内蒙古乌恩齐石油工程技术有限公司

Product Manual

(Oilwell Cement Additives)

Version: V1.0

Release Date: 2025-10-12

Contents

WA-1S | Early Strength Additive for Oil Well Cement (Inorganic Salt Type)

Snapshot

- Moisture, % ≤ 13
- Fineness (0.315 mm residue, %) < 15
- Initial Consistency (32°C, 8.3 MPa, 10 min), Bc ≤ 30
- Ratio of Thickening Time (32°C, 8.3 MPa, 10 min) ≤ 0.5
- 6h Compressive Strength Ratio (39°C, atmospheric pressure), MPa ≥ 1.2
- 24h Compressive Strength Ratio (39°C, atmospheric pressure) ≥ 1.0
- Cement Slurry Composition: Class G Cement, WA-1S; Water: Distilled Water

Key Benefits

- Reduces thickening time and accelerates early strength development, supporting early production or well control requirements.
- Allows fine-tuning of pumpability and early sealing within the target temperature window through dosage adjustment.
- Compatible with fluid-loss control, dispersing, and stabilizing systems (subject to lab validation for each project).

Formulation Notes

- Typical System: Class G Cement + (as needed) Microsilica / Quartz Sand / Dispersant / Fluid-Loss Additive / Defoamer.
- Recommended Dosage: Expressed as %BWOC, to be calibrated by project testing considering temperature, salinity, and density factors.

Industry Reference (Illustrative)

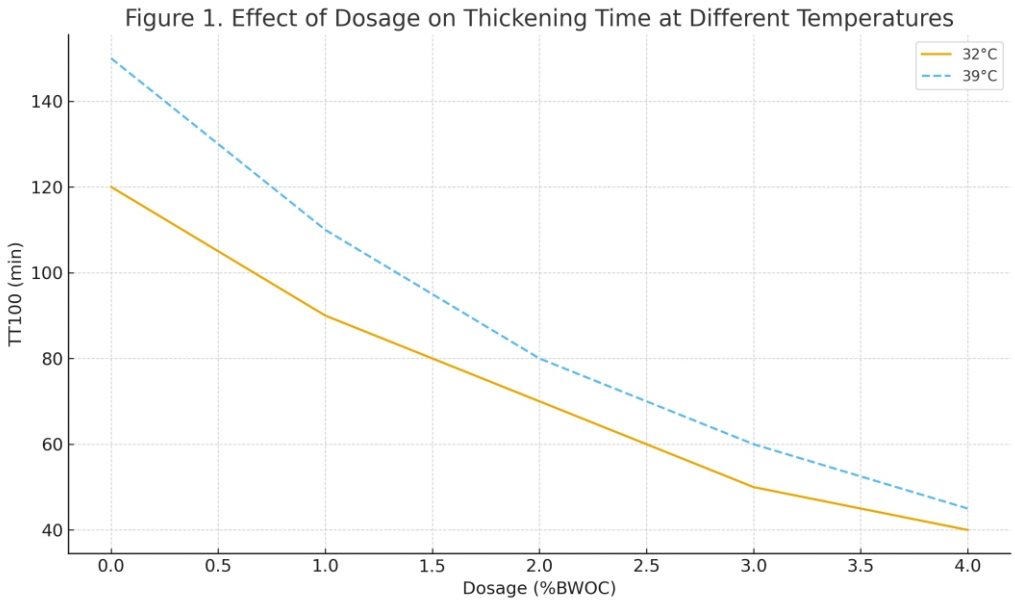


Figure 1. Effect of additive dosage on thickening time at different temperatures (illustrative).

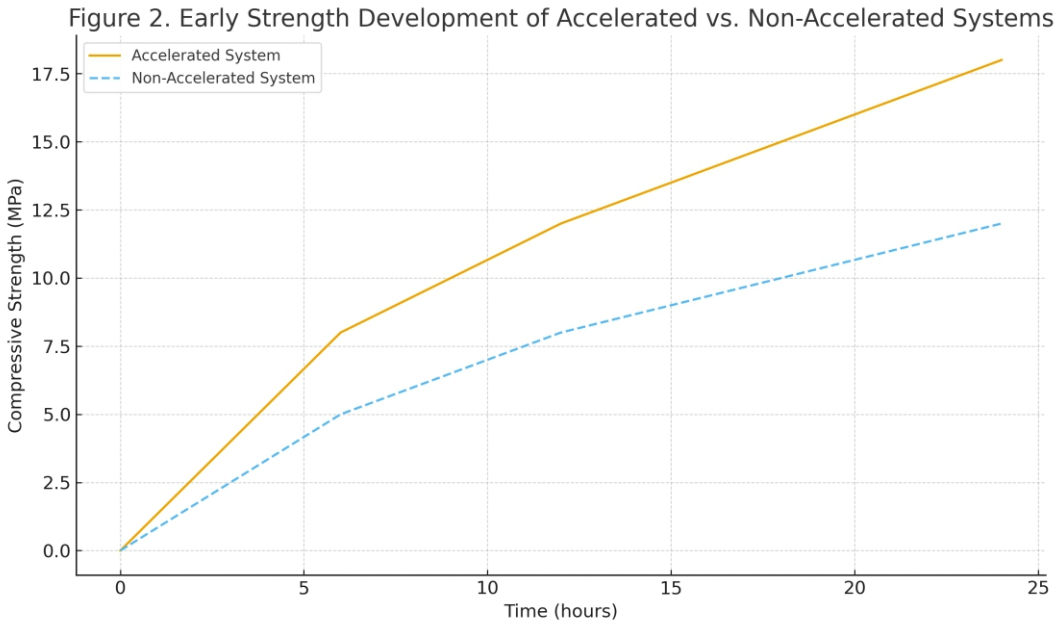


Figure 2. Comparison of early strength development between accelerated and non-accelerated systems (illustrative).

Packaging, Storage & Transportation

• Packaged in plastic-lined composite kraft paper or woven bags, each with a net weight of (25±0.5) kg, or customized as per user requirements.

• Store in a dry, ventilated environment at -5°C to 40°C, avoiding moisture.

• Prevent packaging damage and rain exposure during transportation. Shelf life: three years.

References (Public Sources)

• DrillingManual — Cement Slurry Accelerators (Typical $CaCl_2$ Dosage 2–4% BWOC): https://www.drillingmanual.com/cement-slurry-accelerators-mechanism-chemistry/

• OMICS Review — Oil Well Cement Additives ($CaCl_2$ 2–4% BWOC, >6% Risk): https://www.omicsonline.org/open-access-pdfs/oil-well-cement-additives-a-review-of-the-common-types-ogr-1000112.pdf

• SLB — Well Cementing Fundamentals (Definition and Function of Accelerators): https://www.slb.com/resource-library/oilfield-review/defining-series/defining-cementing

• Baker Hughes — DeepSet Cement System (Early Strength / Short Transition Context): https://www.bakerhughes.com/sites/bakerhughes/files/2020-10/DeepSet-cement-system-spec.PDF

WA-2S | Early Strength Agent for Oil Well Cement (Inorganic Salts)

Snapshot

- Standard Reference: SY/T 5504.4-2019 (Accelerators)
- Fineness (0.315 mm sieve residue, %) < 15
- Initial Consistency (52°C, 35.6 MPa, 28 min), Bc ⩽ 30
- Ratio of Thickening Time (52°C, 35.6 MPa, 28 min) ⩽ 0.8
- Compressive Strength Ratio at 6 h (70°C, 0.1 MPa) ⩾ 3.5
- Compressive Strength Ratio at 24 h (70°C, 0.1 MPa) ⩾ 1.0
- Cement Slurry Composition: Class G Cement, WA-2S; Water Quality: Distilled Water

Key Benefits

- Shortens thickening time and enhances early strength, suitable for higher temperature windows (refer to Snapshot conditions).
- Dosage adjustment allows fine-tuning between pumpability window and early-strength performance, maintaining operational safety.
- Compatible with fluid-loss, dispersing, and stabilizing systems (subject to project-based validation).

Formulation Notes

- Recommended dosage: expressed as %BWOC; inorganic salts (e.g., $CaCl_2$) are commonly applied in the 2–4% BWOC range (to be calibrated per project testing).
- Note: Pay attention to durability and steel corrosion; excessive dosage may lead to premature setting or long-term performance reduction.

Industry Reference (Illustrative)

Figure 1: Dosage (%BWOC) vs Thickening Time (TT100, min). The shaded area indicates the commonly observed 'dosage–thickening time' trend region based on public data.

Packaging & Storage

- Packed in an inner plastic bag and outer composite kraft paper or woven bag, with a net weight of (25±0.5) kg per bag, or as per user requirements.
- Store in a dry, ventilated place at -5°C to 40°C; avoid moisture exposure.
- Prevent damage or rain during transport. Shelf life: 3 years.

WA-3S | Smart Set-Time Modifying Strength Enhancer for Oilwell Cement (Inorganic Salt Type)

Snapshot

• Standards Basis: SY/T 5504.4-2019 (early-strength / set-time modifiers)
• Moisture (%): ≤ 13
• Fineness (0.315 mm sieve residue, %): ≤ 15
• Initial Consistency (110 °C, 55 MPa, 55 min), Bc: ≤ 30
• Thickening Time (110 °C, 55 MPa, 55 min): ≥ 180 min
• Ratio of strength-onset time (80 °C, 20.7 MPa, 40 min): ≤ 0.9
• Compressive Strength (80 °C, ambient pressure, 24 h): > 3.5 MPa
• Cement Slurry: Class G (HSR) cement, iron ore powder; Water: distilled water

Key Benefits

• Maintains pumpability within the HPHT window (TT100 can be engineered to target) while promoting early strength development.
• Dose-dependent balance of "set-time control + strength development," ensuring a smooth transition zone and early strength.
• Compatible with fluid-loss, dispersant, and stabilizer systems (to be confirmed by project-specific laboratory testing).

Formulation Notes

• Recommended dosage expressed as %BWOC. Inorganic salt class typically applied at 2–4% BWOC (calibrate by project testing).
• Balance durability and corrosion resistance; avoid overdosing that could cause flash-set or compromise later-age performance.

Industry Reference (Illustrative — not our in-house test data)

Figure 1 (schematic): x-axis = dosage (%BWOC); y-axis = TT100 (min). The shaded band represents a literature-derived trend range, with 2–4% BWOC as a typical application window.
Figure 2 (schematic): x-axis = time (h); y-axis = compressive strength (MPa). Illustrates early-strength uplift at 6/12/24 hours.

Packaging & Storage

• Inner plastic liner; outer multi-ply kraft or woven bag. Net weight per bag: (25 ± 0.5) kg, or as specified by customer.
• Store in a dry, ventilated place at −5 °C to 40 °C; prevent moisture uptake.
• Protect packaging from damage and rain during transport. Shelf life: 3 years.

WB-1S | Mineral Powder–Type Strength Enhancer for Oilwell Cement

Snapshot

- Standards Basis: SY/T 6466–2016.
- Fineness (0.84 mm sieve residue, %): ⩽ 25.
- Thickening Time (60 °C, 30 MPa, test window 30 min): ⩾ 90 min.
- Initial Consistency (60 °C, 30 MPa, 30 min), Bc: ⩽ 30.
- Compressive Strength (80 °C, 20.7 MPa, 24 h): ⩾ 10 MPa.
- Strength Ratio at 24 h (80 °C, 20.7 MPa): > 1.0 (vs. neat reference).
- Free Water (60 °C, %): ⩽ 1.4.
- Cement Slurry with Enhancer: Class G (HSR) cement + cenospheres; Water: distilled.
- Cement Slurry without Enhancer: Class G (HSR) cement + cenospheres; Water: distilled.

Key Benefits

- Enhances early and 24-hour compressive strength via micro-filler packing and pozzolanic reactions; reduces permeability.
- Lowers free water and bleed, improving slurry stability and homogeneity.
- Compatible with Class G cement and lightweight solids (e.g., cenospheres) for strength-density balanced designs.

Formulation Notes

- Dosage basis: replacement or addition by weight of cement (%BWOC). Optimize by project-specific laboratory testing.
- Rheology and pumpability: fine powders may increase plastic viscosity; use dispersant/defomer/stabilizer packages to balance rheology and mitigate sedimentation.

Figures (Preserved from Source Document)

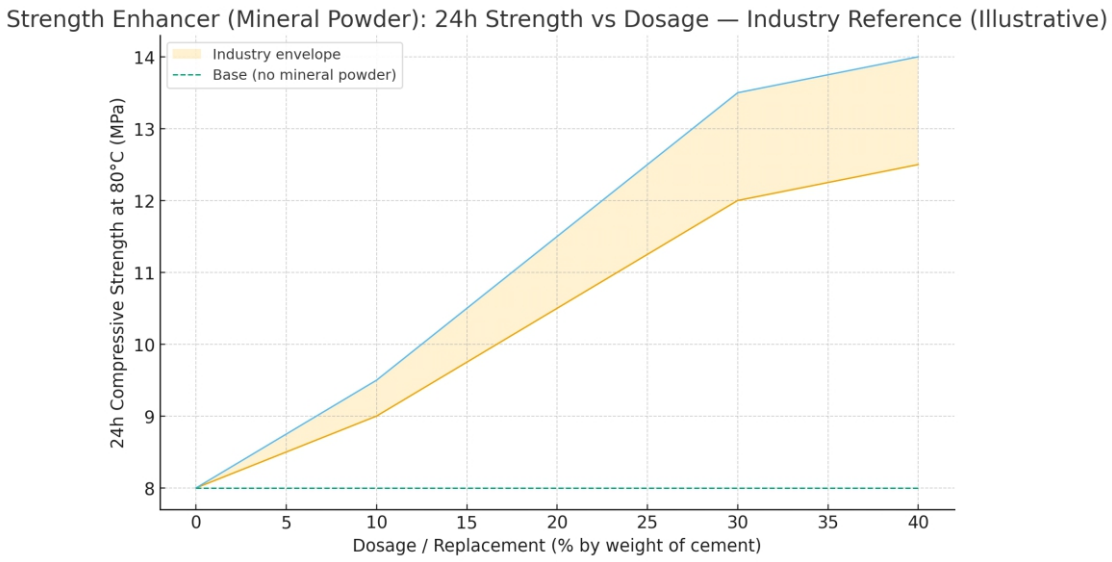


Figure 1. Source: Original document.

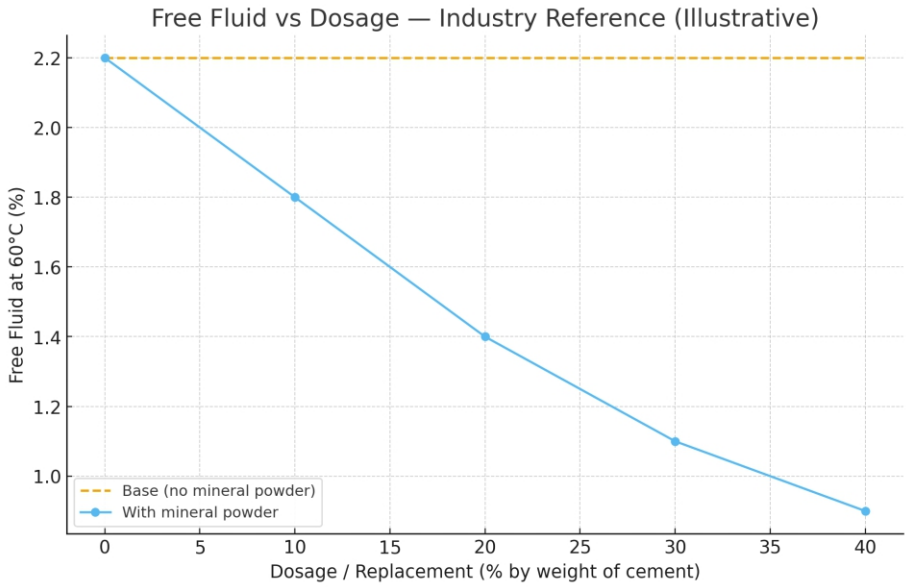


Figure 2. Source: Original document.

Packaging & Storage

• Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg/bag, or per customer specification.

• Store in a dry, ventilated area between −5 °C and 40 °C; prevent moisture ingress.

• Protect from rain and packaging damage during transport. Shelf life: 3 years.

References (Open-Source, Industry-Referenced)

• Shadizadeh, S.R. et al. (2010). Silica fume improves early compressive strength and reduces free water.

• Mahmoud, A.A. et al. (2024). Nanosilica enhances hydration and strength development.

• Larki, O.A. et al. (2019). Natural pozzolan for optimizing 24 h strength and free water.

• Tan, C. et al. (2023). Manganese ore powder context for strength/density design.

WB-2S | High-Temperature Strength Enhancer for Oilwell Cement (Mineral Powder Type)

Snapshot

- Standards Basis: SY/T 6466–2016.
- Fineness (0.84 mm sieve residue, %): ⩽ 5.
- Compressive Strength (120 °C, 20.7 MPa, 2 d): ⩾ 14 MPa.
- 7 d / 2 d Compressive Strength Ratio (120 °C, 20.7 MPa): ⩾ 1.0.
- Cement Slurry Composition: Class G cement, silica fume; Water: distilled.

Key Benefits

- Enhances compressive strength under 120 °C high-temperature curing, providing both early and later strength development.
- Synergizes with pozzolanic materials such as silica fume to densify hydration products and reduce permeability.
- Reduces free water and bleed, improving slurry stability and uniformity (to be verified by project-specific testing).

Formulation Notes

- Dosage / Replacement: expressed as %BWOC (by weight of cement). Must be calibrated under 120 °C high-temperature curing conditions.
- Rheology Balance: fine powders increase specific surface area; combine with dispersant / defoamer / stabilizer systems to control ESD and prevent settling.
- Compatibility with Silica Fume: integrate the reactivity and filling effects of silica fume to optimize the strength–pumpability window.

Packaging & Storage

- Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.
- Store in a dry, ventilated place at −5 °C to 40 °C; avoid moisture exposure.
- Protect from rain and packaging damage during transport. Shelf life: 3 years.

WB-3S | High-Temperature Strength Enhancer for Oilwell Cement (Mineral Powder Type)

Snapshot

- Standards Basis: SY/T 6466–2016.
- Fineness (0.84 mm sieve residue, %): ⩽ 5.
- Compressive Strength (150 °C, 20.7 MPa, 2 d): ⩾ 10 MPa.
- 7 d / 2 d Compressive Strength Ratio (150 °C, 20.7 MPa): ⩾ 1.0.
- Cement Slurry Composition: Class G cement, quartz sand; Water: distilled.

Key Benefits

- Mitigates strength retrogression under 150 °C high-temperature conditions, maintaining 2-day / 7-day compressive strength and long-term integrity.
- Stabilizes mineral phases and promotes secondary reactions (e.g., C–S–H modification, siliceous aggregate interaction) to reduce performance loss caused by high-temperature crystalline transformations.
- Works synergistically with silica fume and quartz-based fillers to achieve density, low permeability, and high thermal stability.

Formulation Notes

- Dosage / Replacement: expressed as %BWOC (by weight of cement). Must be calibrated under 150 °C curing conditions via project-specific testing.
- Particle Size Distribution: optimize gradation with quartz sand / quartz powder to improve packing density and mitigate microcracks from high-temperature crystalline transformations.
- Rheology and Pumpability: fine powders increase surface area; combine with dispersant / defoamer / stabilizer packages to control ESD and prevent settling.
- Durability: monitor compressive strength retention and permeability evolution under thermal cycling; consider anti-carbonation / anti-sulfidation compatibility if required.

