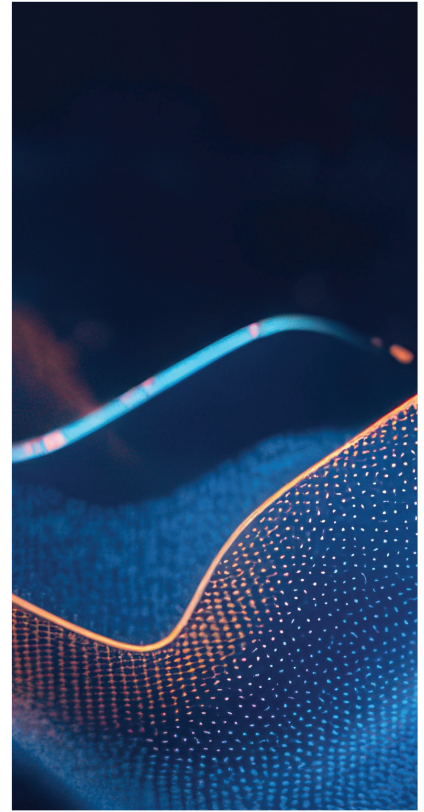
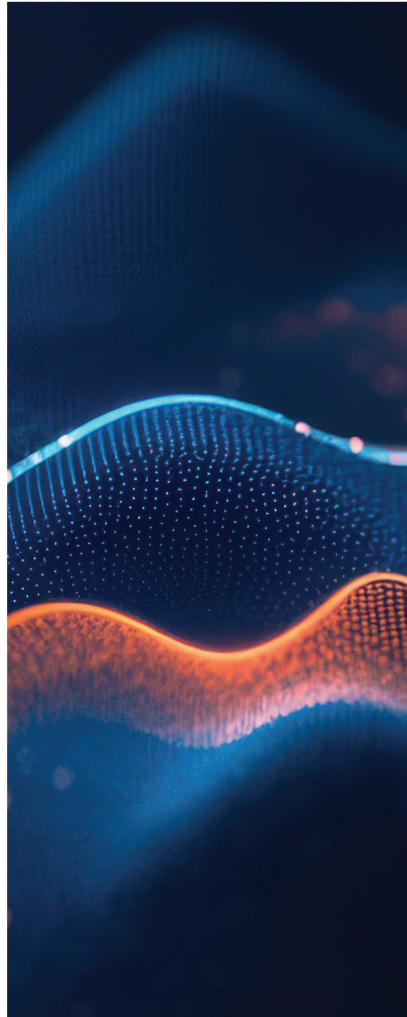


FROST & SULLIVAN
BEST PRACTICES



2026

NORTH AMERICAN
PRECISION FERMENTATION

TECHNOLOGY INNOVATION
LEADERSHIP



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Best Practices Criteria for World-class Performance

Frost & Sullivan applies a rigorous analytical process to evaluate multiple nominees for each recognition category before determining the final recognition recipient. The process involves a detailed evaluation of best practices criteria across two dimensions for each nominated company. Locus excels in many of the criteria in the precision fermentation space.

RECOGNITION CRITERIA	
<i>Business Impact</i>	<i>Technology Leverage</i>
Financial Performance	Commitment to Innovation
Customer Acquisition	Commitment to Creativity
Operational Efficiency	Stage Gate Efficiency
Growth Potential	Commercialization
Human Capital	Application Diversity

Biomanufacturing Breakthrough: Scalable Biosurfactants Accelerating Industrial Decarbonization

Industries worldwide are undergoing a structural shift as the limitations of petrochemical ingredients, resource-intensive processes, and legacy chemistries become increasingly evident¹. Across agriculture, energy, mining, consumer products, and industrial formulations, demand is shifting toward truly differentiated ingredients and step-change performance with measurable gains that reduce environmental impact, improve safety profiles, and support long-term regulatory compliance. This shift reflects a broader transformation in global value chains, where sustainability, functional performance, and reliability are now inseparable from competitiveness². As markets accelerate the move toward bio-based and renewable alternatives, biological innovation is emerging as a critical enabler of the next generation of industrial and agricultural solutions.

