

## 100% Frac Water Recycling - Strategy & Focus

**ozonix<sup>®</sup>**

April 13, 2011



# Agenda

- Criteria for Frac Water Recycling
- On-Site Treatment vs. Off-Site Treatment
- Case Study #1 - On-Site Treatment
- Case Study #2 - Off-Site Treatment
- Ecosphere's Ozonix Technology
- Implications for the Operator



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## Ecosphere Facts

- Ecosphere Has Over **15** Years of Water Treatment Experience
- Ecosphere Has Over **2** Years of Shale Gas Operating Experience
- Ecosphere Has Treated Over **15,000,000** bbl of Frac Fluid with Recycled Water
- Ecosphere Has Recycled Over **1,000,000** bbl of Produced Water
- Ecosphere's **ozonix**<sup>®</sup> Technology Has Been Proven By Third-Party Labs:
  - Results Gathered for Over **300** Wells
- Ecosphere Has Eliminated **450,000 +** Gallons of Biocide from Frac Operations



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## Industry Concerns

- Water Resourcing and Permitting Issues
- Availability and Cost of Disposal
- Regulatory Changes
- Compatibility of Recycled Waters with Traditional Frac Systems
- Challenges of Recycling Water
- Political Pressure and Stakeholder Perception
- HSE Issues:
  - Hazardous Chemicals
  - Road Damage & Impact on Infrastructure



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# Why Should Operators Recycle Water ?

- Less Fresh Water Consumption
- Reduces The Need For Disposal
- Reduces Regulatory Exposure
- Reduction of Liability Exposure
- Reduces Truck Traffic and Impact On Roads
- Extends the Economic Viability of the Play
- Improves Stakeholder Perception
- Reduces The Carbon Footprint
- Risk Mitigation



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# Where to Treat Water ?

## On-Site



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# Where to Treat Water ?

## Off-Site



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# Case Study #1

## On-Site Treatment - Fayetteville Shale



How to Eliminate Chemicals at 120 bbl/min (5,000 gal/min) On-Site?

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## Case Study #1

### On-Site Treatment - Fayetteville Shale

- Operations Began in Nov. 2009
- 100% of Frac Fluid Treated On-Site, “On The Fly”
- Eliminating Chemicals
- Destroying Bacteria
- Averaging 9 Wells Per Month
- Continuous Operations (24/7)



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# Case Study #1

## On-Site Treatment - Fayetteville Shale

### **ozonix®** FACTS:

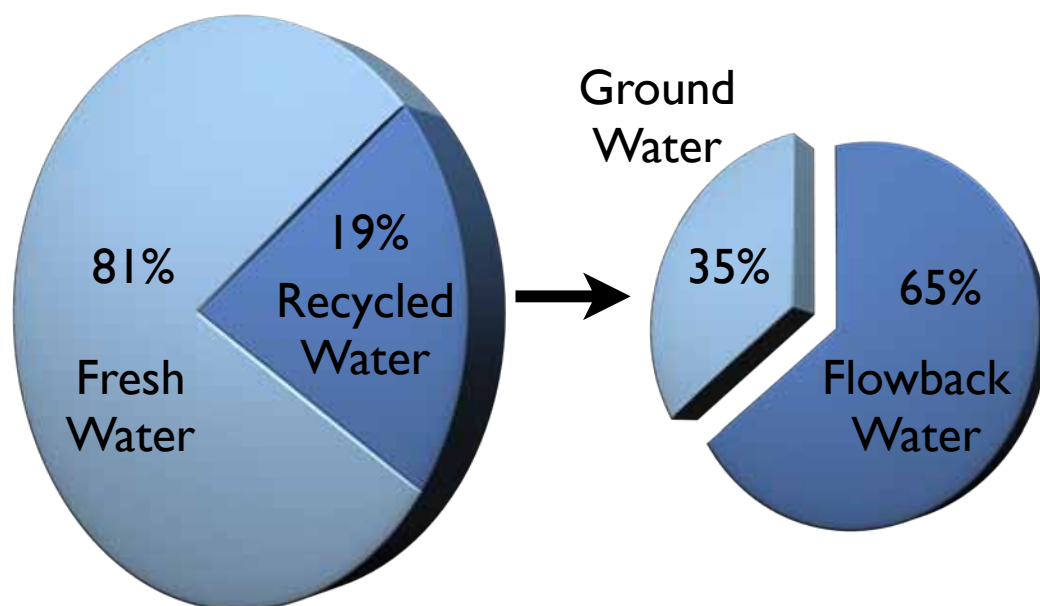
- 15,000,000 + bbl Processed
- 1,400 + Frac Stages
- 120 + Wells Completed
- 120 bbl/min Capabilities



