

PWWG Meeting September 9, 2020 - Recap

Produced Water situation in Oklahoma – spring/ summer of 2020 (not presented during PWWG meeting)

Currently, downturn notwithstanding, Oklahoma is not dealing with nearly so difficult a situation as we were just a few years back (2016) when the PWWG first began to study the problem: earthquakes M3.0+ were over 100 per month and injection rates into some SWDs were subsequently reduced roughly in half to combat the seismic events. In 2020, occurrences of M3.0+ earthquakes are in the single digits in most months and the days of dealing with a billion gal per year of Mississippi-Lime water (@200,000ppm TDS / 10-20 bw/bo) appear to be over with only a handful of small operators still in that Play. Most production work has moved to the SCOOP and STACK plays in Grady, Kingfisher, Blaine, Coal, and Atoka Counties with far lower TDS values commonly ranging from 500ppm to 40,000ppm with cuts bw/bo in the single digits. Even with the downturn, industry and academia are continuing to develop technologies that could be competitively priced with disposal rates; some of which could include the increase of land application via RO treated water.

Sec. Ken Wagner - OSEE

OSEE wants to solve this issue but only through sound science. Presented OSEE's commitment to treatment tested with good science because we must protect our water resources.

SB 1875 – these began as very disjointed meetings but after 7 or 8 meetings we were able to get it done with FarmB, AmF&R, MMathis (CR), Bud Ground, Terry Stowers, Lagoon, and others. One participant stated after the first meeting there was no way, it couldn't happen but indeed we all had a common purpose and with several rewrites and back and forth we had a deal.

SB1875 (Our thanks to Lloyd Hetrick for his apt description - om)

Welcome affirmations in SB 1875 to make reuse / recycling more clear for the “things we all understood already”:

1. Produced water is broadly defined as water and all of its constituents coming out of a well during oil and gas extraction
2. Produced water ownership and liability rests with the oil and gas operator, unless possession and liability have been properly transferred
3. Produced water is a waste that has value only after treatment has been applied

Welcome new language in SB 1875 to make reuse / recycling more clear for the “things we **did not** all agree on already”:

1. Produced water once treated, may be used / reused by the operator for oil and gas operations without owing anything to the surface estate
2. Produced water, once properly transferred to another party may be used / reused or disposed of AND the disposal can go into the new party's SWD without it having to be a commercial SWD
3. Produced water is different from underground brine
4. Brine in the ground is the property of the surface estate, period, and may be extracted by the surface estate outside of oil and gas operations
5. Brine in the ground that comes out with oil and gas operations can still be property of the surface estate if addressed in the mineral lease before drilling

Mike Mathis - Continental Resources - Current status

A very challenging time for the O&G industry but progress is still being made:

- Recycling operations moving from just E&P companies now into service midstream companies – expanding access to recycling to more operators
- Continuing support from the regulatory community facilitates recycling

Focus should continue to be on Job 1 which is recycling and reuse within the O&G industry while we carefully explore opportunities for beneficial use beyond the O&G space

Last year Oklahoma had approximately 80 rigs operating and \$55 - \$60 / barrel oil. Currently down to 11 rigs running in Oklahoma and under \$40 / barrel oil. Mike applauded the cooperation of the Regulatory Community, OCC and OSEE, and OWRB. The PWWG has been very helpful to build support on national scene and at OK Capitol.

Lots of new efforts out there today, shout out GWPC on PW Report, a great resource, Universities, DOE research program all are putting forth large efforts in the PW arena.

Lloyd Hetrick added points he sees that still need to be done in SB1875:

****OPINION**** - *Missing language in SB 1875 to remove additional barriers that remain for greater use of treated and reused (aka recycled) PW:*

1. *Because opposition to layflat hose for PW transport still exists, industry's use of documented and OCC enforced best practices could somehow overrule county opposition, but only for treated (not raw) PW transport*
2. *Because the new reality for all E&Ps is profit, anything to incentivize operators to share PW infrastructure, or support a consortium that operates PW infrastructure, something that financially motivates operators to share*
3. *Because PW treatment and reuse is directly related to both E&P activity levels and the OK drought cycle, we need something to help get operators past these short term, investment killing cycles*

Shawn Coslett OCC Pollution Abatement

Recycling:

Large facilities are being converted from noncommercial flowback pits to commercial recycling facilities. We currently have 4 permitted and will need more of those. Shawn expects 8 new facilities in 2020. Currently 800 MG of storage in pits today.

