



# WATER MANAGEMENT SOLUTIONS

PROVEN EXPERIENCE. TRUSTED RESULTS.®



## Integrated solutions to address water management challenges

Cudd Energy Services Water Management Solutions (WMS) provides integrated services to meet the logistical and environmental water challenges associated with oilfield operations. WMS designs cost-effective solutions for water treatment applications, biocide services, produced water recycling and well remediation operations.

Our water management solutions are derived from proprietary technology, with treatment processes that are scalable and configurable to meet site-specific requirements. This process allows for a range of equipment configurations, from fully automated, unmanned container units to mobile treatment plants that incorporate chemical treatment, oil-water separation and solids control.

Each operation is planned and implemented by our highly trained and qualified personnel to improve operational efficiencies and mitigate risks. As a result, WMS provides the optimal treatment plan and configuration to supply your water needs safely and efficiently.

### Well Remediation Benefits

- Destabilizes emulsions and sludges by destroying binding material (biofilm and sulfides)
- Dissolves iron sulfide and other oxidizable species
- Removes polymer damage
- Proprietary technology allows for tailored activation in order to address different contaminants, emulsions and sludge compositions

### Waster Treatment Benefits

- Provides superior efficacy when compared to conventional biocides
- Effective on all types of sessile and planktonic bacteria, including spores
- Allows for real-time testing of residual biocide
- Engineered activation provides biostatic environment
- Survives any pH environment to provide downhole efficacy

