PROJECT «NETWORK FOR AGRICULTURE AND RURAL DEVELOPMENT THINK-TANKS FOR COUNTRIES IN MEKONG-SUB-REGION (NARDT)»

Regional research: Agricultural innovations review in Sub-Mekong region countries

Hi-tech shrimp farming model of Huetronics Company in Thua Thien Hue province – Viet Nam

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1. General information

The shrimp farming in the Mekong Delta, especially in provinces such as Ca Mau, Bac Lieu, etc., has helped Vietnam's shrimp export output increasing sharply, farmers' incomes have been greatly improved compared with rice cultivation. However, after a few years of farming, farmers often fail due to total loss or the yield drops sharply. The main cause is environmental pollution. During the farming process, most of the excess organic matter from the feed remains in the water source. In addition, the amount of chemicals and antibiotics used in the farming process is also deposited in the bottom of the pond without treatment. The bottom of the pond is also the place where the bottom sludge layer is formed due to the long-term accumulation of organic substances, residues, and is the habitat of rotten microorganisms, microorganisms that produce toxic gases such as NH_3, NO_2, H_2, H_2S, CH_4, pathogenic microorganisms (Vibrio spp., Aeromonas, E Coli, Pseudomonas, Proteus, Staphylococcus).

All the above chemicals, antibiotics and microorganisms are piled up in a shrimp pond, creating favorable conditions for disease-carrying organisms to multiply and develop. This is very dangerous, especially when shrimp ponds are often reared at high densities, compressing large amounts of shrimp into a small living area full of pathogens, and as a result, farming efficiency drops sharply in the following seasons. Meanwhile, to replace this water source, farmers often discharge dirty water into the environment and get new water from the sea. However, the inlet and outlet water systems of shrimp farming are mixed. One household pours out the wastewater while the other takes it in. Therefore, shrimp farmers have spent relatively big money to treat the pond environment, but the results are not as expected. On the other hand, the overuse of chemicals to disinfect water such as chlorine, iodine, potassium, etc. can lead to environmental degradation and cause drug resistance to bacteria, viruses, pathogenic microorganisms.

To solve the water problem for shrimp farming, Huetronics Company has applied ultrasonic electrochemical technology as well as other integrated solutions to raise high-tech shrimp with guaranteed productivity and quality in many localities in the Mekong Delta.

2. Model development

Established in 1989, Huetronics is a long-time unit operating in the field of manufacturing and trading electronic and information technology products in Vietnam. This is a pioneer in Vietnam in research and application of biotechnology, physics, production of electronic equipment, high-tech equipment applied to clean agricultural production.

New technologies have been researched, developed and transferred by Huetronics to farmers in localities in the country, including advanced electrochemical - ultrasonic processes applied to water treatment for aquaculture; Nano ALK active ingredient controls pH, alkalinity, dissolved CO_2 and macronutrients; HEM application for water treatment, livestock and plant care; Highly active mineral HAM maintains and improves the health of intensively cultured shrimp; PSB system of photosynthetic purple bacteria application to ensure the best quality of shrimp farming environment.

