Innovative Tools to Optimize Fluids Management in the Shale Oil & Gas Industry

Ashwin Dhanasekar
Assistant Director, CEWS
Research Associate, CSU
Why do we need Systems?

Bits & Pieces → Categorize → Simple Links → Integrated System

Somewhat Valuable → Valuable → More Valuable → Most Valuable
FEW Nexus

As population grows, pressures mount
And the relationships between food, water, and energy supplies become critical

Because of growth in global population and the consumption patterns of an expanding middle class, in less than two decades three key demands will sharply increase...

- Energy-intensive desalination efforts use energy to produce drinkable water
- Food production requires energy to plant and harvest

Population Increase

Water-Food-Energy Nexus

Demand for freshwater +40%
Demand for energy +50%
Demand for food +35%

Population Increase

Demands of Larger Middle Class

- Crops are being converted into biofuels in some countries

www.cna.org/reports/accelerating-rids
Current Trend

Fresh Water Source

Drilling / Fracturing

Produced Water Storage

90% Disposal

Disposal

Trucks cause road damage!
Current Picture with Treatment

Fresh Water Source → Drilling / Fracturing → Produced Water Storage → Disposal

Treatment
Workshop on Food-Energy-Water Nexus – December 2015

- Participants include Environmental Organizations (EDF), Oil & Gas Operators (Noble Energy, Anadarko), Service Companies (Halliburton, Baker Hughes), Government Organizations (NSF, DOE, NCSE) and Educational Institutions (CSU, CSM, Texas A&M)

- Discussions – Identifying barriers in successful beneficial Treatment/Reuse

- Key Research Need – Need for Systems (integrated approach to solve a complex problem(s))
Focus on One Beneficial Reuse

- Treated Produced Water
- "Black Box"
The Ultimate Solution
The Big Picture

Water Management Technology

Fresh Water Source

Drilling / Fracturing

Produced Water Storage

Disposal

Alternative Surface Use

Treatment

Minimize by Alternative Surface Use

Water Management Technology

C_{\text{fresh}}

V_{\text{fresh}} \quad WQ_{\text{fresh}} \quad T_{\text{fresh}}

V_{\text{frac}} \quad WQ_{\text{frac}}

V_{\text{produced}} \quad WQ_{\text{produced}} \quad T_{\text{produced}}

V_{\text{disposal}} \quad WQ_{\text{produced}} \quad T_{\text{disposal}}

V_{\text{treatment}} \quad WQ_{\text{produced}} \quad T_{\text{treatment}}

V_{\text{surface}} \quad WQ_{\text{surface}} \quad T_{\text{surface}}

V_{\text{recycle}} \quad WQ_{\text{recycle}} \quad T_{\text{recycle}}

C_{\text{surface}}

C_{\text{treatment}}

C_{\text{disposal}}
Improved Beneficial Reuse – Geospatial Optimization

Fresh Water

Treatment

Drilling & Fracturing

Colorado Premium Foods

Innovative Foods LLC

Valley Packing & Catering

Greeley

Swift & Co

Colorado Premium

Auburn

Evans

Garden City

Alden

JBS Swift & Co Lamb Plant

Greeley Weld County Airport

Steves Meat Processing

JBS Five Rivers Cattle Feeding
An Effective Optimized System
What does this mean for the community?

1. Reduced dependency on freshwater
2. Reduced environmental impacts
3. Reduced social impacts
4. Reduced truck traffic
5. Reduced costs
AQUAM

- Comprehensive Oilfield Water Management
- User friendly website
- Dedicated support for customization
- Completely web based tools which can be run on any portable device
- Desktop to Drill Site (D2D) Technology
Tools in development

- Pipeline Routing Optimization
- Fixed & Mobile Facility Location Optimization
- Real-Time Fresh Water Sourcing Evaluation
- Disposal Optimizer
Advantages

- Optimization for Every Scenario
- Feed more Data, reap more benefits!

The systems integration provides a more complete approach to increase the beneficial outcomes from the process.
Current Scenario

Workable Solution for Surface Reuse
Discussion

Ashwin Dhanasekar
Ashwin.Dhanasekar@colostate.edu
(970) 492 4858
http://cews.colostate.edu/