Biotechnology, particularly advanced fermentation, has become central to this transition. Fermentation enables the production of precision-engineered molecules via microbial systems that offer targeted functionality, improved efficiency, and reduced ecological burden. Yet, despite its potential, scaling biological innovation into practical, market-ready solutions remains a challenge. The industries seeking

¹ The Future of Petrochemicals - Towards More Sustainable Plastics and Fertilisers, International Energy Agency, 2018, [The Future of Petrochemicals](#)

² Chemicals and Petrochemicals, International Renewable Energy Agency, 2020, [Chemicals and Petrochemicals](#)

these solutions are highly performance-driven, with established workflows, demanding operational conditions, and limited tolerance for unproven inputs. Only companies capable of pairing scientific sophistication with commercial execution, manufacturing reliability, and measurable performance outcomes can effectively meet these expectations³.

“Through precision microbial design, high-performing glycolipid biosurfactants, and a disciplined commercialization model, the company translates biological potential into solutions that address real operational, agronomic, and formulation challenges. Its technology, adoption track record, and customer-aligned development approach position it as a strong contributor to the industrial transformation underway and a compelling candidate for recognition in technology-led innovation leadership.”

**- Chippy Alphons Augustine,
Research Analyst**

Locus Fermentation Solutions (Locus FS) stands out in this environment by demonstrating how a technology-driven, fermentation-based platform can deliver meaningful advancements across multiple sectors. Through precision microbial design, high-performing glycolipid biosurfactants, and a disciplined commercialization model, the company translates biological potential into solutions that address real operational, agronomic, and formulation challenges. Its technology, adoption track record, and customer-aligned development approach position it as a strong contributor to the industrial transformation underway and a compelling candidate for recognition in technology-led

innovation leadership⁴.

Commitment to Innovation

Locus FS demonstrates strong innovation leadership through a proprietary fermentation platform that consistently generates high-performance biological solutions. Its approach centers on leveraging emerging biotechnology, including advanced microbial engineering and precision-controlled fermentation, to create glycolipid biosurfactants and microbial products with differentiated functional benefits. These technologies enable improved wetting, dispersion, emulsification, and solubilization, surpassing the performance of conventional petrochemical ingredients alone and allowing customers to achieve measurable operational gains in formulated products.^{5 6}

Innovation at Locus FS is continuous and purpose-driven. The company develops ingredients with molecular tunability, enabling tailored surface activity and targeted agronomic performance⁷. This scientific foundation allows new solutions to be designed rapidly and with high functional intent, ensuring that product innovation remains aligned with evolving customer challenges across multiple sectors. The company’s curated-strain strategy, which selects specific microorganisms for defined agronomic outcomes, exemplifies a disciplined and performance-centric model of biological innovation.

³ Bio-Based Chemicals, International Energy Agency - BioEnergy, 2020, [Microsoft Word - Bio-Based Chemicals – A 2020 Update Final - 200213b.docx](#)

⁴ Locus Fermentation Solutions’ company website - [High-Performance Additives / Locus Fermentation Solutions](#)

⁵ [Glycolipids & Microbes | Locus Fermentation Solutions](#)

⁶ [Biosurfactants 101: Exploring the World of Green Chemistry](#)

⁷ [Locus Fermentation Solutions: Profitable Sustainability](#)

Equally important is the company's commitment to ensuring that technological advancements translate into real-world performance. Its fermentation infrastructure is built for industrial scalability, enabling innovative solutions to move efficiently from laboratory development to field deployment. This integration of scientific capability and operational readiness ensures that each innovation strengthens Locus FS's ability to deliver enhanced performance and sustainability benefits with reliability.

"Rather than simply transferring technology across industries, Locus FS creatively adapts functional behaviors observed in soil microenvironments, plant-microbe interactions, or biosurfactant micelle dynamics to solve problems in unrelated fields such as mining, oil and gas, or industrial formulations¹. This capability to reframe mechanisms for new contexts demonstrates a high level of conceptual creativity and scientific repurposing."

**- Chippy Alphons Augustine,
Research Analyst**

Through continuous technology creation, functional enhancement, and platform-driven product development, Locus FS exemplifies the definition of innovation leadership: advancing emerging technology in ways that elevate product capability and expand its scientific frontier.

Commitment to Creativity

Creativity at Locus FS is rooted in the ability to reinterpret biological science in ways that unlock new functional possibilities and unexplored application spaces. The company uses its fermentation platform not merely to produce biological alternatives but to challenge traditional assumptions about how

surfactants and microbial solutions can be designed, deployed, and optimized. This mindset enables Locus FS to push beyond conventional form and function, generating solutions that perform roles not previously associated with biological ingredients⁸.

