

White Paper
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Leveraging Digital Technologies in Oilfield Saltwater Disposal

Expand Accuracy and Reporting Reliability



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Solutions for Critical Saltwater Disposal Challenges: Horizontal Multi-Wellpad drilling has brought a huge increase in produced water in onshore shale basins. So much that producers don't know what to do with it. These excess volumes have led to the recent emergence of 3rd party water management companies that take water from multiple producers to dispose of it or treat it in order to provide it back to producers as recycled water for hydraulic fracturing. Operationally, there are similarities between the 3rd Party Water Management Companies and Upstream Producers but with nuances.

While water is an expense to producers, it is a revenue stream for 3rd parties much like oil is for a producer. Furthermore, they operate on much slimmer margins than oil companies—cents per barrel vs. dollars, which limits the magnitude of operating cashflow that can be re-invested into infrastructure. Therefore, keeping lease operating expenses low is a huge imperative for companies in this space.

The impact of firms Health, Safety, and Environmental initiatives are also critical for water management operations, where spills of produced water can render affected land unusable for agricultural purposes for decades and remediation costs can cost up to hundreds of thousands of dollars.

And just like the producers of upstream of water management companies, key topics such as measurement accuracy, remote monitoring and easy to access operational data at the SCADA layer are also highly relevant to water management companies.

Optimization in these areas allow them to make the most of the limited capital available and keep their operating expenses and health, safety, and environmental risk to a minimum.

ENSURING MEASUREMENT ACCURACY

Measurement is critical for water management to help minimize fiscal risk while formal standards are being developed. Having highly accurate volume measurement and being able to track and trend historical volumes is even more important in minimizing fiscal risk without regulatory standards or authorities to rely on—<2% is rule of thumb.

Poor measurement can lead to reduced productivity through prolonged periods of time attempting to uncover issues that may cause their volume balances to deviate significantly, which ultimately leads to reduced operating margins.

Since there are multiple flow measurement options available, one of the more preferred technologies in the industry so far, is the Magnetic Flowmeter, or Magmeter.

Measurement Challenges: One challenging aspect of measuring produced water is the presence of sand, salt crystals, oil and other materials that can introduce noise and inaccuracies into the measurement. For turbine meters, this would often mean corrosion and wear of the turbine blades and bearings, ultimately leading to drift and eventual failure. Magmeters are more immune to these challenges as they have no moving parts. Offerings such as Emerson's Rosemount Magmeter solution provide corrosion resistant construction materials. These offerings also have liner protectors that shield leading edges from erosion.

Additionally, Magmeters are able to provide diagnostics that can be viewed locally and remotely. They enable early indication of process issues that lead to poor measurement. Here are some examples of early detection diagnostics for improved measurement accuracy:

- **Empty pipe value** diagnostic detection alerts the user when electrodes are not completely covered which would lead to measurement inaccuracy; in the context of water management. Leveraging it can help proactively alert when turbulent flow or other process issues that may cause measurement inaccuracy.
- **Electrode resistance** diagnostics can help indicate coating and buildup of the meter that over time causes measurement drift; in the context of water management, leveraging it can enable proactive maintenance to clean out the meter before it causes significant measurement deviations. Electrode resistance can also help indicate entrained gas and nonconductive slugs of oil going through the meter.
- Comprehensive **Meter Verification** diagnostics such as *Emerson's Smart Meter Verification* can run multiple tests to verify the accuracy and performance of the flowmeter and can be reported via SCADA or viewed within asset management software such as *Emerson's AMS Device Manager*.



Typically, these diagnostics can be purchased and commissioned after installation, providing great amount of flexibility to implement these as needs arise.

Ultimately, leveraging these diagnostics keeps manual rounds and associated operating expenses down while also preventing leaks or spills before they happen or extend for long periods of time.

LEVERAGING AUTOMATION TO IMPROVE PROFITABILITY AND INCREASE SAFETY

Outdated and ineffective equipment, time-consuming manual processes and a lack of reliable and actionable data can hinder decision-making and negatively impact terminal volume capacity, turnover, and revenue capture. Likewise, terminals focused on achieving operational excellence are also the most profitable because they are often sufficiently equipped to automate order fulfillment practices and minimize the amount of error and re-work involved in finalizing account records.

