

2008 North American Alternative Fuels Technology Innovation Green Excellence of the Year Award

Range Fuels

A renewable, environmentally friendly fuel that offers affordability and widespread availability in any geographic location would prove to be an important step in the reduction of greenhouse gas emissions and dependence on oil imports. Range Fuels has developed a proven technology to do just that. The company has created a sustainable, clean technology platform to remedy the country's tenuous reliance on oil imports.

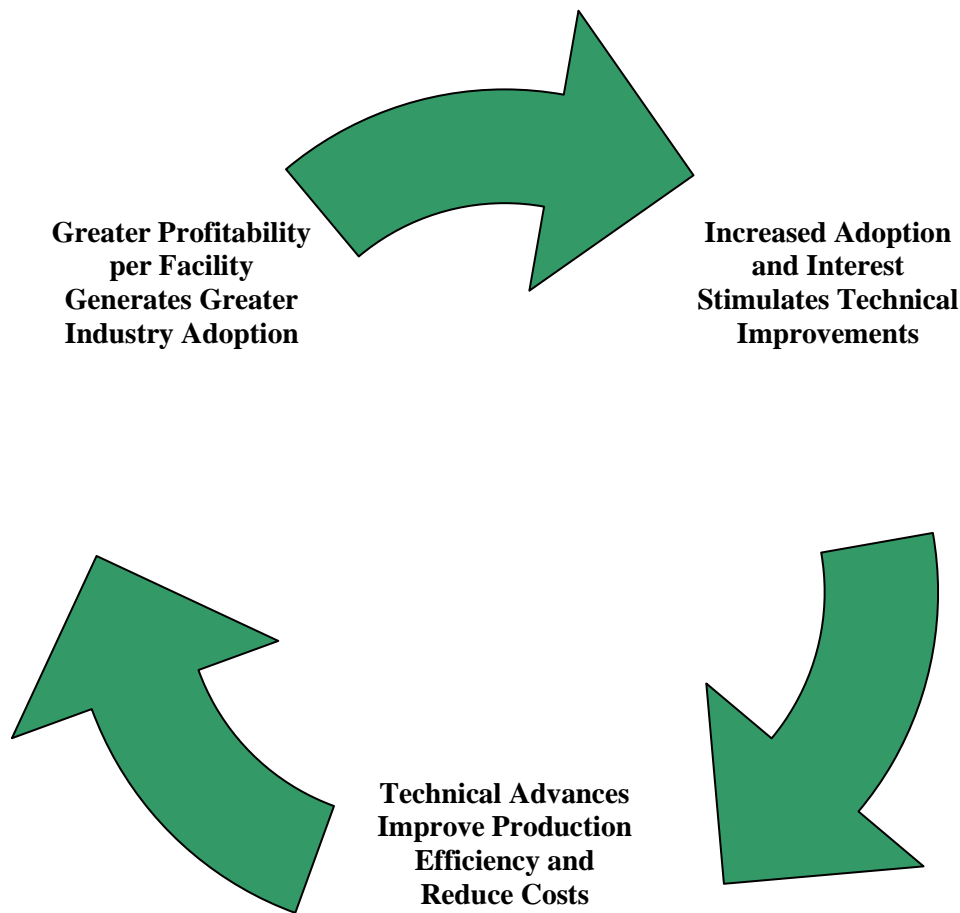
A key difference between Range Fuels' K2 process and current ethanol production techniques is that its process can convert any type of biomass into ethanol. This allows more flexibility in the production stage of ethanol, as there is no need to rely upon specialized or non-indigenous crops as a fuel source. It also eliminates reliance upon a single geographic region for fuel sources. As a result, ethanol availability and pricing can be relatively stable when compared to petroleum fuels. The process also produces minimal and manageable by-products, emits very low levels of greenhouse gases, and produces higher yields of clean ethanol.

Range Fuels demonstrates considerable entrepreneurial dexterity with the modularity of its plant design. Fuel production modules are designed to bring the conversion process right to the biomass source, thereby reducing the energy expended with supplying the facility with feedstock. The design also allows the addition of modules to better respond to increasing consumer needs for transportation fuels.

Thermo-chemical conversion, the system used by Range Fuels' K2 process, offers greater potential efficiency than current sugar fermentation systems or cellulosic systems designed to convert biomass through the action of enzymes. It uses less water, produces fewer by-products, and is more flexible concerning the type and quality of feedstocks it can use. This approach is environmentally friendly, highly flexible, efficient, cost effective, and scalable. While development and production costs are, as of 2008, higher for thermo-chemical systems, Frost & Sullivan believes that advances in this technology, spurred by interest in its inherent advantages, will bring investment costs to competitive levels with sugar fermentation facilities within five years. Declining costs will also serve to drive adoption rates higher.

Figure 1 illustrates the predicted cycle of market adoption for Range Fuels' K2 process.

Figure 1
Alternative Fuels Market: Market Cycle of Range Fuels' Technology Innovation (North America) 2008



Source: Frost & Sullivan

Range Fuels has designed its entire K2 production system to address criticisms of current ethanol production techniques. There are major concerns among biofuel critics that certain conversion processes may require more energy to produce the fuel than the fuel itself can provide. This measurement takes into account not only the energy in the conversion process, but also the energy cost required to grow,

harvest, and transport the crops. However, according to the Argonne National Laboratory's Center for Transportation Research, general cellulosic ethanol has an energy output to input ratio of 10.3:1. As a contrast, current corn-based ethanol and gasoline have ratios of 1.4:1 and 0.8:1, respectively.

