Waste Water Treatment Processing Seafood by Biological Methods

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Abstract:
Research paper on seafood processing processes and the impact of seafood processing on the environment. Since then, an overview of previous studies on methods of treating environmental wastewater from seafood processing Based on practical and theoretical reviews, we propose a method for the treatment of aquatic wastewater. Seafood by biological methods.

***Key words**: Seafood processing wastewater, biological wastewater treatment method, Vietnam Fisheries*

1. Introduction

Seafood processing is an important sector of Vietnam's economy with a long coastline, and the incentives from seafood are extremely rich. However, depending on the type of material such as shrimp, fish, shellfish, squid, crab ... technology will have many distinct points.

Seafood is first washed with water in tanks and pre-treated to remove poor quality seafood. Subsequently, they are weighed and classified into sizes large and small (or according to different standards) in order to create homogeneous products for the next processing stages. After the size classification, the seafood is rotted again and the organ is removed. After removing the organs, the seafood is washed again and weighed and sorted. Before putting into the seafood tray must be washed one last time and put into storage.

In the common seafood processing line, the source of processing is mainly water used in the preparation stage, and some raw materials used for packaging products. The main outlet is waste water with some residual products such as skin, scales, heads, bones

Impact of seafood processing on the environment

The seafood processing industry is one of the industries causing serious pollution to the environment. The impact of the seafood processing industry on the environment varies significantly, depending not only on the type of processing, but also on many other factors such as production scale, products, input materials. , crop, production technology level, production management organization level, etc., in which technical factors, technology and production management organization have a decisive influence on environmental protection issues of each business.

According to the National Environment Report (2010), some typical impacts of the Seafood Processing industry affect the environment:

Emissions: Most seafood processing enterprises produce relatively low levels of toxic gas. The emission is mainly due to the activities of the boiler, backup generators, the amount of gas or charcoal for drying seafood (dry goods), Odor (Cl2, NH3, H2S) mainly generated from the sterilization process, from the cooling system and from the decomposition of aquatic waste.

Solid waste: Solid waste is mainly organic parts, easy to ferment, causing decay and creating unpleasant odors, affecting the air environment of the country, which is also a source of disease spread. The solid waste generated during processing includes shells, heads, organs, etc. The residues caused by waste water treatment and the biodegradation process, if not collected, will cause odor. Uncomfortable.

Wastewater: Wastewater is one of the biggest environmental problems of the seafood processing industry; seafood processing wastewater is characterized by pollution parameters such as color, odor, insoluble solids, suspended solids. , bacteria, BOD, COD, pH, with the pollutant load of the seafood processing industry, wastewater affects greatly on the water ecosystem:

- Increasing the toxicity of water, directly affecting the development of aquatic life, reducing the ability to create dissolved oxygen in water;

- The high content of organic chemicals facilitates the lack of oxygen, anaerobic decomposition occurs in water, creating toxic products such as H2S ... causing rotten smell for water and turning the water black. In wastewater containing substances such as carbohydrates, proteins, fats, when discharged into the water source will reduce the concentration of dissolved oxygen in the water because microorganisms use dissolved oxygen to decompose organic matter. Reduced dissolved oxygen not only causes degradation of aquatic resources, but also reduces the ability to self-purify water sources, leading to a reduction in the quality of domestic and industrial water supplies.

- Oil and grease: Seafood processing produces a large amount of grease in the waste water. Greases, if not treated, will exist as a floating membrane that prevents the diffusion of oxygen into water, reduces the photosynthetic capacity of microalgae, creating an anaerobic digestion environment that affects the decomposition process. substance, causing loss of senses ...

- Suspended solids: Suspended solids cause cloudy or colored water. It restricts the water layer to be lighted down, affecting photosynthesis of algae, algae Suspended solids are also factors that cause negative impacts on aquatic resources and cause harm. organoleptically increases the turbidity of the water

- As a source of disease in the country, contamination of groundwater, hills with shallow aquifers, aquatic product processing wastewater may seep into the ground and cause groundwater pollution. Groundwater contaminated with organic matter, nutrients and germs is difficult to treat into clean water that is also supplied for living

Thus, it can be noticed that in the sources of pollution, sewage is a serious source of pollution to the environment by generating large volumes of wastewater with a high concentration of pollution if not properly treated.

