement, depending on density and final composition of cement slurry. The preferred method of introducing the additive is mixing into a dry cement mixture. The minimum density of cement composition treated with chemical filler NRG-SMA without other lightening additives is 1.45-1.50 g/cm^3.

It can be used as an accelerator in cement mortars of normal density, as well as in lightweight solutions using bentonite. At temperature above 122°F (50°C), the accelerator effect is particularly pronounced, which is important to take into account when selecting a cement slurry design.

PACKAGING AND STORAGE

NRG-SMA is packed in multilayer bags weighing 55 lb (25 kg). The product should be stored in closed undamaged packaging, in covered dry storage areas away from heating devices and sources of moisture.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
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Resin System for Plug and Abandonment

NRG-E-GUM

HIGH PERFORMANCE RESIN SEALANT

PRODUCT DESCRIPTION

Resin system NRG-E-GUM is strong materials for use in blocking and plugging unwanted fluid flow in the wellbore and the very near-wellbore region in the oilfield. Resin System exhibit the same flow-flowing property as cement, and can they be irreversibly set to hard, rigid, and solid.

NRG-E-GUM Resin System is a high-performance elastic polymer that functions as a dependable barrier to prevent fluid flow. NRG-E-GUM is a 4-component system (main composition contains resin, hardener, accelerator and plasticizer) and can be formulated depends on streght and elesticity properties. The main component of NRG-E-GUM System is special resin, the second is a hardener is used to react with resin and form cross-linking structure to improve compessive strength.

BENEFITS

- High performance sealant with excellent penetration.
- Wide compressive strength ranges.
- Increased adhesion strength.
- Strong chemical resistance to acids.
- Can be formulated as solids-free system or used as component of cement system.

CHEMICAL COMPOSITION

NRG-E-GUM is a 4-component epoxy-based resin system and special additives.

PHYSICAL PROPERTIES

Appearance: clear to dark amber liqud.
Target temperature range: up to 266°F (130°C).

RECOMMENDATIONS FOR USE

The optimal dosage and component composition is selected according to laboratory tests and in accordance with the client's requirements. NRG-E-GUM System Resin applications in plug and abandonment is squeezes for annular fluid flow, shut-off gas source and squeeze a previously leaking plug.

PACKAGING AND STORAGE

NRG-E-GUM is packed in drums, cans or IBC. The product should be stored in closed undamaged containers, in covered dry storage space away from heating devices and sources of moisture. After the package has been opened, it should be carefully closed to avoid contamination of the product.

SAFETY REQUIREMENTS

Personal protective equipment must be used when working with the product.
More detailed information is contained in the safety data sheet for the product.

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Gas Migration Preventers

NRG-GM EA

COMPRESSION TYPE GAS MIGRATION CONTROL AGENT

PRODUCT DESCRIPTION

NRG-GM-EA makes it possible to obtain a compressible cement composition to compensate for the shrinkage of cement stone during hydration and reduce hydrostatic pressure. The mechanism of action of the additive is based on the release of hydrogen during a delayed reaction in an alkaline environment. The gas is evenly distributed in the solution, increasing the volume and pressure inside the system, which prevents the formation of channels for the migration of reservoir fluids. Cement slurry fills the annulus space as much as possible due to expansion, which ensures a strong contact of cement with the column and rock and has a positive effect on the results of well cementing.

BENEFITS

- Compensates the cement stone shrinkage.
- Due to the passivation of the particles, the delayed action of the beginning of the reaction is achieved.
- Helps to prevent formation gas or liquids from leaking through the transitioning cement system during slurry to st one setting period.
- Prevents the formation of overflows during the transition time.
- Helps cement slurry to fill the annulus space as much as possible.
- Expansion effect provides a strong contact of cement with the column and the rock.

CHEMICAL COMPOSITION

NRG-GM-EA is a fine-grained metal powder coated with a passivating component.

PHYSICAL PROPERTIES

Appearance: grey powder.
Solubility in water: not soluble.

