No matter where they operate, E&P companies are questioning everything they do and how they do it. The goal is to reduce costs for each step of their business, from clearing land for a location to turning a well to the sales line for production. One challenge that’s only going to become more urgent is the greater call on water used for fracking.

Operators are using big data analytics to determine precisely how much water they should use to stimulate wells as the lateral lengths to be fracked grow even longer, and to what degree flowback and produced water can be reused on the next well. Many are recycling 100% of their water.

“Water—whether sourcing, delivering, or disposing/recycling—is one of the hottest topics in the U.S. oil and gas markets right now, with significant M&A occurring as companies try to expand scale, scope and capability,” Credit Suisse research analyst James Wicklund said in a recent report.

“It is one of the most misunderstood segments of the oilfield service sector, but is the fastest growing, though … it hasn’t yet caught full investor attention. But it will.”

In addition to some midstream companies adding water operations to their business lines, several new entities have cropped up whose sole purpose is to handle water for the oil field. So far, Select Energy Services Inc. is the largest and only pure-play public company focused on water, having acquired Rockwater Energy Solutions Inc. in late 2017.

Oilpatch water costs are not insignificant. SM Energy Co.’s website indicates that since 2014, the amount of fluid it uses per lateral foot in its enhanced completions has
Using recycled water for fracking not only saves money; it enhances well performance, said Approach Resources chairman and CEO Ross Craft.

increased 55%. When the company announced first-quarter 2018 capex guidance of $350 million for 18 net completions in the Midland Basin, it included $70 million for constructing water-handling systems in its so-called Rock-Star area in Howard County, Texas, where it has 65,000 net acres to develop.

Range Resources Corp. in Appalachia is another example. Its estimated water costs are $1.4 million per Marcellus well in Washington County, Pa. Multiply that by literally thousands of locations, all with longer laterals, to be drilled in the years ahead, and you’re talking a big line item. Last year Range drilled a record-setting lateral of 15,000 feet in the county. It is recycling 100% of its water.

In Ohio and West Virginia, Antero Mid-stream LP said it will spend $35 million this year to add more freshwater pipelines and another $15 million to complete its Clearwater facility, the largest wastewater treatment plant in the world for shale oil and gas operations, according to the company’s website. By year-end 2018, it will have 348 miles of freshwater pipeline and 38 impoundments. In fourth-quarter 2017, its revenue from water handling and treating was $104 million vs. expenses of $59 million.

Clearwater can process 60,000 barrels per day (bbl/d) of water and thus eliminate 172,000 truck trips per year in the Marcellus area. Antero said. More important, the facility cleans water to surface discharge standards, even though it is not discharged anywhere but instead is recycled for more fracking for Antero Resources Corp.

Recycling is a key strategy for reducing the costs of sourcing and then trucking water to well locations. It also mitigates the added headache of paying to repair lease roads and county roads that cannot bear the damage caused by a thousand heavy trucks bringing water to frack locations.

It all boils down to this: Should an E&P company build its own water-handling operations or outsource that function to a midstream company or specialist water outfit? We checked in with two operators at opposite ends of the oil patch, with vastly different issues to tackle, to see how they are handling water: Approach Resources Inc. in Texas and Southwestern Energy Co. in Pennsylvania and West Virginia.

Midland Basin

“Water is definitely a big deal; the cost of sourcing it for fracking is getting much more expensive,” said Ross Craft, chairman and CEO of Approach Resources Inc., which focuses on the Midland Basin. Approach has 329,000 bbl of surface storage for recycled water at its central water-handling facility in Crockett County, Texas, and can currently process 40,000 bbl/d with a maximum capacity of around 90,000 bbl/d.

Recycling or disposal will become a bigger challenge as time goes on. “If overall Permian production is estimated to rise to as much as 5 million barrels a day (MMbbl/d) in the next few years, and an average oil well also yields 5 barrels of water produced, you’re looking at 25 MMbbl/d of water,” he noted.

“When you look at the numbers, there are a couple of options—we do have the technology to clean the water to a level where you recycle it into your operation or dispose of it, and it’s getting cheaper and cheaper to do that. We also have the technology to remove the chlorides and unwanted minerals and metals. You can get the water chemistry down to potable water standards and put it into streams, use it for irrigation and livestock and yes, even consume it—this is expensive but we do have the technology.”