Surface Discharge:

Coal County and Omega OK currently have Surface discharge permits and operations. Coal Co. facility is moving to west TX.

OCC is very serious about these permits and is monitoring closely (see [Download OCC rules Ch 10](#))

These facilities have had no spill or other pollution issues in 2020.

The permitted facility in Grady county was used as a method of disposal for any substantial nearby spills .

Questions specific to discharge and recycling requirements

OAC 165:10-7-17(d) – Surface Discharge of Produced water

OAC 165:10-9-4 – Commercial Recycling

[Download OCC rules Ch 10](#)

Robert Huizinga - Cimarex - Discussed the current efforts of multiple start-up companies treating PW with reverse osmosis to meet OCC standards for land application at a price competitive rate both on location and at SWD receiving sites.

Terry Stowers - Coalition of Oklahoma Surface & Mineral Owners - SB1875 clarified that ownership of trace mineral and salts naturally occurring in the produced water were owned in situ by the Surface Estate Owner, as that term is defined in the Act, and continued to be owned by the Surface Estate Owner if those elements were to be extracted for commercial purposes. If those elements are to be extracted for commercial purposes after November 1, 2020, the Act makes it clear that the operations and extraction must be conducted pursuant to the terms of the Oklahoma Brine Development Act. The OCC has jurisdiction over the Oklahoma Brine Development Act. OCC Rules should be modified, and possibly emergency Rules adopted, to comport and comply with the Act.

RESEARCH EFFORTS

Dr. Clint Aichele – OSU – download Presentation Slides on PWWG web page

Established Program to Stimulate Competitive Research (EPSCoR – NSF grant) awarded to OK on how reuse is perceived by the public, several working groups involved. This \$20M/5yr Reuse project is largely a social/behavioral study on public acceptance of (potable) reuse; however, there remains significant funding to be had on the technical side of reuse. Universities are still developing the scopes of many of the projects.

OCAST PW Treatment fueled by high value product extraction using D&B Oilfield Services (SWD) to get samples and understand processes.

Dr. Prem Bikkina – OSU - download Presentation Slides on PWWG web page

Solar Distillation

- Traditionally, it's too energy intensive to boil produced water for treatment via thermal desalination. Introducing solar energy into the equation can reduce costs for this method. In our method we have reduced the necessary energy by orders of magnitude as we can completely prevent the vapor bubble formation on the heating (hottest) surface and promote them on a significantly colder surface. This has never been done before.
- our mechanical vapor compression (MVC) cycle is not new, however the way we are driving the cycle using combined heat and power (CHP) generation using solar energy is certainly novel to the best of our knowledge. This allows us to reach theoretically near 100% energy efficiency compared to about 20% efficiency typical of solar PV panels.

CO2 PW for EOR

Carbonated water is a new tech for EOR. This project is to study the extent of EOR, CO2 sequestration and high salinity produced water disposal in various types of reservoirs high salinity water flooding can reduce the need to use freshwater and will facilitate enhanced oil recovery, carbon sequestration, and produced water disposal in one step.

Dr. Kyle Murray – OU/OGS - download Presentation Slides on PWWG web page

Database and Geospatial Analysis of Produced Water Quality in OK

- The database will allow us to understand the chemical and physical characteristics of produced water and how they vary across the state
- This will allow for strategization of different produced water recycling and reuse projects
- Another use is finding where concentrations of valuable components (zinc, iodine, etc) are highest in the state
- About 4,000 wells already in database
- 875 water quality samples analyzed to date, no profitable levels of rare earth minerals

Dr. Hamid Shabgard – OU - download Presentation Slides on PWWG web page

Freeze Desal - Indirect freezing is method, treat 200,000 TDS down as low as 44 cents/bbl! but needs additional work on values to fully verify

- Utilizes an immiscible inert liquid to remove heat from the brine by direct mixing
- Benefits from the superior heat transfer of direct contact freezing systems
- No attachment of ice to the cooling surfaces
- No chemicals
- Atmospheric pressure

Ramadan on Nanoparticles - OU - download Presentation Slides on PWWG web page

- Maghemite nanoparticles are highly attracted to oil and have a strong surface charge and are recyclable
- Procedure mixes produced water with nanoparticles and then removes the nanoparticles magnetically, then nanoparticles can be washed with solvents and reused

ENVIRONMENTAL REGULATORY UPDATES

Charles Maguire – EPA R6 Water Division Director

EPA to begin working toward meeting the CWA and doing rulemaking on beneficial uses for PW. Much to learn yet on PW treatment. Currently in an internal deliberative stage, not yet having stakeholder meetings.

