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BRINGING THE HUMBLE POTATO INTO THE NEW PLASTICS ECONOMY.

As CEO of BioLogiQ, **Brad LaPray** is the beating heart of a team that is pushing ahead with the company's strategy. He speaks to **Liz Gyekye** about the company's roots, its products and the challenges of certification.

Brad LaPray is a man on a mission. The bioplastic resin manufacturing company he founded in 2011, BioLogiQ, is aiming to help build a world free of pollution caused by non-recycled and non-degradable fossil fuel-based plastic. Based in Idaho, US, BioLogiQ has invented a novel thermoplastic plant-based resin called NuPlastiQ biopolymers. These biopolymers are made using the starch by-product from potato processing plants.

The company recently announced that it was collaborating with chemical giant Dow to evaluate potential synergies between BioLogiQ's NuPlastiQ biopolymer and Dow's polyethylene resin portfolio, in an effort to explore enhanced sustainable plastic options.

And with big relationships already in place with supermarket giants, global plastic resin and product manufacturers and bag closure specialist Kwik Lok, LaPray already has plenty on this plate. But he took time out to talk about BioLogiQ's history, products and challenges with *Bio Market Insights*.

Liz Gyekye (LG): How did you get started within the industry?

Brad LaPray (BLP): I grew up working on farms in Montana and Idaho, which meant I spent long hours working in fields and as a result of this I fell in love with farming. After my time in Idaho, I left to go to the East Coast and embark on a career working in the manufacturing industry, specifically within the automotive and aerospace sectors. I enjoyed working in these industries as a trained mechanical engineer with a business mind.

After spending around twenty years working professionally on the East Coast, I retired from my work in the manufacturing industry around 2009 and returned to Idaho with a renewed passion for the agricultural industry and a newfound interest in bioplastics. When you live in Idaho, you live in an area which has one of the highest number of potatoes manufactured in the world. Working here, I garnered an interest in making plastic from plants and renewable resources.

We are still quite a small company compared to what we are aiming for and planning. However, our goal is to build the largest and most well-respected bioplastic company in the world.

LG: Tell me a bit more about your products?

BLP: NuPlastiQ is a new kind of plastic with a high IQ. It's a biopolymer which is an amorphous, 100% natural, plant-based resin, which is produced by using a highly crystalline starch.

We have a proprietary production process called EcoLogiQ which converts this starch, also known as plant-based carbohydrates, into our polymers. NuPlastiQ contain 100% USDA certified bio-based content.
We normally compound NuPlastiQ with other traditional plastic or bioplastic resins using a proprietary reactive extrusion process called Eco-Alloy. The result of this is a new family of 'BioBlend' resins with enhanced functional and environmental performance. Essentially, our BioBlend resins are conventional resins mixed with our bio-based resins.

We can mix our BioBlend resins with the polyolefins LLDPE, HDPE, PP, PS and HIPS. These resins fall under our BioBlend XP and BioBlend XD grades. These resins are durable and can be recycled.
Alternatively, we can mix our NuPlastiQ resins with other biodegradable polymers such as PLA, PHA and PBAT to make biodegradable plastics. These resins fall under our BioBlend BC and BioBlend MB grades. Essentially, we can make whatever the customer wants.

NuPlastiQ helps make single-use and flexible packaging products strong and durable. It often enhances downgauge possibilities, especially in thin film applications, reduces fossil-fuel resin usage and reduces GHG generation by between 20-40%. In addition, finished products that are made with NuPlastiQ can maintain the same recyclability and strength as the pure fossil-based resin counterpart. Inclusion of NuPlastiQ resins does not adversely affect shelf life in finished products.

LG: You have a range of interesting products. Who uses your products and how have they been received?

BLP: The first application for our product was a bag that holds fresh potatoes currently sold in supermarkets and grocery stores. This started when Wada Farms, a local farmer, called us to see if we could use the waste from potatoes and the by-products made from cutting potatoes into French fries in order to produce bags that hold potatoes to sell at grocery stores. I worked with Wada and their bag manufacturer in order to produce these bags. Consequently, Wada Farms contacted their sales channels, which included major retail grocery chains and asked if they would be interested in producing bags made from potato waste. One major retailer was very supportive, cooperative, and patient throughout the three-year development process knowing this would be a great idea. This is how we got our start.

