Movers & Shakers Interview with Jim Balcom, President and CEO of PolyFuel, Inc.

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PolyFuel, Inc. develops and markets a next generation hydrocarbon membrane technology specifically designed for direct methanol fuel cell (DMFC) power systems. This membrane technology is based on over 14 years of research and development at SRI International, one of the top research facilities in the world. Today, PolyFuel has become one of the leading enabling technology companies in the direct methanol fuel cell industry by focusing engineered membrane component design and not the full fuel cell system development. The company has positioned itself to become the world's leading hydrocarbon membrane component supplier through its vision - "Powering the future of mobile and wireless devices"

This discussion between Jim Balcom, President and CEO of PolyFuel and Sara Bradford, Frost & Sullivan Energy & Power Systems Director will cover many facets of the current and future power source industry. Mr. Balcom has highlighted significant innovations on the engineered membrane compoent side of the fuel cell business, setting the stage for increased fuel cell penetration.

Frost & Sullivan is honored to feature PoyFuel as part of its Movers & Shakers program and would like to thank Mr. Balcom who agreed to share his view on the state of the industry as well as discuss growth opportunities that lie ahead for vendors and PolyFuel in this space.

Sara Bradford (SB): PolyFuel is a leading innovator in the micro/mini fuel cell industry. From this vantage point, what do you consider as the growing/emerging opportunities in this space?

Jim Balcom (JB): There are number of opportunities that we see and a number of drivers that are creating those opportunities. We talk about Moore's Law increasing the amount of functionality people can have on their devices and that increasing functionality tends to come with an increasing power requirement. It also tends to drive an increase in the usage factor, and when you multiply power time's usage, power times time, you get energy. It's the energy that so many of these portable devices are finding that they are constrained within. We see it in the laptop side, for example, as people move towards wireless technology – that increases the power consumption. The more you have availability to use wireless, the more you use wireless and that increases the time people use that functionality. As we see people moving from Wi-Fi to Wi-Max, it is going to make wireless even more available to consumers. On the laptop side, we are seeing an increase in people wanting to be able to be off-grid and have more off-grid runtime.

Intel, who have invested in PolyFuel, would like for their customers to have 8 or 10 or 12 hours of completely off-grid runtime. Batteries are challenged to deliver that much energy today without being too big to be integrated into the device and fully portable. That is one area where the demand is coming from.

Those same factors combine on the handset side as well, also a big market. The laptop market is growing at double-digit rates, 27 percent to be exact, for each of the past 2 years. The handset side is growing even faster than that, and the increased functionality in the handsets is seeing the same effect as people want to watch television, play games, use GPS functionality, enjoy bigger and brighter screens if they are going to interact on video calls, etc. All those factors are causing people to use the device more, and that again faces the same energy constraint. The devices just do not have enough energy as people would like them to have. As people for instance move towards television on mobile phones, they are able to watch about an hour or so, and then they cannot even make a phone call. That is just an example of two markets that are driving demand.

The military market will always be one that has a desire for more power and energy for the individual soldier. There are market opportunities there.

There are industrial applications where workers are needing more connectivity and require more computing functionality. I think we have not figured out what all applications are in this space in which they can have completely unlimited unplugged runtime. People will continue to dream these applications up as fuel cell technology begins to take hold.

Applications and not the actual hardware is growing the demand for fuel cells. It is the functionality that is causing this growth opportunity, not the device. It is the desire to communicate more, to be entertained in a mobile environment, the desire for more functionality – so the applications are driving this growth.

SB: The industry today is highly dynamic. What are some of the key changes that PolyFuel has witnessed over the past 12 to 18 months? How has the company changed to reflect this evolving marketplace?

JB: One of the things that we have seen change is there is more of an emphasis on the portable handset side than we had seen in the past. Particularly over the last 18-24 months, there were not a lot of people talking about handset demand for more runtime. It was mostly revolving around the laptops demand for more runtime. Most of our customers are developing fuel cells for both devices, whereas before they were only focused on laptops.

