

Thailand's First CBG Plant

Leading the Way

Waste water from agro-industries such as rubber, tapioca starch, and ethanol factories contains some of the most dangerous pollutants in the world. It is highly concentrated with organic material and contains sulphur compounds. These factories traditionally discharge their waste water into open lagoons, which leads to the release of methane and hydrogen sulphide gas. The environmental impact is substantial.

To combat the damage to the environment and to recover energy from waste water, the RE Power Group launched a project to build Thailand's first ever hybrid covered lagoon reactor (HCLR) for biogas generation together with a CBG plant to produce compressed biogas (CBG) for sale to the transport sector.



RE Power Group signed an agreement with a local starch factory for the construction of the biogas and CBG plant in Thailand's poorest region.

The project has several benefits:



The starch plant saves **35%** in energy costs



Over **150,000 people** benefit from access to energy, cleaner air, and uncontaminated water

The project serves as a demonstration for **future HCLR plants.**



Each day, the project...

1. treats **5,000 m³** of waste water with **99%** efficiency

2. replaces **15,000 litres** of oil

at the factory

3. refuels up to



500 cars

Thailand's First HCLR-CBG Plant

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Thailand's Biogas Pioneer

Agro-industries are very important for the economy in Isan, the poorest region in Thailand, but agro-industry factories in South East Asia treat their waste water in open ponds. These ponds generate gases like methane and hydrogen sulphide (H₂S), contributing to climate change and creating a substantial odour nuisance. Even a small amount of H₂S causes health problems. Effluent from the ponds create water pollution that endangers the livelihoods of local farmers and fishermen.

The RE Power Group introduced a project to capture biogas from a hybrid covered lagoon reactor (HCLR) and purify it for sale to the transport sector as compressed biogas (CBG), replacing fossil fuel-based compressed natural gas (CNG). EEP Mekong agreed to fund 12% of the €7.08-million project's overall costs. The project was completed in record time and has a significant positive environmental impact on 93,000 people living in the vicinity of the starch factory. Using biogas for CBG production was a pioneering decision in Thailand, where the sale of electricity generated by biogas plants was blocked because of grid saturation.



Inside the starch factory

The Project

The project had the following objectives:

1. Efficient waste water treatment in a dual-feedstock HCLR
2. Economic utilisation of the produced methane for starch drying or CBG generation
3. Provision of clean effluent for use in irrigation and as liquid fertilizer
4. Building the first industrial-scale CBG plant as well as a gas station to sell CBG to the public as car fuel

The installed biogas plant removes organic waste materials from the factory's waste water with 99% efficiency. About half of the collected biogas is sold to the starch factory to replace fossil fuel in the starch drying process. The remaining biogas is purified and compressed to produce CBG, which has an 85% methane content and is suitable for use in the transport sector. Up to 60 trucks or 500 cars per day can be served by the CBG filling station. The CBG is sold at about 10% less than CNG. The availability of CBG therefore has a direct economic impact on the region.

Project Innovations

- Introduced the use of HCLR and CBG production to sell a clean fuel to the public.
- Innovative use of both waste water and waste starch pulp as input materials in the biogas plant. (Before, only waste water was used.)
- The project provides an alternative use for biogas to the conventional electricity generation, an important consideration as the grid company does not sign any new contracts to buy biogas-based electricity.



Sustainability

Operating cash flow is the best measure for sustainability in biogas projects. This project's operating cash flow was positive from the first month after project completion – with an operating margin of over 45%. The technical solutions are economically attractive and applicable in starch factories and other agro-industries across Thailand.

Scale-Up Potential

- The project showcases new, efficient dual-feedstock HCLR biogas and CBG technology, and generates interest from other starch factories in Thailand and neighbouring countries.
- The RE Power Group aims to replicate the project in Viet Nam, Cambodia, and Myanmar.

Socio-Economic Impact

Active in Thailand's poorest region, Isan, the project directly and indirectly reduces poverty and contributes to 14 of the 17 Sustainable Development Goals (SDGs). About 60,000 people benefit from access to less expensive renewable energy, and the starch factory saves up to 35% in its starch drying costs by replacing fossil fuels with biogas supplied by the project. This provides the starch factory with a competitive edge over its competitors.

Environmental Impact

The project aimed to reduce greenhouse gas emissions by 350 tCO₂eq per day. This goal was already reached in October 2018 and the size of the emissions reduction continues to grow in line with an increasing biogas yield.

The almost complete removal of air and water pollution from the starch factory's waste water has a high impact on local fisheries and agriculture. Water sources in the area are protected from the factory's waste. 5,000 m³ of waste water per day is now treated with 99% efficiency.



The biogas compression system