



AGROTECH
BIOENERGY

RENEWABLE ENERGY TECHNOLOGY FOR PALM OIL MILLS

2025



AGROTECH
BIOENERGY

COMPANY PROFILE



Agrotech Bioenergy, in collaboration with KPSR Biogas as its design partner, and Aum Capital/Aumkar Palm Oil Mill as its techno-commercial knowledge partner, can provide end-to-end services, including design, build, commission and after-sales services for Biogas and Biomethane projects in Malaysia and Indonesia (EPC & BOOT). With a projected ROI of 3-5 years, our tested designs include a low-cost medium voltage grid to supply electricity from a biogas engine to surrounding estates and require minimal intervention. In addition, our designs boast ultra-low operating expenditure (OPEX).

Our corporate philosophy is centred on high quality and locally manufactured plant designs at the lowest possible costs. Every design has been implemented at Aumkar Palm Oil Mill and the designs have been improved and operating procedures perfected from years of operations. Agrotech Bioenergy brings to the market these robust designs and operators can be trained in Aumkar to ensure all procedures are well understood.



The primary objectives of renewable energy implementation for palm oil mills in Malaysia and Indonesia include:-

- (i) Reduction of boiler load for significant savings in PKS and increased longevity of steam turbines from the reduced load.
- (ii) Major reduction in diesel consumption with minimal utilization of diesel gensets.
- (iii) Significantly lower dependence on fossil fuels (diesel) and overall reduction in GHG emissions towards achieving carbon neutral directives and goals.
- (iv) Reduction in power generation costs with the biogas engine, and further reduction in vehicle diesel costs with biomethane.

The biogas plant at Aumkar has been in operation for over seven years, and the biomethane plant for 3.5 years, replacing diesel for 12 prime movers/trucks (can go up to 16 trucks, replacing approximately 2,000L of diesel per day), thereby significantly reducing operational costs, and ensuring an attractive ROI with low CAPEX and OPEX solutions.



COMPANIES ACT 2016
(ACT 777)

**CERTIFICATE OF INCORPORATION
OF PRIVATE COMPANY**

This is to certify that

**AGROTECH BIOENERGY SDN. BHD.
202401025132 (1570981-H)**

is, on and from the 24th day of June 2024, incorporated under the Companies Act 2016, and that the company is a company limited by shares and that the company is a private company.

Dated at **KUALA LUMPUR** this 27th day of June 2024.

DATUK NOR AZIMAH ABDUL AZIZ
REGISTRAR





JABATAN PELESENAN DAN PEMBANGUNAN PERNIAGAAN

Dewan Bandaraya Kuala Lumpur
Tingkat 4, 5 & 9, Menara DBKL 2,
Jalan Raja Laut, 50350 Kuala Lumpur



LESEN

AGROTECH BIOENERGY SDN BHD

A-29-8
MENARA UOA BANGSAR JALAN BANGSAR UTAMA
59100 KUALA LUMPUR

SSM No. 1570981-H
No Fail DBKL/JPPP/04411/12/2024/KM01
Taraf LULUS BERSYARAT
Tempoh Sah 20/12/2024 hingga 19/12/2025

BIL	NO RESIT	KOD	KETERANGAN	AMAUN (RM)
1	4990241210452	A102	PEJABAT URUSAN (UNIT) 1. BIOGAS 2. BIOCRG 3. BIOFUELS 4. EFFLUENT EVAPORATION	200.00
Jum. Amaun				200.00
Tunggakan				0.00
Diskaun				0.00
JUMLAH BAYARAN (RM)				200.00

SYARAT-SYARAT PELESENAN

- DATUK BANDAR KUALA LUMPUR BERHAK MENGENAKAN SYARAT-SYARAT TAMBAHAN SEBAGAI LANGKAH KAWALAN PERNIAGAAN DARI SEMASA KE SEMASA SERTA MENGAMBIL TINDAKAN BERDASARKAN UNDANG-UNDANG DAN AKTA YANG DIGUNAPAKAI DENGAN JABATAN/AGENSI LUAR YANG BERKAITAN DENGAN AKTIVITI PERNIAGAAN.
- MEMPERBAHARUI LESEN SETIAP TAHUN 60 HARI SEBELUM TAMAT LESEN TANPA NOTIS DATUK BANDAR KUALA LUMPUR
- PEKERJA DI PREMIS HENDAKLAH 50% WARGANEGARA DAN 50% BUKAN WARGANEGARA DENGAN PERMIT KERJA YANG SAH

(HJ. BADRUL HISHAM BIN HJ. BAHARUDDIN)

SYARAT-SYARAT SEMENTARA

- AKTIVITI YANG DIJALANKAN TIDAK MENIMBULKAN KACAUGANGGU
- HANYA MENJALANKAN AKTIVITI YANG DILESENKAN DAN MEMATUHI SYARAT-SYARAT PELESENAN YANG TELAH DITETAPKAN
- PERLU MEMATUHI SYARAT-SYARAT KEBERSIHAN YANG DITETAPKAN OLEH JABATAN KESIHATAN DAN ALAM SEKITAR, DBKL
- PERLU MEMENUHI KRITERIA KESELAMATAN YANG DITETAPKAN OLEH JABATAN BOMBA DAN PENYELAMAT
- PERLU MENDAFTARKAN PERNIAGAAN DAN MENGEMUKAKAN SALINAN PENYATA KEWANGAN DAN PENYATA TAHUNAN SEMASA KE SSM
- PERLU MENDAPATKAN KELULUSAN PERANCANGAN
- TIDAK MENJALANKAN AKTIVITI YANG MENYALAHUI UNDANG-UNDANG
- PERLU MENDAPATKAN DAN MEMATUHI SEMUA SYARAT-SYARAT KELULUSAN PELAN BANGUNAN DARI JABATAN KAWALAN BANGUNAN

Pengarah
Dewan Bandaraya Kuala Lumpur
b. p. Datuk Bandar Kuala Lumpur





PERAKUAN PENDAFTARAN

Adalah dengan ini diperakui bahawa kontraktor yang dinyatakan di bawah ini telah berdaftar dengan Lembaga mengikut Bahagian VI Akta Lembaga Pembangunan Industri Pembinaan Malaysia 1994. Pendaftaran ini adalah tertakluk kepada syarat-syarat yang telah ditetapkan bersama perakuan ini.