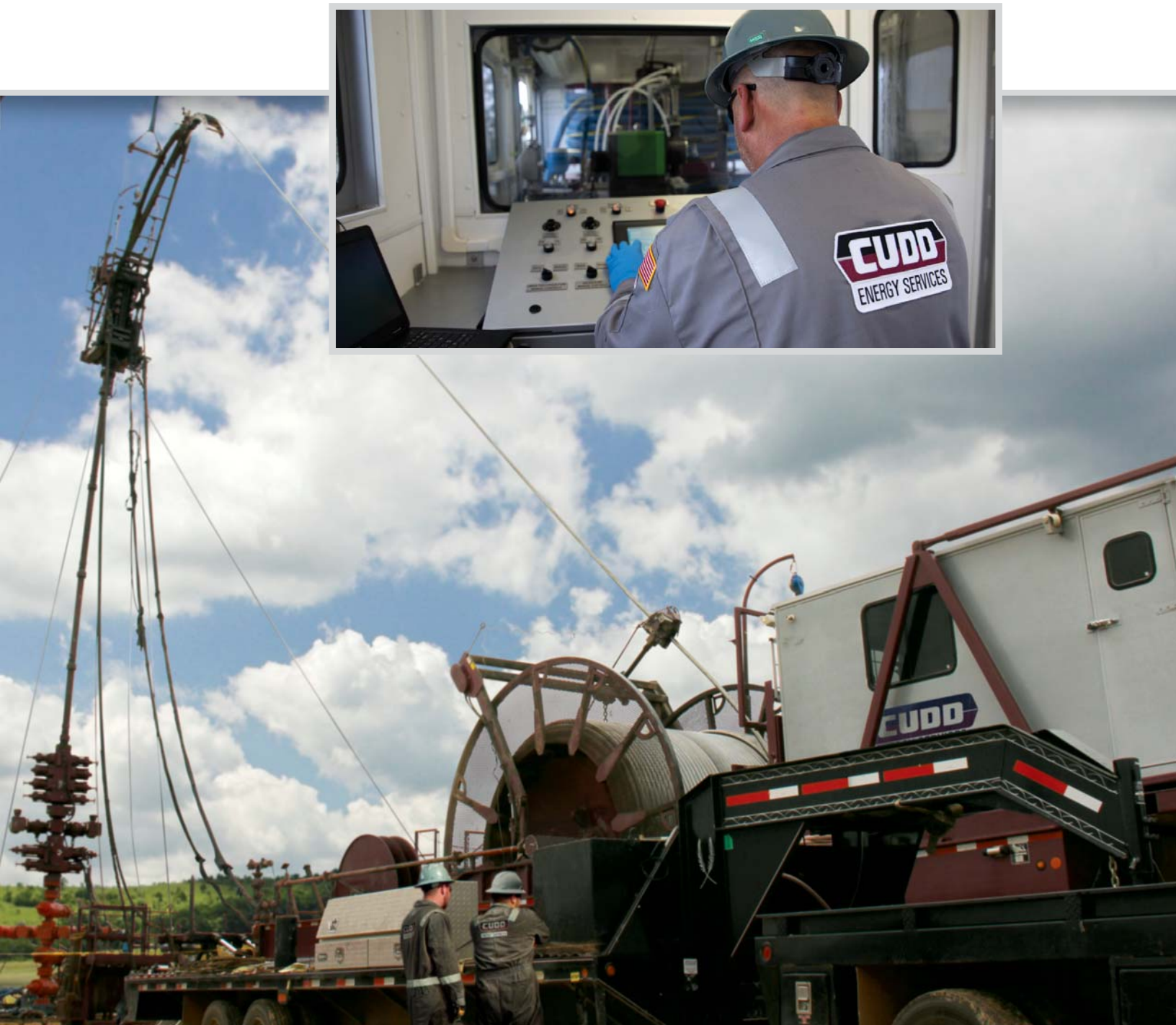
### Water Recycling Benefits

- Reduces water sourcing and disposal costs
- Minimizes or eliminates use of fresh water resources
- Zero liquid discharge system

## ▶ WELL REMEDIATION

Our well remediation services combine OxiFlo® Oxidizer and our proprietary mobile activation unit to repair and restore wellbore damage caused by bacterial, polymer residue, iron sulfide accumulation and other sludge combinations. The OxiFlo® Oxidizer proprietary chemical system offers an efficient and environmentally safe alternative to conventional treatments with engineered activation to meet site-specific requirements. OxiFlo® Oxidizer completely denatures any residual polymer fragments in the formation, improving reservoir performance.

Our mobile activation unit is autonomous and can safely operate in any environment. This unit features a PLC or manually controlled system with engineered activation. It also features an onboard chemical capacity to pump 1,000 barrels at 3,000 ppm, and equipped with backup chemical pumps to avoid downtime during operations.





# ▶ WATER TREATMENT

The water treatment services range from full-scale water recycling to chemical conditioning. The Water Management Solutions (WMS) treatment system includes a mobile unit that restores produced water for reuse in oilfield applications. This water treatment system eliminates bacteria, reduces solids content, removes hydrocarbons, breaks down emulsions, accelerates iron removal and destroys hydrogen sulfide in fresh, produced and recycled water sources.

Our water treatment services include biocide services and water conditioning services to optimize water reuse without jeopardizing the quality of your fracturing fluids or the productivity of your reservoir. Our biocide services feature Petro-Flo™ Microbiocide, a stabilized chlorine dioxide that is considered the biocide of choice due to its efficacy, ability to address biofilm formation and ability to provide long-lasting biostatic properties while maintaining its environmentally friendly footprint.

## KEY FEATURES:

- Efficiently eliminates all forms of bacteria
- Destroys biofilm and sporal bacteria
- Breaks emulsions and facilitates the removal of hydrocarbons and solids
- Selective oxidation properties precipitate out a wide variety of contaminants
- Eliminates all traces of hydrogen sulfide
- Provides a biostatic environment for prolonged periods of time via its selectively engineered activation capabilities
- Contained, mobile units for easy deployment in a wide variety of applications

## Applications

- On-the-Fly Frac Water Treatment
- Impoundment Treatment
- Pipeline Conditioning
- Injection Water Conditioning
- Facility Water Treatment

