

Enabling Technology Leadership Award

Upstream O&G Water Supply Chain

NORTH AMERICA



Contents

Background and Company Performance 3

Industry Challenges 3

Technology Leverage and Customer Impact..... 4

Conclusion 7

Significance of Enabling Technology Leadership..... 8

Understanding Enabling Technology Leadership..... 8

Key Benchmarking Criteria 9

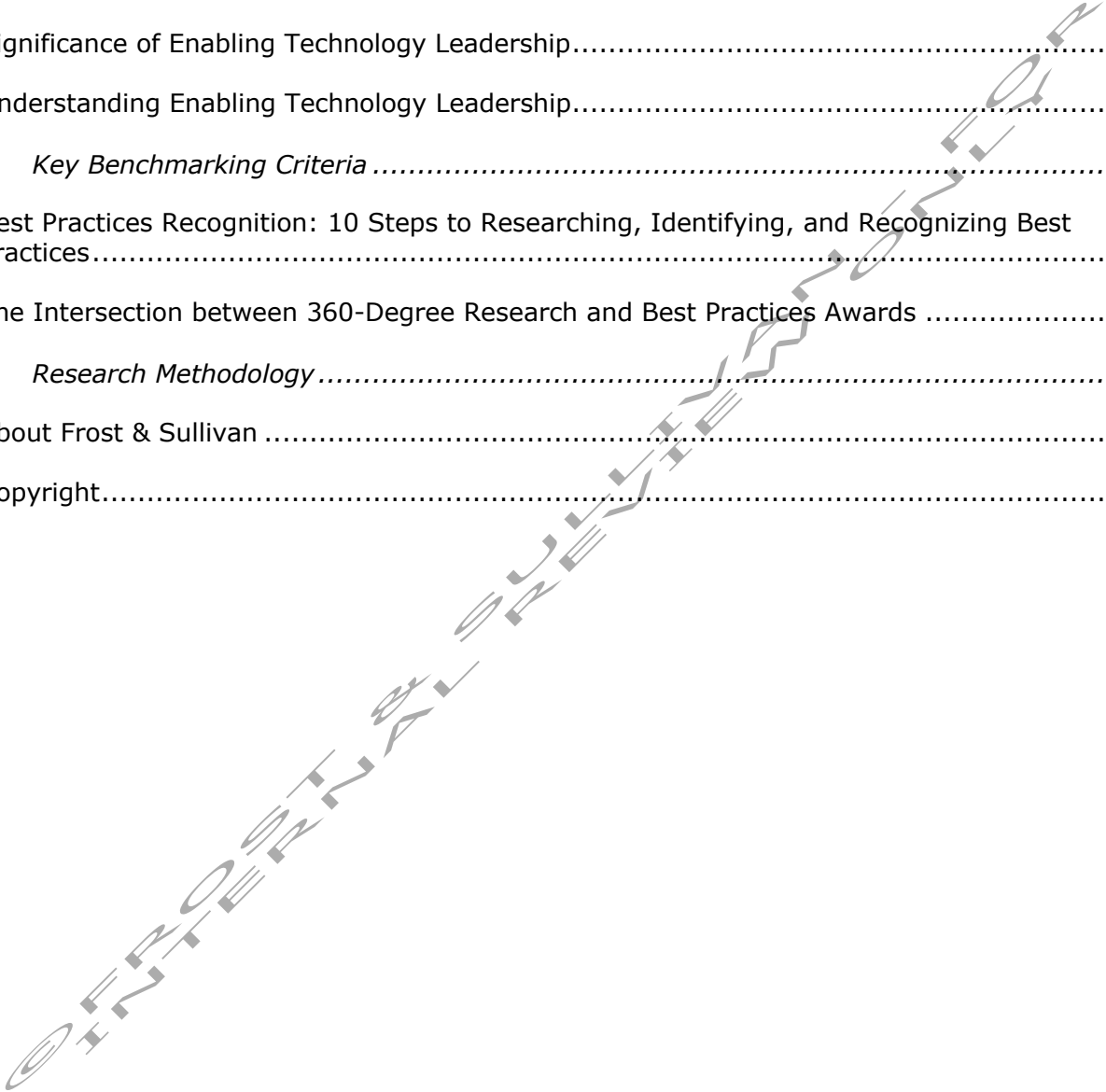
Best Practices Recognition: 10 Steps to Researching, Identifying, and Recognizing Best Practices..... 10

