



**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***

**Innovation model: Applying microbiological technology in waste  
treatment for pig production in Thua Thien Hue province – Viet Nam**

## 1. Introduction

In recent years, the pig industry has accounted for a very large proportion and developed at a dizzying rate due to increased consumer demand, which has made the problem of waste treatment not guaranteed to be safe and hygienic, greatly affecting the quality of life for the environment such as pollution of water sources, soil environment, air and agricultural products.

The process of raising pigs will generate a huge amount of waste: about 20 m<sup>3</sup>/1000 pigs (pigs) meat. Normally, the entire waste + pig manure from the process of washing the barn, collecting manure, leftovers, etc., the pig farmers collect into the biogas tank for treatment and recovery when the biogas is reused.

However, the wastewater after going through the biogas tank is not completely treated with the content of BOD (Biochemical Oxygen Demand), COD (Chemical Oxygen Demand), Ammonium, Phosphorus, E. coli bacteria, coliform, helminth eggs; especially viruses that mutate from diseases such as foot-and-mouth disease, foot-and-mouth disease, and blue ear disease in wastewater, it has been discharged directly into canals, ponds, lakes, etc., threatening human health and the whole world surrounding living environment.

Practices in some key livestock areas in Dong Nai, Bac Giang or Hung Yen provinces show that biogas tanks are often overloaded and do not process all pig manure causing unpleasant odors and free discharge into the environment, so many large farms fined for not meeting wastewater standards.

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The process of raising pigs will generate a huge amount of waste: about 20 m<sup>3</sup>/1000 pigs. Normally, the entire waste and pig manure from the process of washing the barn, collecting manure, leftovers, etc... were collected into the biogas tank for treatment and when the biogas is reused for other purposes such as cooking or heating.

However, the wastewater after going through the biogas tank is not completely treated with the content of BOD, COD, Ammonium, Phosphorus, E. coli bacteria, coliform, helminth eggs; especially viruses related to diseases such as foot-and-mouth disease, Porcine reproductive and respiratory syndrome (PRRS). This kind of water has

been discharged directly into canals, ponds, lakes, etc. threatening human health and the surrounding environment.

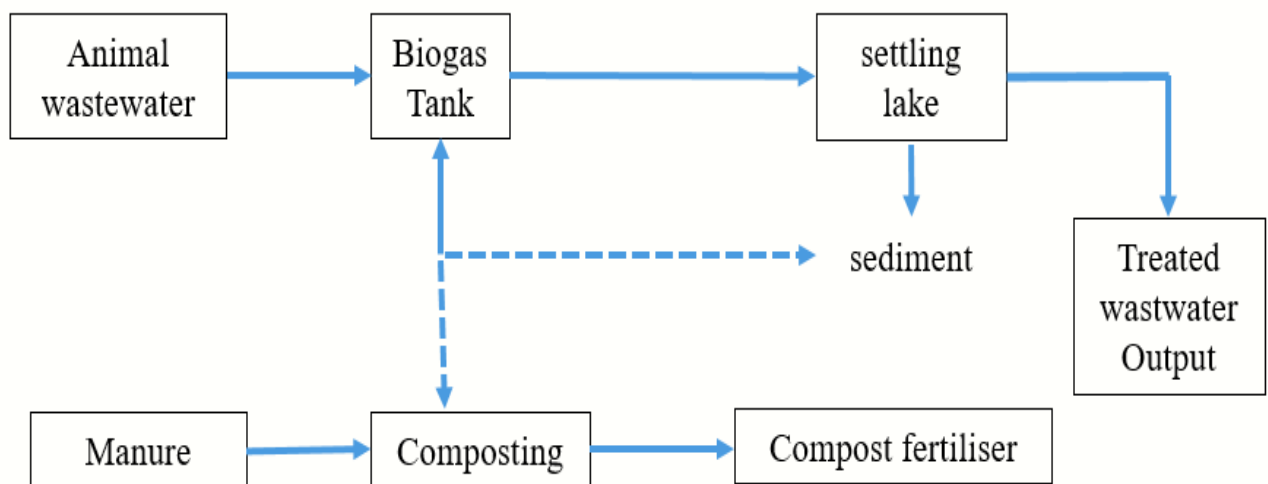
To solve the problem of waste standards (wastewater and odors), Tri Dung livestock farm in Huong Ho commune, Huong Tra district, Thua Thien Hue province is a typical model for solving these problems. With the application of advances in electrochemical ultrasound and microbiology of Huetronics Company, the farm has thoroughly solved the pollution.