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## Case Study #1

### Typical Fayetteville Frac Blend



High of 41% Recycled Water  
Approximately 500 Wells / Year  
Approximately 125,000 bbl / Well

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11,875,000 bbl of Fresh Water  
Saved Per Year

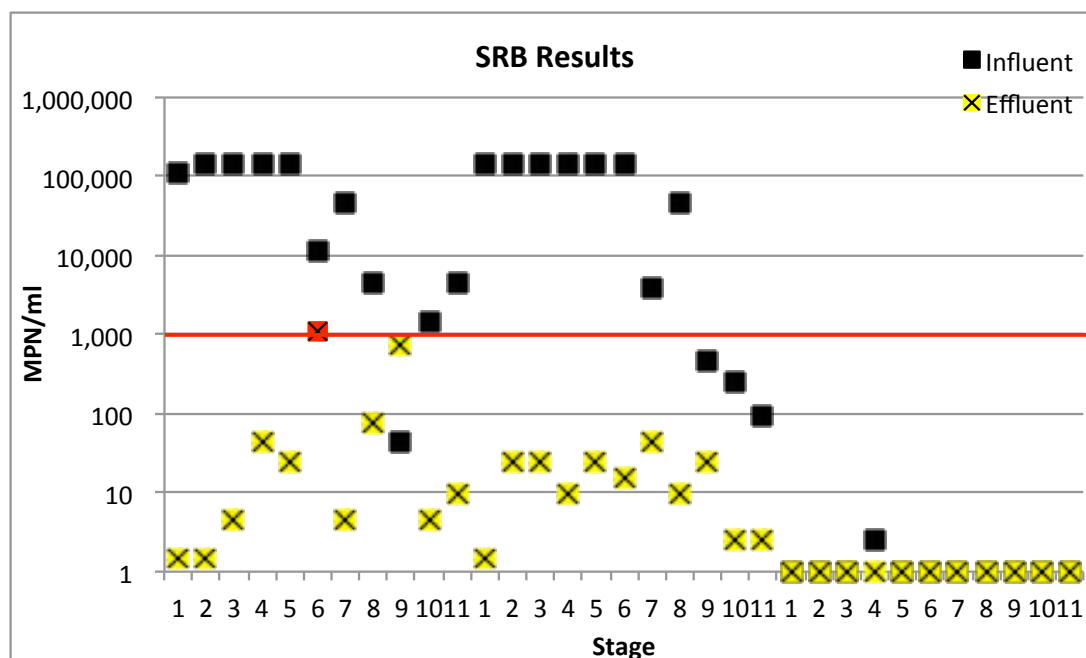
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# Case Study #1

## Microbial Control

### On-Site Scenario:

- 3-Well Pad
- 120,000 bbl Frac's
- 11 Stage Wells
- Treated at 100 + Bbl / Min
- Continuous Operations



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## Case Study # 2

### Off-Site Treatment - Woodford Shale



Recycling Produced Water at a Centralized Facility

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## Case Study # 2

### Off-Site Treatment - Woodford Shale

- Operations Began in Dec. 2008
- 100% Treated at a Central Location:
  - Recycled Produced Water
  - Flowback Water
- Ozonix Technology + Coagulation  
+ TSS Separation (1-5  $\mu\text{m}$ )



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## Case Study # 2

### Off-Site Treatment - Woodford Shale

#### **FACTS:**

- 915,000 + bbl Processed
- 200 Wells Completed
- TDS Range:
  - 160,000 - 180,000 mg/l