The Intersection between 360-Degree Research and Best Practices Awards 11

Research Methodology..... 11

About Frost & Sullivan 11

Copyright..... 11



Background and Company Performance

Industry Challenges

Over the past decade, the U.S. oil and gas industry has entered a period of unprecedented production growth through the large-scale implementation of "unconventional" energy development - the combination of hydraulic fracturing and horizontal drilling technologies to extract hydrocarbons from previously inaccessible shale formations. The sudden resurgence of U.S. energy production has made the U.S. the world's leading energy producing nation after decades of decline. One of the consequences of this extraordinary boom, and perhaps the least measured or understood, is that water has become the largest input and output of the energy development process, and water management, particularly the disposal of wastewater, now accounts for a majority of the production cost of each barrel of unconventional oil. In the Permian Basin, the heart of the U.S. oil and gas industry, water to oil production ratios range from 4:1 at the low end to more than 10:1 depending on the location, producing formation and age of the well, and water to oil ratios rise steadily with the age of the well, after an initial burst of flowback water when the well is first completed. Most of the produced water is naturally occurring ancient seawater, not the water injected and flowed back during the hydraulic fracturing process. In addition to the massive volumes of produced water that only grow over time as new wells are drilled, the amount of water injected per well stimulation -- and therefore flowed back after well completion -- has increased by an order of magnitude in the past decade, from less than 100,000 barrels per frac to often more than 500,000 barrels per frac. The advent of multi-well pad drilling (completing a large number of wells in continuous series) means a multiple of the per well water requirement must be sourced in advance of drilling and must be recycled or disposed of in a short time thereafter, often millions of barrels at a time.

As a result of water logistics becoming the primary activity of the onshore unconventional energy supply chain (volumetrically speaking), there is an increasing need for a more comprehensive understanding of where and how to source and dispose of all the water. Frost & Sullivan expects produced water disposal will be a primary constraint to the growth of energy development over the next 5 to 10 years, as saltwater disposal capacity struggles to keep pace with the unending growth of water production, which continue to grow even when new drilling declines, as we saw in 2015-2016. Consequently, upstream O&G investors, operators, and service companies are directing more focus on the optimization of water logistics in the supply chain. Today, disposal and water sourcing logistics management in the Permian Basin alone represent an underpenetrated market opportunity of approximately \$40 billion.

To equip investors, service companies and operators with superior insights into the water market, there is need for comprehensive understanding of water supply chain dynamics, including the identification and mapping of saltwater transport and disposal capacity, accurate estimates of water needs and production from current and future oil and gas

wells, current and future potential sources and destinations for water both on the ground and in the subsurface, and the resulting supply and demand balances at micro-geographic and geologic levels. However, conducting research on the oilfield water and disposal markets is still time-consuming, inaccurate, and archaic, relying largely on word-of-mouth among locals and insiders. Moreover, some existing energy data firms' offerings are perceived as unreliable because they cannot map accurately and provide actionable details of water market data. Saltwater disposal stratigraphy is a new and unexplored field of geoscience. To incorporate and access these water market dynamics requires a custom, precise, four-dimensional map. There are some initiatives involving satellite imaging and intelligence offerings that provide visibility into the movement of drilling rigs and pads. Nevertheless, the need remains for more detailed water market information combining both surface and subsurface data over time to enable optimized investment decisions. Frost & Sullivan confirms that this industry has been on the lookout for a comprehensive water intelligence data platform that satisfies all of these needs.

Technology Leverage and Customer Impact

Commitment to Innovation & Creativity

Houston-based Sourcewater, Inc. has developed a high-performance oilfield water intelligence platform focused on the Permian Basin of West Texas and Southeast New Mexico. The Sourcewater platform combines automated government regulatory and compliance data gathering with artificial intelligence (AI) technology, satellite imagery computer vision and machine learning, mobile sensors on tens of thousands of oilfield vehicles, new geoscience research and an online water commodity marketplace to offer the industry's only holistic view of oilfield water market dynamics. Launched in 2014 as a spinout from MIT's Energy Ventures program, it is one of the only solutions that meets all the water-related project requirements to plan, find, buy and sell water, recycling and disposal among a wide range of stakeholders in the upstream O&G industry, including energy operators, disposal well operators, water brokers, investors, land owners, and oilfield service companies.

Sourcewater has made significant inroads in the last 5 years to position itself as the leading provider in oilfield water market intelligence, delivering proven cutting-edge solutions and innovative digital technologies to support and reduce the impact of unconventional energy development. Sourcewater continues to elevate its water market intelligence products and online data analytics platform to support every facet of the O&G water supply chain including logistics, sourcing, recycling and disposal, and has expanded into the geoscience of oilfield water production and saltwater disposal.