Packaging & Storage

- Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.
- Store in a dry, ventilated place at −5 °C to 40 °C; avoid moisture exposure.
- Protect from rain and packaging damage during transport. Shelf life: 3 years.

WB-4S | High-Temperature Strength Enhancer for Oilwell Cement (Mineral Powder Type)

Snapshot

- Standards Basis: SY/T 6466–2016.
- Fineness (0.315 mm sieve residue, %): ⩽ 5.
- Initial Consistency (155 °C, 100 MPa, 75 min), Bc: ⩽ 30.
- Thickening Linear Mutation Value, Bc: ⩽ 10.
- Compressive Strength (180 °C, 20.7 MPa, 48 h): ⩾ 18 MPa.
- Compressive Strength (180 °C, 20.7 MPa, 7 d): ⩾ 30 MPa.
- Cement Slurry Composition: Class G (HSR) cement, quartz sand, silica fume; Water: distilled.

Key Benefits

- Designed for HPHT conditions at 155–180 °C, maintaining pumpability (initial consistency ⩽ 30 Bc; linear mutation ⩽ 10 Bc) while significantly improving 48 h / 7 d compressive strength.
- Works synergistically with silica fume and quartz sand to form dense, thermally stable hydration products, lowering permeability and mitigating thermally induced microcracking.
- For HSR (high sulfate-resisting) systems, delivers early load-bearing capacity and long-term integrity while meeting temperature and corrosion resistance requirements.

Formulation Notes

- Dosage / Replacement: set the window as %BWOC (by weight of cement); calibrate under 155–180 °C curing conditions through project-specific laboratory testing.
- Particle Size Distribution: co-optimize gradation and specific surface with quartz sand / silica fume to balance strength development and rheology for pumpability.
- Rheology & Stability: fine powders can increase viscosity and thixotropy—coordinate with dispersant / defoamer / stabilizer packages to control ESD, free water, and settling.
- Durability: evaluate strength retention, permeability, and micro-annulus sensitivity under high-temperature cooling cycles and sulfur-bearing environments.

Packaging & Storage

- Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.
- Store in a dry, ventilated place at −5 °C to 40 °C; avoid moisture exposure.
- Protect from rain and packaging damage during transport. Shelf life: 3 years.

WC-1S | Corrosion-Resistant Additive for Oilwell Cement (Inorganic Type)

Snapshot

- Standards Basis: SY/T 6466–2016.
- Fineness (0.315 mm sieve residue, %): ⩽ 5.
- Initial Consistency (52 °C, 35.6 MPa, 28 min), Bc: ⩽ 30.
- Thickening Linear Mutation Value, Bc: ⩽ 10.
- Compressive Strength Reduction after Corrosion (%): ⩽ 50.
- Compressive Strength after Corrosion (MPa): > 14.
- Permeability Reduction after Corrosion (%): ⩽ 35.
- Permeability after Corrosion (10^{-3} μm²): ⩽ 0.1.
- Cement Slurry Composition: Class G (HSR) cement, quartz sand, silica fume; Water: distilled.

Key Benefits

- In CO_2/acidic environments, significantly reduces permeability and maintains strength (strength reduction ⩽ 50%, post-corrosion strength > 14 MPa).
- Mitigates carbonation/dissolution pathways through pore blocking and matrix densification, extending wellbore barrier life.
- Works synergistically with silica fume/quartz systems to balance high-temperature mechanical integrity and long-term zonal isolation.

Formulation Notes

- Introduce the corrosion-resistant material as an additive or composite (%BWOC), optimizing density and reactivity with silica fume/quartz fillers.
- Corrosion Scenario Design: set targets based on CO_2 partial pressure, temperature/pressure, and aqueous phase composition (e.g., strength retention, permeability ⩽ 0.1 × 10^{-3} μm²).
- Rheology & Pumpability: fine powders and composite systems may raise viscosity—coordinate with dispersant/defoamer/stabilizer systems to control ESD, free water, and settling.

Industry-Referenced Charts (Illustrative — Not Our In-House Test Data)

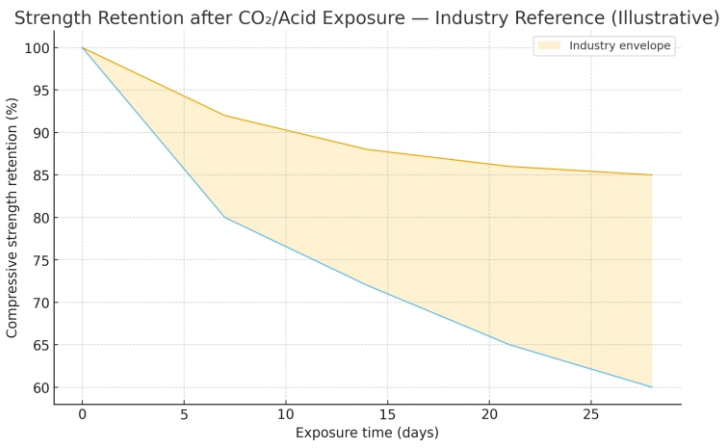


Figure 1. Source: Original document.

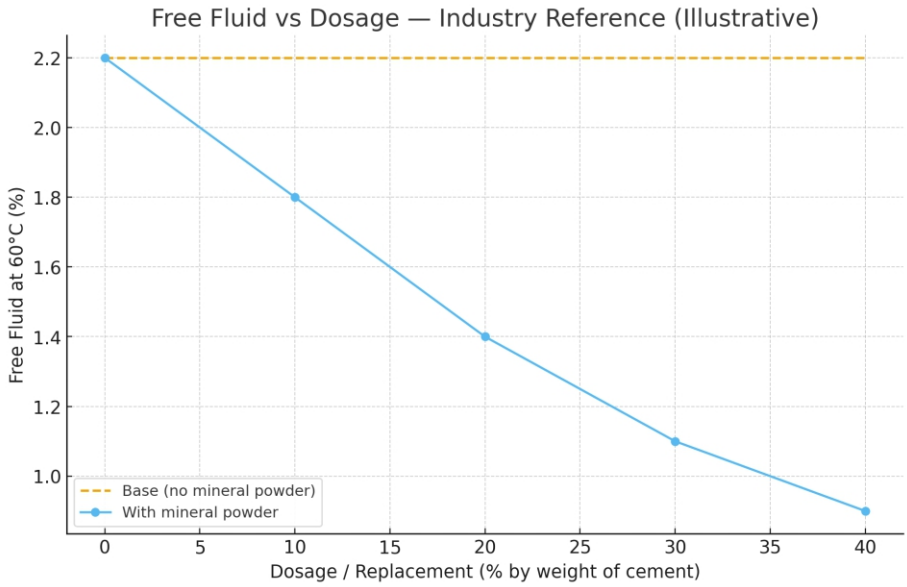


Figure 2. Source: Original document.

Packaging & Storage

• Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.

• Store in a dry, ventilated place at 0 °C to 40 °C; avoid moisture exposure.

• Protect from rain and packaging damage during transport. Shelf life: 3 years.

References

• Halliburton — CorrosaLock™ cement system: https://www.halliburton.com/en/products/corrosalock-cement-system

• SLB — EverCRETE™ CO_2-Resistant Cement System: https://www.slb.com/products-and-services/innovating-in-oil-and-gas/well-construction/well-cementing/cemcrete-cementing-technology/evercrete-co2-resistant-cement-system

• Baker Hughes — PermaSet/PermaSet Ultra: https://www.bakerhughes.com/drilling/cementing/well-cementing/cementing-systems/set-life-cementing-systems/permaset-cement-system

• PNNL — Effective Permeability Change in Wellbore Cement with CO_2: https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-20843.pdf

• ACS Energy & Fuels (2024) — Chemical Changes in Oil Well Cement under CO_2 https://pubs.acs.org/doi/10.1021/acs.energyfuels.4c03686

WE-1S | Toughening Additive for Oilwell Cement (Rubber/Latex Type)

Snapshot

- Standards Basis: SY/T 5504.5–2022 (toughening materials).
- Fineness (0.84 mm sieve residue, %): ⩽ 20.
- Initial Consistency (52 °C, 35.6 MPa, 28 min), Bc: ⩽ 30.
- Thickening Linear Mutation Value, Bc: ⩽ 10.
- Compressive Strength (70 °C, 20.7 MPa, 24 h): ⩾ 14 MPa.
- Elastic Modulus (70 °C, 20.7 MPa, 48 h), GPa: ⩽ 8.5.
- Relative Reduction of Elastic Modulus (70 °C, 20.7 MPa, 48 h, %): ⩾ 15.
- Cement Slurry Composition: Class G (HSR) cement; Water: distilled.

Key Benefits

- Introduces an elastic phase and interfacial toughening to reduce elastic modulus (⩾15% drop) and increase strain capacity, mitigating microannulus formation and thermal-cycling cracking.
- Maintains 24-hour compressive strength ⩾14 MPa while improving impact resistance and resistance to crack propagation.
- Compatible with fluid-loss, stabilizer, and dispersant packages to balance pumpability and early zonal isolation.

Formulation Notes

- Dosage: set the toughening-phase content as %BWOC. Recommend screening at 2–8% BWOC and calibrating rheology/strength tradeoffs.
- Emulsification / Dispersion: latex particle size and interfacial agent selection are critical; coordinate with dispersant/defoamer to manage entrained air and thixotropy.
- Temperature Resistance & Bonding: at target temperature, verify elasticity retention, casing–sheath bond strength, and microannulus control metrics (e.g., gas-tightness tests).

Industry-Referenced Charts (Illustrative — Not Our In-House Test Data)

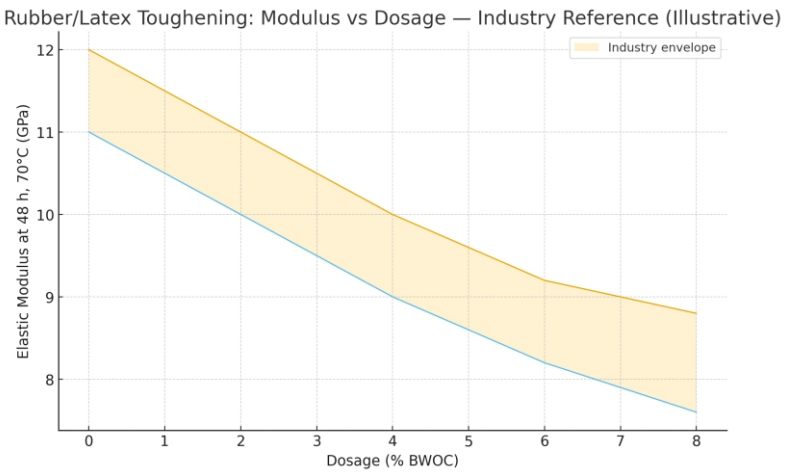


Figure 1. Source: Original document.

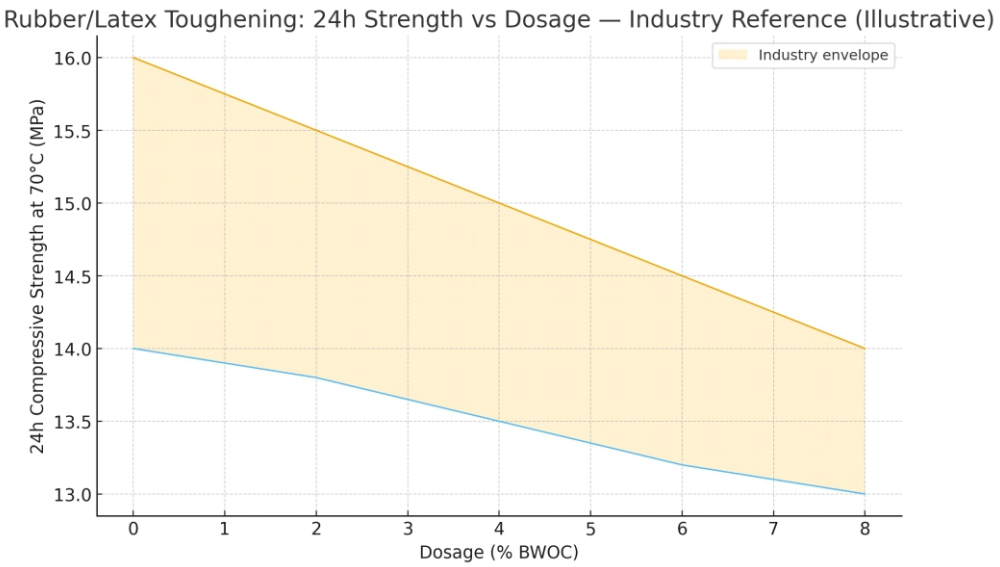


Figure 2. Source: Original document.

References (Open-Source, Industry-Referenced)

• Halliburton — ChannelFix™ (elastic toughening and microannulus mitigation)

• SLB — GASBLOK™ latex (improved tightness against gas migration/microannulus)

• Bello, A.A. et al. (2015). Rubber-Modified Oilwell Cement: Strength & Modulus Tradeoff. SPE-178958-MS.

• Bonavetti, V. et al. (2021). Latex-modified cements: Elastic modulus reduction and toughness improvement. Construction & Building Materials.

WE-2S | Toughening Additive for Oilwell Cement (Rubber Type)

Snapshot

• Standards Basis: SY/T 6466–2016; SY/T 5504.5–2022 (toughening materials).
• Fineness (0.84 mm sieve residue, %): ⩽ 5.
• Initial Consistency (52 °C, 35.6 MPa, 28 min), Bc: ⩽ 30.
• Thickening Linear Mutation Value, Bc: ⩽ 10.
• Compressive Strength (100 °C, 20.7 MPa, 24 h): ⩾ 14 MPa.
• Elastic Modulus (100 °C, 20.7 MPa, 48 h), GPa: ⩽ 8.5.
• Relative Reduction of Elastic Modulus (70 °C, 20.7 MPa, 48 h, %): ⩾ 15.
• Cement Slurry Composition: Class G (HSR) cement; Water: distilled.

Key Benefits

• In the 70–100 °C range, reduces elastic modulus by ⩾15% to increase toughness and strain capacity, mitigating microannulus driven by thermal cycling and differential pressure.
• Maintains 24-hour compressive strength ⩾14 MPa while improving impact resistance and resistance to crack propagation.
• Integrates with fluid-loss, stabilizer, and dispersant packages to balance pumpability, strength, and toughness.

Formulation Notes

• Dosage: set the toughening-phase content as %BWOC. Recommend initial screening at 2–8% BWOC and calibrate under 70–100 °C conditions for rheology/strength tradeoffs.
• Emulsification / Dispersion: latex particle size and interfacial agent selection govern the modulus reduction and permeability; coordinate with dispersant/defoamer to control entrained air and thixotropy.
• Bonding & Integrity: verify casing–sheath bond strength, static gel strength (SGS) transition rate, and sensitivity to microannulus formation.

Packaging & Storage

• Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.
• Store in a dry, ventilated place at 0 °C to 40 °C; avoid moisture exposure.
• Protect from rain and packaging damage during transport. Shelf life: 3 years.

WE-3S | Toughening Additive for Oilwell Cement (Polymer Type)

Snapshot

• Standards Basis: SY/T 5504.5–2022 (toughening materials).
• Fineness (0.315 mm sieve residue, %): ⩽ 5.
• Moisture (%): ⩽ 8.
• Initial Consistency (52 °C, 35.6 MPa, 28 min), Bc: ⩽ 30.
• Thickening Linear Mutation Value, Bc: ⩽ 10.
• Compressive Strength (70 °C, 20.7 MPa, 24 h): ⩾ 14 MPa.
• Elastic Modulus (70 °C, 20.7 MPa, 48 h), GPa: ⩽ 8.5.
• Linear Expansion Rate (70 °C, 20.7 MPa, 48 h, %): ⩾ 0.
• Cement Slurry Composition: Class G (HSR) cement; Water: distilled.

Key Benefits

• Through the flexible polymer network and interfacial toughening, reduces elastic modulus while maintaining 24-hour compressive strength ⩾14 MPa.
• Provides slight positive linear expansion (⩾0%), improving casing–sheath bonding and mitigating microannulus and thermal-cycling cracking.
• Integrates with fluid-loss, stabilizer, and dispersant systems to balance pumpability, toughness, and early zonal isolation.

Formulation Notes

• Dosage: set polymer content as %BWOC. Recommend initial screening at 2–10% BWOC and calibrate at 70 °C for modulus, strength, and expansion trends.
• Emulsification / Stability: particle size distribution and surfactant selection determine phase dispersion and bonding; coordinate with dispersant/defoamer to control entrained air and thixotropy.
• Bonding & Integrity: verify casing–sheath bond strength and static gel strength (SGS) transition; for systems with slight expansion, measure permeability and microannulus indicators.

Industry-Referenced Charts (Illustrative — Not Our In-House Test Data)

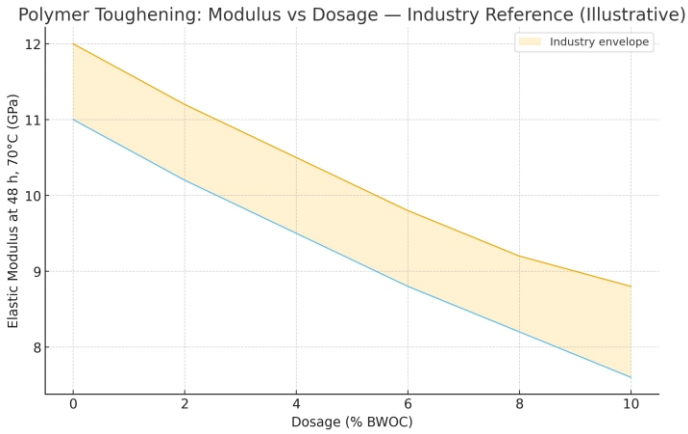


Figure 1. Source: Original document.

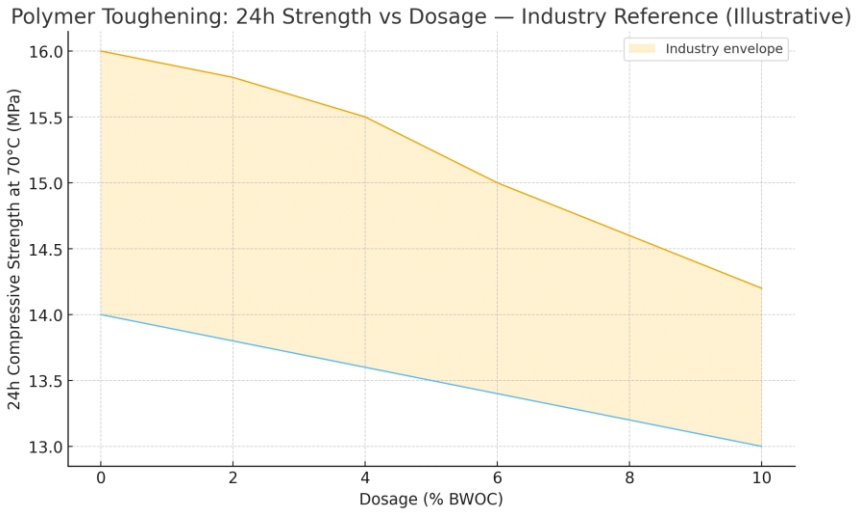


Figure 2. Source: Original document.