Characteristics of wastewater processing aquatic products

In the seafood processing, the difference in raw materials and end products is related to differences in the production process, resulting in different water consumption (catfish: 5-7 m3 / ton of product. products; frozen shrimp: 4-6 m3 / ton of product; surimi: 20-25 m3 / ton of product; frozen frozen seafood: 4-6 m3 / ton of product). Pollution level of wastewater from aquatic product processing (CBTS) varies greatly depending on raw materials (shrimp, fish, squid, octopus, crabs, clams, shellfish), products, changes. seasonal, and even on business days. The waste water composition of some types of aquatic product processing is shown in Table 1.

Table 1. Fishery processing wastewater composition.

Targets	Unit	Nồng độ		
		Frozen shrimp	**Catfish**	**Mixed frozen seafood**
pH	-	6,5 – 9	6,5 – 7	5,5-9
SS	mg/L	100 – 300	500 – 1200	50 – 194
COD	mg/L	800 – 2000	800 – 2500	694 – 2070
BOD_5	mg/L	500 – 1200	500 – 1500	391 – 1539
N_{total}	mg/L	50 – 200	100 – 300	30 – 100
P_{total}	mg/L	10 – 120	50 – 100	3 – 50
Grease	mg/L	-	250 – 830	2,4 – 100

Based on Table 1, the composition of wastewater generated from seafood processing has high concentrations of COD, BOD5, suspended solids, total nitrogen and phosphorus. Wastewater with high biodegradability is expressed through the BOD / COD ratio, which usually ranges from 0.6 to 0.9. Especially for wastewater generated from processing catfish with very high oil and fat concentration from 250 to 830 mg / L. Very high phosphorus concentration in shrimp processing wastewater can reach over 120 mg / L. In addition, seafood processing wastewater contains high levels of organic matter and nutrients (N, P), creating conditions for pathogenic microorganisms to develop such as: typhoid bacteria, cholera, dysentery, viruses liver ... and some fungal pathogens that cause skin diseases, while increasing the number of algae in the water (eutrophication). This type of wastewater has the risk of causing serious pollution to the surrounding environment if not properly treated. In addition, wastewater also contains solids (fins, heads, intestines, ... very easy to collect). In general, wastewater of the seafood processing industry has a pollution level many times higher than the permitted standard into the receiving source set by the State (5-10 times for the indicators of COD, BOD, 8 - 14 Organic nitrogen ...). Therefore, the value of pollution parameters in wastewater from the aquatic product processing industry must comply with QCVN 11: 2008 / BTNMT.

2. Research overview

2.1. Studies on seafood processing wastewater treatment in the world

In the world, there have been many research projects to treat seafood processing wastewater, using many different technologies and methods. In particular, there are some methods with high applicability. Here are some methods that have been researched to treat CBTS wastewater.

Research in Southern Thailand on the advantages of using MBR technology in seafood processing wastewater treatment and water reuse. The wastewater in the study has the following characteristics: pH = 5.67; SS = 150mg / L; COD 1700 mg / L; BOD5 = 1200 mg / L, TKN = 95 mg / L, TP = 19 mg / L, Protein = 156 mg / L and 1-2ppt salinity. The test was conducted in a laboratory in which a flat membrane directly submerged in a 35 L reactor tank. The membrane used was a polyethersulfone with a pore size of 0.22 μm and a surface area of area of 0.047 m2. The operating conditions have been set to improve the processing efficiency with 15 L / min, 20 L / min and 5 L / h / m2 throughput. Experimental results show that the treatment efficiency of MBR technology, BOD5 content is less than 10 mg / L (removal efficiency of 99%), while COD and TOC content remain high at about 100 mg / L and 7 , 4 mg / L (85% removal efficiency) during 1000 hours of operation. After a period of time, the COD and TOC content decreased to less than 50 mg / L and 1 mg / L, BOD decreased to less than 5 mg / L, turbidity was lower than 5 mg / L, TKN values, nitrogen organic, low NH3, less than 5 mg / L. After 4 months of operation, the system has no change in pressure across the membrane, although the salt concentration accumulates in the wastewater, the MLVSS / MLSS ratio is still the same as for non-salt wastewater from 0.75 - 0.95 [20].