Frost & Sullivan believes this figure to be even higher for the Range Fuels system. This is because its modular design allows production facilities to be located near the source of raw materials, thus reducing energy requirements for transportation. Also, the process's ability to use discarded biomass from other applications means that no extra energy is required to cultivate the biomass used for fuel.

Critics of ethanol have also expressed concern that the conversion of forests and grasslands to fuel crop fields will actually yield an increase in net carbon dioxide emissions. The plant designed by Range Fuels, however, has been permitted as a minor source of emissions, and its close proximity to both wood supplies and ethanol markets will minimize energy expended in supplying the facility with feedstock and providing ethanol to consumer markets. This flexibility also prevents increases in the price of food crops from their use as a biofuel. Cellulosic systems generally reduce greenhouse gases by four times the amount of current corn-based ethanol, primarily due to their lower power requirements. Range Fuels' design boasts a lower power consumption than most cellulosic systems, further decreasing net greenhouse gas emissions and ensuring environmentally sustainable ethanol production.

Range Fuels was founded by Khosla Ventures LLC, a venture capital firm focused on the creation of renewable, environmentally-friendly energy sources. Additional investors include Passport Capital, BlueMountain, Leaf Clean Energy Company (advised by EEA Fund Management Ltd. and Shaw Capital), Morgan Stanley, and PCG Clean Energy & Technology Fund (with participation by California Employment Retirement System (CalPERS)). These funds are focused on completing the construction of Range Fuels' first commercial-scale cellulosic ethanol plant. Located in Soperton, Georgia, the plant is permitted to produce over 100 million gallons of ethanol and methanol once construction on all phases is complete. Construction of the first phase is scheduled to be completed by the end of 2009. Range Fuels also received a \$76 million grant from the U.S. Department of Energy and a grant of \$6 million from the State of Georgia for this project.

Frost & Sullivan predicts that Range Fuels' K2 ethanol creation technology and its implementation strategy will prove very successful in the alternative fuels market. Range Fuels' process has the ability to successfully scale to meaningfully reduce greenhouse gas emissions and the country's reliance on imported oil. Frost & Sullivan

is pleased to recognize Range Fuels with the 2008 Green Excellence Award in Technology Innovation for its contributions to the clean fuels market.

Award Description

The Frost & Sullivan Green Excellence Award in Technology Innovation is presented to a company that has demonstrated superior technological advancement, which is aligned with a sustainable and environmentally conscious objective within its industry sector. This Award signifies the company's identification of a unique and revolutionary solution with significant environmental benefits, while presenting tremendous market potential simultaneously. Moreover, the Award also signifies that the company's overall business strategy is sound and poised for success.

Research Methodology

Technological excellence, focused on environmental priorities and long-term sustainability, is assessed regularly through continuous monitoring amongst market participants within specific industry sectors. Frost & Sullivan's analyst teams perform extensive interviews with companies within specific industries to evaluate their technologies, products and business strategies. In addition, research within that market space is performed to benchmark the Award recipient's technology against others. Also considered are elements such as strategic alliances, expected time to market, environmental soundness, long-term green strategies, and management advocacy behind the success of the technology.

Measurement Criteria

Specific measurement criteria used to determine the final award recipient are as follows:

Technology Profile

- Technological platform characterized by long-term sustainability
- Ability to optimize resource usage
- Adaptability and responsiveness of the technology to address changing environmental needs and priorities

Business Commitment

- Entrepreneurial dexterity in incorporating conservation into the business concept
- Development of technological solutions to address concerns regarding climate change
- Industry's acknowledgement of the green initiative in question, by way of financial support, strategic support, and recognition as a pioneering venture

Environmental Accountability

- Demonstration of obligatory responsibility in reducing environmental burden as part of the solution (e.g. cradle to grave solution)
- Inherent features that enhances adoption/participation rate
- Creation of collective accountability towards reducing the impact of climate change, dependency on finite resources and ecological footprint.

About Frost & Sullivan Green Excellence Awards

Instituted as an integral part of the Environment & Building Technologies Practice of Frost & Sullivan, Green Excellence Awards are presented to companies that have excelled in green product and technology innovation, and service achievements. These Awards recognize groundbreaking ideation and innovation across a multitude of disciplines that originated from a firm sense of environmental responsibility. Recipient companies are committed to a continuous focus on reducing the dependency on finite resources, from concept to commercialization. Their efforts demonstrate a resolve to reduce the impact of climate change and overall ecological footprint.

Frost & Sullivan Best Practices Awards recognize companies in a variety of regional and global markets for demonstrating outstanding achievement and superior performance in areas such as leadership, technological innovation, customer service, and strategic product development. Industry analysts compare market participants and measure performance through in-depth interviews, analysis, and extensive secondary research in order to identify best practices in the industry.

About Frost & Sullivan

Frost & Sullivan, the Growth Consulting Company, partners with clients to accelerate their growth. The company's Growth Partnership Services, Growth Consulting and Career Best Practices empower clients to create a growth focused culture that generates, evaluates and implements effective growth strategies. Frost & Sullivan employs over 45 years of experience in partnering with Global 1000 companies, emerging businesses and the investment community from more than 30 offices on six continents. For more information about Frost & Sullivan's Growth Partnerships, visit <http://www.frost.com>.

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