## 2. Model development

The model of Tri Dung pig farm in Huong Ho commune, Huong Tra district, Thua Thien Hue province not only treats wastewater well, but also reduces air pollution (smell) in the region through the application of advances in technology technology of ultrasonic chemistry and EM (Effective Microorganisms).

The common method of waste treatment in pig farms at present is mainly collecting wastewater into biogas tanks and composting and then discharging it into a settling pond and discharging it into the environment.

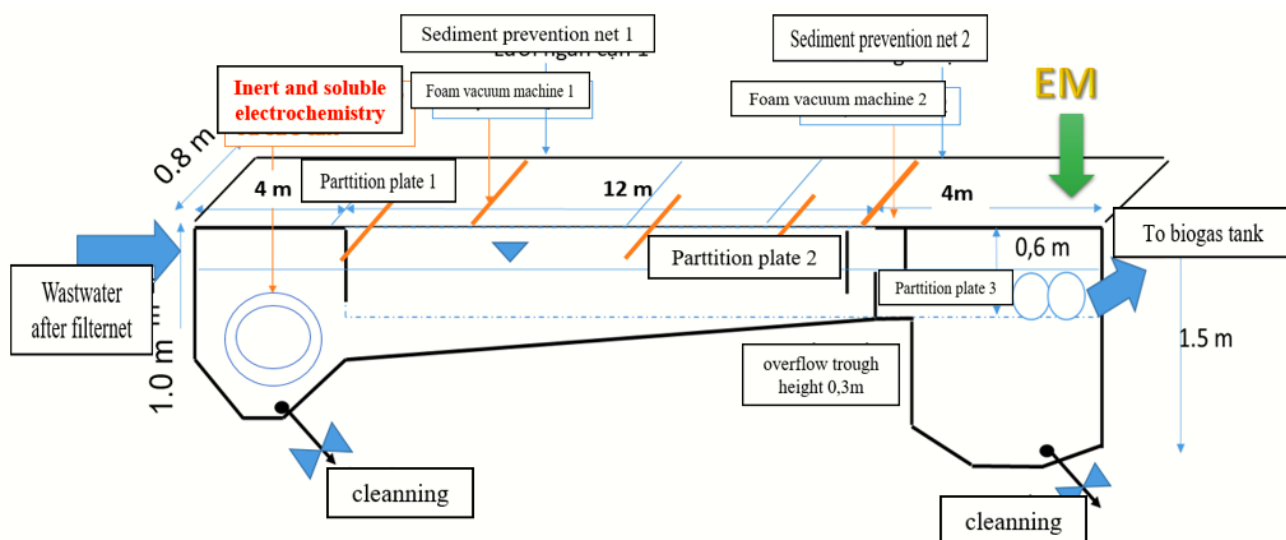
**Popular diagram of sewage treatment in pig farm**



*Source: IPSARD's research team, 2022.*

By this method, only solid wastes and wastewater can be treated in large volumes and are highly dependent on the storage capacity of the biogas tanks compared to the large volume of farm waste. On average, each pig produces about 2 kg of manure a day along with urine, cleaning water, leftovers, etc. In particular, odor pollution cannot be solved.

## Sewage receiving system before discharging into biogas tank



Source: Huetronics Company.

