

Simple Salt Management

By Harikrishnan Parthasarathy

Oil removal solutions treat a petroleum group's produced saltwater

Every year, disposal of produced saltwater costs oil and gas producers in the U.S. an average of \$1 billion to \$6 billion dollars. Approximately five to nine barrels of this saltwater are produced along with every barrel of oil. For every MCF of natural gas from the ground or ocean floor, the result is 0.2 to one barrel of saltwater. Cost efficiencies in oil and gas production depend on the economics of saltwater disposal.

In onshore oil and gas drilling operations, the produced saltwater creates great expense, hauled to re-injection sites or disposed of in evaporation pits. The average cost of produced water haul-off and disposal ranges from \$1 to \$8 per barrel of water, though this value depends on the mode of disposal and the number and proximity of disposal sites to production wells. Effectively, this means that an oil and gas producer spends nearly \$5 million each year to dispose of 5,000 barrels per day of water.

Local environmental enforcement agencies highly regulate the saltwater treatment for discharge into the environment. This produced saltwater is problematic in that it is also contaminated with oil and solids. Surface disposal into the environment is an environmental challenge considering the toxicity of the oils and hydrocarbons to wildlife. Typically, the requirement for surface disposal of the produced water is no visible oil sheen on the discharged water and reduction of volatile organic compounds. This cannot be achieved reliably through conventional oil-water separation methods because of their performance limitations.

Produced water management and handling is, therefore, a frustrating aspect of oil and gas exploration, with high costs and levels of maintenance for what are often unsatisfactory results for surface discharge or water reuse. Though saltwater reinjection into underground aquifers is widely utilized for disposal, it also is regulated in certain regions of the country due to potential risks of groundwater table contamination. The above factors also contribute to tremendous freshwater usage as an additional cost. Conventional filtration techniques currently are unable to facilitate cost-effective produced saltwater management, disposal and reuse.

The MyCelx molecule represents a complete break from obsolete filtration that relies on gravity or mechanical means. It complements and increases the effectiveness of the conventional oil separation techniques. Installing a system in the produced saltwater treatment lineup increases the quality of the water and makes it amenable for surface discharge or reuse. The filters remove toxic oils and hydrocarbons from the produced, enabling safer discharge into the environment.

MyCelx oil removal systems are cost-effective and provide a quick return on investment (ROI) within days or months. The water from the system is oil-free

and can either be discharged into surface water or evaporation pits, reused as "frac" water or fed into a desalination process for freshwater reuse. The systems are simple to operate and maintain, and they can be engaged online within a matter of hours.

Produced Water Treatment in Vernal, Utah

Anadarko Petroleum Corp., one of the largest independent gas producers in the state of Utah with more than 1,700 gas wells, utilizes MyCelx oil removal systems at its produced water treatment facilities.

About 24,000 barrels of produced water can be treated per day at the produced saltwater management facilities of Anadarko in Vernal, Utah. This has drastically reduced the saltwater trucking and saves more than \$8 million to \$10 million annually in water disposal costs. Anadarko's goal was to implement a cost-effective produced water treatment system with the least environmental footprint. MWH Global designed and implemented the water management facilities for Anadarko.

After hydrocarbon and solids removal, the saltwater was disposed into evaporation ponds. These evaporation ponds also supplied the required surge capacity for water reuse for "refrac." Discharge water criteria into the evaporation ponds is "no visible oil sheen," or less than 10-ppm oil content.

Conventional produced water-handling methods proved to unreliable for the treated water quality required. When these other technologies proved nonviable, MyCelx oil removal solutions enabled Anadarko to cost-effectively treat the produced saltwater and produce the required water quality. The units are the only system that guarantee no visible oil sheen in the final treated water. They can handle both free and soluble hydrocarbons effectively with much less waste.

Before deciding on MyCelx systems, engineering company MWH evaluated all possible treatment configurations available, including separators, flotation cells, coalescers, backwashable nut shell filters, carbon/clay absorbents and MyCelx. The company then developed a treatment process that incorporated MyCelx at the end of the treatment train to act as final polishers. A prototype of the treatment process was evaluated for a 6- to 8-month period to test for environmental discharge standards and economic feasibility.

The treatment proved to be environmentally

ARTICLE SUMMARY

Challenge: Oil and gas producers can spend up to \$5 million per year to dispose of 5,000 barrels per day of produced saltwater.

Solution: At a Utah gas facility, evaporation ponds along with MyCelx filtration media treat the produced water for a lesser cost instead of hauling it away.

Conclusion: Using high-level filtration for produced saltwater saves millions of dollars, requires less maintenance, allows for water reuse and lessens the cost and amount of waste.

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sound. The hydrocarbon content of the water entering the evaporation pond after treatment has always been less than 5 ppm (lower than the 10-ppm requirement). Filtration of the salty, produced water has been so thorough that the water has been discharged into large ponds that are safe for local wildlife.

The full-scale treatment systems went online in 2008 and has processed more than 10 million barrels of produced water to date. The total operating costs of the entire treatment process is approximately \$1 per barrel of water, which is considerably lower than \$3 to \$8 per barrel if hauled away. The operating cost from MyCelx is 15% of the total operating expense.

“With the process that Anadarko Petroleum implemented for handling produced water, we were able to eliminate the conventional ground pits used by other operators for oil-water separation,” said William Perry, Anadarko’s facilities manager.

With results of less than 10 ppm, Anadarko’s Utah production sites have exceeded the requirements of any state or local regulation and eliminated the level of pollution that was the previous standard for gas and petroleum exploration.

“The installation of the MyCelx filtration gives Anadarko an assurance that no oil will be discharged to our open evaporation pits,” Perry said. “This guarantee eliminated the need for netting and other intrusive precautions regarding wildlife.”

MyCelx filtration media is highly sustainable because it only activates in the presence of oil. The media are not consumed in the absence of pollution and retain their filtration ability without water logging for long periods of time. The filters are capable of removing more than 99.9% of waxes, free oils and soluble oils, including gasoline and diesel-range organics. MyCelx also produces very little differential pressure and has the smallest environmental footprint of any other pretreatment process with a considerably lower cost of maintenance.

Installation Benefits

In the last year alone, three Anadarko installations have incorporated MyCelx in their water treatment system, saving an estimated cost of \$7 million to 10 million combined annually in hauling expenses. Significant benefits of the system include:

- Successful de-oiling to less than 10 ppm for both free and soluble oils;
- Operating costs of \$0.04 to \$0.15 per barrel of water treated;
- Small footprint of (5-ft-by-5-ft-by-5-ft);
- Low maintenance requirements (1 to 2 man hours per week);
- ROI within days or a month (capital expense of less than \$50,000 for 10,000 barrels/day per system);
- No visible oil sheen or hydrocarbon product in the discharge water;
- Reuse water availability; and
- Low waste (i.e., less than \$5,000 per

year in disposal costs). Spent media is either incinerated for fuel BTU value or disposed of in non-hazardous landfills. [www](#)

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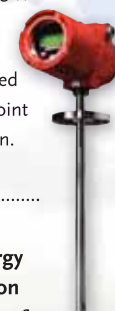
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(1) 2009 Flow Research Study, Yoder



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