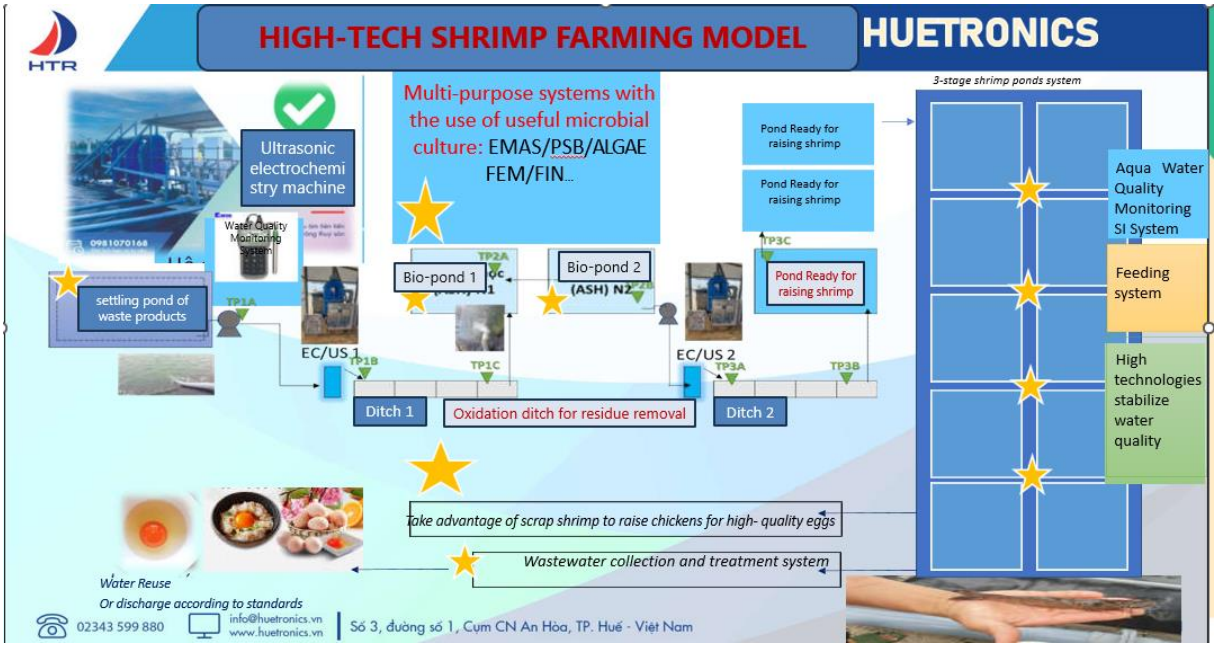
The most prominent is the advanced electrochemical-ultrasonic technology, which is good at treating water with salinity above 3 parts per thousand, this technology both creates nano-level microbubbles and generates many free radicals with the following features: strongly oxidizes pollutants, without the use of chemicals.

Specifically, salt water with a concentration varying from 5g/L to 30g/L flows slowly through the pair of electrode plates to create an anolyte electrochemically activated solution containing air bubbles. The distance from the electrode surface to the diaphragm is very narrow (≈1mm), the time of electrochemical action on the water particles is short, thus minimizing the exothermic effect. All the special structural details have facilitated most of the elements in the water flowing through the electrochemical chamber to be in contact with the electric double layer to absorb the energy from the charged particles and convert it into internal potential. As a result, the water particles are excited to a pseudo-stable excited state with quenching times that can last for tens of hours. After creating air bubbles from the electrochemical unit, the anolyte aqueous solution is put into the ultrasonic beaker and treated for 5–10 seconds to create a solution containing microbubbles - nanobubbles. Anolyte has fast and strong antiseptic properties although it has less active chlorine than Javen water (Hypochlorite sodium), because this solution contains a series of oxidants located in pseudo-stable states such as H2O2, O3, HO2-, HClO, ClO- … When this solution is put into the ultrasonic device, it will explode the air bubbles generated from the electrochemical unit to become micro-bubbles – nanobubbles enhance the ability to kill bacteria many times.

System for treatment of water by electrochemincal-ultrasonic method

Source: IPSARD survey in Huetronics.

Nanobubble microbubble solution is prepared from an electrochemical - ultrasonic system that has the ability to quickly kill bacteria, viruses, and molds in a short time of contact but without being greasy after a long time of use. ; treat saltwater and brackish water polluted by bacteria, algae and toxins with high efficiency; simple production process, low cost - only costs about 700 VND/m^3 compared to 2,000 VND/m3 when using chemicals for treatment. Besides, normally, the shrimp farming process will release a large amount of dirty wastewater into the environment, but this new water treatment method will only consume a small amount of electricity, not water.



Source: HUETRONICS.

Microbubble solution prepared from electrochemical - ultrasonic has many preeminent features such as: capable of treating Vibrio spp. high efficiency; non-toxic, does not affect the user's health, is environmentally friendly; low cost, simple production process suitable for brackish and saltwater aquaculture areas.