Another study in Malaysia was carried out in the laboratory, studying the effect of salt content (NaCl) on the efficiency of wastewater treatment of aquatic product processing in the continuous flow system by the biodegradation method. nature. Diluted wastewater 30; 50; 100 times corresponding to three COD 1000 concentrations; 600; 300 mg / L, with salt concentrations in the range of 0% to 7% NaCl. Investigate retention time (HRT) with 9 different values from 2 to 10 days. Experimental results show that, at the retention time of three values of 8, 9, 10 days, it is possible to effectively treat seafood processing wastewater with salt concentration less than 2.5%; at higher salt concentrations, treatment efficiency is reduced. The effluent does not cause unpleasant odors, maintains the protein and phosphorus content and can be reused as an environmentally friendly liquid fertilizer. Research shows that this method is suitable for small-scale aquaculture.

2.2. Researches on wastewater treatment for aquatic product processing in Vietnam

In Vietnam, there have been studies to treat aquaculture wastewater that bring high treatment efficiency.

Research on treating aquatic wastewater (Surimi) by the anaerobic model (UASB) and aerobic combination (SBR). The source of waste water used in the research process is the Surimi production wastewater collected from the drainage manholes of Danifood Company, Da Nang. Surimi wastewater has high concentration of SS, organic, BOD5 / COD index = 0.77 - 0.88 suitable for biological treatment. UASB anaerobic model is designed with height h = 700mm, diameter d = 400mm, the volume of tank V = 80 L. Anaerobic sludge is taken at the anaerobic lake of Khanh Son landfill, the volume of mud in the tank is 20 L (accounting for 25%). Concentration of COD input 1800 - 4000 mg / L, depending on the ingredients of Surimi fish, the concentration of COD output is relatively stable ranging from 500 - 1000 mg / L. Treatment efficiency reaches 55 - 86%, treatment load is 0.4 - 0.9 kg / m3.day. The composition of CH_4: 58-69.4%; O_2: 0.3-1%; CO_2: 19.6-28%; other gases: 2.9-18.3%. The amount of gas generated can be recovered for use. The aerobic model is the SBR tank designed to be two plastic buckets (60 L) as two parallel models for water treatment with different loads and concentrations (400 mg / L, 600 mg / L and 800 mg / L). Activated sludge: Take in Aerotank tank of Danifood's wastewater treatment system to wash mud with tap water (all chlorine has been removed), filter through a sieve to remove large-scale sediments, let settle for 30 minutes, then fill in. models with 20% and 30% concentrations. COD standard output <50mg / L, with a 20% mud model: it takes 8-9 hours for COD to output less than 50 mg / L. For 30% sludge models: it takes 5-6 hours for the COD to be less than 50 mg / L. Processing efficiency 85-95%. Activated sludge settles well, the quality of the outlet water meets environmental standards. Thus, the use of the anaerobic combined aerobic model to treat seafood processing wastewater brings positive results, helping to treat effectively.

Another study designing and manufacturing USBF (Upflow Sludge Blanket Filtration) tanks to treat seafood preliminary treatment wastewater were conducted in Hau Giang province. The source of wastewater and microorganisms to be used in the experiments was taken from Viet Hai Seafood Company Limited - Long Thanh ward - Phụng Hiệp district - Hậu Giang province. The model of the USBF tank used in the experiment was made of iron with an inner mica surface to be able to observe the phenomena occurring in the model. The dimensions of the model are 0.7 m long × 0.24 m wide x 0.5 m high; in which the operating height of the tank is 0.46 m. The model is divided into 3 compartments with the volume of each compartment as follows: anoxic compartment 19.4 L (27.3%), aerobic compartment 37.1 L (52.3%), sedimentation chamber 14.5 L (20.3%).

The study was conducted with two retention periods of 8 hours and 7 hours. The model operating results in the laboratory show that the retention time of USBF tank is the most technically and economically feasible feasible 8 hours with the following operating parameters: MLVSSdegree = 2773 mg / L, MLVSSaerobic = 2515 mg / L, DO anaerobic = 0.53 mg / L, aerobic DO = 4.18 mg / L. At the retention time of 8 hours, the monitoring indicators concentration in the effluent reached QCVN 11: 2008 / BTNMT and 40: 2011 / BTNMT (column A) with BOD5, COD, SS, TKN, TP times 98.2% respectively; 96.68%; 98.8%; 94.18%; 97.83%. Thus, the USBF tank can be used to treat aquatic products.