We have seen that people who are delivering the applications pushing a lot of this demand. So, rather than the device manufacturers, it is the content providers, the wireless carriers who are delivering that content – they are now exerting influence on the device manufacturers and in turn the battery manufacturers, to be able to deliver devices that can take advantage of the content being made available. This is a definite change we have seen over the last 18-24 months.

This increase in demand is driven by the consumer. One of trends that wireless carriers are experiencing is a limitation in the amount of minutes a person can consume and content that they can sell them because the consumer has run out of runtime. There is a large group of corporations that have the content and in the business of delivering the content, so there is an increased business opportunity if they could get more runtime they could sell more content.

Everyone is pulling for the fuel cell technology, the device manufacturers, the wireless carriers/content providers, battery manufacturers, and the consumer.

SB: In what way is PolyFuel offering a valuable option to its customers?

JB: As the computer chip is the heart of a laptop, the membrane is the heart of the fuel cell. It is the component that determines how the fuel cell functions, it determines the weight/size of it, length of the runtime, how much heat it generates, how much water it generates – all of the characteristics of the fuel cell are determined essentially in the fuel cell membrane. The membrane creates the electricity. PolyFuel delivers a membrane that enables a very favorable set of those characteristics. In particular, the most important one for portable devices is that it allows the fuel cell to be smaller. That is where fuel cell system developers have the challenge - to try to make the fuel cell system small enough to integrate into the device. That is the area in which our membrane specifically, because of its characteristics, enables customers to have the smallest device with the longest runtime.

SB: Why is what PolyFuel does important to the mobile/wireless industry as a whole?

JB: It is the combination of these two areas we were just discussing. Getting the device runtime long enough is what is key to consumers being able to purchase additional content and use the device to the fullest in terms of applications that are being made available. Getting long runtimes is what is required to achieve that and getting the fuel cells small enough so that it can be the answer and deliver that longer runtime are the two key areas. That is where and why PolyFuel plays such a key role in the market to provide a solution to the increase in functionality in the portable industry. Our membrane enables that longer runtime and smaller fuel cell system.

SB: What markets do you consider to be primary markets for your company and what international markets do you consider as key for both present and future growth?

JB: We have spoken about the primary markets for fuel cells being laptops, mobile phones, military and industrial portable devices. From an international perspective, it is important to note that there are expectations that the earliest markets will exist in Japan and Korea. This is where most of the consumer electronic innovations are being developed today and that is typically where new devices are introduced first. Certainly, the wireless networks that will enable the widespread delivery of content have been earliest and most widely adopted in those countries.

SB: What are the major challenges for PolyFuel in the industry today and what are some of the strategies you employ to overcome them?

JB: There are some technical challenges associated with making these devices smaller and we [PolyFuel] have a very strong technical team working on overcoming these by helping our customers get the best out of their devices. There are also challenges associated with fuel cells in general. Fuel cells have been five years away for a long time now. That certainly creates a challenge in the minds of perspective investors and financing fuel cell companies is always a challenge. There is that baggage associated with the fuel cell industry that we, like any fuel cell company, contend with. I think that the portable market is widely considered amongst all that are associated with the fuel cell industry to likely be the first to reach real commercialization.

One of the other challenges that still needs to be overcome is the regulatory side. Without changes, the current regulations would limit adoption of fuel cell technology. That is luckily being pushed forward by many different companies, agencies, and countries so there is a lot of progress being made here.

The other part of the industry that needs to evolve is the fuel cartridge side of the business. There is already a lot of interest between many of the big potential players in the fuel cartridge industry. PolyFuel, on its own, does not need to do the heavy lifting by itself. Companies such as Bic, Duracell, Tokia, and many of the consumer electronics manufactures would like to participate in the sale of fuel cartridges. At the end of the day, it has a potentially similar role as the 'razor/razor blade' strategy or the 'printer/printer cartridge' strategy where they practically give away the product in order to make their profit on the consumable sales. That model exists in the fuel cell industry already, as different players in the industry might chose to exploit that model in a different ways. One example is the fuel cell device maker can give the fuel cell system away, and if it requires a proprietary fuel cartridge, they may well make their money on the cartridge side. Several of the major consumer electronics manufacturers have a battery division such as Panasonic. They have the distribution capabilities to put disposable and consumable devices out there in the field.