Thus, for many companies the question is not technology, but rather, the business model. Should they spend capital to develop their own water infrastructure or let a third-party midstream company do it?

“As a first mover in the basin, we saw an immediate and long-term value creation opportunity for Approach in developing a water infrastructure system,” said Craft. “We have the benefit of a contiguous acreage position, so we had an advantage some don’t. It’s better to do this yourself, if your acreage position is focused.

Craft said if your acreage is fractionated and scattered, it’s much better to have a third party come in and do it. Nevertheless, our 165,000 acres is almost all contiguous, so it was natural for us to do it ourselves. We centralized water facilities and knew we could drive down the cost.

“If you own your system, the cost saving is probably $4 to $5 a barrel. When you equate that down to a well cost, it’s $1- to $1.3 million per well.

“I think there are probably 20-plus water companies in the Permian now where that’s all they do,” he said. “The water business will be its own thing—it’s already happening. There are companies backed by private equity, and full-cycle water companies. It’s a big business, especially in hot plays where there’s a lot of activity.”

Just how big? Craft figures that in the Midland Basin, the industry is looking at future
spending of from $79- to $99 billion to source, transport and dispose of frack water for the multiyear inventory underlying the semi-arid landscape, at an estimated water cost of $1.2- to $1.5 million per well. Approach alone has 1,350 identified horizontal locations across its three productive Wolfcamp benches.

He estimated 20 Bbbl of water will be required in the Midland Basin to develop the Wolfcamp, based on the number of acres in the proven areas of the play, assuming 120-acre spacing, and two benches. “The average well requires around 350,000-plus bbl of water for a typical frack. Now, the longer laterals, greater than 7,500 feet, will require quite a bit more based on the increase in frack stages. You just don’t have enough usable water in the aquifers to support this level of activity.”

Craft said there is not enough allocation of mining water to support projected water usage levels. Utilizing water aquifers alone is unsustainable. “Aquifer volumes can’t be taken for granted, especially when we have perfected the process and chemistry to successfully reuse produced water,” he said.

“When we designed our system, West Texas was in the midst of a multiyear drought. Low rainfall, record-setting heat, a population boom and an increase in drilling activity were affecting the surrounding communities. We decided to take the lead. Thankfully, the industry has made substantial progress in its quest to become even more environmentally friendly in the way it uses water.

“It is a necessity, not an option.”

He decided a while ago that water issues for his operations needed to be addressed. Since 2012, he said, “Net-net, Approach has spent on total infrastructure [including gas lift, gathering lines, water transportation, drilling non-potable deeper water wells and disposal wells, and other items] $120-plus million. Water alone is probably 30% to 35% of the total cost, and this is just a guess, but I’d say probably $25- to $30 million of that was for water pipelines.”

In March 2015, Approach put its water-recycling plant in Crockett County into service. In the first five months of operation, more than $7 million of costs was saved or value created, he said. Now, Approach has the ability to recycle 100% of its daily flowback and produced water volumes. Another major benefit of using recycled water is improved well performance due to compatible water chemistries downhole, he added.

Approach summed up in its fourth-quarter 2017 press release: “In 2017, by reducing resource consumption, improving operating practices and minimizing ground transportation, we were able to maintain our industry-leading LOE [lease operating expense] per boe [barrels of oil equivalent] at $4.23.”

The company’s water-handling costs have fallen approximately 48% from 2015 levels to 87 cents per boe, he said. “We have six disposal wells on our acreage capable of handling 100% of our produced water. By utilizing our recycle facility and pipeline network, when not fracking, we save almost $10,000 a day in costs for trucking and handling the water, which goes directly to our LOE,” he added.

Approach’s total water costs that were once anywhere from $4 to $5/bbl including sourcing, transportation and disposal, have gone down dramatically, to 54 cents/bbl all in. Some 74% of the total cost is related to cleaning and processing the water. “This is one of the biggest savings we’ve seen, and a lot more people out there are also doing it [building their own water systems]. I think it follows the standards we set in 2013.”

