



ENERGY PIPELINE

COVERING THE OIL AND GAS INDUSTRY IN COLORADO

AT *Work* FOR THE *Holidays*



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RECYCLING PRODUCED WATER

Trying to save produced water
from going down the drain

ONE KNOCK AT A TIME

New Wattenberg oil and gas
company moves in on busy territory

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RECYCLING PRODUCED WATER

BY TRACY HUME • FOR ENERGY PIPELINE



Concord Produced Water Services provides mobile treatment units that can be used to treat produced water in the field. This mobile treatment unit was used in the Wattenberg Field to treat produced water and return it for re-use in hydraulic fracturing. Photo courtesy of Industrial Water Permitting and Recycling Consultants, L.L.C.



**GARY BEERS IS A
WATER QUALITY
EXPERT AND HE'S
TRYING TO SAVE
WATER FROM
GOING DOWN
THE DRAIN**

Most of the produced water coming out of exploration and production operations in Weld County ends up being disposed of in one of 39 injection wells in the county. The produced water is injected back into the earth, thousands of feet deep, never to be used again.

Water quality expert Gary Beers thinks that's a waste, and he is on the front lines of a growing movement to examine the economic and environmental benefits of treating and re-using produced water from oil and gas operations.

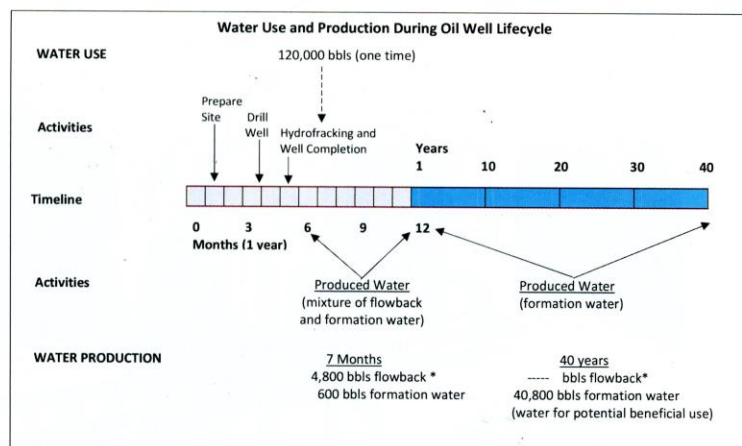
Beers' company, Industrial Water Permitting and Recycling Consultants, LLC, helps operators navigate Colorado's complex regulatory environment and permitting processes to find better uses for produced water than just throwing it away.

"I was born and raised in southern Arizona, where water is very scarce," Beers said, "I guess that planted the seed of being very concerned about not wasting water."

Beers' interest in water led him to pursue several degrees in the field, including a master's degree in fisheries management from the University of Arizona and a doctorate in aquatic ecology from Utah State University. He established his consulting firm after a long career in the water quality field, including stints with the Environmental Protection Agency office in Denver and nearly 10 years in the Water Quality Control Division of the Colorado Department of Public Health and the Environment. His extensive experience on the regulatory side helps him to help operators

A typical Weld County well requires 5 million gallons of water for fracking. Only 200,000 gallons will return to the surface as flowback.

Source: of Industrial Water Permitting and Recycling Consultants, L.L.C. based on information from Anadarko Petroleum.



identify and navigate the obstacles that impede beneficial use of produced water.

One of those obstacles is the public perception of produced water as "contaminated." According to Beers, a lot of people "don't understand that E&P (exploration and production) waste is just a category that's used to identify any type of waste material generated while they're drilling and producing oil and gas.

"But just because it is labeled 'E&P waste' doesn't mean the water is polluted or anything; it just says that's where it came from," Beers said, "You can have E&P waste that's very clean, or you can have E&P waste that's contaminated. There is a lot of variability."

Produced water comes in two main types, each with distinctive characteristics that have implications for beneficial use. The first type of water to return from a well, called "flowback," is the water used to facilitate the initial drilling process, and may include traces of the chemicals used for hydraulic fracturing. The second type, "formation water," is the water that is part of the original geological formation and is brought to the surface in the course of oil and gas production.

"Most of the produced water people talk about is the long-term formation water that's brought up as the well is producing oil and gas," Beers said. "The quality of the initial flowback water can change, because of the different chemicals used in drilling and other factors, but the quality of the formation water is pretty consistent, depending upon the original geological formation."

Some operators in the DJ Basin have

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GARY BEERS, Industrial Water Permitting and Recycling Consultants, L.L.C.

taken steps to treat and re-use produced water, including flowback water, for hydraulic fracturing. Flowback water may include chemical additives and total dissolved solids, but it typically includes fewer salts than formation water, making it easier to treat for industry re-use.

Concord Produced Water Services is a produced water treatment provider that Beers has worked with in the DJ Basin. Among the services Concord offers is mobile recycling units, which can be taken out into the field to treat flowback and produced water for re-use.