A defining aspect of this creative orientation is the company's cross-sector translation of scientific insights. Rather than simply transferring technology across industries, Locus FS creatively adapts functional behaviors observed in soil microenvironments, plant-microbe interactions, or biosurfactant micelle dynamics to solve problems in unrelated fields such as mining, oil and gas, or industrial formulations⁹. This capability to reframe mechanisms for new contexts demonstrates a high level of conceptual creativity and scientific repurposing.

The company also employs creativity in formulation design. Its minimalist microbial assemblies contrast with broader, less targeted blends common in the industry, offering a novel approach to maximizing biological impact through purposeful simplicity. Similarly, glycolipid multifunctionality is leveraged to enable ingredient consolidation that creatively reduces chemical load while preserving or improving performance.

Locus FS further extends creativity into solution accessibility by designing diverse application formats that align with customer workflows, increasing usability and facilitating adoption. Collectively, these creative approaches align directly with the definition of pushing technological boundaries, unlocking white-space potential, and expanding the conceptual possibilities of biological solutions.

⁸ [High-Performance Additives / Locus Fermentation Solutions](#)

⁹ [7 Eco-Friendly Biosurfactant Applications You Need to Know](#)

Stage Gate Efficiency

A unified, platform-driven process at Locus FS enables strong stage gate efficiency, accelerating progression from initial concept to full commercialization. The company's fermentation-driven system provides a consistent scientific and process foundation that minimizes redundancy and accelerates core research activities. This reduces time spent on foundational development and allows resources to be focused on functional refinement, performance validation, and market fit.

The company's solution architecture reinforces this efficiency. Its glycolipid biosurfactants are designed as formulation-ready ingredients, enabling rapid compatibility assessment and minimizing reformulation burdens for industrial, agricultural, and consumer applications. This design philosophy directly shortens downstream development gates, particularly in industries where new ingredient integration can otherwise be slow and complex.

Microbial solutions benefit from similarly efficient design principles. By selecting targeted strains with clear functional roles, Locus FS reduces variability in testing outcomes and accelerates the validation process. This clarity enables predictable progression through stage gate milestones and facilitates faster refinement of formulations.

Locus FS further strengthens its stage gate performance through industrial-scale manufacturing capability. Because the company can produce commercial volumes early in the development cycle, promising innovations avoid typical delays associated with scale-up limitations. Structured third-party trials and customer-driven feedback loops provide high-quality data early in the process, enabling faster decision-making and reducing time-to-market risk.

Through platform consistency, formulation-ready design, scalable production, and disciplined validation, Locus FS demonstrates a highly efficient stage gate model that aligns directly with Frost & Sullivan's definition of technology-enabled acceleration of new product introduction. Unlike many industrial biotech peers that struggle with fragmented R&D and late-stage scale-up risk, Locus FS's integrated fermentation and formulation platform is built for commercialization from the outset. Early access to commercial-scale production and formulation-ready outputs compresses development timelines and creates a structural stage gate speed advantage over competitors.

Commercialization Success

A strong track record of successful commercialization is evident in the widespread adoption of Locus FS's fermentation-derived biosurfactants and microbial products across multiple industries. The company's solutions are deployed in agriculture¹⁰, oil and gas¹¹, mining¹², and industrial and consumer formulations¹³, sectors that demand reliable performance and operational fit. In agriculture, Locus AG's commercialized product lines, such as Rhizolizer®, Rhizolizer® Prime, Rhizolizer® Duo, Pantego®, and Pantego® Duo, Unpac™ and Bombigro™ are used across broadacre and specialty crop systems. In oil and gas, the Locus Bio-Energy business has commercial offerings, including AssurEOR™, AssurFLOW™, SUSTAIN™, and other

¹⁰ [Agriculture | Locus Fermentation Solutions](#)

¹¹ [Oil & Gas | Locus Fermentation Solutions](#)

¹² [Mining | Locus Fermentation Solutions](#)

¹³ [Industrial & CPG | Locus Fermentation Solutions](#)

biosurfactant-based solutions. In the industrial and consumer packaged goods (CPG) markets, Locus Performance Ingredients commercializes its Amphi™ and Ferma™ glycolipid biosurfactants, which support sustainable formulation requirements. This breadth reflects the ability to bring new technologies to market with consistency, supported by verifiable customer outcomes and strong operational readiness.