The other organizations that might take advantage of that strategy are the wireless carriers, the content providers. That type of organization might give away the fuel cell-enabled mobile phone in order to make up the extra money on the minutes they sell to their customers. Or perhaps, sell the fuel cartridges as well, since they have a solid retail channel already set up.

SB: What are PolyFuel's strengths and core competencies that have allowed it to remain successful even in difficult economic conditions?

JB: We certainly have people with good fuel cell industry experience, and we have a very strong customer focus. Understanding our customers' needs is very important, especially as this is a new industry. Our customers are new to this technology and they are learning as they go, and we are evolving our products as their requirements change. One of the key strengths here is the ability to be customer focused, understand what the customer needs are, and in some cases, anticipate those needs. By having strong fuel cell system development capabilities within PolyFuel allows us to anticipate what their needs may be. Then, engineer membrane products specifically to address these needs.

Every customer is different, in a different place on the development path. They are all applying a different strategy in terms of how they want to design the system. Each of those strategies require the membrane to function in a different way. Sometimes the same membrane can meet the needs of several systems, but in other cases we need to tweak the membrane to meet those specific system requirements. Being able to pull on the various design levers, to be able to modify the properties of the membrane chemistry itself is quite important.

Custom orders increases the size of the product family, but it is not impossible for us to do. We have a lot of flexibility within our own pilot production facility.

SB: Overall, how would you rate your company's performance in 2005 and what influenced this performance?

JB: We had a great year last year on a number of fronts. From a customer perspective, we grew our customer base, particularly in the consumer electronics space. We brought on more customers, and every single customer through last year as well that finished testing our membrane, went on to purchase our membrane. We typically provide membrane samples to the customers for free during testing, and once that phase is complete they can either purchase it and become a PolyFuel customer, or not. Our customers themselves have transitioned from the research phase to the development phase, many but not all of them. As evidenced by their order rates being placed with PolyFuel. In late 2004/early 2005, our customers were typically ordering between 10 and 40 pieces of membrane at a time. By the end of 2005, they had increased their orders to between 100 and 500 pieces at a time, depending on the customer.

That demonstrates they like our product, and that they are making good development progress. A piece can be the size of a business card for a mobile phone, to three times the size of that for a laptop. All different sizes and shapes, depending on the customer's fuel cell design.

Another important area for PolyFuel, in early 2006, was to establish a relationship with one of the leading fuel cell component manufacturers, Johnson Matthey. Johnson Matthey is the leading catalyst supplier to the industry, and is also one of the top MEA (membrane electrode assembly) component suppliers to the industry. They take catalyst and apply it to either side of the membrane and sell it to fuel cell device makers. Johnson Matthey will use PolyFuel's membrane and make it into a fuel cell MEA component and sell it on to our customers and others. This is great validation that PolyFuel is one of the leaders in this space, and broadens the market access to our material. It does not prevent us however from selling the membrane to those customers that would prefer to purchase a membrane directly. It does however offer customers the option of purchasing our membrane in an integrated form from a leader in the MEA space.

On the technical front, in 2005 we continued to innovate our product family. In early 2005, we announced a hot bondable version of our membrane specifically designed to emulate the manufacturing characteristics of the fluorocarbon membrane while still delivering the higher performance characteristics of the hydrocarbon membrane. Many of our customers that have been working on fuel cells for a number of years had been focused up until now on fluorocarbon technology as that was all that was available. They have invested a lot of time, effort, money, and equipment into fluorocarbon type fuel cell manufacturing processes. So, having our membrane be able to drop in and replace Nafion fluorocarbon material in the manufacturing process was important to them, and yet they can still get the advantages of the hydrocarbon technology when it comes to operating the fuel cell.

