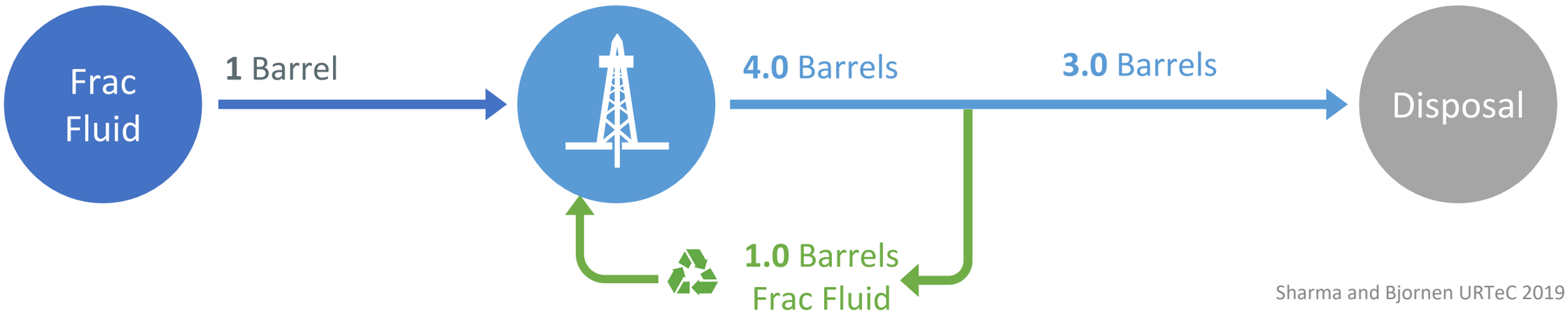
Produced Water Treatment and Reuse in Hydraulic Fracturing: Using Laboratory Research to Select and Implement Technology at Field Scale

Produced water reuse for hydraulic fracturing is key to water management

- Water management during unconventional exploration and production in the Permian Basin is a critical issue impacting both sustainability and economics
- Fresh water sourcing and produced water disposal are important considerations
- Produced water reuse via fit-for-purpose treatment to make “clean brine” assists with both components
  - Robust (resilient), simple to operate, low-footprint, low-cost treatment; i.e. ***high rate***
  - Remove particulate iron and total suspended solids (turbidity)



