



CS OILFIELD

SPECIALITY OILFIELD CHEMICALS

FUSION INVERT

INTRODUCTION

INVERT FUSION is a premium non-aqueous drilling fluid system developed by CS OILFIELD to meet the challenges of today’s most complex wells—ranging from deepwater environments to high-temperature, high-pressure (HTHP) conditions.

Designed with adaptability at its core, INVERT FUSION™ enables precise control over rheology, emulsion stability, and filtration, while maintaining consistent performance in the face of contamination, thermal stress, and solids loading. The system’s modular formulation approach allows for seamless adjustment based on operational needs such as density, pressure management, and environmental compliance.

By incorporating a carefully engineered combination of emulsifiers, rheology modifiers, and filtration control additives from CS OILFIELD’s specialized product line, INVERT FUSION™ empowers drilling engineers with a reliable and high-performing platform to reduce risk, maximize penetration rates, and protect formation integrity across the most demanding drilling campaigns.

TYPICAL FORMULATION

KEY COMPONENTS (System-defining functional additives)

PRODUCT	FUNCTION	APPLICATION CONDITIONS
CS MUL P	Primary emulsifier	4.5–7.5 ppb
CS MUL S	Secondary emulsifier	2.0–5.0 ppb
REYNOCLAY	Organophilic clay	4.0–7.0 ppb
REYNOMOD	Rheology modifier	1.0–2.0 ppb
REYNOVIS	liquid viscosifier	1.0–2.0 ppb

SYSTEM ADVANTAGES

Stable Emulsion Performance INVERT FUSION is built on a superior emulsifier package designed for temperature resilience and contamination resistance, maintaining emulsion integrity across a wide operational range.

Field-Ready Versatility INVERT FUSION™ adapts seamlessly to OBM and SBM systems, making it suitable for HPHT, deepwater, and environmentally sensitive applications.

Contamination Tolerance The system maintains performance even in the presence of water influx, high solids loading, or chemical contamination — ensuring operational stability and reduced maintenance in unpredictable downhole conditions.

Low Dilution & Environmental Footprint High-activity components reduce the total chemical volume required, lowering dilution rates and minimizing waste—supporting efficient logistics and responsible operations in environmentally sensitive areas.



WIDELY AVAILABLE SUPPORTING MATERIALS

PRODUCT	FUNCTION	EXAMPLE CONCENTRATION
Barite	Weighting agent	As required
CS CaCO ₃	Bridging agent	20 ppb (at least)
CS GILSONITE	Fluid loss/sealing	4–6 ppb

SYSTEM ADAPTATION TO SPECIFIC CONDITIONS

PRODUCT	FUNCTION	EXAMPLE CONCENTRATION
SYNTROL-P	HPHT fluid loss control	High temp / pressure zones
SYNTROL-S	HPHT filter cake improvement	HPHT wells / deepwater
FLEXIGEL	Flat rheology enhancement	ERD / deepwater / flat rheology

PERFORMANCE HIGHLIGHTS

PARAMETER	VALUE / PERFORMANCE
Electrical Stability	> 600 V (stable after aging)
HPHT Fluid Loss	< 5 cc / 30 min
LSYP	> 8
PV	< 40
Emulsion Stability Maintained up to 325°F	

SYSTEM FLEXIBILITY

INVERT FUSION™ can be custom-designed for:

- HPHT wells — Fluid loss and rheology stability up to 300°F
- Flat rheology systems — Stable performance in ERD and riserless drilling
- Weighted mud programs — REYNOVIS integration for high-density applications
- Environment-sensitive operations — Adaptable to low-toxicity base oils or synthetic fluids

TYPICAL APPLICATIONS

- Deepwater and ultra-deepwater wells
- Extended-reach and high-angle wellbores
- Shale-prone formations requiring strong inhibition
- Projects with strict environmental discharge limitations (SBM systems)



CASE STUDY

Contamination-Resilient Drilling with INVERT FUSION™ OBM System

1. Background / Objective

This onshore shallow-water project was executed in a region known for its logistical limitations and constrained operational reach. The well program required a drilling fluid system that could sustain performance despite limited access to immediate chemical resupply and remedial services.

Given the critical need for consistent drilling progress under these constraints, the operator required a fluid system capable of resisting formation-related challenges, particularly excessive water influx — a known disruptor of oil-based mud (OBM) stability and emulsion integrity.