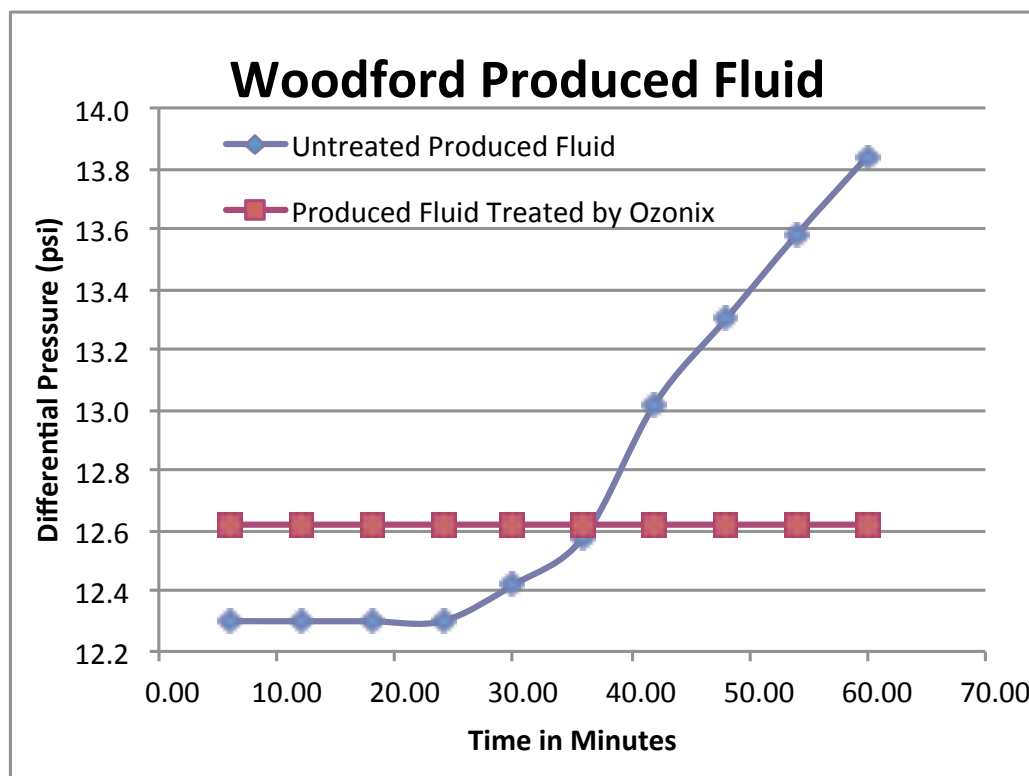
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## Case Study # 2

### Scale Inhibition

#### Centralized Facility Scenario:

- Dynamic Tube Blocking Test:
  - Measures Scale Inhibition
  - Conducted by Third Party (Weatherford Labs)
- 170,000 mg/l TDS
- Treated at 200 bbl/Hour
- Fluid treated at 200 barrels per hour



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# What is the Ecosphere **OZONIX**® Technology?



## **USPTO Green Tech Fast Track Program**

Approved Patents: United States Patent No. 7,699,994 United States Patent No. 7,699,988 United States Patent No. 7,785,470

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# The Ecosphere :oZonIX® Evolution

## Customer Driven Evolution



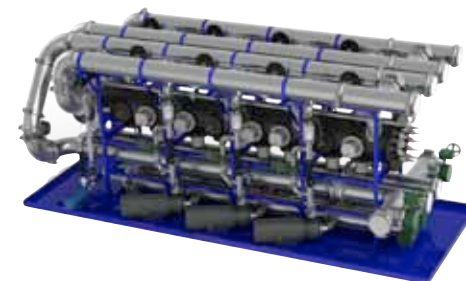
**EF-10 (EF-600)**

Rated for 10 Barrels Per Minute



**EF-20 (EF-1200)**

Rated for 20 Barrels Per Minute



**EF-60**

Rated for 60 Barrels Per Minute



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# **ozonix®** Implications

	ELIMINATE CHEMICALS	RECYCLE FLUID
BENEFITS	Replace Biocides and Scale Inhibitors Improve Friction Reducer Compatibility	Reuse Flowback Water and Produced Fluid
HEALTH & SAFETY	Eliminate Dangerous Exposure to Chemicals	Reduce Truck Traffic Keep NORM in a Closed-Loop
ENVIRONMENT	Eliminate Chemical Spills	Reduce CO2 Emissions Reduce Fresh Water Usage
POLITICAL RHETORIC	"Injecting Chemically-Laden Fluid...."	"Depleting Fresh Water Sources...."
COST CONSIDERATIONS	Biocide Cost Scale Inhibitor Cost Friction Reducer Cost	Freshwater Purchasing and Transfer Trucking Hours Injection Cost Road Repair

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# Eliminate Chemicals . Recycle Fluid

## EcosFrac®





**ecosPHERE**

**ENERGY SERVICES LLC**