Julie offered that we could host these meetings to the PWWG prior to broad public release

Reminded everyone of the recent release of the National Water Reuse Action Plan that describe priority actions necessary to enhance consideration of water reuse and attributes, implementation steps, and milestones to successfully implement the proposed actions.

Scott Thompson - ODEQ Executive Director

- NM Consortium
- DEQ Don't anticipate being able to treat all water but at best will just reduce amount to be injected.
- Looking more at the raw water, but we will be looking more at treated water.
- Big challenge is amount of \$\$ there is to invest in treatment.
- NPDES working with EPA and other states about OK permitting

GWPC's RBDMF App (it tracks water volumes among other things) like Alabama's would be best if Ok would use it, Shawn added that OK would need rule changes and start tracking water

Scott Anderson – Environmental Defense Fund - download EDF White Paper on PWWG web page

EDF has been doing a comprehensive literature review and is developing a database of >1,350 constituents identified in PW and developed a crosswalk comparison of Federal Water Quality Criteria, State Water Quality Standards and other Existing Information on Chemical Constituents Identified in PW.

It is EDF's position that significant expansion of management options for PW that include surface water discharges, land application, or other scenarios that increase potential exposure to constituents of concern from PW should not occur until science-based regulatory programs can be put in place to ensure these practices are allowed only where risks are understood, mitigated, and monitored through enforceable regulations.

However, there are instances where decision-makers have or will move forward despite these gaps. In these cases, acting on data and tools currently available will strengthen any permitting programs that do proceed even as decision-makers gather more information.

Mike Paque and Tara Gross GWPC

- FracFocus will be updating this year and companies can voluntarily report PW volumes or do any required reporting that way; big advance in getting volumes. we only have broad estimates

Mike recommended the PWWG should take a deeper dive on the technology side of things and have meetings specific to Tech

Developing database and tool for NM for decision making

GWPC PW virtual workshop back in July with over 400 people and stuck in to the whole thing.

Reuse and Planning

NM recovery is widespread

Nathan Kuhnert – US Bureau of Reclamation - download announcements on PWWG web page

Nathan presented the many and varied USBR projects being done in Oklahoma and the strong partnerships they have with so many of the agencies, communities, and organizations here.

Nathan presented some of the many funding opportunities relevant to PW Title XVI (Water Reclamation and Reuse Research Projects) currently available and specifically recommended one that might be useful is due on Oct. 7! See PWWG page: www.owrb.ok.gov/pwwg

- Research studies focused on creating or identifying innovative pathways to fast-track the implementation of water reclamation projects in times of drought.
- Research to create state or regional guidance to streamline navigating institutional obstacles such as the multijurisdictional regulatory framework for permitting new facilities.
- Research to evaluate the institutional barriers to expand or modify an existing water recycling facility for new water use applications such as indirect or direct potable reuse.
- Research to develop or expand reclaimed or recycled water use at a specific location through implementation frameworks that outline best practices to address social acceptance, environmental mitigation, or marketing structures for water reclamation projects.

Link below that includes selected applications from previous Title XVI research projects:

<https://www.usbr.gov/watersmart/title/applications/research.html>

OWRB Julie Cunningham – OWRB Executive Director

We have certainly seen that interest in this topic is still very strong. OWRB is happy to continue facilitating discussion and helping to keep this topic up front and relevant. We hope the many interests and organizations represented here today can network and find points of collaboration and synergy to solve the many issues still present today

OWRB will consider separate regular meetings for the technical issues and policy/regulatory issues. Discussion of tech meeting in the coming months getting into the technical weeds sharing technology advances for those interested.

END