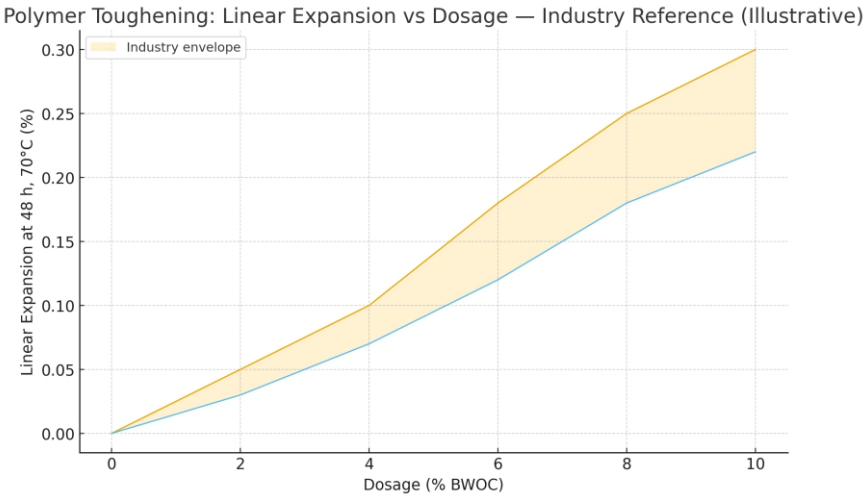


Figure 2. Source: Original document.

Packaging & Storage

• Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.

• Store in a dry, ventilated place at 0 °C to 40 °C; avoid moisture exposure.

• Protect from rain and packaging damage during transport. Shelf life: 3 years.

References (Open-Source, Industry-Referenced)

• SLB — GASBLOK™ / latex family (elastic and toughening context).

• Halliburton — ChannelFix™ (elastic toughening).

• SPE literature — Polymer-modified oilwell cement: modulus reduction and toughness improvement (review and case studies).

WE-4S | High-Temperature Toughening Additive for Oilwell Cement (Mineral Powder Type)

Snapshot

- Standards Basis: SY/T 5504.5–2022 (toughening materials).
- Fineness (0.315 mm sieve residue, %): ⩽ 5.
- Initial Consistency (130 °C, 80.7 MPa, 65 min), Bc: ⩽ 30.
- Thickening Linear Mutation Value, Bc: ⩽ 10.
- Compressive Strength (150 °C, 20.7 MPa, 48 h): ⩾ 14 MPa.
- Compressive Strength (150 °C, 20.7 MPa, 7 d): ⩾ 18 MPa.
- Young' s Modulus (150 °C, 20.7 MPa, 7 d), GPa: ⩽ 8.
- Cement Slurry Composition: Class G cement, quartz sand, silica fume; Water: distilled.

Key Benefits

- Designed for 130–150 °C HPHT cementing; lowers system modulus (target ⩽ 8 GPa) while sustaining 48 h / 7 d compressive strength development.
- Fine mineral powders combined with silica fume / quartz deliver packing and secondary reactions to form a dense, thermally stable matrix, lowering permeability and microcrack risk.
- Meets initial consistency and mutation control while improving resistance to microannulus and impact under thermal cycling.

Formulation Notes

- Dosage / Replacement: set as %BWOC; calibrate modulus, strength, and rheology by project-specific testing under 130–150 °C conditions.
- Particle Size Distribution: co-optimize gradation and specific surface with quartz sand / silica fume to boost early densification and control settling and free water.
- Rheology & Pumpability: fine powders increase viscosity and thixotropy—coordinate with dispersant / defoamer / stabilizer packages to control ESD and static stability.
- Durability: validate modulus retention and permeability evolution under high-temperature cooling cycles and in sulfur- and CO_2-bearing environments.

Packaging & Storage

- Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.
- Store in a dry, ventilated place at −5 °C to 40 °C; avoid moisture exposure.
- Protect from rain and packaging damage during transport. Shelf life: 3 years.

WE-8S | High-Temperature Toughening Additive for Oilwell Cement (Rubber Type)

Snapshot

• Standards Basis: SY/T 5504.5–2022 (toughening materials).
• Fineness (0.315 mm sieve residue, %): ⩽ 5.
• Initial Consistency (130 °C, 80.7 MPa, 65 min), Bc: ⩽ 30.
• Thickening Linear Mutation Value, Bc: ⩽ 10.
• Compressive Strength (70 °C, 20.7 MPa, 24 h): ⩾ 14 MPa.
• Elastic Modulus (70 °C, 20.7 MPa, 48 h), GPa: ⩽ 6.5.
• Cement Slurry Composition: Class G cement, fluid-loss additive, dispersant, defoamer; others as required.

Key Benefits

• Elastic toughening for high-temperature cementing: achieves a significant modulus drop (48 h ⩽ 6.5 GPa target), increasing strain capacity and mitigating microannulus and crack propagation under thermal cycling and differential pressure.
• Maintains 24-hour compressive strength ⩾14 MPa while improving impact and vibration resistance to support long-term zonal isolation integrity.
• Synergizes with fluid-loss / dispersant / defoamer packages to balance pumpability, stability, and toughening performance.

Formulation Notes

• Dosage: set rubber-phase content as %BWOC; recommend initial screening at 2–8% BWOC and calibrate modulus, strength, and rheology at 70–130 °C.
• Emulsification / Dispersion: control latex particle size and interfacial agent selection; coordinate with dispersant and defoamer to avoid microbubbles and excessive thixotropy affecting ESD.
• Bonding & Integrity: verify casing–sheath bond strength, static gel strength (SGS) transition rate, and microannulus sensitivity; combine with slight-expansion / anti-gas migration systems if required.

Packaging & Storage

• Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.
• Store in a dry, ventilated place at 0 °C to 40 °C; avoid moisture exposure.
• Protect from rain and packaging damage during transport. Shelf life: 3 years.

WF-1S | Fluid-Loss Additive for Oilwell Cement (Acrylamide Type)

Snapshot

• Standards Basis: SY/T 5504.2–2013 (fluid-loss additives).
• Fineness (0.315 mm sieve residue, %): ⩽ 15.
• API Fluid Loss (80 °C, 6.9 MPa), mL: ⩽ 150.
• Initial Consistency (80 °C, 35 MPa, 40 min), Bc: ⩽ 30.
• Thickening Linear Mutation Value, Bc: ⩽ 10.
• Time from 40 Bc to 100 Bc (80 °C, 35 MPa, 40 min), min: ⩽ 40.
• Free Water (80 °C, %): ⩽ 1.4.
• Compressive Strength (100 °C, 20.7 MPa, 24 h), MPa: ⩾ 14.
• Cement Slurry Composition: Class G cement, silica fume; Water: distilled.

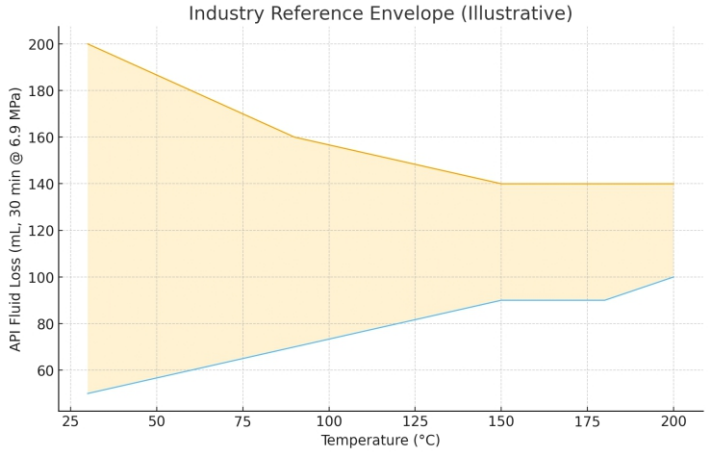
Key Benefits

• Reduces API fluid loss without significantly increasing consistency, improving annular displacement and bond quality.
• Supports control of the 40–100 Bc transition time to preserve a safe pumpability window and thickening profile.
• Compatible with dispersants, retarders, defoamers, and other common additives for field optimization (project-specific testing required).

Formulation Notes

• Recommended Dosage: expressed as %BWOC. Use industry-common screening windows (e.g., 0.35–1.0% BWOC) as a starting point; calibrate for temperature, density, and salinity by project testing.
• Target API Fluid Loss: for the zone temperature, design 30-min fluid loss targets in the 50–150 mL range; coordinate with silica fume/quartz systems to reduce filtration and permeability.
• Operational Considerations: maintain thickening linear mutation ⩽10 Bc, control free water ⩽1.4%, and verify 24 h compressive strength ⩾14 MPa at 100 °C.

Industry-Referenced Charts (Illustrative — Not Our In-House Test Data)



Packaging & Storage

• Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.
• Store in a dry, ventilated place at −5 °C to 40 °C; avoid moisture exposure.
• Protect from rain and packaging damage during transport. Shelf life: 3 years.

WF-2S | Fluid-Loss Additive for Oilwell Cement (Acrylamide Type)

Snapshot

• Standards Basis: SY/T 5504.2–2013 (fluid-loss additives).
• Fineness (0.315 mm sieve residue, %): ⩽ 15.
• API Fluid Loss (90 °C, 6.9 MPa), mL: ⩽ 150.
• Thickening Time (110 °C, 50 MPa, 50 min), min: ⩽ 30.
• Initial Consistency (110 °C, 50 MPa, 50 min), Bc: ⩽ 30.
• Thickening Linear Mutation Value, Bc: ⩽ 10.
• Time from 40 Bc to 100 Bc (110 °C, 50 MPa, 50 min), min: ⩽ 40.
• Free Water (80 °C, %): ⩽ 1.4.
• Compressive Strength (130 °C, 20.7 MPa, 24 h), MPa: ⩾ 14.
• Cement Slurry Composition: Class G cement, silica fume, quartz sand; Water: distilled.

Key Benefits

• Lowers API fluid loss at 90–110 °C, improving annular displacement efficiency and filter-cake quality.
• Controls the 40–100 Bc transition time and linear mutation value to keep a safe pumpability window and operational safety.
• Compatible with dispersant/retarder/defoamer systems and with silica fume and quartz sand blends for well-specific optimization (project testing required).

Formulation Notes

• Recommended Dosage: express as %BWOC. Use industry-common screening windows (e.g., 0.35–1.0% BWOC) as a starting point; calibrate for bottomhole temperature, salinity, and density.
• Target API Fluid Loss: set 30-min fluid-loss targets of 50–150 mL by zone; use silica fume/quartz sand to reduce filtration and increase matrix density.
• Operational Focus: while keeping mutation ⩽10 Bc and 40–100 Bc ⩽40 min, control free water ⩽1.4% and verify 24 h compressive strength ⩾14 MPa at 130 °C.

Packaging & Storage

• Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.
• Store in a dry, ventilated place at −5 °C to 40 °C; avoid moisture exposure.
• Protect from rain and packaging damage during transport. Shelf life: 3 years.

WF-1L | Fluid-Loss Additive for Oilwell Cement (Acrylamide Type)

Snapshot

• Standards Basis: SY/T 5504.2–2013 (fluid-loss additives).
• API Fluid Loss (80 °C, 6.9 MPa), mL: ⩽ 150.
• Initial Consistency (80 °C, 35 MPa, 30 min), Bc: ⩽ 30.
• Thickening Linear Mutation Value, Bc: ⩽ 10.
• Time from 40 Bc to 100 Bc (80 °C, 35 MPa, 40 min), min: ⩽ 40.
• Compressive Strength (100 °C, 20.7 MPa, 24 h), MPa: ⩾ 14.
• Free Water (80 °C, %): ⩽ 1.4.
• Cement Slurry Composition: Class G cement, silica fume; Water: distilled.

Key Benefits

• Lowers API fluid loss without significantly increasing consistency, improving annular displacement and bond quality.
• Balances the 40–100 Bc transition time and thickening linear mutation value to ensure a safe pumpability window and operational safety.
• Compatible with dispersant/retarder/defoamer systems for rapid well-specific optimization (project testing required).

Formulation Notes

• Recommended Dosage: express as %BWOC; use industry-common screening ranges as a starting point and calibrate against temperature, density, and salinity by project testing.
• Target API Fluid Loss: set 30-min targets of 50–150 mL by zone temperature; coordinate with silica fume/quartz systems to reduce filtration and permeability.
• Operational Focus: while keeping mutation ⩽10 Bc and 40–100 Bc ⩽40 min, control free water ⩽1.4% and verify 24 h compressive strength ⩾14 MPa at 100 °C.

Packaging & Storage

• Packaged in plastic drums; net weight (25 ± 0.5) kg per unit, or as specified by the customer.
• Store in a dry, ventilated place at 0 °C to 40 °C; avoid moisture exposure.
• Protect from rain and packaging damage during transport. Shelf life: 2 years.

WF-2L | Liquid Fluid-Loss Additive for Oilwell Cement (Acrylamide Type)

Snapshot

• Target Performance: API fluid loss (80 °C, 6.9 MPa) ⩽150 mL; initial consistency ⩽30 Bc; thickening linear mutation ⩽10 Bc; 24 h compressive strength (130 °C, 20.7 MPa) ⩾14 MPa; free water (90 °C) ⩽1.4%.

• Standards Basis: SY/T 5504.2–2013 (fluid-loss additives).

• Applicable Wells: medium-to-high-temperature cementing systems (typical window: 80–130 °C, subject to project testing).

Key Benefits

• Reduces API fluid loss without significantly increasing consistency, improving annular displacement and bond quality.

• Compatible with Class G cement, silica fume, and quartz sand systems; can work with dispersants,
retarders, and defoamers for rheology optimization.

• Liquid form allows easy blending and dosage control, enhancing operational repeatability on-site.

Formulation Notes

• Typical System: Class G cement + silica fume/quartz sand + dispersant/retarder/defoamer.

• Recommended Dosage: define as %BWOC or by volume; calibration required through project testing (considering temperature, salinity/mineralization, and density).

Industry Reference (Not Wuenqi Test Data)

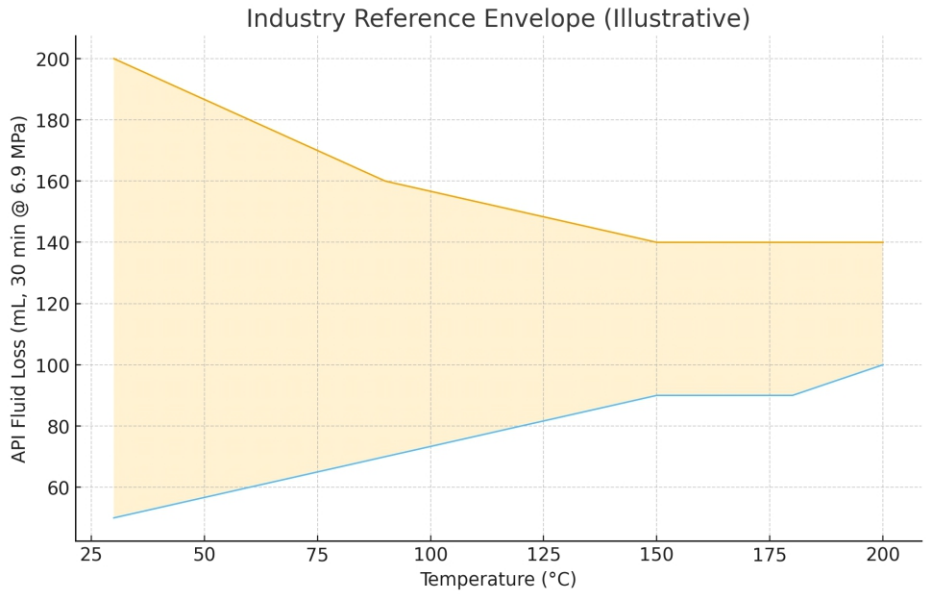


Figure 1. Source: Public literature summary (typical API fluid-loss performance range).

Notes from Public Sources

• Industry literature commonly targets API fluid loss ⩽50 mL (30 min @6.9 MPa) within applicable temperature ranges (as referenced in IsoGuard/IsoBond overview).
• Some suppliers report broad temperature adaptability (e.g., 27–204 °C; UNIFLAC/D168 series), with actual filtration control depending on dosage and formulation.
• These notes define 'common industry ranges/terminology' and do not represent Wuenqi’ s own test data.

Positioning

• WF-2L aligns with mainstream industry targets for fluid-loss performance.
• Under NDA, formulation window recommendations and technical support can be provided.

Packaging & Logistics

• Form: Liquid.
• Packaging: 25 kg drum (or as required).
• Storage: 0–40 °C in dry conditions; shelf life: 2 years.

WF-3L | Liquid Fluid-Loss Additive for Oilwell Cement (Acrylamide Type)

Snapshot

- Standards Basis: SY/T 5504.2–2013 (fluid-loss additives).
- API Fluid Loss (90 °C, 6.9 MPa), mL: ⩽ 150.
- Initial Consistency (130 °C, 80.7 MPa, 65 min), Bc: ⩽ 30.
- Thickening Linear Mutation Value, Bc: ⩽ 10.
- Time from 40 Bc to 100 Bc (130 °C, 80.7 MPa, 65 min), min: ⩽ 40.
- Compressive Strength (154 °C, 20.7 MPa, 24 h), MPa: ⩾ 14.
- Free Water (90 °C, %): ⩽ 1.4.
- Cement Slurry Composition: Class G cement, silica fume, quartz sand; others as required; Water: distilled.

Key Benefits

- Reduces API fluid loss at 90–130 °C, improving annular displacement and filter-cake quality to support high-temperature cementing.
- Controls the 40–100 Bc transition time and linear mutation value to ensure a safe pumpability window and operational safety.
- Compatible with dispersant/retarder/defoamer systems and with silica fume and quartz sand blends for well-specific optimization (project testing required).

Formulation Notes

- Recommended Dosage: express as %BWOC. Use industry-common screening windows (e.g., 0.35–1.0% BWOC) as a starting point; calibrate by bottomhole temperature, mineralization/ salinity, and density.
- Target API Fluid Loss: set 30-min targets of 50–150 mL by zone; coordinate with silica fume/ quartz sand to reduce filtration and increase matrix density.
- Operational Focus: maintain mutation ⩽10 Bc and 40–100 Bc ⩽40 min; control free water ⩽ 1.4%, and verify 24 h compressive strength ⩾14 MPa at 154 °C.

Packaging & Storage

- Packaged in plastic drums; net weight (25 ± 0.5) kg per drum, or as specified by the customer.
- Store in a dry, ventilated place at 0 °C to 40 °C; avoid moisture exposure.
- Protect from rain and packaging damage during transport. Shelf life: 2 years.

WH-1S | Retarder for Oilwell Cement (Organic Salt Type)

Snapshot

- Standards Basis: SY/T 5504.1–2013 (retarders).
- Fineness (0.315 mm sieve residue, %): ⩽ 15.
- Moisture (%): ⩽ 8.
- Thickening Time (78 °C, 35 MPa, 40 min), min: ⩾ 120.
- Initial Consistency (78 °C, 35 MPa, 40 min), Bc: ⩽ 30.
- Thickening Linear Mutation Value, Bc: ⩽ 10.
- Time from 40 Bc to 100 Bc (78 °C, 35 MPa, 40 min), min: ⩽ 40.
- Thickening Time Extension (min): > 60.
- Dosage Sensitivity (%): ⩽ 20.
- Temperature Sensitivity (%): ⩽ 20.
- Free Water (78 °C, %): ⩽ 1.4.
- Compressive Strength (98 °C, 20.7 MPa, 24 h), MPa: ⩾ 14.0.
- Cement Slurry Composition: Class G (HSR) cement; Water: distilled.

Key Benefits

- Effectively extends thickening time (TT100) within the 70–110 °C range to ensure pumpability, reducing early-set and stuck-pipe risks.
- Controlled dosage and temperature sensitivity (⩽20%) simplifies on-site fine-tuning within the design window.
- Works synergistically with fluid-loss, dispersant, stabilizer, and defoamer systems to balance thickening safety and displacement efficiency.