Some of our fuel cell handset customers were particularly looking for a different set of characteristics than the laptop fuel cell developers because the systems themselves are different. When the customer wants a system that does not do any recovery of the water byproduct, they would like to have that water that is produced be brought back to the fuel side of the fuel cell where it participates in the reaction to be done passively without any componentry. They like a membrane to have higher 'water back diffusion', so we engineer a membrane that delivers that in addition to increasing the performance level beyond what the customer was able to achieve before. Our customers have been pleased with that improvement as well as our 45-micron product delivered in the fall of 2005.

From the finance perspective, fuel cell companies today are not yet profitable. Until the industry truly evolves, financing these fuel cell companies will continue to be a challenge. We feel quite fortunate that during 2005, we were able to secure some really solid financing for PolyFuel through our listing on the AIM market on the London Stock Exchange. It has been particularly helpful for us to put in place a very strong financial foundation and investor base for the company.

SB: What are some of the key technology and integration issues for OEMs in the industry today and how does PolyFuel address those issues through its fuel cell solutions?

JB: What we can help system developers with is help them figure out how to make a fuel cell smaller so they can deliver devices that have more functionality and also allow the fuel cartridge to be smaller so that they can get more runtime out of any given size device.

SB: What are the products that you have introduced or plan to introduce in the future and what are their advantages?

JB: PolyFuel is always tracking what our customer's needs are and anticipating those needs where we can, responding to them where we have not. This focus on the customer will continue in 2006 as well. From a product standpoint, PolyFuel will continue to develop the world's best engineered hydrocarbon membranes for fuel cells. These have the particular advantage of helping the system makers build smaller fuel cells which can deliver the longest runtimes.

SB: Who does PolyFuel consider to be competition and how does the company differentiate itself?

JB: At the highest level, from the device perspective, they want a power source. So, it does not matter to them if it is a battery, fuel cell, solar panel, etc. However, PolyFuel does not see batteries as being a competitor here. Most of the device users have concluded that batteries do not meet their extra-long runtime requirements. In terms of the short runtime requirements, today's mobile phone, those consumer who do not use laptops 'off-grid', etc., batteries are perfectly adequate. Fuel cells are not trying to compete with batteries on today's standard applications. It is really in terms of the extra-long runtimes that consumers have concluded that fuel cell technology holds the best promise.

This includes the battery companies. The top-five battery companies in the world today are all focused on fuel cell technology, particularly direct methanol fuel cell technology. All of the major battery companies and most of the major consumer electronic companies have all concluded that portable fuel cells offer the best advantage for the long runtimes. It varies from company to company, but typically, they expect about 10-30 percent of their users would choose to have a portable fuel cell on board in order to enjoy the benefits of longer runtimes. This is a huge opportunity.

We are not trying to compete with batteries, just deliver the longer runtime in areas where batteries are challenged. The battery companies have acknowledged that although the batteries are continuing to improve, they are improving at a relatively pedestrian rate. The devices in terms of the functionality and the applications are improving at a much more rapid rate.

In terms of the fuel cell itself, by far the largest number of organizations are developing direct methanol fuel cells (DMFC). There are over 100 organizations working on this type of fuel cell for portable devices, including most of the major consumer electronics manufacturers.

Dupont's Nafion membrane has been the standard in the industry for many years, ever since the DMFC was invented. Developers were all using Dupont's fluorocarbon and Nafion products. This is who PolyFuel considers to be the primary competitor. There are some organizations that are developing hydrocarbon technology as well as PolyFuel, but we do not see them making the kind of in-roads into the marketplace as we are.

SB: What do you believe are the competitive factors that will enable PolyFuel to emerge as a stronger and resilient participant?

JB: We talked about customer focus being a key factor, and we have talked about our understanding of how the system works. We have talked about our hydrocarbon technology and what advantages that provides. We have not spoken yet about the fact that we do all of our material development and manufacturing on a roll-to-roll process. Some of the organizations that are working in this area are still doing it on postage stamp size pieces built one at a time. It is difficult to get the kind of consistency that is required when you are doing the manufacturing process like that. Roll-to-roll processing is important and we are using production scalable equipment for that. Another area that is important is the application of catalyst to the hydrocarbon membrane. It is actually different that applying catalyst to Dupont's fluorocarbon membrane. PolyFuel has developed specific technology around that. That is one of the things that Johnson Matthey values in our relationship with PolyFuel is our ability and understanding to do that and teach that.

