

**Asia-Pacific Environmental Innovation Strategies (APEIS)  
Research on Innovative and Strategic Policy Options (RISPO)  
Good Practice Inventory**

**Biogas Technology for Carbohydrate-based Wastewater from a Starch  
Factory**

**Summary of the Practice**

**Keywords:** Wastewater, anaerobic fixed film, industrial applications

**Strategy:** Promotion of biomass energy

**Environmental areas:** Waste management

**Critical instruments:** Economic instruments, Partnerships, Regulatory instruments, Technologies

**Country:** Thailand

**Location:** Bangkok Interfood Co. Ltd., Nakorn Phratom

**Participants:** King Mongkut's University of Technology Thonburi (KMUTT), Bangkok Interfood Co.Ltd, National Centre for Genetic Engineering and Biotechnology (BIOTEC)

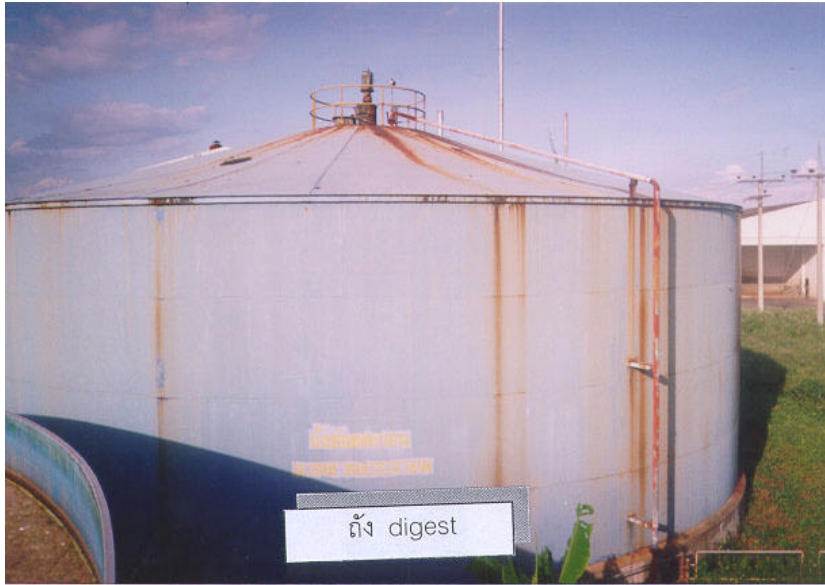
**Duration:** Three years (1999-2001)

**Funding:** BIOTEC, Energy Policy and Planning Office (EPPO), Bangkok Interfood Co. Ltd.

***Background:***

Most food-related industries generate wastewater containing organic matter, which creates environmental problems during disposal. Anaerobic treatment has been widely practiced to treat strong organic wastewater. In Thailand, a system of anaerobic ponds is the most popular treatment, since it can offer the lowest treatment cost as well as simplicity in design and operation. It has several drawbacks, however, such as extremely low treatment efficiency, and there can be a problem of odours. A long retention time is required for treatment using anaerobic ponds; hence, a series of several ponds is commonly needed. Modern anaerobic digestion technology can provide a very reasonable means of wastewater treatment, in addition to making available an oft-needed auxiliary energy source in the form of biogas and an energy saving natural fertilizer. Not all organic residues will lend themselves to efficient digestion into biogas, and many factors have to be considered. Examples of some industries which could benefit from fermentation technologies adapted to the region's conditions and raw materials are pineapple canning, tapioca starch, pulp and paper, palm oil mills, alcohol distilleries, etc. These industries produce high volumes of wastes which, at present, are inadequately treated or not treated at all before disposal.

The Biogas Technology Research Group (BTRG) at KMUTT has been conducting research on anaerobic digestion technology for over 18 years and has successfully designed and installed several industrial-scale systems. Bangkok Interfood Co. Ltd. approached KMUTT for assistance in treating the wastewater resulting from their production of rice flour.



Biogas digester installed at Bangkok Interfood Co. Ltd.

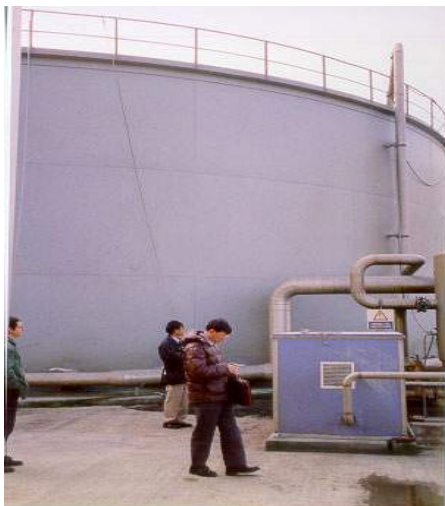
Source: PDTI

**Objectives:**

To design and build a biogas reactor based on anaerobic fixed film technology that would treat carbohydrate-based wastewater and generate biogas.