Formulation Notes

- Recommended Dosage: express as %BWOC; first calibrate TT100 at the design temperature (e.g., 0.1–0.5% BWOC) and verify the 40–100 Bc transition time.
- Operational Window: maintain initial consistency ⩽30 Bc and linear mutation ⩽10 Bc; combine with dispersant/fluid-loss packages as needed to balance rheology and filtration.
- Post-Job Evaluation: verify 24 h compressive strength ⩾14 MPa at 98 °C; for long intervals or high-density slurries, consider a larger safety margin for thickening behavior.

Industry-Referenced Charts (Illustrative — Not Our In-House Test Data)

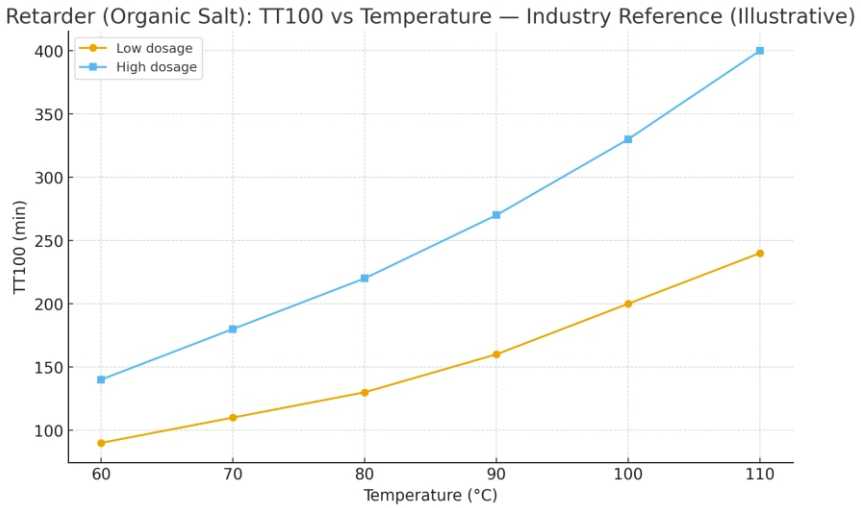


Figure 1. Source: Original document.

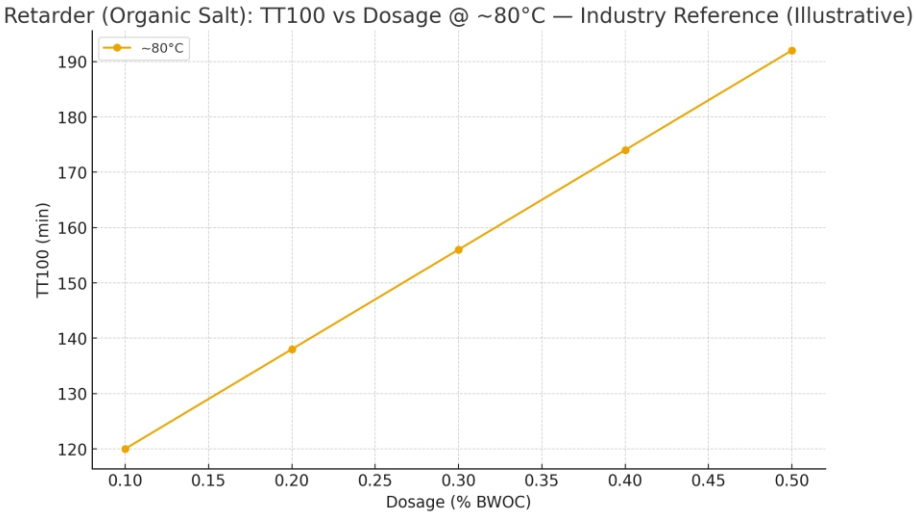


Figure 2. Source: Original document.

Packaging & Storage

- Packaged in plastic drums; net weight (25 ± 0.5) kg per drum, or as specified by the customer.
- Store in a dry, ventilated place at 0 °C to 40 °C; avoid moisture exposure.
- Protect from rain and packaging damage during transport. Shelf life: 3 years.

References (Open-Source, Industry-Referenced)

- Halliburton — HR-series retarders (specifications and application windows).
- Baker Hughes — R-3 Retarder (MSDS/overview).
- General handbooks — Cement retarders and thickening time design (textbook/guide).

WH-3S | Retarder for Oilwell Cement (Organic Acid Type)

Snapshot

- Standards Basis: SY/T 5504.1–2013 (retarders).
- Fineness (0.315 mm sieve residue, %): ⩽ 15.
- Moisture (%): ⩽ 8.
- Water Solubility: soluble.
- Thickening Time (140 °C, 70 MPa, 80 min), min: ⩾ 280.
- Initial Consistency (140 °C, 70 MPa, 80 min), Bc: ⩽ 30.
- Thickening Linear Mutation Value, Bc: ⩽ 10.
- Time from 40 Bc to 100 Bc (140 °C, 70 MPa, 80 min), min: ⩽ 40.
- Free Water (90 °C, %): ⩽ 1.4.
- Compressive Strength (160 °C, 20.7 MPa, 24 h), MPa: ⩾ 14.0.
- Cement Slurry Composition: Class G (HSR) cement, quartz sand, silica fume; Water: distilled.

Key Benefits

- For high-temperature sections (140–160 °C), significantly extends thickening time (TT100) to reduce early-set and stuck-pipe risks and maintain pumpability over long intervals.
- Controls initial consistency and linear mutation (⩽30/⩽10 Bc) for a stable thickening trajectory and on-site controllability.
- Synergizes with silica fume/quartz systems for high-temperature stability while balancing filtration, rheology, and later-age strength.

Formulation Notes

- Dosage & Temperature Calibration: define dosage window as %BWOC and first calibrate TT100 for the 140–160 °C target; verify the 40–100 Bc transition time.
- System Compatibility: combine with dispersant/fluid-loss/stabilizer/defoamer packages as needed to balance pumpability and filtration; avoid overdosing that may cause excessive retardation.
- Operational Safety: maintain linear mutation ⩽10 Bc, control free water ⩽1.4%, and verify 24h compressive strength ⩾14 MPa at 160 °C.

Packaging & Storage

- Packaged in plastic drums; net weight (25 ± 0.5) kg per drum, or as specified by the customer.
- Store in a dry, ventilated place at 0 °C to 40 °C; avoid moisture exposure.
- Protect from rain and packaging damage during transport. Shelf life: 3 years.

WH-4S | Retarder for Oilwell Cement (Organic Acid Type)

Snapshot

- Standards Basis: SY/T 5504.1–2013 (retarders).
- Fineness (0.42 mm sieve residue, %): ⩽ 15.
- Moisture (%): ⩽ 8.
- Water Solubility: soluble.
- Thickening Time (140 °C, 70 MPa, 80 min), min: ⩾ 280.
- Initial Consistency (140 °C, 70 MPa, 80 min), Bc: ⩽ 30.
- Thickening Linear Mutation Value, Bc: ⩽ 10.
- Time from 40 Bc to 100 Bc (140 °C, 70 MPa, 80 min), min: ⩽ 40.
- Free Water (90 °C, %): ⩽ 1.4.
- Compressive Strength (160 °C, 20.7 MPa, 24 h), MPa: ⩾ 14.0.
- Cement Slurry Composition: Class G (HSR) cement, quartz sand, silica fume; Water: distilled.

Key Benefits

- For 140–160 °C high-temperature sections, significantly extends thickening time (TT100) to reduce early-set and stuck-pipe risks and maintain pumpability over long intervals.
- Controls initial consistency and linear mutation (⩽30/⩽10 Bc) for a stable thickening trajectory and reliable on-site controllability.
- Synergizes with silica fume/quartz systems to balance filtration control, rheology, and later-age strength under HPHT conditions.

Formulation Notes

- Dosage & Temperature Calibration: set the dosage window as %BWOC; first calibrate TT100 to the 140–160 °C target and verify the 40–100 Bc transition time.
- System Compatibility: combine with dispersant/fluid-loss/stabilizer/defoamer packages as needed to balance pumpability and filtration; avoid overdosing that may cause excessive retardation.
- Operational Safety: maintain linear mutation ⩽10 Bc, control free water ⩽1.4%, and verify 24h compressive strength ⩾14 MPa at 160 °C.

Packaging & Storage

- Packaged in plastic drums; net weight (25 ± 0.5) kg per drum, or as specified by the customer.
- Store in a dry, ventilated place at 0 °C to 40 °C; avoid moisture exposure.
- Protect from rain and packaging damage during transport. Shelf life: 3 years.

WH-1L | Retarder for Oilwell Cement (Organic Acid Type)

Snapshot

- Standards Basis: SY/T 5504.1–2013 (retarders).
- Thickening Time (78 °C, 34–35 MPa, 40 min), min: ⩾ 120.
- Initial Consistency (78 °C, 35 MPa, 40 min), Bc: ⩽ 30.
- Thickening Linear Mutation Value, Bc: ⩽ 10.
- Time from 40 Bc to 100 Bc (78 °C, 35 MPa, 40 min), min: ⩽ 40.
- Thickening Time Extension (min): > 60.
- Dosage Sensitivity (%): ⩽ 25.
- Temperature Sensitivity (%): ⩽ 20.
- Free Water (78 °C, %): ⩽ 1.4.
- Compressive Strength (98 °C, 20.7 MPa, 24 h), MPa: ⩾ 14.0.
- Cement Slurry Composition: Class G (HSR) cement; Water: distilled.

Key Benefits

- Within the ~78–98 °C range, effectively extends thickening time (TT100) to reduce early-set and stuck-pipe risks and preserve pumpability.
- Controls initial consistency and linear mutation (⩽30/⩽10 Bc), improving operational stability and predictability.
- Dosage and temperature sensitivities are controlled (⩽25%/⩽20%), enabling on-site fine-tuning within the design window.

Formulation Notes

- Dosage Calibration: define the window as %BWOC; at design temperature, calibrate TT100 and correlate with the 40–100 Bc transition time.
- System Compatibility: coordinate with dispersant/fluid-loss/stabilizer/defoamer packages tobalance rheology, filtration, and thickening safety; avoid excessive retardation.
- Quality Acceptance: control free water ⩽1.4% and verify 24 h compressive strength ⩾14 MPa at 98 °C.

Packaging & Storage

- Packaged in plastic drums; net weight (25 ± 0.5) kg per drum, or as specified by the customer.
- Store in a dry, ventilated place at 0 °C to 40 °C; avoid moisture exposure.
- Protect from rain and packaging damage during transport. Shelf life: 2 years.

WH-2L | Retarder for Oilwell Cement(Acrylamide Type)

Snapshot

• Standards Basis: SY/T 5504.1–2013 (retarders).
• Thickening Time (110 °C, 55 MPa, 50 min), min: ⩾ 180.
• Initial Consistency (110 °C, 55 MPa, 50 min), Bc: ⩽ 30.
• Thickening Linear Mutation Value, Bc: ⩽ 10.
• Time from 40 Bc to 100 Bc (110 °C, 55 MPa, 50 min), min: ⩽ 40.
• Thickening Time Extension (min): > 60.
• Dosage Sensitivity (%): ⩽ 25.
• Temperature Sensitivity (%): ⩽ 20.
• Free Water (90 °C, %): ⩽ 1.4.
• Compressive Strength (140 °C, 20.7 MPa, 24 h), MPa: ⩾ 14.0.
• Cement Slurry Composition: Class G (HSR) cement, quartz sand, silica fume; others as required; Water: distilled.

Key Benefits

• Designed for the 110–140 °C temperature window, significantly extending thickening time (TT100) to minimize early-set and stuck-pipe risks.
• Controls initial consistency and linear mutation (⩽30/⩽10 Bc) to ensure a stable thickening trajectory and safe pumpability.
• Controlled dosage and temperature sensitivity (⩽25%/⩽20%) allows for on-site fine-tuning within the operational window.

Formulation Notes

• Dosage Calibration: define dosage window as %BWOC; calibrate TT100 at the design temperature (~110 °C) and correlate with the 40–100 Bc transition time.
• System Compatibility: coordinate with dispersant/fluid-loss/stabilizer/defoamer systems to balance rheology, filtration, and thickening safety; avoid excessive retardation.
• Quality Control: maintain free water ⩽1.4% and verify 24 h compressive strength ⩾14 MPa at 140 °C.

Packaging & Storage

• Packaged in plastic drums; net weight (25 ± 0.5) kg per drum, or as specified by the customer.
• Store in a dry, ventilated place at 0 °C to 40 °C; avoid moisture exposure.
• Protect from rain and packaging damage during transport. Shelf life: 2 years.

WH-3L | Retarder for Oilwell Cement (Acrylamide Type)

Snapshot

- Standards Basis: SY/T 5504.1–2013 (retarders).
- Thickening Time (130 °C, 80.7 MPa, 65 min), min: ⩾ 180.
- Initial Consistency (110 °C, 80.7 MPa, 65 min), Bc: ⩽ 30.
- Thickening Linear Mutation Value, Bc: ⩽ 10.
- Time from 40 Bc to 100 Bc (130 °C, 80.7 MPa, 50 min), min: ⩽ 40.
- Thickening Time Extension (min): > 60.
- Dosage Sensitivity (%): ⩽ 25.
- Temperature Sensitivity (%): ⩽ 20.
- Free Water (90 °C, %): ⩽ 1.4.
- Compressive Strength (154 °C, 20.7 MPa, 24 h), MPa: ⩾ 14.0.
- Cement Slurry Composition: Class G (HSR) cement, quartz sand, silica fume; others as required; Water: distilled.

Key Benefits

- Designed for 110–154 °C conditions, significantly extending thickening time (TT100) to reduce early-set and stuck-pipe risks.
- Controls initial consistency and linear mutation (⩽30/⩽10 Bc) to ensure stable thickening behavior and pumpability.
- Controlled dosage and temperature sensitivity (⩽25%/⩽20%) allow for on-site fine-tuning within the operational window.

Formulation Notes

- Dosage Calibration: define dosage window as %BWOC; calibrate TT100 under 110–130 °C and correlate with the 40–100 Bc transition time.
- System Compatibility: combine with dispersant/fluid-loss/stabilizer/defoamer systems to balance rheology, filtration, and thickening safety; avoid overdosing that may lead to excessive retardation.
- Quality Control: maintain free water ⩽1.4% and verify 24 h compressive strength ⩾14 MPa at 154 °C.

Packaging & Storage

- Packaged in plastic drums; net weight (25 ± 0.5) kg per drum, or as specified by the customer.
- Store in a dry, ventilated place at 0 °C to 40 °C; avoid moisture exposure.
- Protect from rain and packaging damage during transport. Shelf life: 2 years.

WK-2S | High-Temperature Stabilizer for Oilwell Cement (Mineral Powder Type)

Snapshot

- Standards Basis: SY/T 6544–2017 (stabilizers / sedimentation control).
- Fineness (0.315 mm sieve residue, %): ⩽ 5.
- 2 h Sedimentation Stability (Δρ, g/cm³): ⩽ 0.03.
- Free Water (90 °C, %): ⩽ 1.4.
- Initial Consistency (150 °C, 70 MPa, 70 min), Bc: ⩽ 30.
- Thickening Linear Mutation Value, Bc: ⩽ 10.
- Cement Slurry Composition: Class G (HSR) cement, quartz sand, silica fume; Water: distilled.

Key Benefits

- Improves slurry stability at 150 °C, reducing 2-h top/bottom density difference (Δρ) and free water, suppressing sedimentation and phase separation.
- Balances initial consistency and thickening linear mutation (⩽10 Bc), ensuring pumpability and process control under HPHT conditions.
- Works synergistically with silica fume / quartz systems to enhance matrix density, reduce permeability, and improve long-term sealing performance.

Formulation Notes

- Dosage: define as %BWOC (typically 0.25–1.0% for initial screening); calibrate against 2 h Δρ and free water under actual density/temperature conditions.
- Gradation & Rheology: fine powders increase specific surface area and thixotropy; coordinate with dispersant / defoamer / fluid-loss systems to control ESD and prevent over-gelation.
- Evaluation Method: assess stability via top/bottom density difference (Δρ, g/cm³), 2-h static free fluid (%), and static stability tests; optionally measure SGS growth rate for additional validation.

Industry-Referenced Charts (Illustrative — Not Our In-House Test Data)

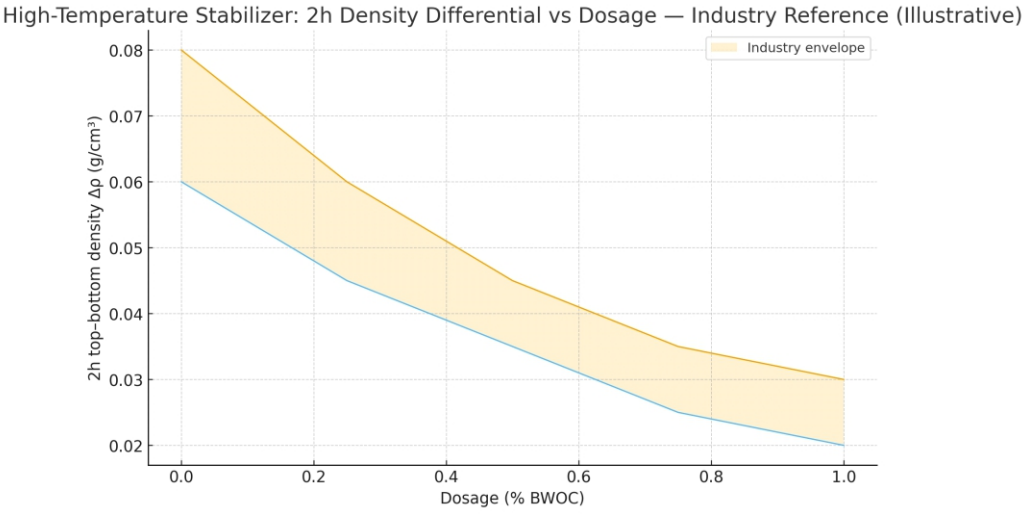


Figure 1. Source: Original document (illustrative sedimentation / free-fluid trends).

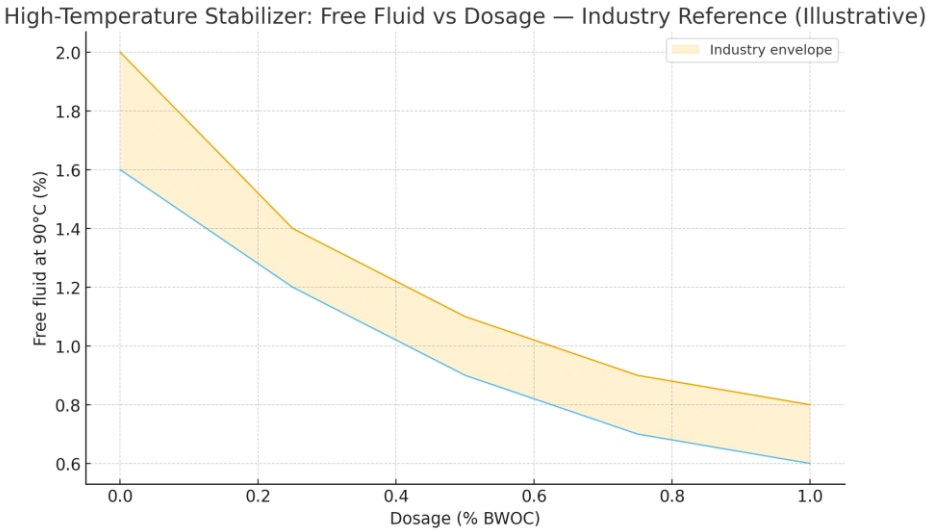


Figure 2. Source: Original document (illustrative sedimentation / free-fluid trends).

