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Dealing with WSD in Thailand

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Early weaning: Facts and trends

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RAS and feed enzymes

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APA'19 show preview

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## Aquafeed Production constrained by demand



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Feeding vanaamei shrimp at PT Delta Marine Indonesia, Sumbawa, Indonesia. Picture provided by Rizky Darmawan.

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## From jet fuels to fish feeds

Suresh Menon journeys into aquaculture with oligometry for tailor-made functional ingredients.

It all started when **Dr Suresh Menon** received a US Department of Defense contract to create jet fuels using his proprietary CelTherm® technology. As the oils produced were high in long chain polyunsaturated fatty acids (C20-C 22 PUFAs), it dawned upon him to embark on a different path. "It became apparent to me that these hydrocarbons would be more valuable in aquaculture, as a replacement for fish oil. We were able to create n-3, n-6 and n-9 PUFAs using this process. This was a much better option than making jet fuels. Thus, started my involvement in the aquaculture industry," said Suresh, during his recent visit to VIV Asia 2019, Bangkok, Thailand in March.

Those were in the years 2009 to 2012. Fast forward to today, Menon Renewable Products, Inc., San Diego, USA has a global footprint, with a large presence in the aquafeed and livestock markets in 10 countries. In Asia, India is its largest market with shrimp feed, Vietnam and Thailand (shrimp and tilapia feeds), Indonesia (shrimp, tilapia, catfish and pangasius feeds) and Malaysia (shrimp feeds). The company focusses on animal feed products built around its MrFeed® brand which stands for Menon Renewable Feed. "We launched our animal feed ingredient in 2013 and have continued to refine the CelTherm® process to produce a pipeline of animal feed products," said Suresh.

Such an enterprising venture is not new to Suresh. Armed with a PhD in Engineering Science and Mechanics (ESM) from Pennsylvania State University, USA, Suresh had an early jump-start with startups. During his student days, a consortium of companies (small to Fortune 500) funded his research. Menon International (the parent company of Menon Renewable Products) is his third company. His focus has been to scale up new ventures; commercialising core technologies and transitioning these from the laboratory into a commercial environment.

### Novel, disruptive technology for aquafeeds


"Back then we were producing oils from cellulosic material (hemi- and cellulose) and with enzymatic hydrolysis, we created cellulosic sugars (xylose, mannose, arabinose etc). The hydrolysates are then fermented in bioreactors, and both fermented biomass and residuals later go through oligomerization and other steps to produce custom-tailored formulations. When we combine these steps, the result is a formulation which contains amino acids, lipids, nucleotides, peptides and other valuable ingredients that can be tailored to end user requirement and be species-specific," explained Suresh. Oligometry is explained as the science of breaking up molecules into smaller monomers.

"Over 1,000 types of feedstocks are available in our technical library, and our team can optimise the sugar levels from the wide variety of feedstocks that may be utilised. Our novel ingredients represent a disruptive technology that significantly enhances the animal's immune systems, leading to higher survival and faster growth. Our oligomerization process and hydrolysis steps allow us to tailor to what the formulator wants; for example, our shrimp ingredient contains 50% crude protein and 4% fat; for tilapia and salmon, 52% crude protein and 10% lipid."

Suresh listed the attributes of the functional ingredient. The presence of non-genetically modified grains helps to overcome anti-nutritional factors in complete diets, ensuring higher digestibility and absorption of nutrients. As an immune-stimulant, it improves survival in the presence of pathogens. It is a sustainable alternative to fish meal, alleviating limitations of energy, water and land resources.



"The earlier the animal starts feeding with this ingredient, the better the benefits."  
Suresh Menon



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"Through pond trials as well as at universities, we demonstrated the efficacy of the products. These are all independent third-party trials. In addition, our commercial customers do their own trials.

The functional ingredient has successfully replaced all of the fish meal in a trout trial in the US. Specifically, the product line has demonstrated success in shrimp ponds warding off bacteria, virus and parasites that result in diseases such as early mortality syndrome (EMS), white spot disease (WSD), white faeces disease (WFD) and others. Added in shrimp diets, the effect is 25 to 30% faster growth across all life stages, and around 85% survival as compared to 30 to 40% for the control group."

The recommendation is 15-20% inclusion rates to replace or complement fish meal, fish oil, soy meal and poultry meal. However, Suresh acknowledges that the inclusion rate is a function of the goals to be met in commercial aquaculture or terrestrial animal farming.

"In shrimp ponds, the ingredient replacement strategy is a function of the density of the animals in the ponds, feeding frequency, feeding techniques used, cost of ingredients, and other factors. To enable replacing ingredients such as fish meal, soybean meal and poultry meal, it is important to generate the necessary protein and lipids while also providing the immune boosting function."

### From the petri-dish to global markets

While the initial funding to develop the product came from the US government, Suresh himself invested proceeds from two previous ventures to see its fruition to a large-scale commercial production. Between 2013 and 2017, the company focused on scale-up, validation and trials.

Menon Renewable Products began at the "petri-dish scale", working with various feed mills and formulators. "In early 2016, we sold ingredients to make the first tonne of feed and by year-end we reached 60 tonnes. By 2018, we produced 10,000 tonnes of feeds," he said. Starting in 2018, the company focused on commercial scale pond trials for shrimp across 12 countries, including India, China, Thailand, Malaysia, Vietnam, Panama and Honduras. It has also commenced trials for salmon, tilapia, poultry and swine. External validation was with US government and state-sponsored studies along with extensive (and on-going) laboratory and field trials.

Today there are production facilities in India, the USA and Canada to meet market demands. The current production capacity can support 300,000 tonnes of feeds. New facilities in Latin America and Europe, which will come on line during 2019, will support further scale-up in 2020. The company has an active R&D program to continue improving its existing products and develop new products, as well as expand into other animal industries. Furthermore, through the utilization of abundant agricultural products and related by-products, its ingredients reduce environmental pressure and improve the carbon footprint of aquaculture and livestock operations.

The company tagline is MrFeed®-Feed for Life! "The earlier the animal starts feeding with this ingredient, the better the benefits. In terms of cost, we have been scaling up production to be as economical as possible. At 10% inclusion in shrimp feeds, there is no difference in feed cost compared to conventional feeds but at 15% inclusion rate, the feed is 10% more expensive. However, the yield and taste make it worth it," concluded Suresh.

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