The use of submerged aerobic biological filtration tanks has also been studied to treat seafood processing wastewater with submerged aerobic biological filtration tanks. The study was conducted to exploit the advantages of adhesion growth technology in aerobic tanks to improve the efficiency of wastewater treatment for catfish processing, as a basis for making treatment technology recommendations. wastewater treatment of catfish processing plants. This study was carried out on two models of submerged substrate biofilter tanks operating on two principles of air - water in the opposite direction and gas - water in the opposite direction.

The two models are composed of a vertical square cylinder, each side is 0.15 m long. The height of the model is h = 1.2 m, in which the working height is hct = 1.15 m. The total volume of the model is V = 27 L and the working volume is 26 L. Biological filters with the same air-water flow operating in the same effluent and air type are supplied to the model in a magnetic direction. bottom up through the material as a substrate for microorganisms, then flow through the drain trough out. Biological filters with reverse air-water flow operating on a top-down sewage cycle, not from the bottom up, post-treated effluent follows the flush valve on the lower part of the effluent. out.

The research results show that the biofilter is suitable for treating catfish processing wastewater, in which the air - water in the opposite direction has higher treatment efficiency than the same gas - water. pm. At the retention time of 8 hours, loading organic matter 0.0066 kg BOD / m2.day, the biofilter tank has an inverse flow of air - water for removal efficiency of COD, BOD5, TKN and TP, respectively, 97, twelfth%; 98.58%;

95.65%; 78.43%. Concentrations of pollutants in outlet wastewater meet the discharge standards of QCVN 11: 2018 / BTNMT and QCVN 40: 2011 / BTNMT (column A).

In general, in recent years, Vietnam has had a number of studies and models of wastewater treatment for aquatic product processing. Although the success level of each project is different, it contributes to wastewater treatment.

However, there are some limitations in Vietnamese studies. Studies have not mentioned much about the salt content in wastewater, the effects of salt content on treatment efficiency or methods to effectively treat salt content in the wastewater.

3. Waste water treatment by biological treatment method

Among wastewater treatment methods, biological treatment is one of the most effective and widely applied treatment methods.

The basis for biological wastewater treatment is the process of material metabolism, sediment formation process and the self-purification process of heterotrophic and autotrophic microorganisms in nature thanks to the ability to assimilate many different sources of substrates in wastewater. In water sources, there is always the process of ammonia of organic chemicals containing nitrogen by Amonizing bacteria. Thanks to the extracellular enzymes of rotten bacteria such as Pseudomonadales, Eubateriales, etc., proteins are broken down into simple compounds rather than polipeptides, oligopeptides. These substances either continue to be broken down into amino acids by extracellular Peptidase enzymes or absorbed by the cell which will then be further broken down in the cell into amino acids. Amine acids are partly used by microorganisms to synthesize proteins, build new cells, partly broken down following different synthesis paths to create NH3 and many other intermediate products.

This method is based on the living activity of VSV, mainly nematode heterogeneous bacteria in wastewater. Their action results in contaminated organic matter that becomes mineralized and becomes inorganic, simple gases and water. Domestic VSV uses organic matter and some minerals as a source of nutrition and energy. The process of nutrition causes them to reproduce, growing, increasing the number of cells (increasing biomass). For VSV to grow and develop well, it is necessary to provide enough organic matter as well as nutrients for them in the proportion of total BOD: N: P = 100: 5: 1 or COD: N: P = 150: 5: 1 (Le Van Cat, 2007). For inorganic impurities in wastewater, biological treatment methods can remove sulfites, ammonium salts, nitrates ... The products of this decomposition process are CO2, water, N2, ions. sulfate