CS OILFIELD was tasked with delivering a field-ready, low-maintenance OBM system capable of withstanding severe contamination without compromising drilling continuity or increasing non-productive time (NPT).

2. Challenging Regional Geology

The operational zone was characterized by abnormally high and aggressive water influx events from reactive or fractured formations. Unlike traditional shallow formations where influx volumes are limited and manageable, this region presented sustained exposure to large quantities of invading water, posing a threat to emulsion stability, oil/water ratio (OWR), and overall mud properties.

Left unchecked, such influx can rapidly destabilize an OBM system, leading to emulsifier depletion, rheology shifts, and potential wellbore instability — particularly when resupply logistics are constrained.

A system capable of buffering contamination while maintaining predictable properties was essential to operational success.

3. Solution / Approach: INVERT FUSION™ Fluid System

To meet these conditions, CS OILFIELD deployed the INVERT FUSION™ non-aqueous drilling fluid system, specially adapted for high-tolerance contamination zones.

The fluid design included the following key interventions:

Elevated emulsifier concentration The emulsifier package was deliberately formulated at the upper end of the recommended range, boosting baseline emulsion stability without crossing into overtreatment. Lab evaluations — including excess emulsifier tests — confirmed the optimal loading point, enabling the system to absorb large water influxes without secondary destabilization effects.

Targeted ES performance The Electrical Stability (ES) was maintained **above 1,000 V** throughout the operation, even after repeated influx cycles. This helped protect emulsion structure under stress conditions.

OWR resilience Despite a ~16% reduction in oil/water ratio (from 77:23 to 65:35) due to invading water, the system retained its rheological integrity and filtration control within safe operating thresholds.

4. Execution

The INVERT FUSION™ system was deployed and monitored in real time throughout the problematic intervals. Key highlights of the execution phase include:

- **Continuous emulsifier buffering** without exceeding lab-validated treatment levels
- **No loss of performance** despite progressive OWR shift
- **Quick rebalancing** of the system without additional dilution or significant downtime
- **No recorded NPT** despite aggressive influx episodes

Operational teams relied on real-time mud property surveillance and pre-planned response scenarios to restore fluid parameters when needed — without compromising drilling progression or delaying the well schedule.

5. Results / Benefits

Contamination Tolerance Demonstrated

The INVERT FUSION™ system effectively absorbed and buffered high volumes of formation water while preserving key performance indicators, including ES, rheology, and HTHP fluid loss control.

Resilient OWR Control

Even with a ~16% reduction in oil/water ratio, the system remained within desired performance envelopes — highlighting the stability and flexibility of the REYNO-based rheology system and emulsifier package.

Zero Non-Productive Time

At no point during the operation was NPT attributed to fluid system limitations — a key indicator of performance success in a zone where other systems typically fail or require high dilution/replacement rates.

Logistics-Friendly Operations

By minimizing the need for emergency re-treatments and chemical re-supply, the INVERT FUSION™ solution directly supported the operator’s logistical constraints, reducing dependency on frequent material mobilization. Additionally, the selected chemical components featured **higher active content**, reducing the overall volume of product required on-site — a critical advantage in operations where storage space and supply access are limited.

6. Conclusion / Key Takeaways

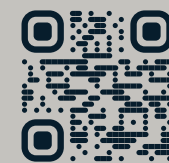
INVERT FUSION™ proved its field value as a contamination-tolerant OBM system capable of maintaining performance even under aggressive water influx conditions. Through a carefully engineered balance of emulsifiers, rheology modifiers, and smart field practices, CS OILFIELD enabled uninterrupted drilling without compromising system integrity or wellbore stability.

Beyond water influx, the system is also engineered to tolerate **other types of downhole contamination**, such as solids loading and chemical pollutants — reinforcing its versatility for unpredictable environments.

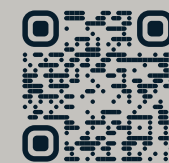
This case highlights INVERT FUSION’s readiness for complex, supply-constrained drilling environments where fluid reliability cannot be compromised — delivering measurable value through minimized risk, reduced dilution, and operational continuity.



INFO@CS-OILFIELD.COM
WWW.CS-OILFIELD.COM
LINKEDIN.COM/COMPANY/CSOILFIELD



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