Packaging & Storage

- Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.
- Store in a dry, ventilated place at 0 °C to 40 °C; avoid moisture exposure.
- Protect from rain and packaging damage during transport. Shelf life: 3 years.

References (Open-Source, Industry-Referenced)

- Halliburton — D-Air / SEAL stabilizer family (slurry stability concepts, technical manual).
- SLB — CemSTAB / CemCRETE documentation (stability and segregation control, density difference, and free-fluid trends).
- SPE & API publications — Free Fluid and Sedimentation evaluation (API RP 10B laboratory protocols).

WK-3S | High-Temperature Stabilizer for Oilwell Cement (Biopolymer Type)

Snapshot

- Standards Basis: SY/T 6544–2017 (stabilizers / sedimentation control).
- Fineness (0.315 mm sieve residue, %): ⩽ 5.
- Moisture (%): ⩽ 8.
- 2 h Sedimentation Stability (Δρ, g/cm^3): ⩽ 0.03.
- Free Water (90 °C, %): ⩽ 1.4.
- Initial Consistency (120 °C, 60 MPa, 60 min), Bc: ⩽ 30.
- Thickening Linear Mutation Value, Bc: ⩽ 10.
- Cement Slurry Composition: Class G (HSR) cement, quartz sand, silica fume; Water: distilled.

Key Benefits

- Improves slurry stability at 120 °C, reducing 2-h top/bottom density difference (Δρ) and free water to suppress sedimentation and phase separation.
- Biopolymer provides effective structuring and binding while keeping initial consistency and linear mutation within control (⩽30/⩽10 Bc) for pumpability and process control.
- Synergizes with silica fume / quartz systems to increase matrix density, reduce permeability, and improve long-term sealing performance.

Formulation Notes

- Dosage: define initial screening window as %BWOC (e.g., 0.2–0.8%); calibrate against 2 h Δρ and free water under the target density/temperature conditions.
- Gradation & Rheology: biopolymer increases thixotropy and static stability; coordinate with dispersant / defoamer / fluid-loss systems to control ESD and avoid excessive thixotropy.
- Evaluation Method: assess top/bottom density difference (Δρ, g/cm^3), 2-h static free fluid (%), and static stability tests; optionally monitor SGS growth rate for additional validation.

Packaging & Storage

- Packaged in plastic drums; net weight (25 ± 0.5) kg per drum, or as specified by the customer.
- Store in a dry, ventilated place at 0 °C to 40 °C; avoid moisture exposure.
- Protect from rain and packaging damage during transport. Shelf life: 3 years.

WN-1S | Toughening and Lost-Circulation Additive for Oilwell Cement (Mineral Powder Type)

Snapshot

- Standards Basis: SY/T 6544–2017.
- Fineness (0.315 mm sieve residue, %): ⩽ 5.
- Initial Consistency (52 °C, 35.6 MPa, 28 min), Bc: ⩽ 30.
- Thickening Linear Mutation Value, Bc: ⩽ 10.
- Compressive Strength (70 °C, 20.7 MPa, 24 h), MPa: ⩾ 14.
- Elastic Modulus (70 °C, 20.7 MPa, 48 h), GPa: ⩽ 8.5.
- Cement Slurry Composition: Class G (HSR) cement; Water: distilled.

Key Benefits

- Integrated toughening and loss-control mechanism: optimized mineral particle gradation combined with flexible fines reduces elastic modulus and increases strain capacity while sealing fractures and pores.
- Improves displacement and sealing: maintains controlled consistency and linear mutation while forming dense filter cake and bridge plug structures to reduce loss and micro-annulus risk.
- Compatible with fluid-loss, dispersant, defoamer, and stabilizer systems to ensure balanced pumpability, filtration, and long-term integrity.

Formulation Notes

- Dosage: define initial screening window as %BWOC (e.g., 0.2–1.0%); optimize based on fracture width or leak path aperture.
- Gradation Design: apply multi-modal particle size distribution (bridging particles + fillers + fine powders) to match fracture width and D90; introduce fiber reinforcement where necessary.
- Evaluation Method: assess sealing pressure (ΔP–fracture width curve), regained permeability, and fluid loss; concurrently monitor 24 h compressive strength, 48 h modulus, and free water.

Industry-Referenced Charts (Illustrative — Not Our In-House Test Data)

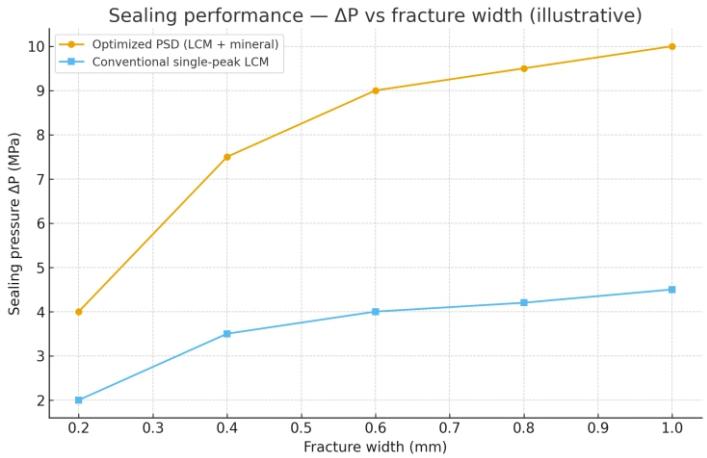


Figure 1. Source: Original document (illustrative sedimentation / free-fluid trends).

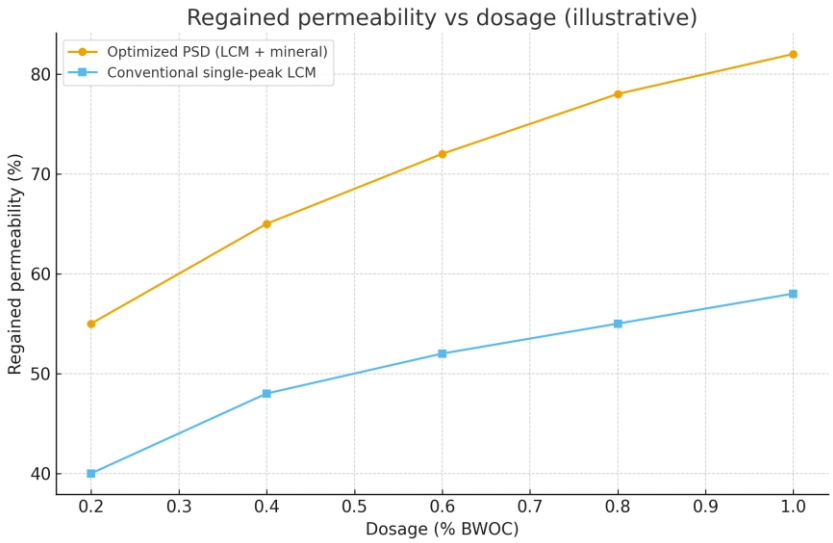


Figure 2. Source: Original document (illustrative sealing and permeability trends).

Packaging & Storage

• Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.

• Store in a dry, ventilated place at 0 °C to 40 °C; avoid moisture exposure.

• Protect from rain and packaging damage during transport. Shelf life: 3 years.

References (Open-Source, Industry-Referenced)

• SLB — Lost-Circulation Additives (LCM selection and PSD matching).

• Halliburton — LCM / Bridge Plug systems (sealing and particle gradation concepts).

• SPE Publications — Fracture sealing pressure and regained permeability evaluation using graded LCM systems.

WP-1L | Anti-Contamination Additive for Oilwell Cement (Organic Salt Type)

Snapshot

• Standards Basis: SY/T 5374.1–2016 (anti-contamination / compatibility).

• pH: 1–3.

• Compatibility (52 °C, 35.6 MPa, 28 min): Initial consistency ⩽ 30 Bc; Thickening time extension ⩾ 30 min.

• Mixed System (7:2:1 = cement slurry : drilling fluid : spacer fluid) compatibility: Initial consistency ⩽ 30 Bc; Thickening time extension ⩾ 30 min.

• Cement slurry / drilling fluid / spacer composition: available upon request.

Key Benefits

• Improves cement slurry tolerance to drilling-fluid and spacer contamination, achieving the compatibility targets (initial consistency ⩽30 Bc, TT extension ⩾30 min).

• Maintains stable thickening trajectory under contamination, reducing early-set and stuck-pipe risk while enhancing displacement efficiency.

• Compatible with fluid-loss, dispersant, stabilizer, and defoamer systems for balanced pumpability, filtration, and final strength.

Formulation Notes

• Dosage: define initial screening window as %BWOC (e.g., 0.3–1.0%); calibrate initial consistency and TT extension under contamination levels (2–20% drilling fluid).

• Test Combinations: validate (1) cement slurry + additive; (2) 7:2:1 composite system of cement slurry : drilling fluid : spacer for contamination compatibility.

• Operational Notes: control pH and integrate with dispersant / fluid-loss / stabilizer / defoamer systems; avoid over-thickening or excessive retardation; adjust density and silica/quartz content as needed.

Industry-Referenced Charts (Illustrative — Not Our In-House Test Data)

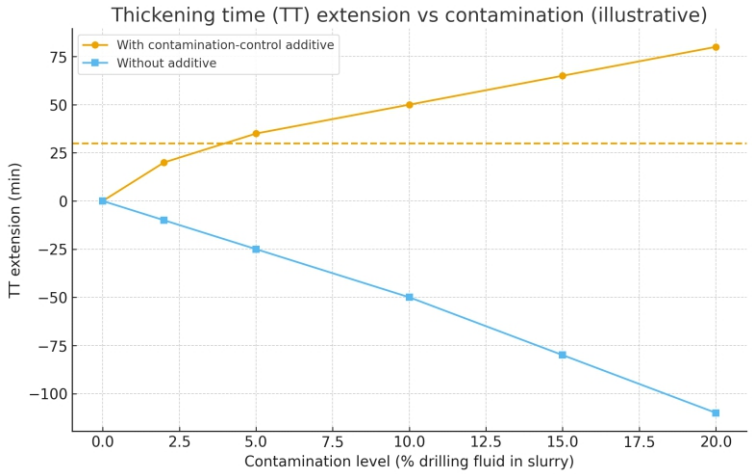


Figure 1. Source: Original document (illustrative contamination and TT stability trends).

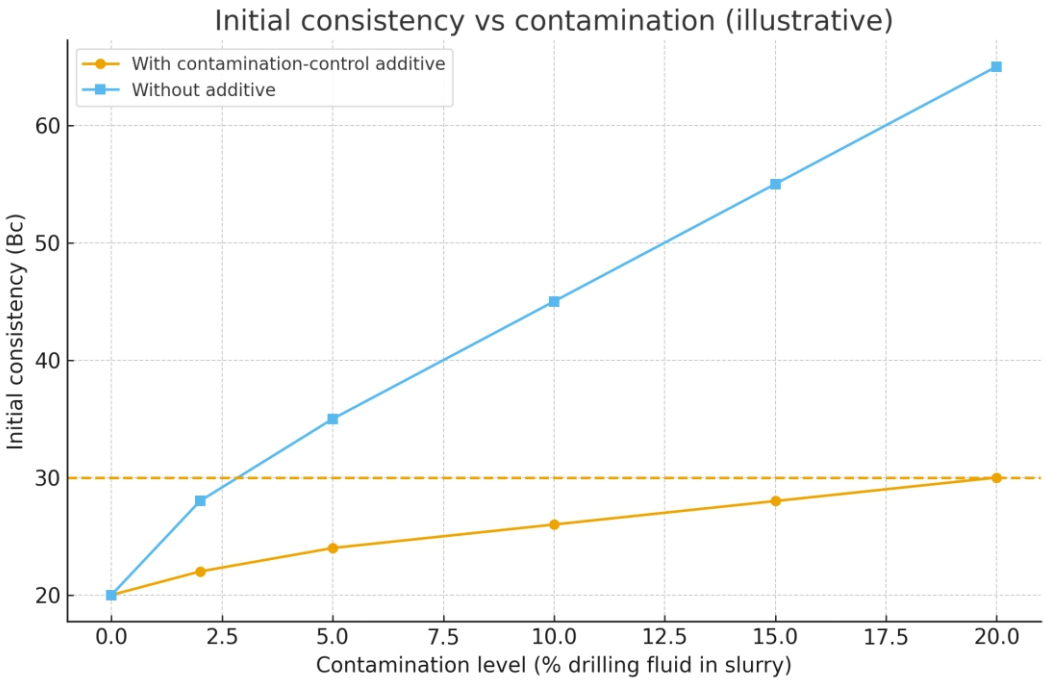


Figure 2. Source: Original document (illustrative contamination and TT stability trends).

Packaging & Storage

- Packaged in plastic drums; net weight (25 ± 0.5) kg per drum, or as specified by the customer.
- Store in a dry, ventilated place at 0 °C to 40 °C; avoid moisture exposure.
- Protect from rain and packaging damage during transport. Shelf life: 2 years.

WS-1S | Dispersant for Oilwell Cement (Aldehyde–Ketone Condensate Type)

Snapshot

• Standards Basis: SY/T 6545–2017 (dispersants for oilwell cement).
• Fineness (0.315 mm sieve residue, %): ⩽ 5.
• Fluidity (80 °C, 35 MPa, 30 min), mm: ⩾ 230.
• Free Water (80 °C, %): ⩽ 1.4.
• Compressive Strength (80 °C, 20.7 MPa, 24 h), MPa: ⩾ 14.
• Cement Slurry Composition: Class G (HSR) cement; Water: distilled.

Key Benefits

• Enhances cement slurry fluidity and reduces yield stress, maintaining rheological stability under elevated temperatures (80–120 °C).
• Reduces water demand and slurry viscosity, improving pumpability and minimizing friction pressure during placement.
• Compatible with fluid-loss additives, retarders, defoamers, and stabilizers to achieve balanced rheological performance and thickening control.

Formulation Notes

• Dosage: define as %BWOC (commonly 0.2–0.8%); calibrate according to slurry density, temperature, and water–cement ratio.
• Rheology Calibration: measure plastic viscosity and yield stress at target temperature and pressure; ensure adequate dispersion without excessive free fluid.
• Compatibility: validate with other cement additives (especially retarders and fluid-loss agents) to maintain thickening safety and prevent segregation.

Industry-Referenced Charts (Illustrative — Not Our In-House Test Data)

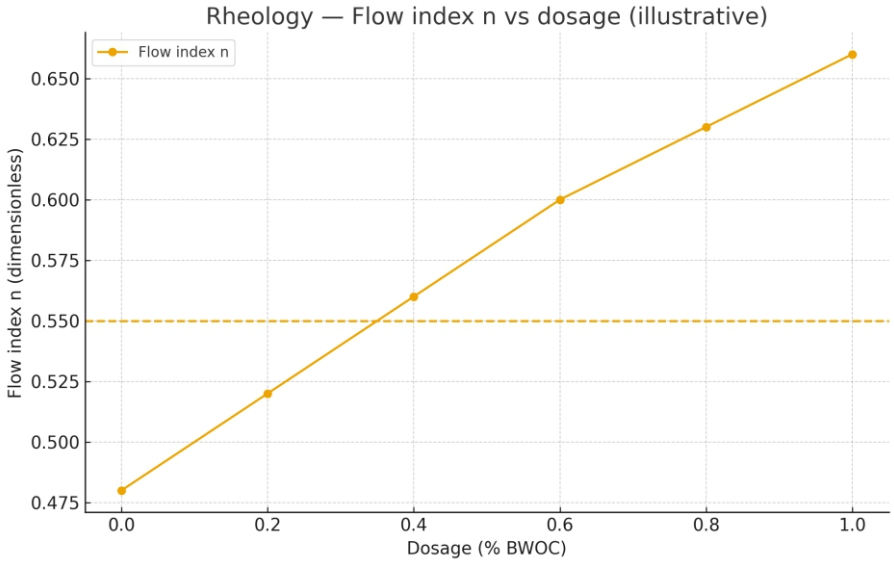


Figure 1. Source: Original document (rheology and fluidity trends).

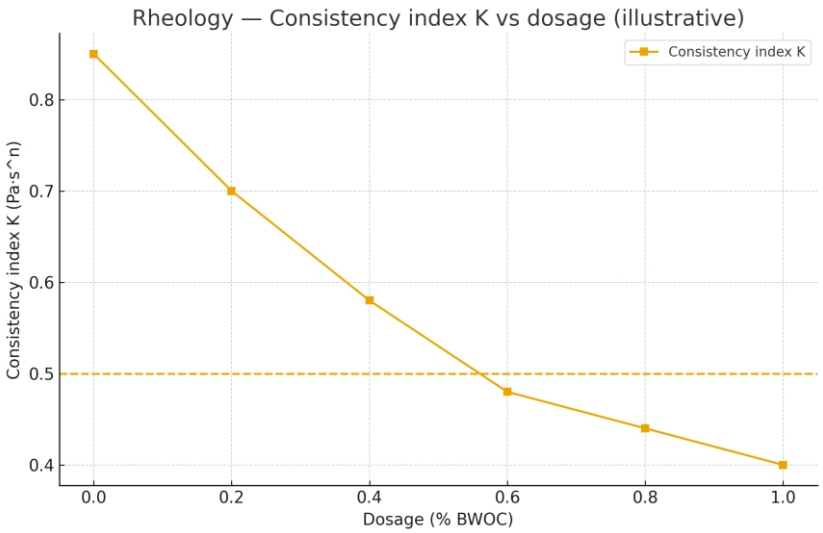


Figure 2. Source: Original document (rheology and fluidity trends).

Packaging & Storage

• Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.

• Store in a dry, ventilated place at 0 °C to 40 °C; avoid moisture exposure.

• Protect from rain and packaging damage during transport. Shelf life: 3 years.

References (Open-Source, Industry-Referenced)

• SLB — CemDISP™ Dispersant (fluidity and rheology control in HPHT systems).

• Halliburton — CFR™ dispersant family (cement rheology and dispersion characteristics).

• SPE & API literature — Cement dispersant mechanisms and temperature-dependent performance trends.

WS-2S | Dispersant for Oilwell Cement (Polycarboxylate Type)

Snapshot

• Standards Basis: SY/T 6545–2017 (dispersants for oilwell cement).
• Fineness (0.315 mm sieve residue, %): ⩽ 5.
• Fluidity (80 °C, 35 MPa, 30 min), mm: ⩾ 230.
• Free Water (80 °C, %): ⩽ 1.4.
• Compressive Strength (80 °C, 20.7 MPa, 24 h), MPa: ⩾ 14.
• Cement Slurry Composition: Class G (HSR) cement; Water: distilled.

Key Benefits

• Electro-steric dispersion lowers plastic viscosity and yield stress while sustaining fluidity at elevated temperatures.
• Reduces water demand and friction pressure, improving pumpability and placement efficiency.
• Good compatibility with fluid-loss additives, retarders, stabilizers, and defoamers for balanced rheology and thickening control.
• Salt and temperature tolerance suitable for common HP/HT cementing windows (to be validated by project-specific testing).

Formulation Notes

• Dosage: express as %BWOC (typical screening 0.10–0.80%). Calibrate for density, temperature, and water–cement ratio.
• Water Quality Sensitivity: verify performance with make-up water salinity/mineralization; adjust dosage accordingly.
• Additive Interactions: optimize with retarders and fluid-loss agents to maintain initial consistency and thickening linear mutation control.
• Mixing Order: disperse in mix water or as pre-blend per lab protocol to ensure consistent rheology and minimal entrained air.

