



NOVAVIRO TECHNOLOGY SDN BHD

**Methane Recovery by
KS™ Anaerobic Digester Technology
for Palm Oil Mill Effluent**



RENEWABLE ENERGY DEVELOPMENT

ENVIRONMENTAL FRIENDLY GOLDEN CROP OF MALAYSIA: PALM OIL

The palm oil sector contributes significantly to the economy of Malaysia. It accounts for approximately 2.93% or RM6.4 billion of the gross domestic productivity of Malaysia in 2002. Providing a yield of 10 times more than most of the other oil crops, oil palm is most efficient in land and resource utilisation and contributing effectively to sustainable development.

It is recognised that there are vast potentials for the sector to tap the abundant biomass waste and the high organic-content palm oil mill effluent (POME) effectively as renewable energy sources. The energy potential from biomass residue has been estimated at 365 MW and POME at 177 MW.

The industry should now look beyond their obligation to comply with the requirements of Environmental Quality Act 1974 in the management of biomass residue and POME, for the opportunity to maximise utilisation of renewable energy resources while contributing to the reduction of greenhouse gas (GHG) emission.

The future growth of the industry sector will require further enhancement in their environmental management practices and in advancing their social and sustainability development responsibility. Appropriate technologies are rapidly evolving in the local scene to meet the demands of the industry.



RECOVERY OF METHANE FROM POME:

- **Tapping Energy from Wastes**
- **Earning Carbon Asset**

KSTM Anaerobic Digester Technology has been developed by Keck Seng (M) Bhd to treat POME efficiently and at the same time the methane gas produced is captured and used as a replacement of the fossil fuel for steam boilers.

The technology has been perfected over 18 years of continuous full scale operations.

Novaviro Technology Sdn Bhd through a licensing agreement with Keck Seng, is introducing this technology to the Malaysian market. We look forward to the opportunities for sharing the benefits of the innovations with the industry.

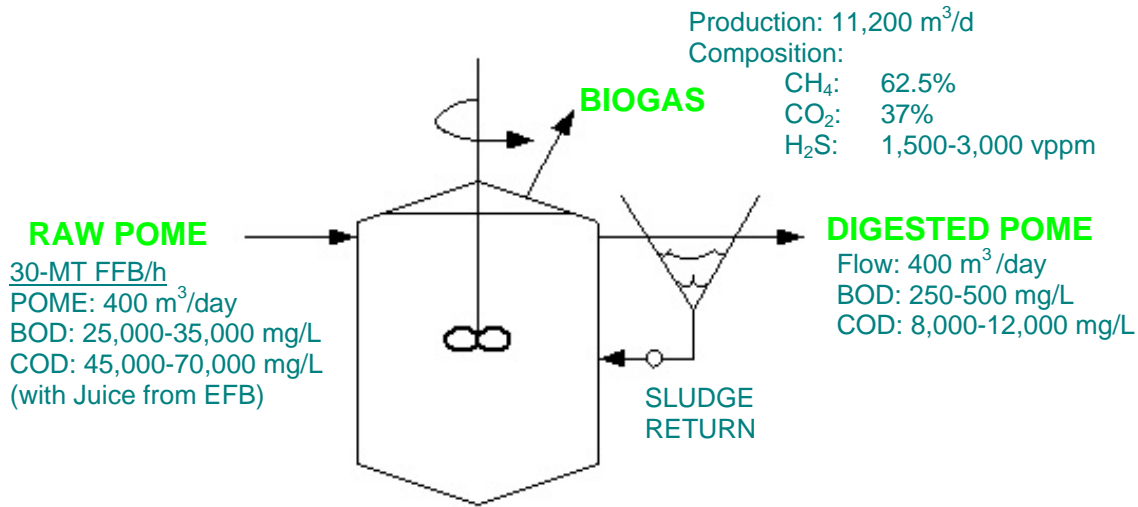
The highly efficient anaerobic digestion design of KSTM system allows maximum recovery of methane possible from the optimally controlled operation of anaerobic digestion of POME.



Energy from Wastes: Implementation of KSTM Anaerobic Digester Technology gives favourable returns for investment through the utilisation of methane recovered as boiler fuel or for power generation.

Carbon Asset: Investors may also earn significant carbon emission reduction credits from methane recovery projects.

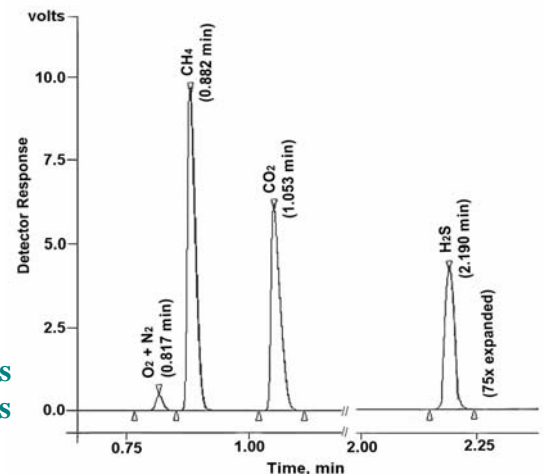
SPECIFICATIONS OF KS™ ANAEROBIC DIGESTER TECHNOLOGY:



ANAEROBIC DIGESTER

2 units Floating Cover & 1 Fixed Roof
Continuous Flow Stirred Tank Reactor
Combined Operating Capacity: 7,500 m³

Gas Chromatographic Analysis of POME Biogas



FEATURES

- Optimally design pretreatment, feeding and distributions of POME to digesters.
- Innovative and efficient digester mixing.
- Efficient biogas capture and distribution; with built-in excess gas auto-flare.
- Optimised operational and control parameters from 18 years of continuous operations experience.
- Incorporates automated, on-line control and monitoring and safety features where applicable.