That project kicked off commercially late in 2016. Today, more than 25% of grocery stores in the US sell potatoes in bags made from BioLogiQ resins. They also sell apples in bags made from our bio-based plastics. These bags are made with up of 25% NuPlastiQ - the balance of the bag being made with LLDPE.

LG: Do you have compostable plastics in your range?

BLP: Yes, we do. Our BioBlend BC and MB Resins are thermoplastic resins and offer exceptional functional and environmental benefits for applications requiring industrial compostability or marine biodegradation. Essentially, they are blends of NuPlastiQ CG with other compostable resins such as PLA, PHA and PBAT. They are intended for disposal in an industrial composter.

BC resins are designed for applications requiring BPI or TUV certification. MB resins are designed to biodegrade in marine environments according to test method ASTM D6691. According to third-party testing, NuPlastiQ CG will biodegrade 100% within 27 days in an industrial composting environment or in 28 days in a simulated marine environment. Separately, we cannot make any claims that our XP and XD products are biodegradable. Yet, there is scientific evidence to show that they do biodegrade, but it takes a little longer than when we blend with other biodegradable resins.

LG: What's your view about the compostable certification process?

BLP: In order to understand my issue with certification we need to define some terms in relation to this. Biodegradation takes place through the action of enzymes that are excreted by living organisms, bacteria and fungi. A material may be labelled as biodegradable if it conforms to certain national or regional standards, such as ISO, European Norm (EN) and the American Society for Testing and Materials (ASTM).

Biodegradation can occur with composting, but composting cannot occur without biodegradation. Composting is basically high-temperature biodegradation. Just because a product degrades (fragments), doesn't mean it will biodegrade. Disintegration and fragmentation are not biodegradation, but they can lead to it. This is the case with PLA, which must disintegrate into small pieces before microbes begin the biodegradation process.

When you put part of an apple into the ground, microbes accumulate on surface of the apple and start to eat at the apple from the outside in. This is a perfect analogy to describe what happens to NuPlastiQ.

When we measure for biodegradation, we are trying the measure the amount of carbons that are actually converted into CO2. We don't want to create microplastics that could remain in the environment, we want the plastic pieces to remain whole or we want them to biodegrade from the surface inward while staying intact.

To be considered for the ASTM industrial compostable standard, a plastic product needs to biodegrade within 180 days, 90% of the carbon atoms have to be converted to CO2 and it has to disintegrate in the first 12 weeks. They also measure the heavy metal content of a product and its toxicity levels.

Other standards evaluate deterioration of products in different ways. For example, in another standard, samples are taken from the material and placed in controlled conditions within a laboratory to mirror conditions for industrial composting. The amount of carbon atoms within that product are captured and analysed to see if they can be converted into CO2. Around 90% of the cellulose in the product has to be converted to CO2 then that is considered to be acceptable. If you meet the test requirements, you get a biodegradability certificate. There is no accepted methodology that exists for a marine biodegradability certification.

LG: What message would you like to give to industry about this?

BLP: You have to be careful about making misleading claims to consumers. It's always preferable to reduce, reuse and recycle in the first instance, before you start thinking about composting. There are understandable concerns about the accumulation of microplastics in the environment and it remains to be established whether fragmentation into microplastics presents greater environmental risks than the original intact items of litter. There is no marine biodegradability certificate to start making basic claims that products are marine biodegradable. It's the last line of defence.

LG: What are your next moves?

BLP: We have learned a lot and invested a lot. In fact, we are going to invest more than a $1m in the next few years in order to help us understand the real benefits and enablers for biodegradation in the environment. We want to analyse how we go from a lab environment to a usable solution and find out what this solution means for the natural environment.

Plastic has improved the living standards of many people in the world, especially those in lower income brackets. Plastic preserves food and helps prevent food waste, improves safe and sanitary medical treatment, and reduces transportation impacts across the globe. We think plastic is good, but we want to make it better.