Packaging & Storage

• Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.
• Store in a dry, ventilated place at 0 °C to 40 °C; avoid moisture exposure.
• Protect from rain and packaging damage during transport. Shelf life: 3 years.

WS-2L | Dispersant for Oilwell Cement (Polycarboxylate Type, Liquid)

Snapshot

• Standards Basis: SY/T 6545–2017 (dispersants for oilwell cement).
• Physical Form: Liquid.
• Fluidity Target (80 °C, 35 MPa, 30 min), mm: ⩾ 230.
• Free Water (80 °C, %): ⩽ 1.4.
• Compressive Strength (80 °C, 20.7 MPa, 24 h), MPa: ⩾ 14.
• Cement Slurry Composition: Class G (HSR) cement; Water: distilled.

Key Benefits

• Electro-steric dispersion effectively lowers plastic viscosity and yield stress, sustaining fluidity at elevated temperatures.
• Reduces water demand and friction pressure, improving pumpability and displacement efficiency.
• Liquid form enables precise dosing and easy on-site blending; compatible with fluid-loss additives, retarders, stabilizers, and defoamers for balanced rheology and thickening control.

Formulation Notes

• Dosage: express as %BWOC or by volume for liquids (typical screening 0.10–0.80% BWOC equivalent). Calibrate against density, temperature, and water–cement ratio.
• Water Quality: verify performance under varying salinity/mineralization; adjust dosage to maintain fluidity and control free water.
• Additive Interactions: optimize with retarders and fluid-loss agents to keep initial consistency and thickening linear mutation within control; manage entrained air with defoamers.
• Mixing Sequence: add to mix water or pre-blend per lab protocol to ensure consistent dispersion and minimal agglomeration.

Packaging & Storage

• Packaged in plastic drums; net weight (25 ± 0.5) kg per drum, or as specified by the customer.
• Store in a dry, ventilated place at 0 °C to 40 °C; avoid moisture exposure and freezing.
• Protect from rain and packaging damage during transport. Shelf life: 2 years.

WT-1S | Toughening & Permeability-Reducing Additive for Oilwell Cement

(Polymer Latex Powder Type)

Snapshot

- Standards Basis: SY/T 5504.5–2022 (toughening materials).
- Fineness (0.315 mm sieve residue, %): ⩽ 5.
- Initial Consistency (52 °C, 35.6 MPa, 28 min), Bc: ⩽ 30.
- Thickening Linear Mutation Value, Bc: ⩽ 10.
- Compressive Strength (70 °C, 20.7 MPa, 24 h), MPa: ⩾ 14.
- Elastic Modulus (70 °C, 20.7 MPa, 48 h), GPa: ⩽ 8.5.
- Permeability (70 °C, 20.7 MPa, 48 h), 10^{-3} μm^2: ⩽ 0.1.
- Cement Slurry Composition: Class G (HSR) cement; Water: distilled.

Key Benefits

- Polymer latex powder introduces an elastic phase and pore-blocking domains, decreasing elastic modulus while lowering permeability.
- Improves casing–sheath bonding and resistance to microannulus formation under thermal cycling and pressure fluctuations.
- Maintains initial consistency and thickening control (⩽30/⩽10 Bc), supporting a safe pumpability window and early zonal isolation.

Formulation Notes

- Dosage: express as %BWOC; screen at 2–8% BWOC and calibrate for modulus reduction and permeability control at the target temperature.
- Dispersion & Wetting: ensure adequate wetting of latex powder; coordinate with dispersant/defomer to manage rheology and entrained air.
- Compatibility: validate with fluid-loss/stabilizer/retarder systems to maintain thickening trajectory and minimize free water; verify bond strength and gas-tightness if needed.

Industry-Referenced Charts (Illustrative — Not Our In-House Test Data)

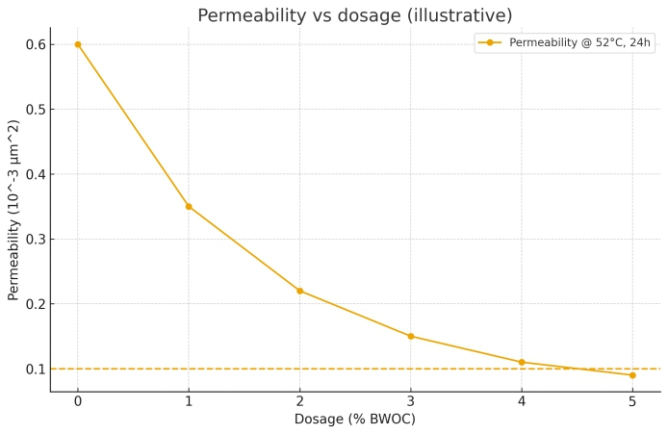


Figure 1. Source: Original document (strength, modulus, and permeability trends).

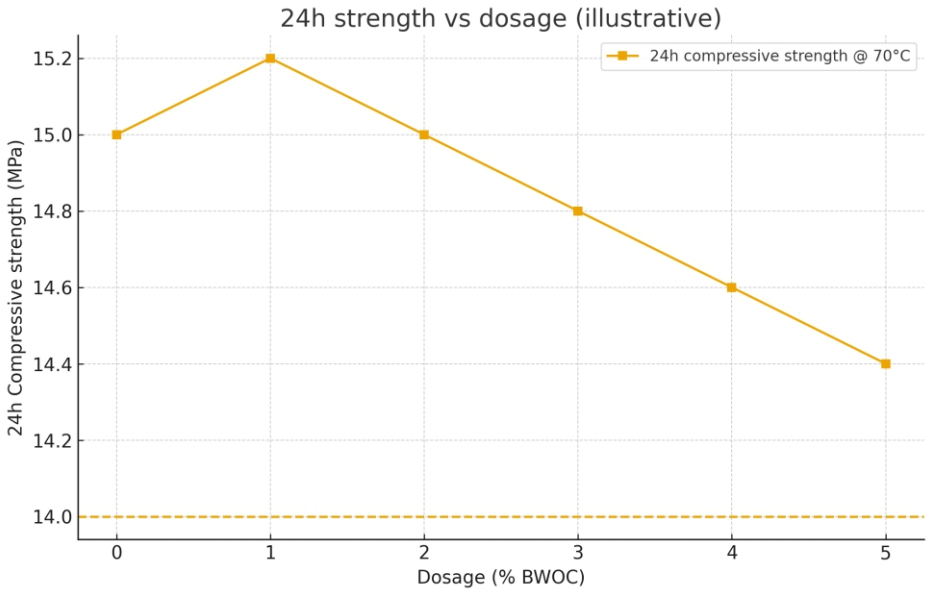


Figure 2. Source: Original document (strength, modulus, and permeability trends).

Packaging & Storage

• Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.

• Store in a dry, ventilated place at 0–40 °C; avoid moisture uptake.

• Protect from rain and packaging damage during transport. Shelf life: 3 years.

References (Open-Source, Industry-Referenced)

• SPE and API literature — Polymer-modified oilwell cement: modulus reduction and permeability control.

• Halliburton / SLB technical notes — Latex toughening and gas-tightness control in cement systems.

WT-2S | Toughening Additive for Oilwell Cement (Mineral Powder Type)

Snapshot

• Standards Basis: SY/T 5504.5–2022 (toughening materials).
• Fineness (0.315 mm sieve residue, %): ⩽ 5.
• Initial Consistency (155 °C, 100 MPa, 75 min), Bc: ⩽ 30.
• Thickening Linear Mutation Value, Bc: ⩽ 10.
• Compressive Strength (180 °C, 20.7 MPa, 48 h), MPa: ⩾ 18.
• Compressive Strength (180 °C, 20.7 MPa, 7 d), MPa: ⩾ 30.
• Cement Slurry Composition: Class G (HSR) cement, quartz sand, silica fume; Water: distilled.

Key Benefits

• Optimized for HPHT conditions (155–180 °C), maintaining low initial consistency and linear mutation while enhancing strength retention and thermal stability.
• Reduces elastic modulus and micro-crack propagation by forming dense hydration products and thermally stable microstructures with silica fume and quartz sand.
• Delivers improved zonal isolation integrity and long-term durability under cyclic thermal and mechanical stress.

Formulation Notes

• Dosage / Replacement: define as %BWOC; calibrate under project-specific HPHT curing (155–180 °C) for compressive strength and rheology performance.
• Particle Size Distribution: coordinate with silica fume / quartz gradation to enhance packing density and minimize permeability.
• Rheology & Stability: fine mineral powders increase viscosity; balance with dispersant / defoamer / stabilizer systems to control ESD and static stability.
• Durability: evaluate long-term strength retention, permeability, and micro-annulus tolerance under high-temperature cooling cycles.

Industry-Referenced Charts (Illustrative — Not Our In-House Test Data)

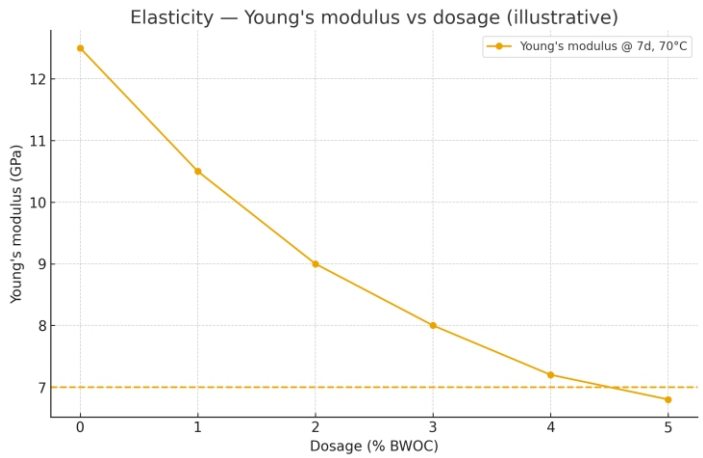


Figure 1. Source: Original document (compressive strength and temperature correlation trends).

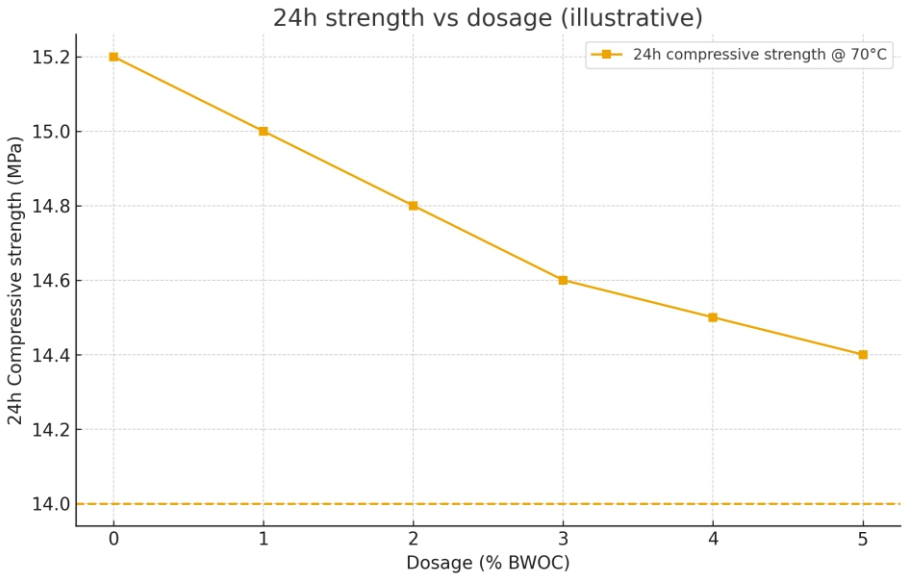


Figure 2. Source: Original document (compressive strength and temperature correlation trends).

Packaging & Storage

• Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.

• Store in a dry, ventilated place at −5 °C to 40 °C; avoid moisture exposure.

• Protect from rain and packaging damage during transport. Shelf life: 3 years.

References (Open-Source, Industry-Referenced)

• SLB — GASBLOK™ / latex toughening systems (strength and thermal stability data).

• Halliburton — ChannelFix™ / IsoBond™ systems (modulus and bonding enhancement).

• SPE and academic literature — Mineral and silica toughening mechanisms in HPHT cementing (strength-modulus correlation).

WT-1L/ Latex for Oilwell Cement (Styrene–Butadiene Rubber, SBR)

Snapshot

- Standards Basis: SY/T 6466–2016; SY/T 6544–2017.
- API Fluid Loss (90 °C, 6.9 MPa), mL: < 50.
- Initial Consistency (90 °C, 55 MPa, 50 min), Bc: ⩽ 30.
- Thickening Time (90 °C, 55 MPa, 50 min), min: ⩾ 120.
- Time from 40 Bc to 100 Bc (90 °C, 55 MPa, 50 min), min: ⩽ 40.
- Thickening Linear Mutation Value, Bc: ⩽ 10.
- Free Water (90 °C, %): ⩽ 1.4.
- 2 h Sedimentation Stability (90 °C, g/cm^3): < 0.02.
- Compressive Strength (70 °C, 20.7 MPa, 24 h), MPa: ⩾ 14.
- Permeability (90 °C, ambient pressure, 24 h), 10^{-3} μm^2: ⩽ 0.1.
- Cement Slurry Composition: Class G cement, silica fume; Water: distilled.

Key Benefits

- SBR latex forms a flexible film phase and dense microstructure during hydration, significantly decreasing API fluid loss and permeability to enhance gas-tightness and barrier integrity.
- At 90 °C / 55 MPa, provides a balanced thickening profile (TT100 ⩾120 min) with controlled initial consistency and linear mutation, preserving a safe pumpability window.
- Improves static stability (low 2 h density difference and free water), reducing sedimentation/segregation; synergizes with silica fume to increase density and bond strength.

Formulation Notes

- Dosage: screen as %BWOC (e.g., 1–5%) at 70–90 °C and co-evaluate API fluid loss, permeability, thickening trajectory, and 24 h strength.
- Emulsification / Compatibility: ensure latex stability and suitable particle-size distribution; coordinate with dispersant / fluid-loss / defoamer packages to avoid microbubbles and ECD bias.
- Evaluation Protocol: API fluid loss (30 min @ 6.9 MPa), permeability (90 °C / 24 h), 2 h sedimentation stability and free water; optionally test bond strength and static-gel-strength (SGS) growth rate.

Packaging & Storage

- Packaged in plastic drums; net weight (25 ± 0.5) kg per drum, or as specified by the customer.
- Store in a dry, ventilated place at 4–30 °C; avoid moisture ingress and freezing.
- Protect from rain and packaging damage during transport. Shelf life: 2 years.

WT-LT | Latex Conditioner for Oilwell Cement (Surfactant Blend Type)

Snapshot

• Standards Basis: SY/T 6466–2016; SY/T 6544–2017 (latex systems and stability).
• Physical Form: Liquid; non-ionic/anionic surfactant blend with coalescence aid.
• pH (as supplied): 6–9 (typical).
• Initial Consistency (80–90 °C, 35–55 MPa, 30–50 min), Bc: ⩽ 30.
• Thickening Linear Mutation Value, Bc: ⩽ 10.
• 2 h Sedimentation Stability (Δρ, g/cm^3, 80–90 °C): ⩽ 0.02.
• Free Water (80–90 °C, %): ⩽ 1.4.
• API Fluid Loss impact: neutral to mildly reducing (formulation-dependent).
• Cement Slurry Composition reference: Class G cement with latex, dispersant, fluid-loss additive, defoamer; Water: distilled.

Key Benefits

• Improves latex dispersion and stability, limiting agglomeration and phase separation during mixing and placement.
• Controls foaming tendency and entrained air, supporting predictable rheology and equivalent circulating density (ECD).
• Enhances film formation/coalescence of latex at target temperature, aiding permeability reduction and gas-tightness.
• Maintains thickening trajectory (⩽30/⩽10 Bc), supporting a safe pumpability window and early zonal isolation.

Formulation Notes

• Dosage: express as %BWOC or %BVOW (by volume of water) for liquids; initial screening 0.05–0.50% BWOC equivalent.
• Mixing Sequence: pre-dilute in mix water, then add latex; coordinate with dispersant and defoamer to balance dispersion and air control.
• Compatibility: validate with fluid-loss additives, retarders, and stabilizers; avoid antagonistic surfactant interactions that raise viscosity or free water.
• Evaluation: verify 2 h density difference (Δρ), free water, API fluid loss, rheology (PV/YP), and thickening parameters at the design temperature/pressure.

Packaging & Storage

• Packaged in plastic drums; net weight (25 ± 0.5) kg per drum, or as specified by the customer.
• Store in a dry, ventilated place at 5–30 °C; protect from freezing and direct sunlight.
• Shelf life: 2 years in unopened containers.

WW-2S | Weighted Spacer / Stabilizing Additive for Oilwell Cement (Mineral Powder Type)

Snapshot

• Standards Basis: SY/T 5504.7–2024 (weighted spacer / stabilizing materials).

• Fineness (0.315 mm sieve residue, %): ⩽ 5.0; Moisture (%): ⩽ 1.0.

• Target Spacer Density (g/cm^3): 1.50 ± 0.05; Stability at 52 °C (2 h top/bottom density difference, g/cm^3): ⩽ 0.10.

• Compatibility (52 °C, 35.6 MPa, 28 min): Cement slurry : spacer = 7 : 3 → initial consistency ⩽ 30 Bc; thickening time longer than neat cement slurry.

• Compatibility (52 °C): Drilling fluid : spacer = 1 : 1 → apparent viscosity (mPa · s) lower than drilling fluid.

• Compositions of cement slurry / drilling fluid / spacer: available upon request.

Key Benefits

• Achieves the 1.50 ± 0.05 g/cm^3 density window using mineral weighting while maintaining 2-h stability Δρ ⩽ 0.10 g/cm^3 to suppress sedimentation and phase separation.

• Optimized compatibility with cement and drilling fluids: meets 7:3 and 1:1 test conditions for thickening/viscosity targets, lowering interfacial instability and stuck-pipe risk.

• Works synergistically with dispersant / stabilizer / defoamer / anti-contamination packages to balance density, rheology, and interface cleanliness, improving displacement efficiency and sheath integrity.

Formulation Notes

• Dosage vs. Density: design using %w/v or kg/m^3 curves to first satisfy 1.50 ± 0.05 g/cm^3; concurrently calibrate 2-h Δρ and filtration/free fluid.

• Gradation & Synergy: optimize coarse/fine ratio and specific gravity; stagger addition with dispersant/stabilizer, and consider small fibers where loss control is needed.

• Compatibility Validation: run (1) 7:3 cement:spacer thickening/initial consistency and (2) 1:1 drilling fluid:spacer apparent viscosity tests at representative temperature/salinity.

Industry-Referenced Charts (Illustrative — Not Our In-House Test Data)

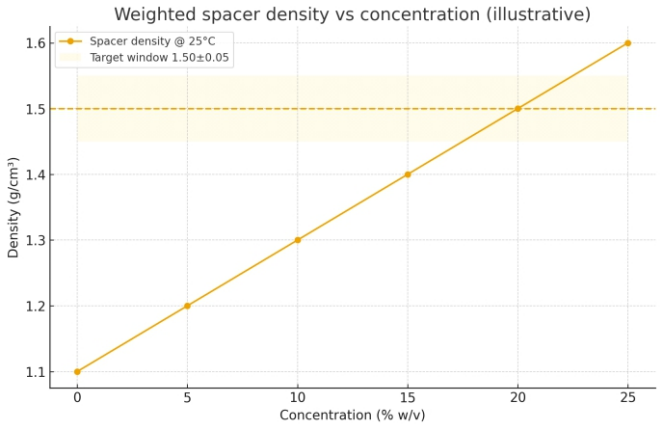


Figure 1. Source: Original document (density and stability trends).

