Developing a Shale Gas Research Strategy: water and waste

Paul Ziemkiewicz, PhD, Director
West Virginia University Water Research Institute
Morgantown WV

29 Nov 2012

Marcellus Shale Coalition/Research Collaboration:

Developing a database for water treatment technologies

Technology Showcase at Shale Gas Insight
Sept. 2012

Developed a questionnaire to allow vendors to summarize their technologies and performance

Provided a forum for vendors to present their technologies to the membership

Regarding water/waste treatment, we found out that:

- Most treatment processes used combinations of pre-existing technologies:
  - membranes
  - evaporation/distillation
  - filtration
- Most were not developed for shale gas water
- Compliance and cost performance were poorly understood
- Need for a systematic technology development

Shale Energy Resources Alliance (SERA) Water Program Plan

Objective:
to assist E&P companies and their contractors by improving the economics and performance of water and waste treatment and reuse.

Key Personnel:

- West Virginia University-Paul Ziemkiewicz, PhD, Lead
- URS Corporation-Timothy Murin, CPG, PG
- University of Pittsburgh-Radisav Vidic,PhD
- Virginia Tech-Gregory Boardman, PhD
- NETL-Jason Monnell, PhD

Water treatment technology: Research strategy

- Technology market: E&P production and service sectors, regulatory, policy sector
- Identify partners: Industry/Federal Gov't
- Engagement: meaningful role for industry/gov't partners
  - priorities
  - funding
  - program review

Task 1. Develop a Treatment Technology Evaluation Protocol

- **Performance**:
  - throughput
  - footprint
  - potential for on- or off-site deployment
  - scalability
  - treatment performance
  - secondary waste stream characterization
  - residuals disposal and
  - regulatory acceptance

- **Cost estimation:**
  - CapX, OpX
  - Identify a cost accounting standard

Water treatment technology: Evaluation protocol

1. Identify treatment endpoints
   - quality criteria
2. Identify/standardize performance metrics
   - economic
   - technical
3. Develop and operate a technology test bed

Task 2. Develop a Technology Test Bed

- Accurately estimate site specific costs
- Accurately estimate site specific performance
  - specific waste streams
  - geologies
  - flowback vs. produced water
- Eliminate unsuitable technologies
- Perform reliable comparisons with other technologies

Task 3. Develop a Technology Performance Database

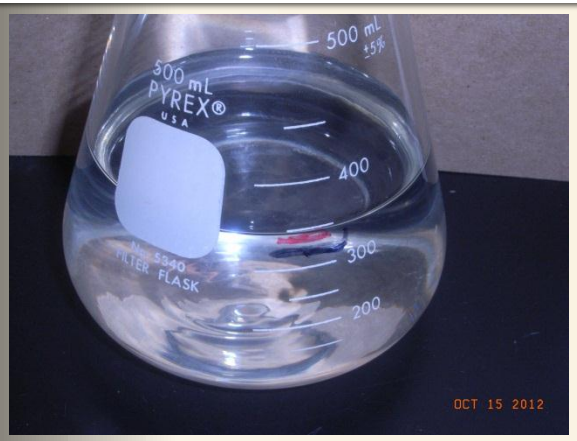
- Distinguish industry proprietary vs. public information
- Results will be included in a database that will be available to partners
- Technology reports:
  - cost and performance information
  - scalability
  - transferability
  - compliance with treatment endpoints

Task 4. Develop Innovative Technologies

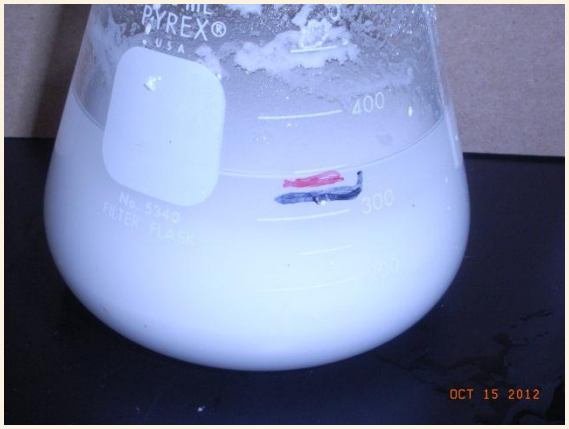
- Develop annual technology assessments
- Identify technology needs
- Develop innovative treatment technologies
- Test and report
- Add to treatment technology database

Non-membrane salt removal-WVU

Before treatment



After treatment



Precipitate

	Initial (mg/L)	Final (mg/L)	Removal
Mg	1,985	2.2	99.9%
Ca	811	19	98.0%
Na	79,910	26,113	67.3%
Cl	106,740	35,924	66.3%
SO_4	3,260	2,810	13.8%

Thank you

Paul Ziemkiewicz, PhD, Director

West Virginia Water Research Institute
West Virginia University

pziemkie@wvu.edu