RECOMMENDATIONS FOR USE

The additive NRG-GM-EA is added only to dry cement mix. Working dosages are from 0.1 to 0.4% by weight of cement. During laboratory tests on pressure equipment (consistometers, HPHT filter presses, etc.), when using cement formulation with GM-EA, safety rules and work instructions should be strictly followed, since internal overpressure is created in the cell. Note that thickening time and compressive strength should be tested only under significant pressure. For thickening test when 100Bc will be achieved do not release the pressure and cool the temperature, cement slurry in the cell should set completely and become a stone. Only after few ours at least temperature could be cooled down and pressure could be released. While reassembling the cell if pressure in cell is observed, cool the cell down to room temperature, fill some bucket or something with water 5-10L and reassemble the cell in the water in case some pressure still in the cell. The same procedure with the UCA cell or with autoclave and molds.

PACKAGING AND STORAGE

NRG-GM-EA is packed in tin pails weighing 50 kg. The product should be stored in closed undamaged packaging, in covered dry storage areas away from heating devices and sources of moisture. Personal protective equipment must be used when working with the product. More detailed information is contained in the safety data sheet for the product.

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Hollow Glass Microspheres

NRG-GLASS BEADS

HOLLOW GLASS MICROSPHERES LIGHT-WEIGHT CEMENT SLURRIES

PRODUCT DESCRIPTION

High-performance glass bubble & hollow glass microspheres NRG-GLASS BEADS are a kind of ultra-lightweight inorganic non-metallic material with hollow structure, and it is a versatile and high-performance new lightweight material. Hollow Glass Microspheres NRG-GLASS BEADS are near perfect engineered spherical bubbles of thin walled glass, that are approximately 10 to 100 microns in size, with a really low density of between 0.1-0.6 g/cc.

BENEFITS

- Extremely lighter and stronger and help achieve higher strength-to-weight cement designs.
- Successfully and predictably reduce the control fluid density
- Helps reduce the density of control fluids, including cement slurries, completion and workover fluids.
- Incompressible and more homogeneous control fluid properties compared to aerated systems.
- Compatible with both water and oil based systems.

CHEMICAL COMPOSITION

The chemical nature of NRG-GLASS BEADS is soda-lime borosilicate glass.

PHYSICAL PROPERTIES

Appearance: white to transparent powder.
True density and Crush strength: depends on grade.
pH of the slurry: 8,0-9.5.
Moisure content: less 0.5%.
Mud acid solubility (by weight): 99.9%.

RECOMMENDATIONS FOR USE

Hollow glass microspheres NRG-GLASS BEADS are typically used as a functional filler due to their light weight and strength properties. The dosage of the product is selected depending on the requirements and design of the solution.

PACKAGING AND STORAGE

NRG-GLASS BEADS is packed in standard 50 lbs bag or jumbo bag. The product should be stored in closed undamaged packaging, in covered dry storage areas away from heating devices and sources of moisture. Personal protective equipment must be used when working with the product. Packing factor (ratio of bulk density to true particle density) 55%–65%. For 20GP container, the loading weight is 4,950 kg; for 40HQ container, the loading weight is 12,000 kg.

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HOLLOW GLASS MICROSPHERES LIGHT-WEIGHT CEMENT SLURRIES

RECOMMENDED GRADES OF GLASS MICROSPHERES FOR OIL&GAS INDUSTRY APPLICATION

Grade	True Density (g/cm^3)	Bulk Density (g/cm^3)	Crush Strength 90% Retention (Mpa/psi)
GB40	0.38-0.42	0.20-0.23	28/4000
GB40S	0.39-0.41	0.20-0.23	42/6000
GB46	0.44-0.48	0.23-0.26	42/6000
GB46S	0.45-0.47	0.24-0.27	69/10000
GB60	0.58-0.62	0.30-0.34	69/10000
GB60S	0.59-0.61	0.32-0.36	97/14000
GB16HS	0.45-0.47	0.24-0.27	110/16000
GB18HS	0.59-0.61	0.32-0.36	124/18000

Additional parameters:

Particle size D50: 30-40 microns
Oil absorption value: 0.2-0.6 g/ml
Thermal Conductivity: 0.02-0.06 (w/m·k) @ 20°C
pH Value: 8.0-9.5
Softening Point: 620°C

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