Re-use of produced water within industry operations is, in some ways, the most straightforward beneficial use to implement. When operators re-use produced water within their own organizations, it minimizes the number of regulatory hoops that have to be negotiated. Furthermore, the public typically supports industry re-use of produced water because it reduces the industry's impact on public water supplies.

"There's a lot of controversy around the issue of using fresh water supplies, such as surface water or shallow ground water, for hydraulic fracturing," Beers said. "The use of public water to supply the oil and gas industry is a continuing issue in Weld County."

The possibilities of treatment and re-use could make it possible for the industry to decrease its reliance on municipal water sources.

"There have been significant efforts to ramp up re-use practices in Weld County," Beers said, pointing out that "in theory, the demand for water for hydraulic fracturing in Weld County could be met by recycling all the produced water five times over."

Another possibility for beneficial use of produced water is dust suppression. Many rural communities with high numbers of dirt roads use significant amounts of water to mitigate dust and maintain roads. Some communities have begun exploring the idea of using produced water, particularly formation water, for this purpose.

Brine Water			Salt Concentration mg/l	
	Typical Depth (Ft)	Oil Producing Formation	Chlorides	Total Dissolved Solids
Produced Water	0 to 5,000	Above Marine Sediments	14,900	24,316
	5,000 to 9,000	Transition Zone	86,750	203,404
	9,000 +	Marine Sediments	262,000	364,000
Magnesium Chloride Solution	NA	NA	283,000	458,000

Produced water from marine sediments is similar in chemical composition (chlorides and Total Dissolved Solids) to commercial magnesium chloride solutions used on dirt roads for dust suppression, road stabilization and ice control. Source: Industrial Water Permitting and Recycling Consultants, L.L.C.

"The deeper formations were laid down when the land was almost totally dominated by oceans," Beers explained, "so produced water from these marine sediments typically has a high concentration of salts." Interestingly, the composition of these briny produced waters is similar to the composition of common commercial magnesium chloride solutions municipalities use for dust control on unpaved roads. Beers sees an opportunity there.

"Many counties in Colorado spend hundreds of thousands of dollars a year for commercial magnesium chloride solutions," Beers said, despite the fact that the produced water coming out of the oil fields might serve the same purpose.

However, this particular beneficial use is quite a bit trickier to implement. The beneficial use of produced water is overseen by a complex network of regulatory agencies including the Colorado Oil and Gas Conservation Commission, the Water Quality Control Division of the Colorado Department of Public Health and the Environment, and county permitting processes. Which regulations and permitting processes apply is contingent upon variables such as the produced water source; the composition of the water; whether the water has been treated, how it has been treated, and by whom; and the proposed use.

Beers finds irony in the fact that despite the similarities in composition between commercial magnesium chloride products and produced water (brine), there are virtually no regulatory hurdles to using a commercial magnesium chloride solution for dust suppression, but there are numerous regulatory hurdles to using produced water for the

BEERS SAID HE BELIEVES THAT WITH ENOUGH EDUCATION, THE PUBLIC, TOO, WILL BEGIN TO SEE THE BENEFITS OF TREATING AND USING PRODUCED WATER

same purpose, because it is classified as industrial waste.

"Let's say you're going to buy 'Compound X' for dust suppression," Beers said. "The company is required to disclose what chemicals they put in their solution. If you look at that, they'll say so much magnesium chloride, etc. Then they'll say 'confidential' or 'proprietary' ingredients and they won't disclose what they are. So you don't know."

"But if you were going to use produced water," Beers said, "you would have to get state approval to do that. You would have to analyze hundreds of compounds and disclose what each of those were. So if you were going to buy the magnesium chloride solution from a commercial guy, he would say, 'Well, it only has salt in it and a bunch of stuff which I can't tell you.' And then you look at the produced water and say, 'Look at all of the things they found in it!' Whether those components are harmful or not."

"Nine times out of ten the buyer will say, 'I'm not going to get that produced water because it's got all these weird things in

it.' But I've done some side-by-side testing and there are a lot of materials in the commercial products that they should tell you about, but they don't, because they don't have to," Beers said.

The bottom line is, "it's an uneven playing field, because recycled products, like produced water, have regulatory baggage and they have to disclose everything, unlike commercial products," he said.

Beers sees the possibility of change on the horizon.

The industry is starting to acknowledge the economic benefits of water re-use. Treating and re-using water in the field cuts down on the cost of purchasing water and transporting it to the site. Treating produced water and using it for dust suppression, or similar beneficial uses, even holds the potential of turning an industry expense, such as disposal of produced water, into a revenue stream, such as selling treated produced water to municipalities.

Stakeholders, such as regulatory agencies, are also beginning to discuss streamlining permitting processes to make it easier to recycle produced water and use it for beneficial purposes. In January of this year, the Colorado Energy Office and the Water Center at Colorado Mesa University convened 65 stakeholders from the Grand Junction community to talk about re-use projects on Colorado's Western Slope.

Beers said he believes that with enough education, the public, too, will begin to see the benefits of treating and using produced water.

"A lot of people are looking at beneficial uses for produced water," Beers said, "it's just a matter of having a few on-the-ground projects to show people that it does work and that it can be done." ♦