This device can kill up to 99.6% of bacteria and 100% of algae in water. In addition, it is possible to completely remove suspended organic matter and heavy metals such as iron, manganese or sodium. Moreover, the cost of water treatment is also significantly reduced compared to the chemical method, only 1,200 VND/m^3 compared to 1,500-1,800 VND/m^3 without causing environmental pollution. In particular, the survival rate of shrimp was significantly improved. If in conventional water treatment method, the survival rate of shrimp is only 40%, this new method can raise this number to 70%.

With these advantages, the company's equipment is applied in many shrimp ponds in the provinces of Quang Nam, Dong Thap, Kien Giang, Bac Lieu, Ca Mau or Can Gio district, Ho Chi Minh City. When talking about the effectiveness of this method, Mr. Le Viet Binh, Ly Hoa Hiep hamlet, Ly Nhon commune, Can Gio district confided: "I have used the water purifier technology of Huetronics company from 2020 up to now and this year. 2022 I buy another machine to treat shrimp pond water. In the past, when using chemicals to treat shrimp pond water compared to now, using electrochemical - ultrasonic technology for superior efficiency and reducing costs by 50 to 60%, safe for workers and not being affected to the environment, helping me to have a higher income". He also said that with an area of 24 hectares, since the application of Huetronics' electrochemical-ultrasonic technology process to the water environment treatment for ponds, he has never failed in any shrimp crop.

In addition to applying ultrasonic electrochemical water treatment technology, the company's shrimp farm with an area of 12 hectares in Dien Huong commune, Phong Dien district, Thua Thien Hue province also combines with other solutions including:

- Use microbial products such as EM.

- Use herbs instead of antibiotics with nanotechnology products such as nano silver, nano curcumin, nano red algae or nano berberine with good quality and low price.

This farm also combines egg-laying hens with Japanese technology and makes use of waste products from shrimp farming such as shrimp carcasses to create a brand organic chicken egg Hikari with much higher price compared to regular one.

3. Opportunities and challenges

The application of the achievements of biophysical science in water treatment for aquaculture, especially shrimp farming, is a great opportunity for solving the major problems in shrimp farming related to water pollution in producing regions. The ultrasonic electrochemical model of shrimp farming water has reduced the waiting time between shrimp crops and increased farming time for farmers.

This water treatment equipment is quite suitable for the scale of shrimp farming of today's farmers and especially the cost is not large compared to switching to super-intensive hi-tech farming. Therefore, it is applied in many local shrimp ponds.

Due to the fairly thorough treatment of harmful bacteria along with the application of probiotics and herbs instead of antibiotics, the shrimp industry has become more sustainable with ecological and organic products that respond well. requirements of consumers and import markets of Vietnam.

However, this is a new technology that requires knowledge of management and supervision, so farmers are so ready to invest. It takes time to convince shrimp farmers to change their minds and move to a new solution. On the other hand, farmers with limited financial resource are not encouraged to change to invest a device (about several hundred million VND).

However, this is a new technology that requires knowledge of management and supervision, so people are not encouraged enough to invest. It requires time to convince shrimp farmers to change their minds about investing in an equipment costing several hundred million (320 million VND), switching to a new, more environmentally friendly solution even though the cost of water treatment has not been reduced much (1,200 VND/liter) compared to the chemical method (1,500-1,800 VND/liter). However, for the long term, this economic benefit is not small and does not harm the environment of the farming area, reducing diseases and improving shrimp quality.

4. Conclusion

The process of wastewater treatment using ultrasonic electrochemical technology in the shrimp farming model of Huetronics Company has basically solved the problem of water for shrimp farming with 3 groups of solutions combining ultrasonic electrochemical technology, microbiology and non-antibiotic herbs have made shrimp farms increase productivity and product quality, develop sustainably, and protect the environment. This model can be suitable for many different farming sizes of the household shrimp industry in Vietnam today.

In order to promote the process of applying it to actual production, certain incentive policies are needed through measures such as support for interest rates on credit loans, investment support for science and technology enterprises such as Huetronics to improve equipment to suit the affordability of different customers to transition to a more environmentally sustainable shrimp farming process.