From a competitive perspective, our significant investment into fuel cell testing facilities is a competitive factor. We have over 50 fuel cell test stations. Without a lot of fuel cell test stations, it is difficult to do the innovation and the durability testing that is required to stay ahead of the competition. Having significant investment in that is important to our customers and to our competitive standing.

Additionally, our ability to rapidly innovate and do each of these things with a mindset of completing it quickly is a competitive factor. We can go from an idea in the mind of a polymer chemist, to a new approach to address a customer challenge quickly. We can get that polymer synthesized, produced on our roll-to-roll equipment, catalyst applied, get it tested and the results back to the chemist very quickly to expedite the development process. We call this the 'PolyFuel Engineering Advantage' and it is that combination of characteristics.

As an example, in coming up with the material we are delivering today, we developed about 200 different polymers. We have also developed over 200 polymers in pursing a new membrane for the hydrogen automotive application. The automotive industry has indicated that they need a better membrane to make the fuel cell vehicle a reality. We have made several breakthroughs in that area, although we do not yet, and neither does anyone yet have a product that meets all the requirements of the automotive industry at this time. We have certainly demonstrated progress on a number of the key challenges this industry is facing. This ability to rapidly innovate is one the competitive factors that has made us be able to make progress in such a short amount of time.

That leads to a very strong suite of intellectual property. We have over 20 patent applications now and we expect those to begin issuing later this year [2006]. Being able to continue to innovate and develop new polymers is important. We are by no means at the end of the diving board in terms of capabilities of the hydrocarbon technology to help our customers continue to make improvements in the fuel cell systems. Having that intellectual property base is important and what has helped us make the progress we have made in terms of growth.

SB: Are there any alliances or partnerships that you expect to make in the coming year?

JB: We do not pre-announce customer relationships or alliances. We have announced that both NEC and Sanyo are customers of PolyFuel, those are two important relationships for us. Sanyo is the largest battery manufacturer. NEC has the largest market share of mobile phones in the Japanese market.

SB: As the growth of mobile devices (consumer, industrial, and military) affect the growth of your company, what areas holds the most potential?

JB: All of these markets are growing quickly, so this will certainly help PolyFuel grow our customer base. Fortunately for us, the same material is essentially required and desired for each of these applications. We are not focused specifically on one market which helps us diversify. As long as we have engineered the best membrane product, our customers can deliver the best fuel cell product to any number of different portable device areas. We are very happy with our strategy in terms of being an enabling component supplier to the fuel cell industry.

SB: What does the future hold for the micro fuel cell industry and more specifically PolyFuel?

JB: We will see a shift towards micro fuel cells for longer runtimes. We will also see an increasing number of capabilities being designed into the devices once the longer runtimes and instant rechargeability are able to be delivered. I also think we will see new devices designed and released into the marketplace to take advantage of these longer runtimes and instant rechargeability. From PolyFuel’s perspective, we are likely to see a transition from fluorocarbon membranes to hydrocarbon based membrane technology, particularly in the micro fuel cell space but also in the automotive and stationary markets.

SB: How will PolyFuel’s strength in the micro-fuel cell area be a benefit as it moves to other parts of the market?

JB: Our experience in the micro fuel cell space will help us capitalize on the automotive and stationary markets for fuel cells. Our partnership with Johnson Matthey, who has worked in the automotive and stationary markets for quite some time, will enable us to continue to growth there.

SB: Do you have any additional comments?

JB: The work being done in portable fuel cells today will help in the long-term goal of creating a hydrogen-based economy. Portable fuel cells have a lot of promise and are quickly overcoming commercialization challenges. This is demonstrated by the quite positive product announcement statements being made by leaders in the industry. We are seeing quite strong activity on behalf of major consumer electronics companies with significantly sized teams working in this area. The demand will just continue to get stronger for extended runtimes.

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