BENEFITS

- High efficiency in methane generation of ~0.35 Nm³/kg COD.
- Low power consumption, low O&M costs.
- Regulated biogas output for direct use as boiler fuel and power generation.
- Ease of operations with simple and well planned operational and maintenance schedule; no need of system shut down for maintenance.
- Minimised risks of digester failure; improved treated effluent quality for subsequent facultative/aerobic treatment.

SCOPE OF KS™ ANAEROBIC DIGESTER SYSTEM:

The scope of KS™ Anaerobic Digester System offered by NOVAVIRO Technology includes the follow aspects of design, supply, installation and commissioning:

- Optimised raw POME acidification ponds.
- Efficient influent pumping and continuous feeding/distribution system.
- Anaerobic digester tanks capacity: 2,500 m³ - 3,000 m³ per tank; ~18 days retention time; floating and fixed roofs.
- Provision of continuous dual-function digester mixing system.
- Sludge sedimentation tank (~2 days retention time) and return system.
- Biogas piping system for direct biogas supply to boilers or power generation; incorporating lightning arrestor, excess gas auto-flare system.
- High quality mechanical and electrical materials and installation.
- Assured biogas output depending on POME COD loadings.

UTILISATION OF BIOGAS CAPTURED

Methane Production (30 t FFB/h mill):

6,160 Nm³/day
(11,120 m³/day as Biogas at 308K)

Energy Rate of Methane Produced:

2.2 x 10⁸ kJ/d; 5.3 x 10⁷ kCal/d
2.1 x 10⁸ Btu/d; 6.13 x 10⁴ kWh/d

Power Generation

Gas engine (40% efficiency): 1.02 MW
Steam turbine (25% efficiency): 0.64 MW

Biogas Utilisation for Steam Generation:

Saving in fuel costs: RM1.5 million per annum. (KS experience)

WINNER OF ASEAN ENERGY AWARDS 2003

KS™ Anaerobic Digester Technology won the recognition of the organisers of the ASEAN Energy Award 2003 for its innovations and achievements. Keck Seng (M) Bhd was judged and awarded the Winner for the Off-Grid Category of the New Renewable Source of Energy Project Competition, in view of its efforts in maximising the utilisation of in-house renewable sources, in particular biogas capture from POME treatment.





CERTIFIED EMISSION REDUCTION CREDITS

KS™ Anaerobic Digester Technology offers not only appreciable returns to investment from methane recovery in POME treatment, it also contributes to significant greenhouse gas (GHG) emission reduction and hence to the mitigation of global warming. The implementation of methane recovery projects is eligible for Certified Emission Reduction (CER) credits under the Clean Development Mechanism of the Kyoto Protocol, which has been established as a means for developed countries to support such activities in developing countries, including Malaysia. CER credit has been estimated as follows, for a **30 t FFB/h mill**:

- Methane Recovery: 1,407 t/yr methane
29,547 t CO₂-e/yr
- Fuel Oil Displacement: 4,992 t CO₂-e/yr
- Total CER: 34,539 t CO₂-e/yr
- Total CER Value: US\$1.55 million/10 years
(@US\$4.50/ t CO₂-e/yr)

CDM Project Development Services

Novaviro Technology in collaboration with Perspectives GmbH of Hamburg, Germany jointly offer services to develop quality CDM projects and to link potential purchasers of CERs in Annex 1 countries with project proponents in Malaysia.

TECHNICAL AND MANAGEMENT TEAM

Novaviro Technology Sdn Bhd

Dato' Dr. A. Bakar Jaafar (Chairman)
Dr. S.L. Tong (Managing/Technical Director)
Dr. H.C. Tang (Director)
Dr. Teh Ser Kok (Engineering Consultant)

Keck Seng (M) Sdn Bhd (Licensor)

Mr. N.S. Chua (Technical Advisor)
Mr. H.F. Gian (Technical Advisor)
Mr. T.N. Chua (Engineering Advisor)
Mr. K.H. Lee (System Design Consultant)

Enviro-LIFT Services Sdn Bhd

Associate company (Environmental Consultant)

CDM Project Partners:

Perspectives GmbH (Germany)
Dr. Axel Michaelowa (CDM Consultant)
Natsource Japan Co. Ltd., Tokyo

At the international level, the Kyoto Protocol commits industrialized countries to reduce their carbon emissions by an average of 5.2% below their 1990 levels in the period 2008-2012.

KYOTO PROTOCOL



NOVAVIRO Technology Sdn Bhd

6B, Jalan Astaka L U8/L, Bukit Jelutong BTC
40150 Shah Alam, Selangor, Malaysia
Tel: +603-78463682; Fax: +603-78463615
www.envirolift.com.my; envlift@streamyx.com