In agriculture, the company's microbial products are used across major crop systems and have been validated through extensive independent field trials demonstrating measurable yield and soil-function benefits. These outcomes have translated into repeat adoption, expanded acreage, and multi-season use, indicating sustained market confidence. The availability of diverse application modes strengthens commercial engagement by aligning products with established grower practices.

In the oil and gas sector, biosurfactants have gained relevance in fracking shale oil, enhanced oil recovery, flow assurance, and well treatment applications. Performance under demanding operating conditions demonstrates that the company's technology is not only technically advanced but also commercially robust.

In the mining sector, Locus FS provides biosurfactant-based mineral processing additives designed to improve ore liberation, flotation efficiency, and extraction yields. These solutions, delivered through Locus Mining Solutions, are used as renewable, carbon-neutral processing aids that enhance mineral recovery where conventional methods are limited. While marketed as functional solution classes rather than branded products, these biosurfactant additives are actively deployed in mining workflows, demonstrating the company's commercial reach and operational impact.

A key enabler of this commercialization success is the company's industrial-scale fermentation infrastructure coupled to extensive formulation know-how, and industry expertise, which ensures performant solutions with reliable supply to support large-volume deployments. The ability to meet customer demand consistently reinforces trust and strengthens adoption cycles.

While many biosurfactant and biological solution providers remain limited to pilots or single-industry deployments, Locus FS has demonstrated repeatable commercialization across agriculture, oil and gas, mining, and industrial/CPG markets. This multi-sector adoption highlights superior operational readiness, customer integration, and supply consistency compared to peers.

Collectively, these achievements demonstrate the company's proven ability to take new technologies to market with high success, meeting Frost & Sullivan's commercialization criteria.

Application Diversity

Locus FS demonstrates strong application diversity through a technology platform capable of serving multiple functional needs, industries, and operating conditions. Its fermentation-derived glycolipids and microbial products are used across a wide spectrum of applications, enabling the company to participate in markets with distinct performance expectations. This diversity is enabled by core molecular and microbial behaviors that translate effectively across agricultural, industrial, and consumer contexts.

In industrial and consumer formulations, glycolipid biosurfactants deliver multifunctional benefits, defined by their performance trifecta of improved penetration, dispersion, and suspension, buttressed by wetting, emulsification, dispersion, and solubilization properties which allow them to support cleaning,

degreasing, extraction, and formulation enhancement. Their stability and tunability in formulated solutions allow adaptation to different chemical systems and environmental conditions, reinforcing their suitability across varied applications.

In agricultural environments, microbial products support nutrient mobilization, soil activity, water availability, and root development, demonstrating effectiveness across crop types, soil systems, and climatic conditions. Multiple delivery formats, including seed treatments, dry box applications, in-furrow liquids, irrigation, and foliar systems, allow the same underlying technology to serve diverse operational conditions and farming practices.

Beyond these sectors, oil and gas represent Locus FS's strongest commercial traction and most demanding validation environment. In this market, its biosurfactants deliver measurable productivity gains, supporting improved oil production across both new and existing wells via enhanced flow behavior and surface modification, resulting in best-in-class operational efficiency. These benefits are sustained under high temperature, pressure, and wide pH conditions, underscoring both technical robustness and commercial relevance. Mining applications further reinforce this versatility, with biosurfactants contributing to improved mineral liberation and processing efficiency. This capacity to perform consistently across sectors and environments reflects a technology architecture built for cross-functional relevance. By enabling multiple applications from a unified platform, Locus FS meets Frost & Sullivan's criteria for application diversity with clarity and strength. Competing biological and biosurfactant platforms are often optimized for narrow use cases, whereas Locus FS's unified fermentation platform enables the same core technologies to perform across diverse industries and operating conditions. This cross-application versatility provides a scalable expansion advantage that is difficult for single-market competitors to replicate.

Growth Potential

Locus FS demonstrates strong growth potential supported by a scalable technology platform, expanding global relevance, and a customer-centered operating model that reinforces loyalty and long-term engagement. The company's fermentation capabilities enable continuous product innovation and entry into multiple industries, giving it access to large addressable markets across agriculture, energy, mining, consumer products, and industrial systems. This breadth forms the foundation for sustained expansion.

Customer focus is central to the company's growth trajectory. Performance outcomes—whether improved crop yields, increased oil production or mineral extraction efficiency, or cleaner and more effective consumer formulations—drive repeat purchasing and deepen customer trust. By tailoring application formats and solution designs to operational workflows, Locus FS reduces adoption friction and strengthens customer relationships. These dynamics contribute to growing brand recognition and embed the company more deeply into customer operations over time.