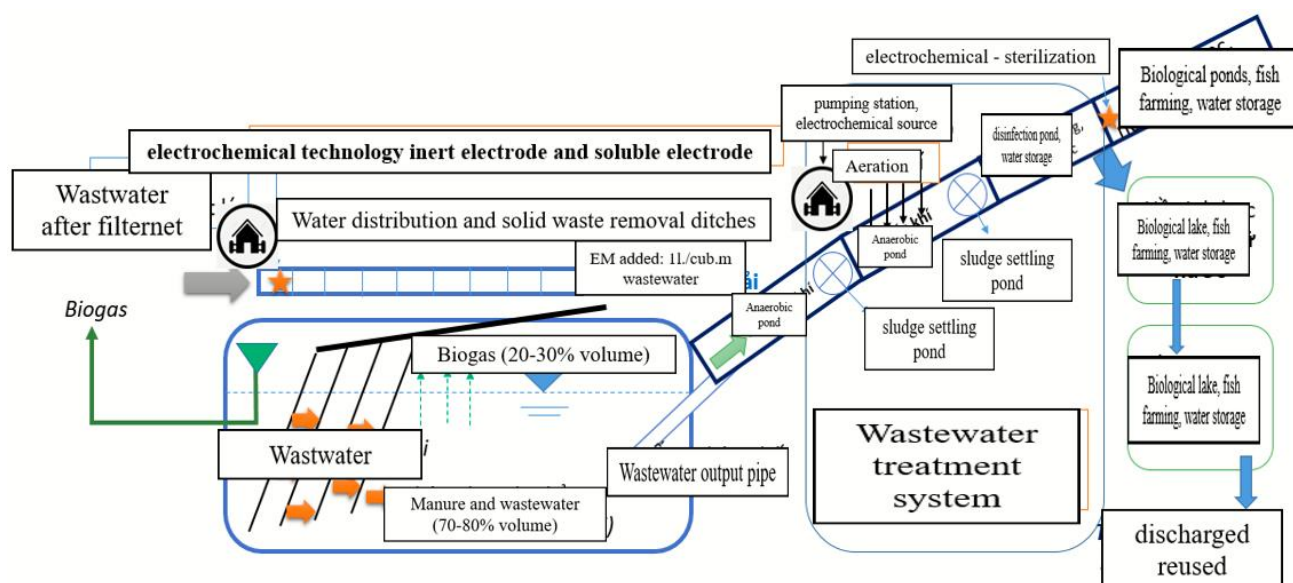
Measures to reduce odors on the farm have been controlled by using EM microorganisms along with the placement of air filters and exhaust fans. Feed for pigs will be mixed with EM solution at a dose of 100 ml/60 kg of feed and poured into the drinking water (100 ml/day when cleaning the barn). In addition, the pig house is sprayed with EM solution (concentration of 1 liter of EM / 50 liters of clean water) 1-2 times/day. After a period, the smell and air pollution are reduced.

Wastewater control measures are implemented using a variety of techniques. The first is to reduce the volume of waste treatment in biogas tanks through the establishment of physical nets to retain solid residues in the water collection ditches.

The solid residue in the water is separated from the manure collection pits at high altitude and transferred to and run through the tank using electrochemical technology of inert and soluble electrodes to remove solids by electrochemical flotation; quickly reduce the number of pollutants entering the biogas tank; increase the operating life of the biogas tunnel. Electrochemical technology can remove heavy metals from wastewater while this cannot be done by using only microbiological measures in biogas tank. Automatic suction system and blowdown valve increase the efficiency of fresh manure collection.

Wastewater after coming out of the biogas tank is added with EM solution and put into storage ponds (anoxic, aerobic, dehumidifying and water storage) before being discharged into the environment or reused.

## Wastewater treatment system after biogas tank



*Source: Huetronics.*

Measures to treat solid waste are arranged at the disposal site to make fertilizer for plants. In the future, if biogas is generated a lot, it can form a place to supply more from biogas for drying materials.

Thus, with these integrated solutions, this Tri Dung pig farm has met the requirements of the standards set out by the Decision No. 62 of the Ministry of Natural Resources and Environment.

### 3. Opportunities and challenges

With a system of basic solutions in controlling air pollution, water pollution and solid waste, this model of pig farm has created an opportunity for widespread application to livestock farms. With the technology of wastewater treatment by electrochemical measures, it can be applied to aquaculture models through the treatment of water sources before farming as well as after farming.

This waste treatment system will have conditions to be widely applied on large-scale farms as Vietnam is moving towards safe and ecological agriculture and promoting strict monitoring on wastewater standards in the livestock industry.

However, this model requires certain investments in machinery and equipment, construction of settling ponds, etc., so it can be difficult to apply to small-scale pig production when the financial resources of households are relatively limited.

#### **4. Conclusion**

The waste treatment model at Tri Dung Farm, Huong Ho commune, Huong Tra district, Thua Thien Hue province has combined biophysical achievements to solve not only air pollution, wastewater, and solid waste. but also improve meat quality and increase livestock production, reuse part of wastewater after treatment. The volume of pig manure that can be treated and reused as fertilizer for crops.

The equipment produced at the company has different capacities suitable for processing scales from 40-100 m<sup>3</sup>/h and will be suitable for different farms. According to calculations by company experts, the equipment selling price for 1 hectare is about 320 million VND and the cost of water treatment is reduced to 1,200 VND/liter of water compared to 1,500 VND-1,800 VND/liter of water for the treatment method using chemicals that are harmful to the environment.

This model applies not only to pig production but can also be extended to other livestock industries even suitable for water treatment for aquaculture. /