

Challenges to Recycling and Reuse of Wastewater from Oil and Gas Wells




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Dan Mueller, P.E.



Who is EDF?

- Non-profit environmental advocacy
 - Comprised of technical and legal expertise
 - Sound science informs sound policy
 - Science drives policy not vice versa
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Managing Produced Water

- 20+ billion bbls (800+ billion gallons) of produced water generated each year
 - Hydraulic fracturing of one well can use as much as 15 million gallons
 - What to do with produced water?
 - Disposal wells
 - Discharge to surface waters
 - Recycle for subsequent well completions
 - Reuse for other purposes
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Recycle, Reuse, Discharge of Produced Water

Recycle

- Use for fracturing subsequent wells
- Minimal to no treatment required
- Lessens completion on other water sources

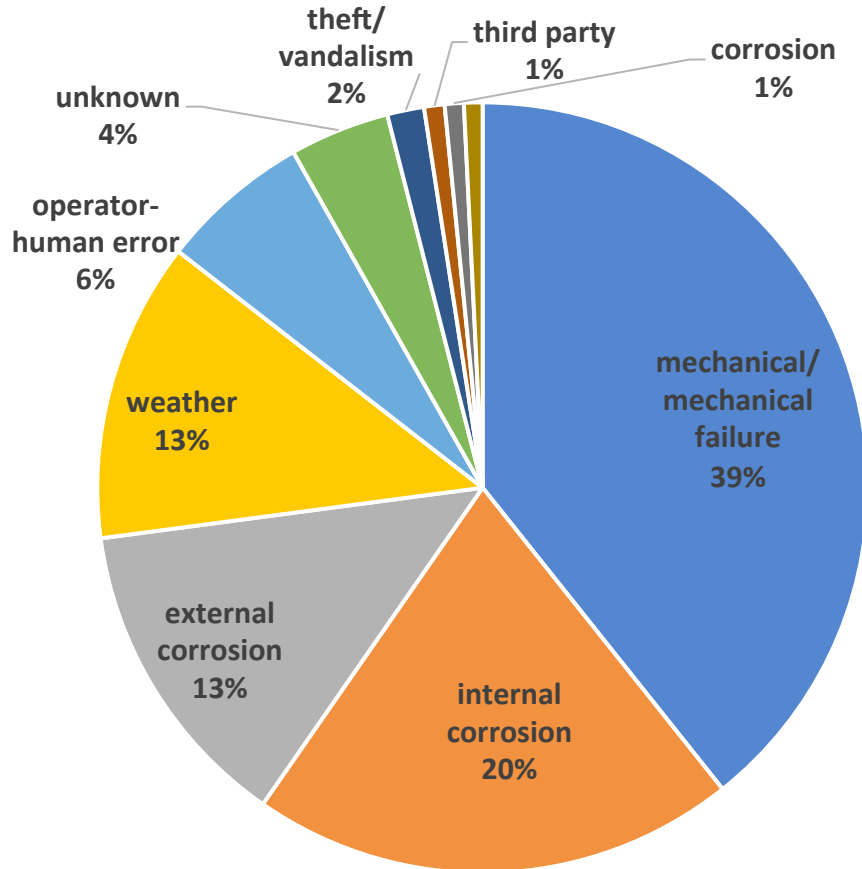
Reuse or discharge

- Drivers
 - More water produced than needed for completion of wells
 - Less drilling thus fewer wells to complete
 - Limited to no access to disposal wells
- Options
 - Surface discharge
 - Agriculture/Livestock
 - Other
- Robust treatment required


Challenges – Spills/Leaks

- Requires storing larger volumes for longer periods of time
 - Majority of environmental impacts from surface operations
 - Minimizing leaks and spills very important
 - Storage (surface impoundments or tanks)
 - Transportation (pipelines)
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Produced Water Spills RRC Probable Cause – 2016 Data