Scaling capacity adds further momentum. With fermentation infrastructure being expanded in phases, the company is positioned to meet increasing global demand and support large-volume customers. This manufacturing readiness is a key differentiator, ensuring that market expansion is not constrained by supply limitations.

The company's technology platform also provides extensibility into adjacent applications and geographies. Its bio-based solutions align with global sustainability priorities, opening new growth pathways as industries transition away from petrochemical ingredients.

Through customer-centric value delivery, scalable infrastructure, multi-industry relevance, and platform extensibility, Locus FS demonstrates meaningful and sustained growth potential aligned with Frost & Sullivan's definition¹⁴.

Conclusion

Locus FS has established a strong technology and market position built on a scalable fermentation platform, multi-industry adoption, and measurable customer outcomes. The company's commitment to innovation, creativity, disciplined development, and performance-centered commercialization has enabled it to deliver bio-based solutions that meet pressing industrial and agricultural challenges. Application diversity, combined with customer-aligned product design and expanding global relevance, positions the company for sustained future growth. With a consistent ability to translate scientific advancement into operational and commercial value, Locus FS demonstrates leadership in technology-driven industry transformation.

Based on these achievements, Locus Fermentation Solutions merits Frost & Sullivan's 2026 Technology Innovation Leadership Recognition in the North American precision fermentation industry.

¹⁴ [Product Catalog - Locus Fermentation Solutions](#)

What You Need to Know about the Technology Innovation Leadership Recognition

Frost & Sullivan's Technology Innovation Recognition identifies the company that has introduced the best underlying technology for achieving remarkable product and customer success while driving future business value.

Best Practices Recognition Analysis

For the Technology Innovation Leadership Recognition, Frost & Sullivan analysts independently evaluated the criteria listed below.

Technology Leverage

Commitment to Innovation: Continuous emerging technology adoption and creation enables new product development and enhances product performance

Commitment to Creativity: Company leverages technology advancements to push the limits of form and function in the pursuit of white space innovation

Stage Gate Efficiency: Technology adoption enhances the stage gate process for launching new products and solutions

Commercialization: Company displays a proven track record of taking new technologies to market with a high success rate

Application Diversity: Company develops and/or integrates technology that serves multiple applications and multiple environments

Business Impact

Financial Performance: Strong overall business performance is achieved in terms of revenue, revenue growth, operating margin, and other key financial metrics

Customer Acquisition: Customer-facing processes support efficient and consistent new customer acquisition while enhancing customer retention

Operational Efficiency: Company staff performs assigned tasks productively, quickly, and to a high-quality standard

Growth Potential: Growth is fostered by a strong customer focus that strengthens the brand and reinforces customer loyalty

Human Capital: Leveraging innovative technology characterizes the company culture, which enhances employee morale and retention

Best Practices Recognition Analytics Methodology

Inspire the World to Support True Leaders

This long-term process spans 12 months, beginning with the prioritization of the sector. It involves a rigorous approach that includes comprehensive scanning and analytics to identify key best practice trends. A dedicated team of analysts, advisors, coaches, and experts collaborates closely, ensuring thorough review and input. The goal is to maximize the company's long-term value by leveraging unique perspectives to support each Best Practice Recognition and identify meaningful transformation and impact.

VALUE IMPACT			
STEP		WHAT	WHY
1	Opportunity Universe	Identify Sectors with the Greatest Impact on the Global Economy	Value to Economic Development
2	Transformational Model	Analyze Strategic Imperatives That Drive Transformation	Understand and Create a Winning Strategy
3	Ecosystem	Map Critical Value Chains	Comprehensive Community that Shapes the Sector
4	Growth Generator	Data Foundation That Provides Decision Support System	Spark Opportunities and Accelerate Decision-making
5	Growth Opportunities	Identify Opportunities Generated by Companies	Drive the Transformation of the Industry
6	Frost Radar	Benchmark Companies on Future Growth Potential	Identify Most Powerful Companies to Action
7	Best Practices	Identify Companies Achieving Best Practices in All Critical Perspectives	Inspire the World
8	Companies to Action	Tell Your Story to the World (BICEP*)	Ecosystem Community Supporting Future Success

*Board of Directors, Investors, Customers, Employees, Partners

