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GARY BEERS
18058 N. DUMBARION DR.
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TECH TALK

BRINE PROCESSING IS GREEN ALTERNATIVE TO DEEP WELL INJECTION

BY GARY BEERS • FOR ENERGY PIPELINE

DEEP WELL INJECTION IS WASTING RESOURCES

The widespread practice of disposing produced and flowback waters (brines) in injection wells involves wasting resources that can be used in oilfields and adjoining areas.

In the Marcellus and Utica Shale region (West Virginia), an innovative, processing facility produces useful products (Table 1) from brines that would normally go to deep well injection.

EXPERIENCES USING EXTRACTED PRODUCTS

The treatment of produced and flowback waters for reuse in fracking fluids is a widespread practice in oil fields. This practice is in place at the brine processing facility, and trucks off-load raw produced and flowback waters and load treated brine for subsequent use in the fracking process. Obviously, this is an efficient use of water and minimizes the cost of transportation to pick up fracking fluids at a separate location. The oil operators make full use of this practice available at the brine processing facility.

The unique and innovative service provided by the brine processing facility is the local supply of salt products and distilled water. Examples of the benefits to the local oil companies and community are summarized below.

LOCAL OIL COMPANIES

- Every well uses calcium chloride for use when pulling plugs from fracked well-bore stages to control pressure and keep the gas in pace and for use in frack fluid. This liquid is expensive and the brine processing facility provides the liquid, at a discount or free, to customers.
- The use of distilled water provides an alternative to obtaining water from local communities for use in fracking fluids. Distilled water reduces biocide, scale inhibitors, and friction reducers at the wellhead. Further, oil companies save transportation costs if they can pick-up water from the same location where they offloaded produced and flow back waters.

LOCAL COMMUNITY

- The West Virginia Department of Environmental Quality allows for the use of "natural gas well brines for roadway pre-



For over 50 years, **GARY BEERS**, has worked in numerous fields of environmental science as a consultant, regulator and educator. This career included senior management position with major consulting, nonprofit and public organizations. He has founded several successful firms to capture emerging resource management markets. One of his latest ventures, EnviroScienceINFO, provides content for public media.

TABLE 1. INFLOWS AND OUTFLOWS

Inflow of Produced and Flow Back Waters*	Brine Processing Facility	Outflow of Useful Products		
		Product	Amount	Uses
5,000 bbls/day	Pretreatment processes	Treated Brine	3,000 to 5,000 bbls	Use in frack fluid
		Recovered Oil	<10 bbls	Sold to refineries
	Evaporation crystallization and other processes	Calcium Chloride (liquid)	750 bbls	Road application Reuse in drilling fluid
		Sodium Chloride (rock salt)	120 tons	Road application Chemical manufacturing
		Distilled Water	1,000 bbls	Permitted discharge Reused in drilling/fracturing

*Typical salt levels (mg/l) are: total dissolved solids (274,000), sodium (85,000), calcium (30,000) and magnesium (3,500).

wetting (brine mixed with rock salt/abrasive mixes prior to roadway application), anti-icing (brine applied directly to road surfaces prior to precipitation), and de-icing (brine applied to roadway surfaces during and after the precipitation event).

The brine processing facility produces a very safe and clean sodium rock salt that can be used for road application under the department guidelines. In fact, chemical tests show that this rock salt is purer than the commercially mined salt typically used on roads. Further, local counties are pleased that this rock salt costs about \$45/ton which is significantly cheaper than the commercial mined salt (\$60-\$100/ton).

Further, the liquid calcium chloride is valuable for conditioning unpaved road surfaces as a dust suppressant.

- Fresh water is not in short supply in the vicinity of the brine processing facility; thus, the distilled water is discharged under a permit to surface waters. However, this water is provided free of charge to local fire departments.

BRINE PROCESSING FACILITY

An aerial photograph of the first brine processing facility (Fairmont Brine Processing) is provided in Figure 1. A second facility is under consideration for a location in the Midwest.

The facility's pretreatment process (facility in lower right of photograph) serves to remove metals and hydrocarbons through chemical precipitation, mechanical means, and filtration through granulated activated carbon media. The resultant treated brine water is stored in a large impoundment (150,000 bbls) for trucking to uses in the oilfield or for piping to subsequent treatment to recover resources.

The innovative component of the processing facility is the patented process that recovers calcium and sodium chloride salts with the co-production of distilled

water (facility in lower left of photograph). Treated brine is withdrawn from the impoundment and boiled in the next process to separate the sodium chloride crystals. The slurry goes to a centrifuge, where the salt is drawn and transported, as a dry material, to a storage shed. The distilled water is routed to a separate impoundment (36,000 bbls).

THIS IS A GREEN OPTION WORTH EXPLORING

The one-of-a-kind brine processing facility is demonstrating that there is a green option to the continued injection of produced and flowback waters into deep wells. While there are some constraints (i.e., minimum size is 5,000 bbls/day, incoming waters should be high in total dissolved solids or salts), an actual operation in West Virginia demonstrates the technical feasibility with business profitability.

Hopefully, operators in oilfields in the Western states — where produced and flowback water disposal practices rely upon deep-well injection — will consider the availability of this "green" option which solves the current problem of having a sustainable beneficial use of the residual salts in produced and flow back waters. ♦

FIGURE 1



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