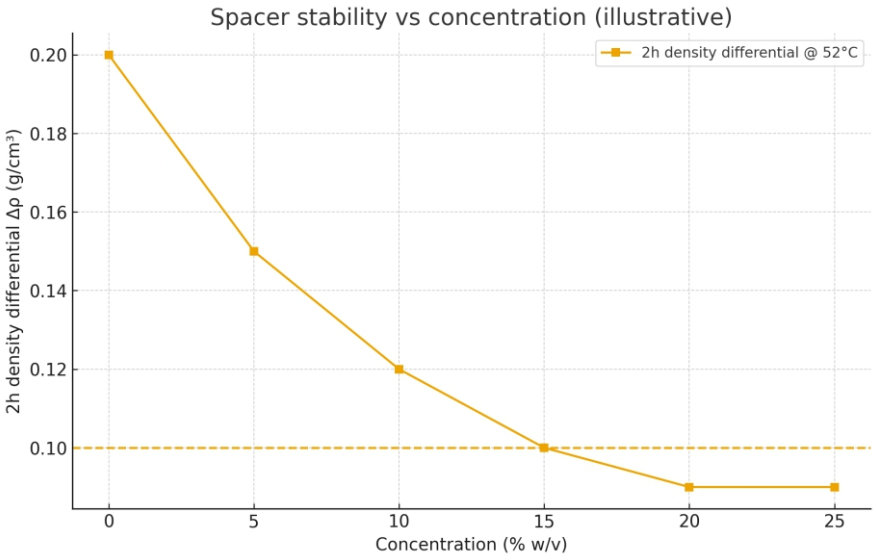


Figure 2. Source: Original document (density and stability trends).

Packaging & Storage

• Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.

• Store in a dry, ventilated place at −5 °C to 40 °C; avoid moisture exposure.

• Protect from rain and packaging damage during transport. Shelf life: 3 years.

WX-1L | Defoamer for Oilwell Cement (Organic Ester Type)

Snapshot

• Standards Basis: SY/T 6548–2017 (defoamer performance and evaluation).
• Physical Form: Liquid (organic ester type).
• pH (25 °C): 5–8.
• Foam Suppression Test (25 °C): initial height ⩽ 20 mm, foam break time ⩽ 5 s.
• Compatibility: suitable for dispersant, fluid-loss control, and stabilizer systems without phase separation.
• Dosage Range: 0.1–1.0% BWOC (laboratory recommendation).
• Cement Slurry Composition: Class G (HSR) cement; Water: distilled.

Key Benefits

• Provides rapid foam collapse and long-lasting suppression, improving cement slurry density control and pumpability.
• Compatible with fluid-loss and dispersant systems, maintaining stable rheology and reducing entrained air under shear and temperature variations.
• Organic ester base minimizes oil contamination and enhances environmental safety compared with silicone-based defoamers.

Formulation Notes

• Dosage & Optimization: determine at laboratory scale based on air content and rheology; typical dosage 0.1–1.0% BWOC or 0.05–0.5% BVOW.
• Addition Sequence: add after dispersant and fluid-loss agent to avoid interference with wetting and hydration kinetics.
• Compatibility Verification: confirm with retarders, stabilizers, and latex systems to ensure uniform dispersion and bubble suppression.

Industry-Referenced Charts (Illustrative — Not Our In-House Test Data)

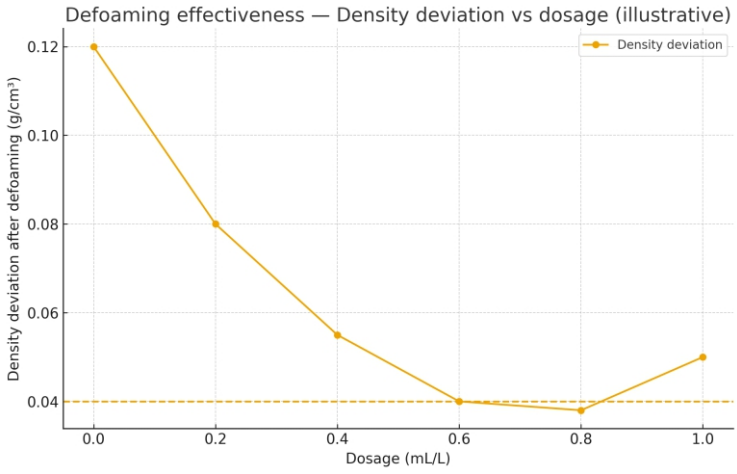


Figure 1. Source: Original document (foam collapse and air-content reduction trends).

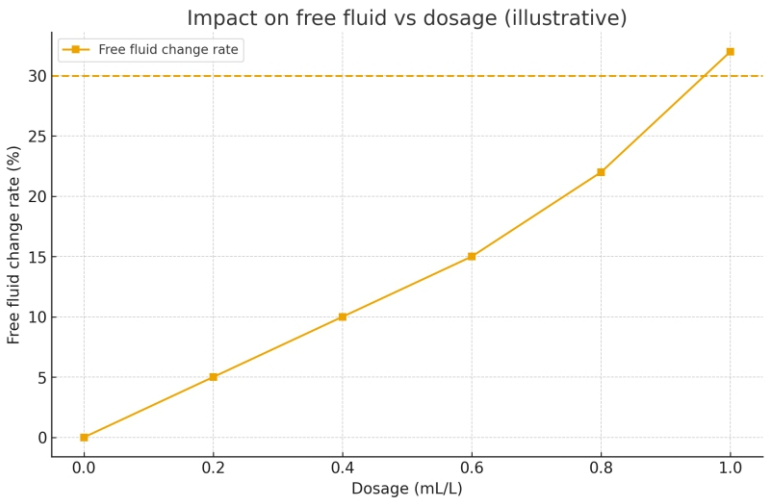


Figure 2. Source: Original document (foam collapse and air-content reduction trends).

Packaging & Storage

• Packaged in plastic drums; net weight (25 ± 0.5) kg per drum, or as specified by the customer.
• Store in a dry, ventilated place at 0–40 °C; avoid freezing and direct sunlight.
• Protect from rain and packaging damage during transport. Shelf life: 2 years.

References (Open-Source, Industry-Referenced)

• Halliburton — Defoam 3 / Defoam 5 product literature (organic-ester and silicone hybrid defoamers).
• SLB — CemDEFOAM™ technical data (foam collapse performance and compatibility).
• SPE & API publications — Evaluation of defoamers in cement slurry design under HPHT conditions.

WX-2L| Defoamer for Oilwell Cement (Organic Ether Type)

Snapshot

• Standards Basis: SY/T 6548–2017 (defoamer performance and evaluation).
• Physical Form: Liquid (organic ether-based).
• pH (25 °C): 6–9.
• Foam Suppression Test (25 °C): initial height ⩽ 20 mm, foam break time ⩽ 5 s.
• Compatibility: suitable for dispersant, fluid-loss control, and stabilizer systems without phase separation.
• Dosage Range: 0.1–1.0% BWOC (laboratory recommendation).
• Cement Slurry Composition: Class G (HSR) cement; Water: distilled.

Key Benefits

• Rapid defoaming and foam suppression under moderate-to-high temperatures, minimizing entrained air and density variations.
• Ether-based structure provides broad compatibility with polymeric dispersants, stabilizers, and retarders, preventing adverse chemical reactions.
• Enhances slurry homogeneity, reduces friction pressure, and improves pumpability across extended mixing and placement operations.

Formulation Notes

• Dosage Optimization: test within 0.1–1.0% BWOC (or 0.05–0.5% BVOW for liquid basis) according to air content, rheology, and API fluid-loss data.
• Addition Sequence: add after dispersant and fluid-loss control agent to minimize emulsification and interference with cement hydration.
• Compatibility Validation: ensure consistency with other additives (retarders, stabilizers, and latex systems); monitor foam regeneration during mixing.

Packaging & Storage

• Packaged in plastic drums; net weight (25 ± 0.5) kg per drum, or as specified by the customer.
• Store in a dry, ventilated place at 0–40 °C; avoid freezing and direct sunlight.
• Protect from rain and packaging damage during transport. Shelf life: 2 years.

WX-3L| Defoamer for Oilwell Cement (Organic Ether Type)

Snapshot

• Standards Basis: SY/T 6544–2017 (foam control for cementing fluids).
• Post-defoaming slurry density difference (g/cm^3): ⩽ 0.04.
• Applicable Media: cement slurry / spacer / wash fluids and other surfactant-containing systems (verify by project testing).

Key Benefits

• Rapid defoaming and foam suppression minimize entrained air; helps control slurry density difference within ⩽0.04 g/cm^3 for accurate metering and ECD management.
• Organic-ether chemistry provides strong diffusion and low residue, ensuring broad compatibility with dispersant / fluid-loss / latex systems and allowing small on-line trims.
• Operations-friendly window: minimal impact on rheology and thickening behavior, enabling dynamic fine-tuning with changing drilling-fluid conditions.

Formulation Notes

• Dosage: calibrate in mL/L (e.g., 0.2–0.8 mL/L initial screen) targeting “density difference ⩽ 0.04 g/cm^3”; simultaneously verify effects on free water and stability.
• Addition Sequence: recommended order is dispersant / fluid-loss agent → defoamer; small trims can be added during mixing and circulation. Avoid overdosing that may cause foam rebound.
• Evaluation Protocol: density difference (gassy vs. degassed), defoaming response time, foam half-life, and impact on initial consistency / thickening trajectory.

Packaging & Storage

• Packaged in plastic drums; net weight (25 ± 0.5) kg per drum, or as specified by the customer.
• Store in a dry, ventilated place at 0–40 °C; protect from direct sunlight.
• Handle with care during transport to avoid package damage and inversion. Shelf life: 2 years.

WY-S1 | Suspension Additive for Oilwell Cement (Biopolymer Type)

Snapshot

- Standards Basis: SY/T 6544–2017 (suspension and rheology control materials).
- Fineness (0.315 mm sieve residue, %): ⩽ 5.
- Moisture (%): ⩽ 8.
- 2 h Sedimentation Stability (Δρ, g/cm³): ⩽ 0.03.
- Free Water (90 °C, %): ⩽ 1.4.
- Initial Consistency (90 °C, 35 MPa, 40 min), Bc: ⩽ 30.
- Thickening Linear Mutation Value, Bc: ⩽ 10.
- Cement Slurry Composition: Class G cement, silica fume, quartz sand; Water: distilled.

Key Benefits

- Improves cement slurry suspension stability, effectively reducing 2-h density difference (Δρ ⩽ 0.03 g/cm³) and preventing solid settling under static conditions.
- Biopolymer structure enhances rheological elasticity and gel strength recovery, minimizing free water and maintaining uniform slurry density distribution.
- Compatible with fluid-loss, retarder, dispersant, and stabilizer systems, ensuring balanced pumpability and static stability under HPHT conditions.

Formulation Notes

- Dosage: typically 0.2–1.0% BWOC; calibrate for target Δρ and free-water performance at operating temperature.
- Rheology Calibration: balance yield stress and gel strength to prevent sedimentation without compromising pumpability.
- Evaluation Method: measure 2-h top/bottom density difference (Δρ, g/cm³), static stability, free water (%), and 24 h compressive strength for verification.

Industry-Referenced Charts (Illustrative — Not Our In-House Test Data)

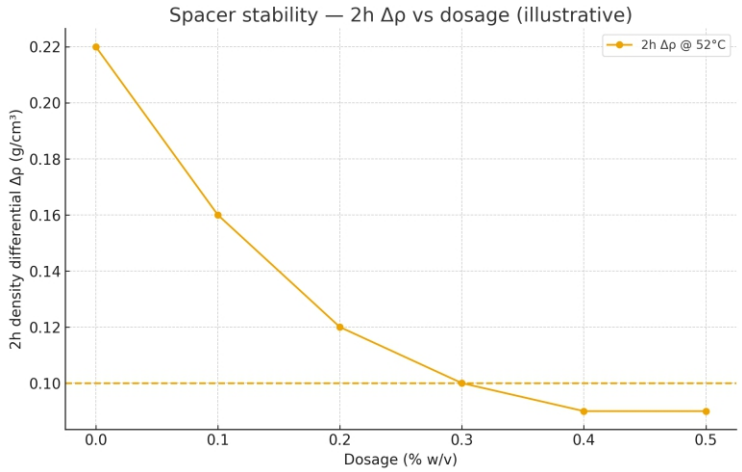


Figure 1. Source: Original document (illustrative sedimentation and free-fluid stability trends).

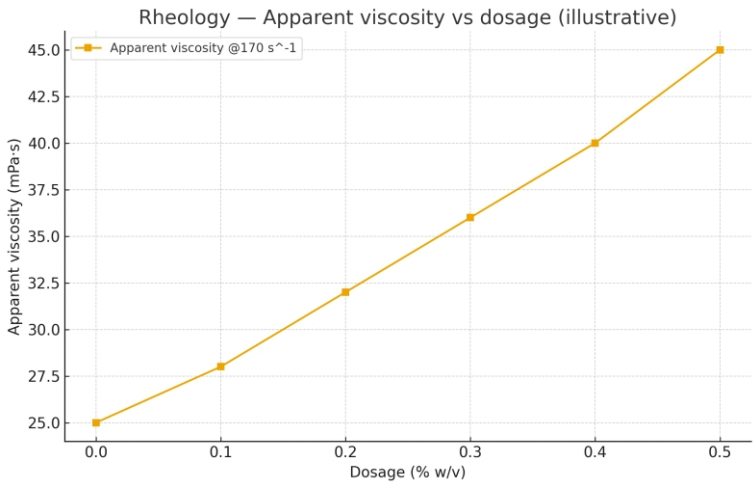


Figure 2. Source: Original document (illustrative sedimentation and free-fluid stability trends).

Packaging & Storage

• Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.

• Store in a dry, ventilated place at 0–40 °C; avoid moisture exposure.

• Protect from rain and packaging damage during transport. Shelf life: 3 years.

References (Open-Source, Industry-Referenced)

• Halliburton — Suspender™ / SEAL family (rheology and sedimentation control concepts).

• SLB — CemSTAB™ polymer stabilizers (density-difference and free-fluid control).

• SPE & API publications — Rheology and static-stability testing for cement systems (Δρ and free-water evaluation).

WY-S2| Suspension Additive for Oilwell Cement (Mineral Powder Type)

Snapshot

• Standards Basis: SY/T 5374.1–2016 (spacer compatibility and stability).
• Fineness (0.315 mm sieve residue, %): ⩽ 5.0.
• Spacer Stability (52 °C): 2-h top/bottom density difference Δρ (g/cm^3) ⩽ 0.10.
• Compatibility (52 °C, 35.6 MPa, 28 min): Cement slurry : spacer = 7 : 3 → no gelation/flocculation;
thickening-time ratio ⩾ 0.8; initial consistency ⩽ 30 Bc; thickening linear mutation ⩽ 10 Bc.
• Cement Slurry Composition: Class G cement; Water: distilled (others as required).
• Spacer Composition: barite powder; Water: distilled (others as required).

Key Benefits

• Constructs a mineral-powder suspension framework to suppress solid settling and stratification, maintaining Δρ ⩽ 0.10 g/cm^3 after 2 h to enhance spacer stability and carrying capacity.
• Meets compatibility window at 52 °C / 35.6 MPa / 28 min (TT ratio ⩾ 0.8, initial consistency ⩽ 30, mutation ⩽ 10), ensuring interfacial coordination with cement slurry.
• Works synergistically with weighting, dispersing, defoaming, and anti-contamination agents to balance density, rheology, and interface cleanliness, reducing stuck-pipe and micro-annulus risks.

Formulation Notes

• Dosage: define by %w/v for initial screening; calibrate 2-h Δρ and apparent viscosity at target density and solids loading. Combine with trace biopolymers if low-shear viscosity enhancement is needed.
• Gradation & Specific Gravity: optimize coarse/fine ratio and particle-size distribution in conjunction with barite density to achieve static stability while maintaining pumpability. Stagger dosing with dispersant/defoamer.
• Compatibility Validation: perform 7:3 cement : spacer thickening/consistency/mutation evaluation and confirm no gelation/flocculation; conduct worst-case tests if drilling-fluid residue is present.

Packaging & Storage

• Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.
• Store in a dry, ventilated place at 0–40 °C; avoid moisture exposure.
• Protect from rain and packaging damage during transport. Shelf life: 3 years.

WY-S3| High-Temperature Suspension Additive for Oilwell Cement (Mineral Powder Type)

Snapshot

• Standards Basis: SY/T 5374.1–2016 (spacer compatibility and stability).
• Fineness (0.315 mm sieve residue, %): ⩽ 5.0.
• Spacer Stability (52 °C): 2-h top/bottom density difference Δρ (g/cm^3) ⩽ 0.10.
• Compatibility (52 °C, 35.6 MPa, 28 min): Cement slurry : spacer = 7 : 3 → no gelation/flocculation; thickening-time ratio ⩾ 0.8; initial consistency ⩽ 30 Bc; thickening linear mutation ⩽ 10 Bc.
• Cement Slurry Composition: Class G cement, quartz sand, silica fume; Water: distilled.
• Spacer Composition: barite powder; Water: distilled (others as required).

Key Benefits

• Maintains a stable suspension network under high-temperature conditions (paired with quartz-sand/silica-fume systems), preventing solid settling and stratification while keeping 2-h Δρ ⩽ 0.10 g/cm^3.
• Preserves compatibility at 52 °C / 35.6 MPa / 28 min (TT ratio ⩾ 0.8, initial consistency ⩽ 30, mutation ⩽ 10), ensuring interfacial coordination and pumpability with cement slurry.
• Synergizes with weighting, dispersing, defoaming, and anti-contamination agents to balance density, rheology, and interface cleanliness, minimizing stuck-pipe and micro-annulus risks.

Formulation Notes

• Dosage: define by %w/v (e.g., 0.1–0.5%) for initial screening; under target density and solids content, revalidate 2-h Δρ and apparent viscosity at elevated temperatures (>70 °C).
• Gradation & Thermal Resistance: optimize mineral-powder coarse/fine ratio and specific gravity; combine with silica fume and quartz sand to improve thermal stability and density; blend trace biopolymer for low-shear viscosity if required.
• Compatibility Validation: perform 7:3 cement : spacer thickening/consistency/mutation tests to confirm no gelation/flocculation; incorporate drilling-fluid residue for worst-case combination testing if necessary.

Packaging & Storage

• Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.
• Store in a dry, ventilated place at 0–40 °C; avoid moisture exposure.
• Protect from rain and packaging damage during transport. Shelf life: 3 years.

WY-1L | Wash Additive for Oilwell Cement (Fatty Acid Type)

Snapshot

• Standards Basis: SY/T 5374.1–2016 (spacer and wash fluid additives).
• Physical Form: Liquid (fatty acid derivative).
• pH (25 °C): 6–9.
• Compatibility (52 °C, 35.6 MPa, 28 min): Cement slurry : wash fluid = 7 : 3 → no gelation/flocculation; initial consistency ⩽ 30 Bc; thickening-time ratio ⩾ 0.8; linear mutation ⩽ 10 Bc.
• Spacer Stability (52 °C): 2-h top/bottom density difference Δρ (g/cm^3) ⩽ 0.10.
• Cement Slurry Composition: Class G cement; Water: distilled (others as required).
• Wash Fluid Composition: fatty acid derivative; Water: distilled.