Automating Loading/Unloading During Custody Transfer: While approximately 75% of water volumes are transported by pipeline, the other 25% is transported via truck haul. These truck hauls represent a high number of transactions that, if done manually, comes with a lot of difficulty to verify entered quantities along with the operating expenses spent in the efforts to enter and correct the tickets. Exacerbating this issue is the fact that these companies don't have full visibility into their operating results and finances until all of these tickets are entered.

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Automation of these loading and unloading transactions helps water management companies capitalize on the accurate flow measurements outlined in the previous paragraph.

- Automating the inlet AND outlet is key – we've seen sites where there was a fair amount of measurement and automation around the facility and flow leaving the site, but the inlet was completely manual and was susceptible to truck drivers loading the facility with fluids that weren't even water. These anomalies aren't caught until it's too late.

Ensuring accurate payments in and out of facilities helps minimize transcription errors and misuse and ultimately ensures companies get paid for what was taken into their facilities and sent out to their customers. It also provides a reduction in manual operations—reducing the time it takes to enter info, up to thousands of hours a year. Emerson provides solutions to *measure custody transfer with absolute precision*.

Sending Remote Measurement and Process Data to Centralized Operations: Once precise measurement has been established in a repeatable and automated fashion, sending that data to a centralized location to be reviewed and monitored remotely, in a cost-efficient manner, presents its own set of challenges.

In produced water applications, a lot of these measurement points are in highly distant areas without access to readily available power. In these applications, these remote measurement points commonly come from polyethylene flow lines which are derated elevated temperatures. Using low power, high functionality flow computers like the *Emerson FB1200* with complete historians can provide standard periodic logs available providing hourly, daily, weekly, and monthly history which is key in remote location operations.

These flow computers can be configured with integral pressure sensor and use the standard RTD, eliminating separate cost of individual pressure and temperature transmitters and their installation costs, and supports RS-485 Modbus input from Rosemount 8732 Magnetic Flowmeter transmitter. The flow computer communicates with Edge devices through ethernet.

Ultimately leveraging the flexibility of the flow computer along with high-precision Magmeters allows water management companies to economically integrate water volume totals with valuable flow diagnostics, pressure, and temperature of remote water intake locations with minimal field integration costs.

Sending Accurate Measurement Data Securely via Cloud SCADA: As far as where to send this data, system networks for water management are straightforward, with a focus on measurement and safety—for these types of applications it may be worth considering a SCADA platform that is cloud based.

Going with a cloud-based SCADA network is very cost-efficient option for these applications, especially if there's a possibility that additional assets may be added in the future via mergers and acquisitions.

Some cloud-based SCADA providers, such as *Emerson's Zedi Cloud SCADA-as-a-Service*, also provide managed alarm service that can help provide operational insights behind the alarms notifications that may come up during operation.

Lastly, a cloud-based SCADA-as-a-Service model provides flexibility and peace of mind that your SCADA system will comply with future regulations around disciplines like leak detection and measurement accuracy.

Gain Insight into the Health of Your Assets Remotely with Asset Monitoring Software: For those looking for a more granular view of their operational process health than what a traditional SCADA system may provide, asset monitoring software applications as *Emerson's AMS Device Manager* can provide incremental value in the following ways:

Window of health into fleet of devices:

- Identify, troubleshoot, resolve device issues from a central location—set and review alerts remotely
- View and trend data and diagnostics
- Compare current and historic process variables
- Remote access of meter SMV reports
 - Verify and document performance and health remotely
 - Identify and avoid problems before process is affected
 - Online monitoring of configuration, alert, and process variable info with intuitive view of all devices
 - Data import, export, and reporting options that can be saved or printed, enabling traceability for quality or compliance assurance
- Configuration templates that can reduce commissioning time
- Standardized documentation for measurement auditing/traceability purposes
- Schedule calibration/maintenance proactively instead of as needed