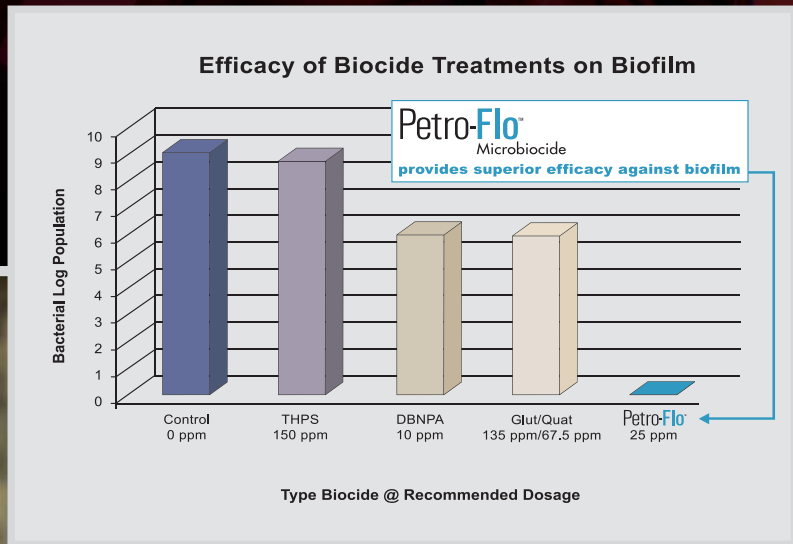




# BIOCIDE SERVICES

The biocide treatment system treats produced water, surface water, surface vessels and wells for bacterial control. The biocide treatment system also includes oxidizing treatments to control iron sulfide, eliminate hydrogen sulfide, remove biomass and biofilm, break emulsions, and control other oxidizable species.

The WMS biocide treatment system uses Petro-Flo™ Microbiocide, a fast-acting biocide that effectively controls all types of bacteria, including sulfate reducing, acid producing, and biofilm forming bacteria that contaminate water supplies. In addition, WMS performs onsite water testing to determine the optimal dosage to treat the particular water source.





## ▶ WATER RECYCLING

WMS offers state-of-the-art water treatment technologies to meet growing water recycling requirements in oil and gas fields. Our technology generates recycled water that is fully compatible with today's engineered fracturing fluid technologies. We designed a treatment process that is scalable and configurable to meet site-specific requirements. Our process allows for a range of equipment configurations, from fully automated, unmanned container units to mobile treatment plants that incorporate chemical treatment, oil-water separation and solids control. Additionally, the zero-liquid discharge process separates all waste into a dry solid waste stream to minimize waste disposal costs and maximize water recovery.

The custom WMS treatment plants feature OxiFlo® Oxidizer, a selective oxidant that efficiently destroys sulfidic compounds, including iron sulfide and hydrogen sulfide. OxiFlo® Oxidizer breaks down emulsions that trap hydrocarbons and solids to optimize the de-oiling and solids removal process. OxiFlo® Oxidizer completely denatures any residual polymer fragments in the water and eliminates potential formation damage when the water is reused on the next frac job. This innovative water treatment process destroys all forms of bacteria and biofilm present in the water and establishes biostatic properties that may prevent water degradation as it is staged for the next frac operation. By combining our proprietary OxiFlo® Oxidizer chemical pretreatment technology with aggressive oil-water separation and robust solids control, we optimize water reuse without jeopardizing the quality of your fracturing fluids or the productivity of your reservoir.





## KEY FEATURES:

- Modular systems easily adapt to site-specific recycling requirements
- Chemical pretreatment removes a wide variety of contaminants, enables efficient separation of hydrocarbons and destroys all forms of bacteria
- Robust solids control capabilities to produce clear brine product
- Oil-water separation feature to remove and capture valuable hydrocarbons
- Zero liquid discharge process
- Class 1 Division II configuration that meets the most stringent HS&E requirements
- Reduced footprint and energy requirements
- Designed for continuous operations in all weather conditions

## Applications

- Flowback Water Recycling
- Produced Water Recycling
- Brackish Water Conditioning
- Municipal Water Conditioning





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