Frost & Sullivan recognizes Sourcewater's geospatial intelligence platform for offering unmatched advanced AI, machine learning, and analytics features, which include the ability to support water supply planning activities for logistics, sourcing, recycling, development, and production. It features advanced satellite technologies and mapping of

the supply chain relationships between every O&G lease and commercial disposal well in Texas, North Dakota and Pennsylvania. Sourcewater's geospatial intelligence platform is able to map the oilfield water supply chain and track oilfield asset movement on the ground in near-real time, 24/7 with the use of an oilfield navigation app for smartphones that is installed on over 20,000 devices. It features advanced analytics around frac pit levels, water production and disposal pressures. It provides a detailed mapping highlighting new drilling pads and frac ponds and new proposed but unfiled disposal well locations on a daily or near-daily basis. It is also mapping the true active injection intervals for every disposal and injection well in Texas and New Mexico, and the true depths, pressures and capacities of the 47 potential saltwater disposal formations in the Permian, of which only 3-4 are commonly accessed today.

Frost & Sullivan's industry benchmarking analysis finds that in comparison to many existing, time-consuming research offerings, Sourcewater's water intelligence platform is able to generate a report in less than an hour, having scanned the entire Permian Basin to generate deep insights into potential deal opportunities. In contrast, many existing offerings will need several hours a day to generate similar reports and spot every new well pad.

In comparison to many competing offerings in the market that rely solely on public information, Sourcewater compares surface water in the Permian Basin over a period of many years from a wide range of sources, including satellite imaging analytics, internal market research, government mining records (e.g., H-1 and W-14 disposal permits, P-18 skim oil report filings, landowner records, well logs, and oil and gas permit and production filings), over 600 local newspapers, and mobile sensors in the field. As a result, Sourcewater is able to generate precise forecasts that determine critical water source and disposal availability with unmatched clarity and precision. It is the first-ever geospatial intelligence platform of its type, featuring superior deep-learning model capabilities that process satellite images of the entire Permian Basin every three to five days. Sourcewater's geospatial intelligence platform stands out because of its robust object identification capabilities able to foresee drilling up to six months before a spud happens. It is the only known source for the location and ownership of frac ponds. Since its launch, the platform has detected thousands of frac pits in the Permian Basin, differentiating between freshwater pits and produced water pits, and it attempts to identify and contact the owner of each pit to verify size, volume, water type, water price and operator. About one-third of the commercial saltwater disposal capacity of the Permian Basin is offered for sale through the Sourcewater marketplace platform.

Stage Gate Efficiency

Frost & Sullivan is impressed that Sourcewater has introduced a superior proprietary data-driven water and disposal market intelligence technology serving many hundreds of users, including two of the five largest U.S. oil and gas operators. The company uses its water intelligence platform to map saltwater disposal flows on a monthly basis, listing exactly

how much water comes out of each O&G lease in Texas and to which commercial disposals that water is sent. Fit for use in a range of water and oilfield applications, Sourcewater's platform is a superior value proposition for identifying capacity and utilization levels of saltwater disposals by pressure and injected water volume. In addition, users can instantly visualize and compare water volumes produced by each operator, identify the supply chain relationships of saltwater disposals, O&G producers and surface owners, and view new drilling and disposal permits and their approval statuses in an area of interest, down to the actual subsurface formations that each well will access. In fact, the company identifies the locations of new oil and gas and disposal wells before permits are ever filed - the former by detecting new drilling pads in satellite imagery, and the latter by scraping nearly 700 local newspapers to identify mandatory pre-permit legal notices and place them on a map using patent-pending methods.

Moreover, the company is building its satellite analytics technology with machine learning and AI to identify, classify and analyze more and more aspects of energy infrastructure development, and has already been granted four U.S. patents pertaining to the use of aerial imagery to energy infrastructure. Unlike competing oilfield market intelligence offerings, Sourcewater's online mapping platform combines data from multiple source types that include all available oilfield water data sources, and applies advanced data engineering and data science methods to ensure data integrity from irregular sources such as Texas Railroad Commission records.

