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The second generation biofuels dance: Grab a partner before it's too late!

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Mark Emalfarb

Mark Emalfarb, President and Chief Executive Officer of **Dyadic**, looks at how joint ventures can accelerate the commercialization of Cellulosic Sugars for use in producing biobased fuels and chemicals.



The recent announcement of a joint venture between POET and DSM underscores a couple of key strategic themes in the path towards developing and commercializing second generation biofuels.

First is the realization that enzymatic hydrolysis continues to be the most preferred route for generating Green Sugars(tm) for use in producing advanced biofuels from non-food sources. Accordingly, the ability to produce the most cost-effective and productive enzymes to unlock these sugars is, arguably, the most crucial technological barrier to overcome in bringing competitively priced second generation biofuels to

market.

Second is the growing understanding by leading companies of the long term benefits associated with the on-site model of producing specialty enzymes at commercial scale that are customized to specific feedstocks and operating conditions vs. the short term approach of purchasing a "one-size-fits-all" cocktail of enzymes for smaller non-commercial production.

POET demonstrated this awareness by deciding to transition from this short term strategy (i.e., purchasing enzymes from industry-leader, Novozymes) to the long term strategy of developing their own enzymes, in conjunction with DSM, and gaining valuable input into their subsequent modification and improvement. If the DSM technology proves to be viable, then POET will have succeeded in reducing their enzyme costs, improving productivity and controlling their enzyme technology while also eliminating its dependence on a third party enzyme supplier.

POET is just the most recent of several companies leading the charge toward commercialization of second generation biofuels that have embraced the on-site model by acquiring or licensing enzyme technology. Others include DuPont (in acquiring Genencor through its acquisition of Danisco); BP (in acquiring the biofuels assets of Verenum); and Abengoa Bioenergy and Codexis (partnered with Shell Oil) (in licensing the C1 platform technology from Dyadic International).

Going forward, companies that want to participate and compete effectively in the commercialization of second generation biofuels have three clear choices:

1. Continue purchasing enzymes on an as-needed basis from enzyme suppliers.

Risks of this choice are being totally dependent on a third party enzyme company to continue to reduce costs and increase productivity to remain competitive. Other risks include potential challenges and conflicts over intellectual property surrounding the most commonly used microorganism, Trichoderma. Last but not least is the risk that the

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large enzyme suppliers will be acquired by companies who may restrict access to these enzymes and/or increase their prices;

2. License a total solutions package which includes an enzyme technology.

This will require waiting for others to spend the money to further refine and improve existing technologies which may ultimately provide the benefits of the onsite model but also still carry the risks of dependence on a third party. Also, some companies may not need the full solutions package and only need the enzyme portion; or

3. License or acquire enzyme technology.

Partner now with one of a very few select remaining companies that have the necessary enzyme technology and begin conducting focused research to create the most productive and least expensive fungal strains to produce the ideal enzyme mixture for a specified feedstock(s) so that the first two choices can be avoided. This choice requires considerable funding. Also, the marriage of resources with technology may require years of dating with several potential partners before being able to make a final commitment to the right technology.

Companies that choose options 1 and 2 invariably will always ask, "How much do your biofuel enzymes cost now?" This question ignores the fact that no company today produces enzymes that are cost-effective enough for the economically viable production of second generation biofuels. More importantly, it ignores the fact that very few companies possess the necessary resources and technology to achieve this objective.

Companies that choose option 3 only want to know, "How much will these enzymes cost after they collaborate with the right enzyme technology partner to develop the best enzymes for the future whose costs can be managed and controlled at their own facilities?"

In the near future, those companies with sufficient resources will have chosen dance partners who have promising technologies. Those without partners will be left on the sidelines and either be too late to the party or never get there at all, being left forever at the mercy of those who had greater foresight and vision.

Aspiring leaders in this field need to quickly do their due diligence to select the right technology(ies) with the best likelihood of success and embark on the journey of making second generation biofuels a commercial reality.

Editor's note: Mark Emalfarb's company Dyadic has trademarked the term "Green Sugars™", to describe the fermentable sugars from biomass which he hopes will drive the shift away from an oil-based economy; highlighting his commitment to this new source of fuel. We ran an [interview](#) with Mark back in 2009 providing an interesting insight into how Mark's interest in renewable sugars came about.

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