**Description of the activity :**

Bangkok Interfood Co. Ltd. produces rice flour and generates around 1,000 m<sup>3</sup>/day of wastewater with a COD concentration of 5–7,000 mg/l. Previously, the company used an open pond system to treat their wastewater and the resultant odour drew complaints from their neighbours. The company approached KMUTT to solve the odour issues and it was proposed that anaerobic fixed film technology be examined to reduce odour problems and chemical costs. The Energy Policy and Planning Office (EPPO) agreed to finance 25 percent of the investment cost to company.



Source: PDTI

## Critical Instruments

### Overview

A series of instruments were implemented to enhance the policies for biogas technology promotion, including design, planning and management, regulatory instruments, economic instruments, partnerships, and technology.

### Economic instruments

Economic measures that should encourage more widespread use of new and renewable sources of energy (NRSE) technologies include (1) fiscal incentives, i.e., subsidies, grants or tax breaks, and (2) guaranteed prices and markets for electric power generated by NRSE based technologies.

The Energy Conservation Act of 1992 considers renewable energy under the heading of energy conservation and activities are therefore eligible for funding under the Energy Conservation Promotion Fund (ENCON Fund). The Department of Energy Development and Promotion is responsible for the Demonstration and Promotion of Alternative Energy Production and Utilisation Plan (DPAEPU Plan) which has as part of its mandate providing support for demonstration of biogas production from industrial wastewater and animal manure.

### Partnerships

Trust in the competence of KMUTT engineers by the private sector partner was essential for success. KMUTT has been working on developing relationships with industrial partners for over twenty years. Particularly innovative was the setting up by KMUTT of the Pilot Plant Development and Training Institute (PDTI) to manage the university's interface with the private sector by providing technical advice and consultancy.

### Regulatory instruments:

The Royal Thai Government has an established policy on NRSE development and promotion. Under the 9<sup>th</sup> National Economic and Social Development Plan (2001-2005), the research and development, production and utilization of NRSE are promoted in the following areas:

- The production of non-conventional energy technologies that are commercially viable and would better the quality of life
- The utilization of non-conventional energy sources such as solar energy, thermal energy and energy from agricultural and industrial residues
- Demonstration of biogas production from industrial wastes
- Measures that should encourage more widespread use of NRSE technologies include
  - fiscal incentives,
  - integrated planning considering NRSE research and development, information and education programs, as well as encouragement of private sector participation, and
  - rules and regulations on energy use and associated environmental standards that may favour the utilization of NRSE.
- The Department of Energy Development and Promotion is responsible for the Demonstration and Promotion of Alternative Energy Production and Utilisation Plan (DPAEPU Plan), which has as part of its mandate providing support for demonstration of biogas production from industrial wastewater.

These instruments created the environment necessary for the private sector collaborator in the project to be willing to invest in new technology. The regulations were also instrumental in helping to reduce risk for the investor. Also, the introduction of regulations by the Pollution Control Department requiring stricter environmental controls on wastewater from agro-industries has acted as an additional incentive when choosing appropriate energy technology.



*Source: PDTI*

### **Technologies**

- Trust in the competence of KMUTT's staff by the private sector partner.
- The technology used was developed and refined locally, making it more attractive and cheaper than imported technology.
- KMUTT was able to provide fast and convenient technical advice and consultancy after the reactor was constructed.
- The increase in price for fossil fuels was also an incentive factor for this biogas project.

### **Impacts**

The demonstration project at Bangkok Interfood Co. Ltd. illustrated that the company can daily save about 2,400 kilowatt-hours by using biogas technology and an efficient engine to generate electricity. Odours have been considerably reduced with no further complaints and the wastewater is now efficiently treated before being released to the environment.

### **Lessons Learned**

Anaerobic fixed film reactors have high potential for agriculture and food industries. The biogas utilization depends on the source of energy use in each factory. The subsidization of some of the investment cost from the government does much to accelerate the adoption of this technology.

### **Potential for Application**

Based on the success of this demonstration project several projects are already underway throughout the country treating wastewater from tapioca starch factories. This technology may also be applicable to other ASEAN countries.

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## References

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