Price/Performance Value

Success for any company hinges on offering the best possible price-performance balance to customers. Sourcewater's solutions (including water intelligence, oilfield water mapping, and water research) exhibit striking differentiation from conventional research on the water market. O&G investors, operators, and service companies appreciate the price-performance value offered by Sourcewater's water intelligence and online mapping platform that provide the most comprehensive and accurate data gathering available today in the upstream O&G water supply chain market.

With no hidden costs, predictable and transparent price packages are becoming accepted in the water intelligence supply chain market. Several vendors are offering a complex price quoting system and process. Others' solutions typically license by how they collect the data in the application. Sourcewater has removed that complexity and made it simple for customers to buy water intelligence using a transparent annual subscription, and software-as-a-service (SaaS) model. Its price structure is based on a simple, predictable pricing scale and one-time payment with no hidden costs.

The company announced a \$7.2 million Series A funding round in September of this year. Despite its establishment just 5 years ago in 2014, Sourcewater has won the confidence of top-tier investors in the industry, including Marubeni Corp, Bison Technologies, and several energy family offices across Texas whose goals align with this visionary startup's

mission of disrupting the upstream water and energy markets as well as removing archaic and time-consuming processes in water supply chain data collection.

Customer Purchase Experience

Sourcewater's successful, easy-to-use, and interactive water intelligence platform has positioned it ahead of its competitors. Unlike many inaccurate water market research offerings that only provide partial mapping of disposal wells and have limited, inaccurate data about their performance, Sourcewater's platform is the only solution in the market with comprehensive water intelligence that helps customers understand and visualize the exact location of produced water by operator lease and identify disposal capacity shortages by well and by geological formation. Sourcewater's technological water intelligence platform differentiation is reflected in its capability to provide comprehensive accounting of each and upstream operators' water and disposal vendor list to find the best disposal options for the operators and the best business opportunities for the service providers.

Moreover, Sourcewater's platform has been able to provide customers with significant water logistics benefits. Some customers, including Shell, have reported a substantial reduction in their hauling distances as a result of using the platform. According to the company, it has been able to track over 20,000 oilfield workers through its mobile app, providing mobile data of truck location using GPS, to see when trucks are delayed at a backed-up disposal well or other oilfield facility. Sourcewater plans to provide full real-time visibility into waiting times and capacities at disposal sites to optimize logistics and investment decisions and improve efficiencies in the water supply chain, which by some estimates wastes up to 30% of current expenditures to inefficiency, error and overhead.

Conclusion

Sourcewater enjoys a leadership position providing the most comprehensive water and disposal intelligence platform and one of the most valuable technologies in the oilfield water supply chain space. The company has made significant inroads to provide a data-driven platform with abundant information to clearly identify and understand advanced perspectives on water production and water commodity and services markets.

With a superior geospatial intelligence platform and advanced mapping technologies for the O&G industry including the only subsurface mapping of saltwater disposal stratigraphy, Sourcewater enables investors, operators, and service companies to identify the best business opportunities and make optimal operational decisions. Sourcewater is in a unique position to contribute to future digital innovations to better serve the O&G supply chain. For its strong overall performance, Sourcewater has earned Frost & Sullivan's 2019 Enabling Technology Leadership Award.

Significance of Enabling Technology Leadership

Ultimately, growth in any organization depends on customers purchasing from a company and then making the decision to return time and again. In a sense, then, everything is truly about the customer. Making customers happy is the cornerstone of any successful, long-term growth strategy. To achieve these goals through enabling technology leadership, an organization must be best in class in three key areas: understanding demand, nurturing the brand, and differentiating from the competition.



Understanding Enabling Technology Leadership

Product quality (driven by innovative technology) is the foundation of delivering customer value. When complemented by an equally rigorous focus on the customer, companies can begin to differentiate themselves from the competition. From awareness, to consideration, to purchase, to follow-up support, organizations that demonstrate best practices deliver a unique and enjoyable experience that gives customers confidence in the company, its products, and its integrity.

Key Benchmarking Criteria

For the Enabling Technology Leadership Award, Frost & Sullivan analysts independently evaluated Technology Leverage and Customer Impact according to the criteria identified below.

Technology Leverage

- Criterion 1: Commitment to Innovation
- Criterion 2: Commitment to Creativity
- Criterion 3: Stage Gate Efficiency
- Criterion 4: Commercialization Success
- Criterion 5: Application Diversity

Customer Impact

- Criterion 1: Price/Performance Value
- Criterion 2: Customer Purchase Experience
- Criterion 3: Customer Ownership Experience
- Criterion 4: Customer Service Experience
- Criterion 5: Brand Equity

Best Practices Recognition: 10 Steps to Researching, Identifying, and Recognizing Best Practices

Frost & Sullivan analysts follow a 10-step process to evaluate award candidates and assess their fit with select best practices criteria. The reputation and integrity of the awards are based on close adherence to this process.

