Stanford eCorner

Driving Low Cost and Time to Market

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Rather than simply re-invneting the wheel on new energy sources, Amyris Biotechnologies CEO John Melo discusses his company's decision to focus on blended fuels that already meet market specifications. This practice, he points out, can get alternatives competing in the marketplace years faster than starting a formula from scratch. Melo also discusses his enterprises' numerous cost-saving techniques, such as simplified manufacturing, low capital investment, and efficient fermentation toward product growth.

Transcript

We had to make a choice in the kind of molecule we selected. We had to make a choice driven by time to market. We kind of stood back and said if time to market is really important, trying to prove to the world that we're developing a molecule that's going to redefine what diesel is, it's probably going to be a pretty hard road that's going to add two to three years in certification. So we decided actually to go a very different way. We decided to look at the makeup or what I like to call the cocktail of diesel - because diesel is really many molecules bonded together. We looked at that cocktail and we asked ourselves, "In that cocktail, which molecule could we blend at a much higher level inside the cocktail and still get diesel to perform at the current or better specification than is already approved, the ASTM spec for diesel? Based on that, could we get to market faster?" That's exactly what we did. So our molecule is a blend in current petroleum diesel, and blended up to 50%, we meet or exceed the specifications of current petroleum diesel. That's the same thing with jet. It's a different blend rate but it's the same approach. We decided let's not go invent the world and try to find a different molecule.

Let's find a molecule that's currently in the cocktail that actually does what the world needs, and then let's blend that molecule at a much higher level than the industry has traditionally done because we could make it at a lower cost. That's the approach we've taken. The cost profile of making this stuff, how do you keep the cost at a breakthrough low level? It sounds very expensive to me. Yes, not easy. That's actually the second part of the magic. The first part of the magic is, "Can you actually make the darn thing?" The second thing is, "Can you make it in a cost-effective way at scale?" We have focused that on several dimensions. One is keeping the manufacturing process as simple as possible. One of the key factors in cost is capital cost. There's a fantastic product out today. There's two issues.

It's not very good for the environment, and it's very costly to produce, and that's what I'll call the coal to liquids method of making either diesel or jet. You get a great molecule. It's a fantastic product, but it costs two to three billion dollars to build a basic plant, and you don't produce a lot when you spend two to three billion dollars, and you have an issue with carbon sequestration and what you do with C02 for the environment. So our focus has been, actually, that could be our advantage. How do we pick a scalable process that's low-cost? The good news is we're working with microbes, and they love fermentation. So we focused on a fermentation process as the manufacturing process to make the product. By doing that, we also decided we wanted to make our scale up or what I like to call capital white. So instead of building a complete new infrastructure for manufacturing our product, we decided let's go where there's available capacity in fermentation today. Let's convert that fermentation capacity from doing whatever it does today to making diesel from a scalable feedstock. So that's the first part of cost.

It's that exact model. You take an existing process, make sure it's low cost, and make sure you can scale it with low capital. Our conversion process today is we could take an ethanol mill in Brazil for about $30 million converted for making 40, 50, 60, 75 million gallons of ethanol a year to making the equivalent in diesel a year. That's a pretty breakthrough model for how you go to market with our technology. We didn't say let's start from scratch. Let's start with what's out there. Let's find a low-cost conversion, and let's get that plant to make our product. The second and, I think, as hard part of cost, is getting the microbes to be super efficient. If you think about where we are today, and I'll actually go back even further, Artemisinin about nine months ago, and you can say it differently, Artemisinin's cost target is about $3,000 a barrel of oil cost equivalent. I don't know about you, I'm not happy with the fact we are at 134 today, so we went up about $4.67 a barrel, I think.

So a pretty big increase in price of oil today, yet it's still far off from the $3,000 a barrel cost equivalent that Artemisinin is actually cost competitive at. In the last nine months, we've moved our microbe from a $3,000 a barrel of oil equivalent producer to our best strain today which is about $175 to $200 a barrel. So that kind of gives you a sense of the magnitude of change and what we're constantly doing to get to cost. It's really in those two areas: low-cost manufacturing process and ensure we get as much efficiency in that process as possible, and then highest efficiency strain to get the most conversion of the sugars from the fermentation process to product.