Sharma and Bjornen URTeC 2019

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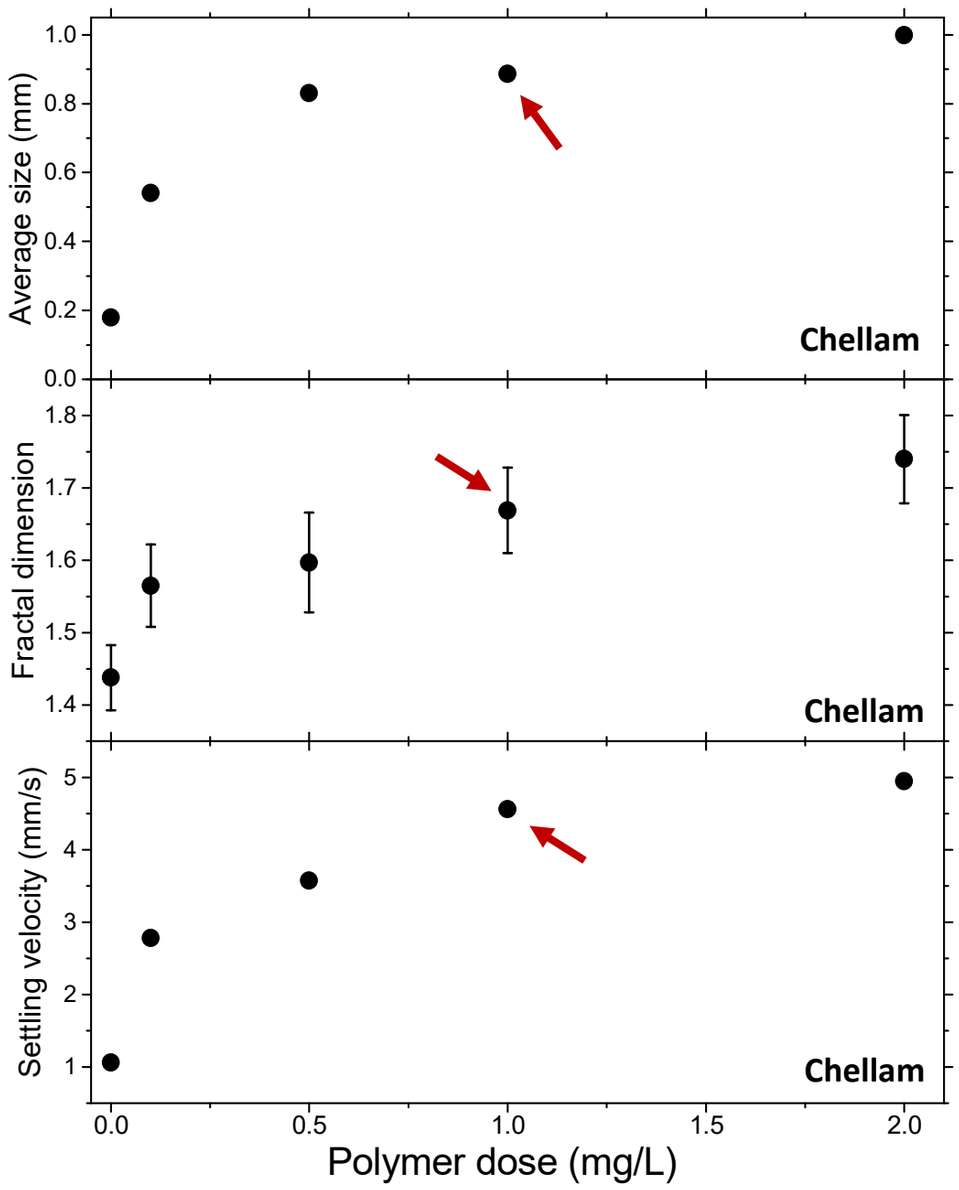
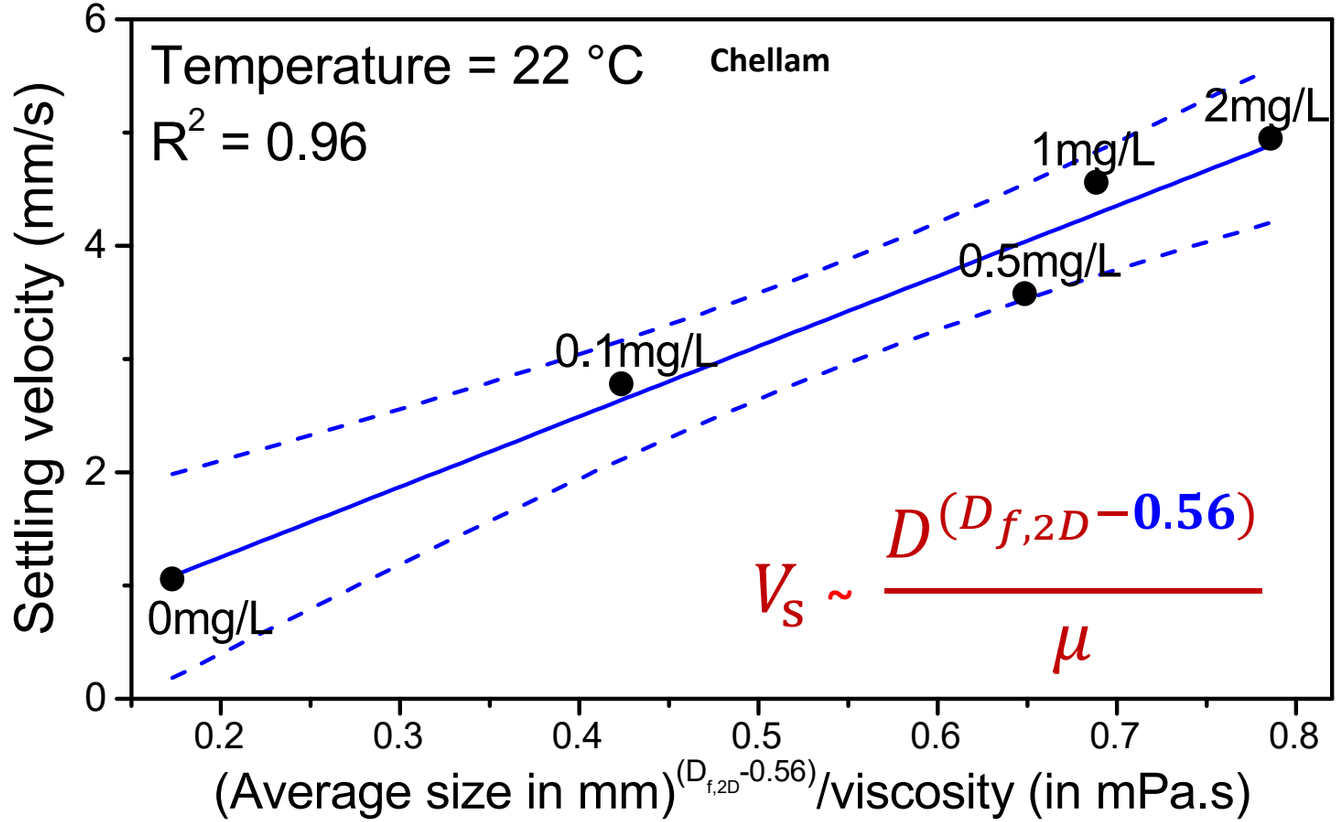
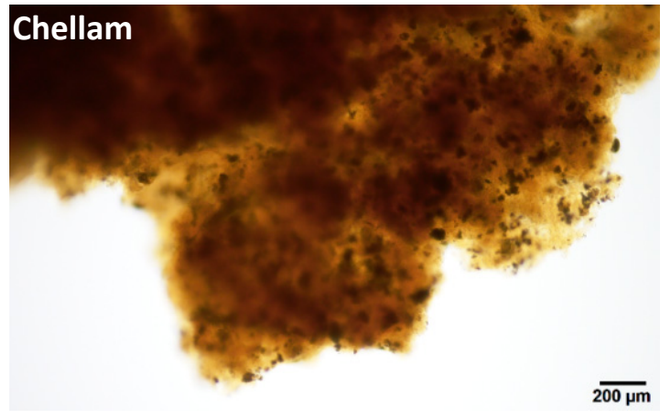
Key results/findings