STEP	OBJECTIVE	KEY ACTIVITIES	OUTPUT
1 Monitor, target, and screen	Identify award recipient candidates from around the world	<ul style="list-style-type: none"> • Conduct in-depth industry research • Identify emerging industries • Scan multiple regions 	Pipeline of candidates that potentially meet all best practices criteria
2 Perform 360-degree research	Perform comprehensive, 360-degree research on all candidates in the pipeline	<ul style="list-style-type: none"> • Interview thought leaders and industry practitioners • Assess candidates' fit with best practices criteria • Rank all candidates 	Matrix positioning of all candidates' performance relative to one another
3 Invite thought leadership in best practices	Perform in-depth examination of all candidates	<ul style="list-style-type: none"> • Confirm best practices criteria • Examine eligibility of all candidates • Identify any information gaps 	Detailed profiles of all ranked candidates
4 Initiate research director review	Conduct an unbiased evaluation of all candidate profiles	<ul style="list-style-type: none"> • Brainstorm ranking options • Invite multiple perspectives on candidates' performance • Update candidate profiles 	Final prioritization of all eligible candidates and companion best practices positioning paper
5 Assemble panel of industry experts	Present findings to an expert panel of industry thought leaders	<ul style="list-style-type: none"> • Share findings • Strengthen cases for candidate eligibility • Prioritize candidates 	Refined list of prioritized award candidates
6 Conduct global industry review	Build consensus on award candidates' eligibility	<ul style="list-style-type: none"> • Hold global team meeting to review all candidates • Pressure-test fit with criteria • Confirm inclusion of all eligible candidates 	Final list of eligible award candidates, representing success stories worldwide
7 Perform quality check	Develop official award consideration materials	<ul style="list-style-type: none"> • Perform final performance benchmarking activities • Write nominations • Perform quality review 	High-quality, accurate, and creative presentation of nominees' successes
8 Reconnect with panel of industry experts	Finalize the selection of the best practices award recipient	<ul style="list-style-type: none"> • Review analysis with panel • Build consensus • Select recipient 	Decision on which company performs best against all best practices criteria
9 Communicate recognition	Inform award recipient of recognition	<ul style="list-style-type: none"> • Announce award to the CEO • Inspire the organization for continued success • Celebrate the recipient's performance 	Announcement of award and plan for how recipient can use the award to enhance the brand
10 Take strategic action	Upon licensing, company is able to share award news with stakeholders and customers	<ul style="list-style-type: none"> • Coordinate media outreach • Design a marketing plan • Assess award's role in strategic planning 	Widespread awareness of recipient's award status among investors, media personnel, and employees

The Intersection between 360-Degree Research and Best Practices Awards

Research Methodology

Frost & Sullivan's 360-degree research methodology represents the analytical rigor of the research process. It offers a 360-degree view of industry challenges, trends, and issues by integrating all 7 of Frost & Sullivan's research methodologies. Too often companies make important growth decisions based on a narrow understanding of their environment, resulting in errors of both omission and commission. Successful growth strategies are founded on a thorough understanding of market, technical, economic, financial, customer, best practices, and demographic analyses. The integration of these research disciplines into the 360-degree research methodology provides an evaluation platform for benchmarking industry participants and for identifying those performing at best-in-class levels.

360-DEGREE RESEARCH: SEEING ORDER IN THE CHAOS



About Frost & Sullivan

Frost & Sullivan, the Growth Partnership Company, helps clients accelerate growth and achieve best-in-class positions in growth, innovation, and leadership. The company's Growth Partnership Service provides the CEO and the CEO's growth team with disciplined research and best practices models to drive the generation, evaluation and implementation of powerful growth strategies. Frost & Sullivan leverages nearly 60 years of experience in partnering with Global 1000 companies, emerging businesses, and the investment community from 45 offices on 6 continents. To join Frost & Sullivan's Growth Partnership, visit <http://www.frost.com>.

Copyright

This research is owned by Frost & Sullivan. No part of this research may be disclosed to external parties without formal written permission from Frost & Sullivan. Furthermore, no part may be reproduced, stored in a retrieval system, or transmitted in any form or by any means—electronic, mechanical, photocopying, recording or otherwise—without the written permission of Frost & Sullivan.