In water, nitrogen compounds exist mainly in the form of ammonium (NH4 +), nitrate (NO3-), less than in the form of nitrite (NO2-) and in some other organic compounds. The component considered to be persistent in the field and not adversely affecting the environment is nitrogen (N2). Organic nitrogen may exist in living organisms or byproducts of the decomposition of organic matter. Wastewater treatment containing nitrogen compounds based on microorganisms capable of transforming into non-toxic substances such as N2, returning the atmosphere. Biological methods have advantages over chemical and physical methods such as: high denitrification efficiency, stability and relatively easy to operate, manage, reasonable and important investment costs for the development. Sustainable development, environmental and ecosystem protection. To treat biological wastewater containing nitrogen. Studies based on nature exist microorganisms capable of metabolizing nitrogen compounds. The processes in the nitrogen cycle converting nitrogen from one form to another are carried out by different groups of microorganisms for the purpose of obtaining energy or to accumulate nitrogen into a form necessary for their growth. . Organic forms of nitrogen from animal and plant sources after death are transformed by the ammonium bacteria to form NH4 +; then NH4 + is converted to NO2- by nitrite bacteria; NO2- produced nitrifying organisms transformed into NO3-; Finally, nitrate is transformed into molecular nitrogen by the anaerobic group through nitrification.

One can classify biological methods on different grounds. But generally they can be divided into two main categories:

- Aerobic method: using aerobic VSV groups. To ensure their active life, they need to provide continuous oxygen and maintain temperatures in the range of 20 to 40 ° C. Living activities of aerobic VSV include nutrition: VSV uses organic matter, nutrients and trace metal minerals to build new cells to increase biomass and reproduction. Decomposition process: VSV oxidizes dissolved organic matter or in the form of colloidal particles dispersing into water and CO2 or creating other gases.

In aerobic conditions, NH4 + and H2S are also decomposed by nitrification and sulfation by autotrophic VSV. NH4 + will be converted to NO2-, NO3- thanks to Nitrosomonas and Nitobactor bacteria to produce energy. the amount, in 2 steps:

Step 1: NH4 + is oxidized to NO2- by the action of nitrifying bacteria according to the reaction:

$$NH_4^+ + 1{,}5\ O_2 \xrightarrow{\text{nitrifying bacteria}} NO_2^- + 2\ H^+ + H_2O$$

Step 2: Oxidizing NO2-to NO3-due to the impact of nitrifying bacteria:

$$NO_2^- + O_2 \xrightarrow{\text{nitrifying bacteria}} NO_3^- + 2\ H^+ + H_2O$$

Summary of NH4 + conversion to NO3-:

$$NH_4^+ + 1{,}5\ O_2 \xrightarrow{\text{nitrifying bacteria}} NO_3^- + 2\ H^+ + H_2O$$

The bacteria use the energy from these reactions to maintain their own vital activity and synthesize biomass. About 20 - 40% of NH4 + is assimilated into cell walls. The fusion reaction for biomass can be written as follows:

$$10NO_2 + 5CO_2^- + NH_4^+ + 2H_2O \rightarrow C_5H_7O_2N + 10NO_3 + H^+$$

C5H7O2N represents bacterial cells that have been synthesized.

- Anaerobic method: using anaerobic VSV. The decomposition of organic matter in anaerobic conditions by VSV population (mainly bacteria) works without the presence of air oxygen, the end product is a mixture of gases containing CH4, CO2, N2, H2 ... of which 65% is CH4 (methane). So, this process can also be called methane fermentation and the organism population is collectively known as methane VSV. Anaerobic VSVs use a part of organic matter in waste water or the environment to build cells, increase biomass. It has been calculated that the amount of organic matter for this purpose is only about 10% of the total organic matter (for aerobic VSV, this figure is 40%). Therefore, the amount of BHT formed in anaerobic digestion is very low.

In the absence of oxygen, VSVs with the common name Denitrifier will use the oxygen of nitrate, nitrite as an oxidant (receiving electrons in biochemical reactions) to produce energy.

The denitrification process is similar to the aerobic respiration process but instead of using oxygen, VSV uses nitrates and nitrites when the environment does not have oxygen for them. To reduce nitrate, VSV needs reductant (nitrate is oxidant). The reducing agent can be organic or inorganic such as H2, S, Fe2 +.

Most VSV Denitrifer group is heterotrophic, using organic carbon sources to build cells in addition to the portion used for denitrification. The process of denitrification occurs in 4 successive steps with the reduction of the valence of element N from +5 to +3, +2, +1 and 0.