Craft said the company has been approached a number of times by water companies wanting to buy its water system, but at this point, the value is not where he’d want it to be. Due to the downturn and reduced drilling, the system’s water throughput is down. “The timing has not been right in terms of realizing a meaningful value. Once we get the water volume back up to pre-downturn levels, then we’ll think about it; everything is for sale at the right price,” he said.
Southwestern Energy Co. is building its freshwater pipeline facilities in West Virginia. It has also initiated conservation projects such as this in Preston County, to offset its use of freshwater.

An Appalachian plan of attack

Southwestern Energy continues to expand in the Marcellus and Utica shales in its southwest Appalachian acreage, where it expects the average cost for wells placed to sales to be $7.6 million each. That’s with approximately 7,200 feet of horizontal length, increasing throughout the year to average about 8,500 feet in second-half 2018. That alone means more water.

Southwestern’s concerted focus on water began years ago, when it integrated operations in the Fayetteville Shale from stimulation crews, drilling and procurement to scheduling. Huge white boards at company field offices in Arkansas laid out a detailed plan of attack. These business practices are being applied in earnest now with water infrastructure in West Virginia, and in northeast Pennsylvania where it recycles 100% of its produced water.

“Water management starts from the very beginning of our operations, when we go into an area for the first time all the way to peaking during hydraulic fracturing, and even after, when we manage our produced water,” said Roy Hartstein, vice president, strategic solutions, Southwestern Energy.

“One thing we learned in the Fayetteville that became clear is the value of having piping infrastructure for water. We want to minimize truck traffic, so that leads to water infrastructure. In Pennsylvania we have pipe above and below ground for fresh and produced water, and we’re building out infrastructure for freshwater in West Virginia now,” he said.

“It leads to significant savings of as much as half a million dollars a well, so it’s important to us.”

The Costs Of Water

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Cost for recycled water</td>
<td>50 to 80 cents/bbl</td>
</tr>
<tr>
<td>Saving for use of recycled water and existing infrastructure</td>
<td>$3.20 to $4.50/bbl</td>
</tr>
<tr>
<td>Cost saving per well</td>
<td>$0.96 MM to $1.35 MM</td>
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<tr>
<td>Estimated total for remaining wells in Midland Basin</td>
<td>$638 B to $89 B</td>
</tr>
<tr>
<td>Cost of Sourcing And Disposing Of Water</td>
<td></td>
</tr>
<tr>
<td>Water sourcing from well to transport on lease roads and local highways (road damage and air pollution), to well pad, then back to lease road to saltwater disposal well</td>
<td>$4 to $5/bbl or $1.2 MM to $1.5 MM per well</td>
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So much so that in 2013, Southwestern assembled a corporate-level, water-focused group called ECH²O, which stands for Energy Conserving Water. It analyzes ways to source and conserve water and alternatives to drawing freshwater from area rivers and streams. In 2016, it met its goal: for every gallon of freshwater the company uses, it returns the same amount of freshwater to the environment.

Hartstein said another key component that drives returns is how to figure out the optimum amount to use in a specific frack to create the most value from a well at the least cost.

This year Southwestern plans to invest approximately $60- to $75 million in its West Virginia water pipeline system, delivering freshwater to its operating area. “While this project does not directly provide production growth, it is expected to reduce well costs by approximately $500,000 per well beginning in late 2018, significantly enhancing returns and lowering the breakeven gas price threshold by 25 cents per Mcf [thousand cubic feet],” the company said in statement.

“This water project will be utilized for future development of the rich and lean gas Marcellus wells, along with dry gas Utica development,” Hartstein said, adding that the water infrastructure it is building in West Virginia will be even more extensive than what it has done in Pennsylvania.

In addition, at Cheat River, W.Va., it is partnering with the West Virginia Department of Environmental Protection to collect and treat acid mine drainage from abandoned mines’ discharge sites that was polluting the area.

Although operators in shale plays are working to solve water issues, they also are sharing produced water with each other as needed for fracking, sources said, and everyone is finding additional ways to reuse as much of the produced water as possible. Whether E&Ps or the midstream sector manage water issues, water is commanding more attention, time and capital.