

Sustainable Treatment of POME (Palm Oil Mill Effluent) to Produce Useful Products Bio Compressed Natural Gas (BIOCNG®,) and Organic Fertilizers to Replace Fossil Fuels and Inorganic Fertilizers in Plantation/Mills

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Editorial

Biogas is an energy source, which can be produced from POME, and contributes to waste management and creating sustainable environment. Biogas utilization is one of the understated in most parts of the world especially in developing countries. The profits are enormous even for putting up an independent Biogas plants with purchased feedstock. The ROI is just 3 years which is an excellent option for any investment by an investor.

KIS Group is the asia's most awarded company in providing sustainable clean technologies for biogas, BIOPOWER®, BIOCNG®, waste water and water treatment plant. We are the only company with approved (CDM-PoA 7864) for Carbon credits at UNFCCC. The CER issued in 2019 so far from UNFCCC is 300,000. All our projects are registered for Carbon Credits.

KIS Group are the first in the world especially in Indonesia and Malaysia to give solution for POME pollution using integrated BIOCNG®, KIS Group has developed many first of its kind Technologies, such as Zero Pond/Pollution, Higher Biogas. The Case Study is on 90 TPH Mill located in Kalimantan, Indonesia for POME treatment to produce BIOPOWER®, and upgradation of biogas to BIOCNG®.

Earlier open ponding and Lagoon system were used in palm oil mills for treating the POME leading to contamination of ground water and methane emissions to the environment. The concept of capturing methane and putting it to use in plantations was conceptualized by KIS group. Our ZPHB® system has a higher biogas generation as compared to the conventional technology wherein every 1 m³ of POME generates 35 nm³ of biogas as compared to conventional of producing 28nm³ of biogas. The enhancement is because of the special type of mixing systems in the reactor, which provides for thorough mixing resulting in hydrolysis of the waste. Also the HRT of 14 days is optimum such that the complete degradation occurs before the digestate overflows from the reactor generating higher methane percentage of greater than 60%. The Features of ZPHB® are very simple and user-friendly technology, lesser hydraulic retention time, less foot print area and power, effective mixing without any stratification inside the digesters, very economical, high removal efficiency of COD and BOD and less O and M cost.

The POME Treatment is divided into four phases:

- Pre-treatment
- Anaerobic digester
- Biogas purification and
- Biogas upgradations/power generation.

Pre-treatment is consisting of equalization and reducing the POME Temperature and the cooled uniform POME is fed into the anaerobic digester (CSTR) for biodegradation of organics where Mixing system is provided in the digester. Digester will be monitored daily for pH, Temp, V/A Ratio and Biogas generation. The produced biogas is stored in standalone gasholder as buffer between generation and usages. The biomass from the clarifier system is recycled back to the digester to maintain required F/M ratio for effective operation. The raw biogas having H₂S which has to be removed before usage for any applications. Biological scrubber is provided for removal H₂S where sulphur eating bacteria will be there for removal of sulphur. The free purified biogas (H₂S) is taken further for Power Generation or Biogas upgradation to produce BIOCNG®, The produced electricity will be used for in house application where KCP and utilities are utilized. The produced BIOCNG®, produced through the PSA/ Membrane system/ Amine and methane is purified (separated) to the purity of 93%-99%. This purified methane in storage tank and filled into high pressure cylinders for further utilization.

We have successfully done BIOPOWER®, BIOCNG®, for Palm Oil Mills, which is generated from waste POME. Because of the low support prices for the palm oil, mills are reeling under the pressure of maintaining the palm oils mills profitably. The mills as of now utilize diesel for their internal power requirements and also for the transportation of palm fruits increasing their operation and maintenance. The raw biogas can be upgraded using simple technologies and bottled, thus facilitating its use in applications such as domestic and commercial cooking, power generation via engines and as vehicular fuel and gensets.

The BIOCNG®, can be a win-win solution in palm oil mills in terms of *in-situ* production and consumption of power and also usage of BIOCNG®, for vehicles and gensets. The excess BIOCNG®, can be sold in the market for higher revenues. In terms of revenue as compared to exporting power to grid the bottling of purified biogas and using it in palm oil plantations as diesel replacement in trucks/vehicles and diesel gensets has an attractive ROI and increasing profits year after year. The environmental benefits are huge with CO₂ emissions reductions to the tune of 89,269 tons/year by methane emissions reductions and replacement of fossil fuels like, diesel. Moreover, the implementation of

the project is very quick and returns start within 6 months of commissioning. Besides the mentioned benefits, another major advantage is, BIOCNG®, project generates more employment when compared to biogas power plant/other renewable energy plants. The other important aspect of this project is that COD, BOD and the TSS of the POME are meeting the discharge standards as per local DOE. The final treated POME will be used for land application or discharge into water bodies.