$NO_3 \rightarrow NO_2 \rightarrow NO \rightarrow N_2O \rightarrow N_2$

The reduction of nitrate with organic substance is methanol or acetic acid according to reaction (Tran Duc Ha, 2006):

$$NO_3^- + 5\ CH_3OH \rightarrow 3\ N_2 + 5\ CO_2 + 7\ H_2O + 6\ OH^-$$

$$NO_3^- + 5CH_3COOH \rightarrow 4\ N_2 + 10\ CO_2 + 8\ OH^-$$

4. The method of adding salt-loving microorganisms in the treatment of aquatic product processing wastewater pollution

Wastewater from seafood processing plants located near the sea in fresh water shortage areas often uses seawater for many stages such as defrosting and washing raw materials ... Waste water generated from these stages in addition to indicators Specific pollution, also high salinity almost seawater: from 10-30 g / l NaCl. In saline environments, the inactivation of microorganisms due to the plasmolysis process occurs in the presence of table salt, that is, the primary contraction of material away from the bacterial cell wall due to dehydration under the application of pressure osmotic capacity, which leads to gaps between cells and cell membranes. This adversely affects the growth ability of VSV. Consequently, traditional biological treatment systems are often ineffective at removing organic pollutants from salt water. There are microorganisms that need salt to grow called halophilic VSVs. The intracellular salt concentrations of the halophilic (halophilic) and halotolerant VSVs are often low and they maintain an osmotic balance between their cytoplasm and the outside environment by accumulating at a concentration of High in various organic osmotic solutes. Therefore, the use of salt-resistant VSV in biological treatment systems can be a solution to remove COD in saline wastewater. Most of the studies on saline wastewater treatment by biological methods have applied the saline water hygienic VSV and aerobic techniques. Dincer and Kargi (2001) studied the removal of COD in saline wastewater by rotating biological discs with activated sludge biomass supplemented with halobacterium halobium. The authors also studied the process of nitrification and denitrification as well as eliminating nutrients in saline wastewater with different techniques.

Treating saline wastewater by the anaerobic method is a new approach that needs to be studied in detail. Studies have been conducted with different biological conditions and process configurations with adapted anaerobic biomass. However, currently there are many strains of anaerobic anaerobic VSV, such as Haloanaerobacter chitinovorans, Haloanaerobiumcongolense, Haloanaerobium lacusrosei, Haloanaerobium praevalens, Haloanaerobium alkaliphilum, of which Haloanaerobium praevalens has been recorded as having high carbon content.

Kapdan and his collaborators used UAPB-type equipment (Upflow Anaerobic Packed Bed) to treat artificially saline wastewater with COD ranging from 1900 to 6300 mg / l, the salt content ranges from 0 - 5%, and hydraulic retention time (HRT) from 11 - 30 hrs, with the dominant strain being Haloanaerobiumlacusrosei. With an initial COD of 1900 mg / l and a 19-hr HRT and 3% salt content, the COD removal efficiency reaches 94%. With COD input 3400 mg / l and 3% salinity, increasing HRT from 11 hours to 30 hours leads to an increase in COD efficiency of 60 - 84%. No mechanical inhibitory effect was observed. The observed organic decomposition inhibition starts at 3% salinity onwards. The Stover - Kincannon model is used to determine kinematic coefficients. Saturation value constant Kb = 5.3 g / l.day, Maximum decomposition rate umax = 7.05 g / l.day.

A species of salt-tolerant bacteria - Staphylococcus xylosus has also been used as bait inoculum for batch-shaped organic devices that decompose artificial saline-effluent in aerobic conditions with three types of biomass: bio-slurry, mixture of Staphylococcus with biological mud; and pure S. xylosus with salinity levels of 5, 10 and 15 g NaCl / L, respectively. Research results show that:

- Purified Staphylococcus mixture with biological sludge allows removal of 92.59% COD with a salt concentration of 5g / L NaCl and hydraulic retention time HRT is 24 hours.

- For pure S. Xylosus, COD removal efficiency reaches 86.36% with a salt concentration of 10g / l NaCl and reaches 72.57% with a salt concentration of 15g / l NaCl when hydraulic retention time of HRT reaches 24 hours.