The Challenge – Reuse or Discharge

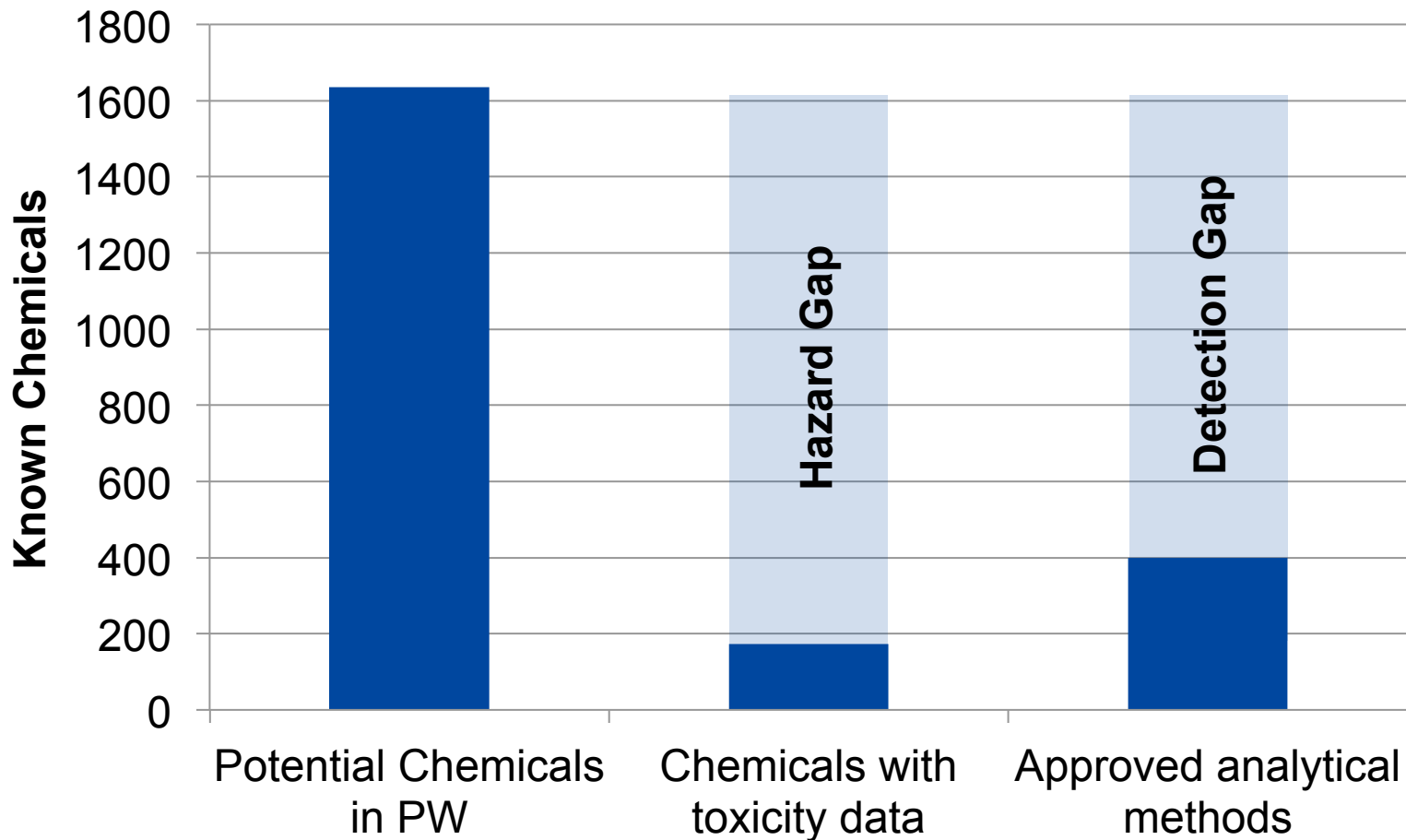
- What is in produced water?
 - What are the constituents of concern?
 - What treatment processes are required?
 - What is an appropriate monitoring program?
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Constituents of Concern in Produced Water

- Produced water a combination of flowback, maintenance chemicals, and formation water
- Fracturing chemicals return with the flowback
- On-going maintenance chemicals can return to surface
- Formation water contain more than just total dissolved solids
 - Studies show 60 priority pollutants identified in produced water
- Transformational products
 - High heat + high pressure = chemical reactions

Data Gaps & Produced Water

There are significant data gaps that pose barriers to more thorough understanding of produced water and reuse risks



A repeating cycle...

DETECTION

We struggle with finding chemicals that may be present in oil & gas wastewater...

AWARENESS

...which means we don't know exactly which chemicals or what amounts may be present because we can't find what we aren't looking for...

EXPOSURE

...which means we aren't researching who/what may come in contact with those chemicals...

HAZARDS

...where constituents are known we have insufficient information to determine whether exposures present hazards...

PROTECTION

...and corresponding regulations do not address constituents and lack foundational health-related basis....



...and the cycle repeats

Robust Treatment Technologies

Need multiple technologies

– Example - Treatment plant in Pennsylvania

- Pretreatment
- MVR distillation
- Biological
- Reverse Osmosis
- Ion exchange



• Emerging technologies

- Membrane distillation
- Forward osmosis
- Biological in high-salinity conditions



Varying Levels of Environmental Risks



CAUTION

**OPEN DOOR
SLOWLY**



Dan Mueller
dmueller@edf.org
512-691-3453