Key Benefits

• Enhances cleaning and interfacial separation between drilling fluid and cement slurry, promoting improved bonding and zonal isolation.
• Maintains stable dispersion and rheology; no gelation or flocculation within the compatibility window (52 °C / 35.6 MPa / 28 min).
• Fatty-acid chemistry improves wetting, film removal, and compatibility with surfactants and polymers used in spacers and preflush systems.

Formulation Notes

• Dosage: express as %BVOW (by volume of water); initial screening 0.1–1.0% BWOC equivalent; verify 2-h Δρ and interface stability.
• Compatibility: conduct 7:3 cement : wash tests for consistency (⩽30 Bc) and linear mutation (⩽10 Bc); confirm no phase separation or precipitation.
• System Integration: pair with dispersant / defoamer / stabilizer systems to balance density, rheology, and interface cleanliness.

Industry-Referenced Charts (Illustrative — Not Our In-House Test Data)

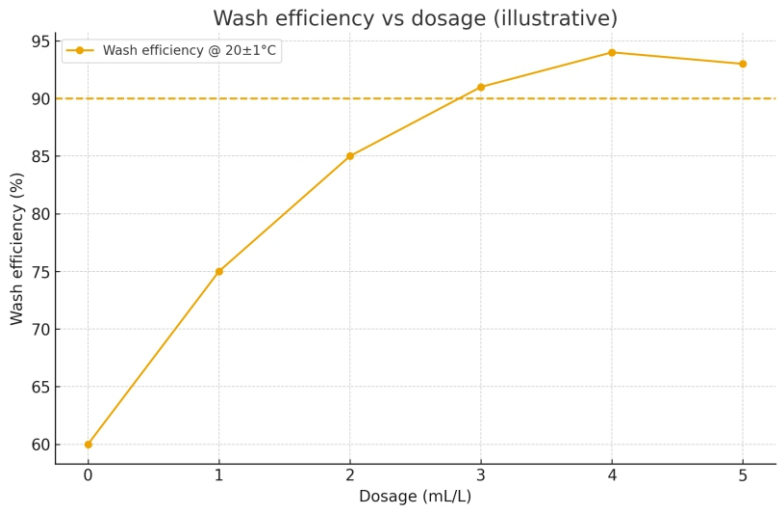


Figure 1. Source: Original document (illustrative interfacial and rheology trends).

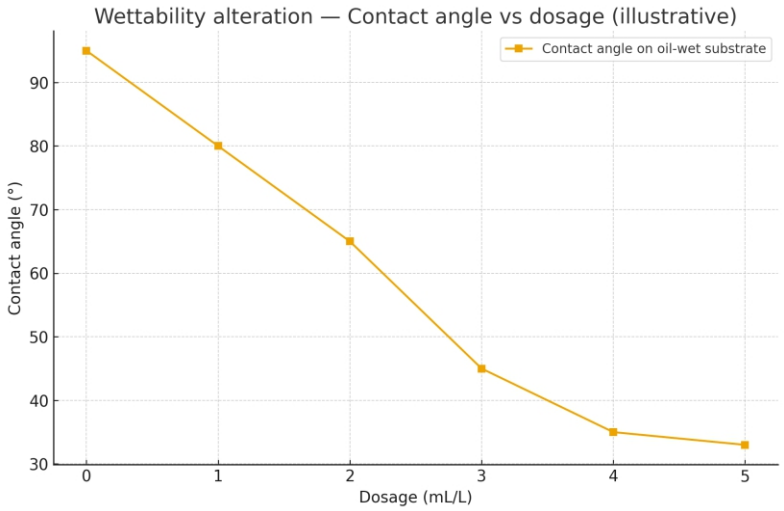


Figure 2. Source: Original document (illustrative interfacial and rheology trends).

Packaging & Storage

- Packaged in plastic drums; net weight (25 ± 0.5) kg per drum, or as specified by the customer.
- Store in a dry, ventilated place at 0–40 °C; avoid freezing and direct sunlight.
- Protect from rain and packaging damage during transport. Shelf life: 2 years.

References (Open-Source, Industry-Referenced)

- Halliburton — Spacer and wash fluid additives (cleaning and wetting agents).
- SLB — Wash fluid formulations and compatibility guidelines (interface testing).
- SPE literature — Spacer/wash fluid interfacial rheology and cleaning efficiency evaluation.

WY-2L/ Wash Additive for Oilwell Cement (Polyoxyethylene Ether Type)

Snapshot

• Standards Basis: SY/T 5374.1–2016 (washing/interface cleaning).
• Washing Efficiency (20 ±1 °C, %): ⩾ 90.
• Preflush Composition: barite powder; Water: distilled (others as required).
• Drilling Fluid Composition: water, bentonite, caustic soda, PAC-LV, partially hydrolyzed polyacrylamide (HPAM), diesel (for oil-contaminated scenario).

Key Benefits

• Nonionic polyoxyethylene ether surfactant offers excellent solubilization, emulsification, and wetting-reversal capability against oil/polymer composite contamination, achieving washing efficiency ⩾90%.
• Reduces contact angle and enhances interfacial hydrophilicity in diesel/polymer-residue scenarios, improving subsequent cement-sheath bond strength and annular sealing performance.
• Features low critical micelle concentration (CMC) and good temperature/salinity tolerance; synergizes with antifoaming/dispersing/suspending systems to maintain foam control and rheological window balance.

Formulation Notes

• Dosage Recommendation: screen in mL/L (e.g., 1–5 mL/L) under representative 'diesel + PAC/HPAM' contamination system to determine washing efficiency and foaming behavior.
• Evaluation Method: combined assessment of contact angle, surface tension, and interfacial tension; optionally verify hydrophilization effect through core-holding or micro-annulus bond-strength testing.
• Operational Notes: optimize preflush slug volume and contact time; stagger defoamer addition to suppress foaming and prevent density or measurement deviations.

Packaging & Storage

• Packaged in plastic drums; net weight (25 ± 0.5) kg per drum, or as specified by the customer.
• Store in a dry, ventilated place at 4–30 °C; avoid moisture exposure.
• Protect from rain and packaging damage during transport. Shelf life: 2 years.

WY-8L/ Wash Additive for Oilwell Cement (Fatty Acid Type)

Snapshot

• Standards Basis: SY/T 5374.1–2016 (washing/interface cleaning).
• Washing Efficiency (20 ±1 °C, %): ⩾ 90.
• Preflush Composition: barite powder; Water: distilled (others as required).
• Drilling Fluid Composition: water, bentonite, caustic soda, PAC-LV, partially hydrolyzed polyacrylamide (HPAM).

Key Benefits

• Fatty-acid surfactant system designed for water-based mud cake and polymer (PAC/HPAM) contamination; exhibits strong decontamination and wetting-reversal capability with washing efficiency ⩾90%.
• Reduces interfacial contact angle, improves wettability and interfacial tension, resulting in cleaner annular interfaces and higher cement-sheath bonding strength.
• Synergizes with suspension/dispersant/defoamer/anti-contamination systems to suppress foaming and maintain rheology and density stability of the preflush.

Formulation Notes

• Dosage: screen in mL/L (e.g., 1–5 mL/L) under 'water-based mud (PAC/HPAM) contamination' system to determine washing efficiency and foaming tendency.
• Evaluation Method: combined assessment of contact angle, surface tension, and interfacial tension; optionally confirm interface cleanliness improvement via bond-strength and micro-annulus sealing tests.
• Operational Notes: optimize preflush slug volume, contact time, and circulation rate; stagger defoamer addition to prevent bubble interference with density or flow measurements.

Packaging & Storage

• Packaged in plastic drums; net weight (25 ± 0.5) kg per drum, or as specified by the customer.
• Store in a dry, ventilated place at 4–30 °C; avoid moisture exposure.
• Protect from rain and packaging damage during transport. Shelf life: 2 years.

WZ-1S | Expansion Additive for Oilwell Cement (Mineral Powder Type)

Snapshot

• Standards Basis: SY/T 6544–2017 (expansion materials for oilwell cement).
• Fineness (0.315 mm sieve residue, %): ⩽ 5.0.
• Initial Consistency (52 °C, 35.6 MPa, 28 min), Bc: ⩽ 30.
• Thickening Linear Mutation Value, Bc: ⩽ 10.
• Compressive Strength (70 °C, 20.7 MPa, 24 h), MPa: ⩾ 14.
• Relative Expansion Ratio (70 °C, 20.7 MPa, 7 d, %): 0.4–3.2.
• Cement Slurry Composition: Class G cement; Water: distilled.

Key Benefits

• Provides moderate volumetric expansion (7 d: 0.4–3.2%) to compensate for hydration shrinkage, enhancing annular seal and micro-annulus resistance.
• Maintains 24-h compressive strength ⩾14 MPa while controlling initial consistency and linear mutation, balancing pumpability and early strength development.
• Compatible with micro-silica, quartz powder, and latex systems to improve interfacial bonding and gas-tightness after thermal cycling.

Formulation Notes

• Dosage: express as %BWOC (e.g., 0.5–3.0%) targeting 7-day expansion within 0.4–3.2%, with 24-h compressive strength as secondary control.
• Evaluation: measure linear/volumetric expansion (HP/HT confining setup), 24-h/7-d compressive strength, permeability/gas-tightness, and optional micro-annulus sealing under pressure cycling.
• Operational Guidance: avoid overdosing to prevent excessive expansion or micro-cracking; optimize with dispersant/fluid-loss/stabilizer/defoamer systems to refine thickening trajectory and filtration.

Industry-Referenced Charts (Illustrative — Not Our In-House Test Data)

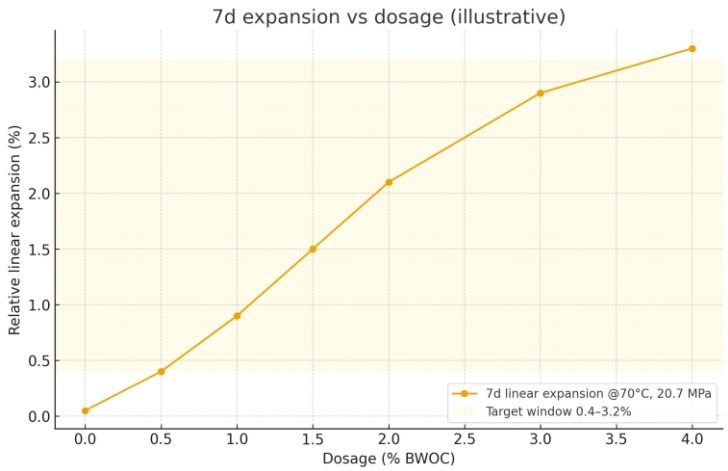


Figure 1. Source: Original document (expansion and compressive strength trends).

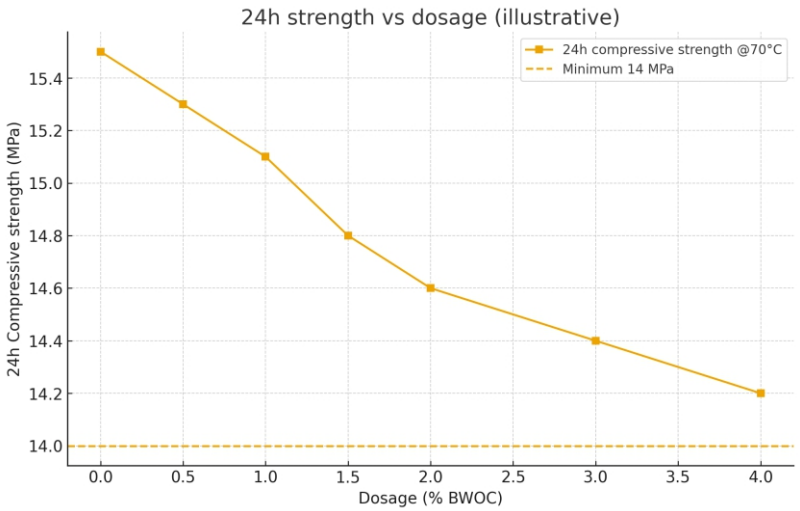


Figure 2. Source: Original document (expansion and compressive strength trends).

Packaging & Storage

• Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.

• Store in a dry, ventilated place at −5 °C to 40 °C; avoid moisture exposure.

• Protect from rain and packaging damage during transport. Shelf life: 3 years.

WJ-1S | Interface Enhancer for Oilwell Cement (Mineral Powder Type)

Snapshot

- Standards Basis: SY/T 5374.1–2016 (interface enhancement and compatibility).
- Fineness (0.315 mm sieve residue, %): ⩽ 5.0.
- Mixed Slurry Compressive Strength (80 ±1 °C × 2 h), MPa: ⩾ 1.0.
- Cement Slurry Composition: Class G cement; Water: distilled.
- Spacer Composition: suspending agent; Water: distilled.
- Combined Slurry Composition: cement slurry : spacer = 7 : 3.

Key Benefits

- Promotes solid–solid interface cohesion between cement and spacer, increasing compressive strength of the combined system (⩾1.0 MPa at 80 °C × 2 h).
- Improves particle bridging and interfacial wetting, reducing micro-channels and promoting early mechanical bonding.
- Compatible with dispersant, fluid-loss, stabilizer, and defoamer systems, ensuring uniform rheology and thickening control without flocculation or segregation.

Formulation Notes

- Dosage: screen within 0.2–1.0% BWOC; adjust per density, temperature, and slurry-to-spacer ratio to maintain compressive strength target and rheological consistency.
- Testing: perform 7:3 cement slurry : spacer combined test; measure interface compressive strength (⩾1.0 MPa) and verify initial consistency and thickening curve continuity.
- Operational Notes: ensure thorough mixing; avoid excessive dispersant that may weaken particle contact; verify no interface separation under static conditions.

Industry-Referenced Charts (Illustrative — Not Our In-House Test Data)

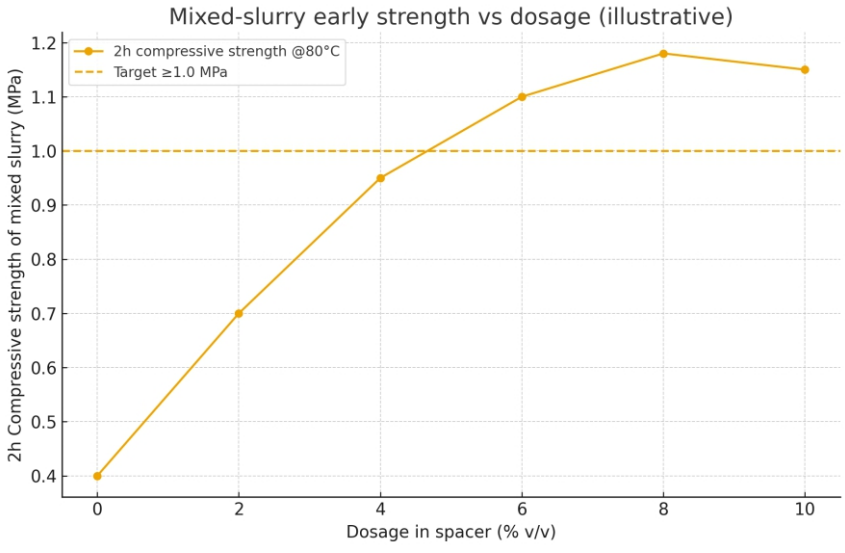


Figure 1. Source: Original document (interface strength and bonding trend data).

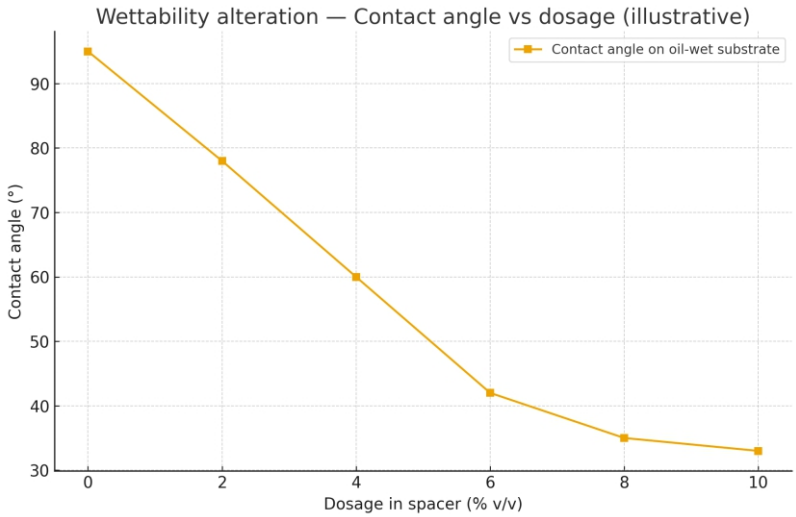


Figure 2. Source: Original document (illustrative interfacial and rheology trends).

Packaging & Storage

• Inner plastic liner with outer multi-ply kraft or woven bag; net weight (25 ± 0.5) kg per bag, or as specified by the customer.

• Store in a dry, ventilated place at 0–40 °C; avoid moisture exposure.

• Protect from rain and packaging damage during transport. Shelf life: 3 years.

References (Open-Source, Industry-Referenced)

• Halliburton — Interface bonding improvement additives (cement–spacer cohesion systems).

• SLB — Spacer and bonding enhancer literature (interface strength optimization).

• SPE papers — Evaluation of interface strength and bonding mechanisms in spacer–cement systems.

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Quality and Compliance Statement

• Products are developed and manufactured in accordance with relevant industry and corporate standards.
• Each batch is supplied with a Certificate of Analysis (COA), including key indicators such as particle size, moisture content, thickening/consistency window, API fluid loss, strength/modulus, and stability.
• Third-party testing and joint evaluation can be provided upon project request.

HSE and Storage & Transportation Guidelines (Summary)

• For industrial use only; wear protective gloves, goggles, and approved respiratory protection.
• Keep away from heat sources and direct sunlight; storage and handling conditions are specified on each product page.
• Handle leaks and waste in compliance with local regulations; dispose of or recycle packaging as required.
• For complete HSE details, refer to the respective product SDS.

Compatibility and Field Application Notes

• Formulation and dosage should be calibrated according to formation temperature and pressure, wellbore geometry, residual drilling fluid, target density, and operational window.
• Recommended verifications:
① Compatibility
② Fluid loss and stability
③ Mechanical integrity and compactness
④ Pumpability (40–100 Bc range)
• We provide a technical support workflow from “formulation screening → laboratory evaluation → field application package.”

Testing Methods and Reference Standards

• General: SY/T 5504 (series), SY/T 6466, SY/T 6544, SY/T 5374, and related standards.
• Parameter index: thickening/consistency, API fluid loss/free fluid/Δρ, strength/modulus/permeability, n/K rheological parameters, compatibility/anti-contamination, etc.
Note: Some “industry-referenced trend charts” in this manual illustrate general tendencies and are not in-house test data. Final formulations must be validated by project-specific testing.

Environmental and Sustainability Commitment

• Priority use of low-VOC / low-odor raw materials and recyclable packaging.
• SDS and ESG support documents available; ongoing development of product carbon-footprint accounting.

Legal Disclaimer and Limitation of Liability

• The information in this manual does not constitute a guarantee of performance under specific operating conditions; users must conduct adequate testing to confirm applicability.
• The company assumes no liability for losses caused by improper storage, out-of-scope use, or failure to verify compatibility as recommended.
• All trademarks and names belong to their respective owners; reproduction or unrelated marketing use is prohibited without authorization.
• Export and trade compliance: adhere to destination country/region laws and control requirements.

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创新引领

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