- HRT hydraulic retention time increased to 48 hours has no significant effect on the efficiency of organic decomposition, so HRT = 24 hours is appropriate even with the highest salt concentration (15g / l). In addition to saline-tolerant bacteria, yeast strains adapted to relatively high salinity levels are also a source of microorganisms capable of effectively treating saline wastewater.

A number of new studies have shown that using saline tolerant strains is a very promising research direction. Although yeast strains generally have a specific specific growth rate - the umax (maximum specific grow rate) at a salt concentration of 20 g / l lower than that of bacteria, when the salt concentration increases to> 30 g / l , the specific growth constant of the yeast is not diminished, while this quantity in the bacteria is strongly reduced. In addition, saline tolerant yeast strains can operate within a wider range of pH values than bacteria and are most likely to eliminate COD in the pH range of 5.0-5.5. Results of the operation comparing two biological devices using a membrane filter with yeast (YMBR-Yeast Membrane Bioreactor) and bacteria (BMBR-Bacterial Membrane Bioreactor) under low COD conditions: 1000mg / l and high salt concentration

32g / l NaCl shows a COD removal efficiency of up to 90% with a 5-hour HRT. In the same condition, YMBR can operate with 10 times lower transmembrane pressure and less membrane obstruction than BMBR.

Some researches with some other specific types of wastewater, such as tanning wastewater, tanker rinsing wastewater, seafood processing wastewater, and olive oil processing wastewater, have also been initially investigated.

In recent years, in Vietnam, scientists inside and outside the military have done a number of researches on this topic and isolated and selected strains of microorganisms capable of decomposing organic matter. in saline conditions, try proteinase activity, and study the effects of external conditions such as temperature, initial pH, salt concentration, substrate concentration ... on the activity of these VSVs. Some strains, such as the saline-resistant anaerobic VSV strains, P21, and P3 T9 strains have been classified, by identifying and comparing the coding gene sequence with those published on the international gene bank.

Scientists inside and outside the military have also made great efforts to collect and treat saline waste and wastewater on some islands in particular, as well as treat saline wastewater of some processing plants. seafood, with the main technology of wastewater treatment, is to use biological products, or classical technologies such as septic tanks, activated sludge, etc.

However, these works are quite a low efficiency, mainly due to the application of inappropriate technology, such as the use of bio-products with large restrictions that requires time to adapt and often need to supplement, replace. So. Moreover, probiotics formed from the freshwater environment on the shore are difficult to grow in the saltwater environment on the island.

Wastewater treatment systems using classical technology also face difficulties because in the environment of high salinity wastewater, VSVs often grow very slowly, failing to achieve biomass density in the system high enough to decompose effectively. Models using activated sludge faced similar difficulties. According to published international studies, with a salinity of 3000 mg / l or more, aerobic biomass is significantly impacted, leading to a sharp reduction of organic decomposition efficiency. The reason is that high salinity can cause osmotic pressure or inhibit reaction pathways during organic decomposition.

Advantages and shortcomings of the method:

Using saline-loving microorganisms to treat waste from aquatic product processing plants is a safe, convenient and low-cost method.

However, the use of effective bacterial strains requires specific studies on the effect of conditions on their growth as well as on their ability to degrade organic matter. in terms of wastewater.

5. Conclusion

Seafood processing (CBTS) is an industry that brings many benefits and plays an important role in the economic development of the country. Besides, it has been causing serious environmental pollution, affecting human health and the natural ecological environment. The reason is that wastewater from aquaculture processes from processing plants has not been treated, or only treated by single methods, ineffective, not meeting the discharge standards. Wastewater from aquaculture has a high content of organic substances, suspended solids, nitrogen and phosphorus nutrients many times higher than the discharge standards. In particular, in aquaculture wastewater also has high salt content. There are many methods of treatment of aquaculture wastewater such as biological methods (activated sludge technology, anaerobic decomposition, aquatic plants), physicochemical methods, have been studied and applied. These methods are either costly in terms of chemical costs, or require long retention times. In addition, due to the large concentration of nitrogen components and salt concentration in wastewater, most of these methods have not been able to handle pollutants fully. Therefore, we have proposed to study the use of anaerobic activated sludge system combined with aerobic treatment of seafood processing wastewater with high salt content.

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