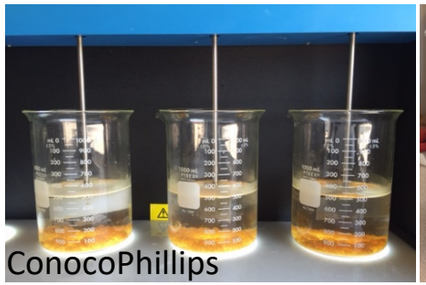


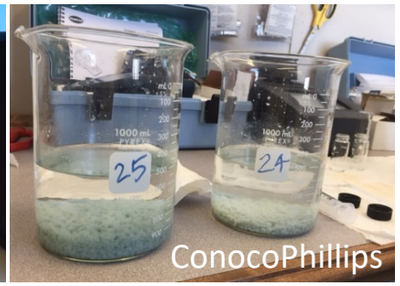


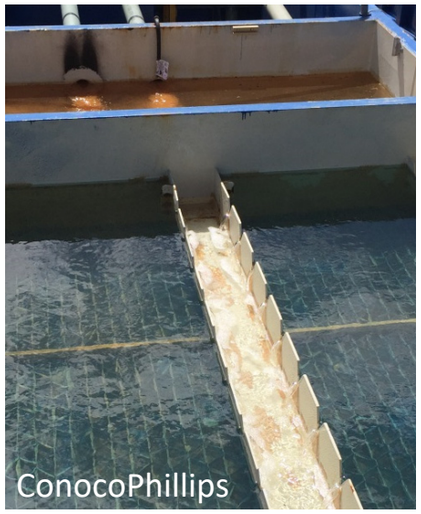
Combining $FeCl_3$ with a high molecular weight anionic polymer generates large, settleable flocs

Nadella, Sharma, and Chellam (2020). *Water Research* **170** 115330

Significance and broader impacts: Lab → pilot → field







- Lab test data replicated within ±2% on actual equipment operation
- Dosing sequence, dosing rates and retention times scaled up very well
- Switching between varying feed sources was easy based on laboratory data generated
- Good quality compact sludge obtained, dry to touch, and no drips
- Least amount of sludge at near neutral pH
- Solids disposed to landfills without need for special permits

- Bench-scale testing useful to screen various products and provide input to pilot- and field-scale testing
- Close coordination of bench- and pilot-scale treatment optimized chemical usage and thereby reduced operating costs by ~50%
- Improved process design for field implementation
  - Bench → Pilot (5,000 BPD) → Full-scale (50,000 BPD)
- Successful example of industry-academic collaboration and student mentoring

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