No. Pendaftaran : 0120241223-SB148281
Nama Kontraktor : AGROTECH BIOENERGY SDN. BHD.
Alamat Berdaftar : NO.8-2, 2ND FLOOR, BLOCK G DAMAI PLAZA PHASE IV LUYANG
88300 KOTA KINABALU
SABAH
Daerah : KOTA KINABALU
Tarikh Mula Berdaftar : 24/12/2024

<u>GRED</u>	<u>KATEGORI</u>	<u>PENGGHUSUSAN</u>
G6	B	B04
G6	CE	CE21
G6	ME	M15

Tarikh Mula Berkuatkuasa : 24/12/2024
Tarikh Habis Tempoh Perakuan : 23/12/2026

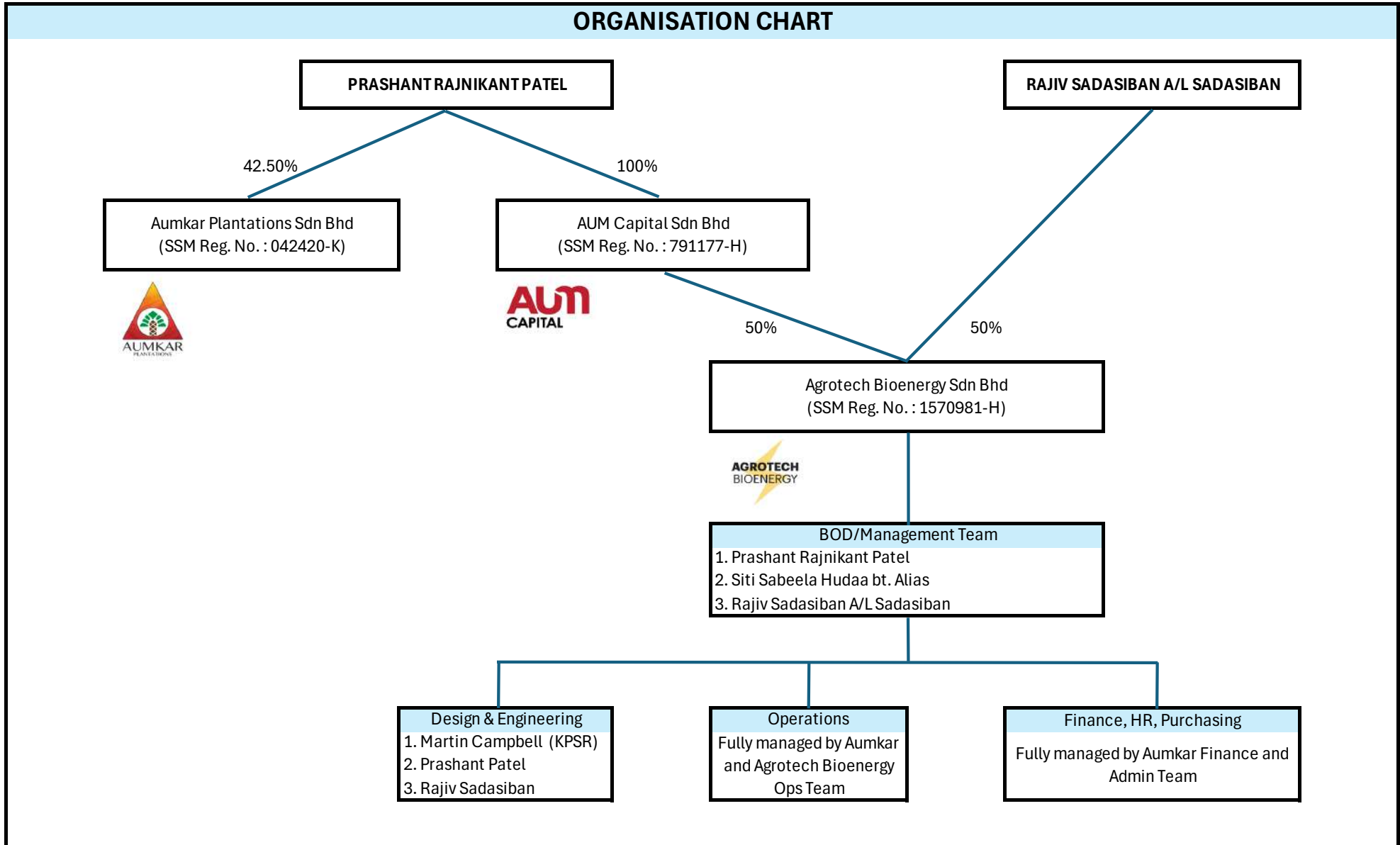
STATUS: BARU

Ketua Eksekutif
Lembaga Pembangunan Industri Pembinaan Malaysia
Tarikh: 24/12/2024





THE OPERATING STRUCTURE





THE TEAM

Prashant Patel

Family owner of Aumkar Palm Oil Mill. His expertise incorporates Martin's designs with his input to drive a commercial outcome towards maximizing the return on investment (ROI). The investment Aumkar made in a biogas plant in 2016 was entirely repaid within three years from large savings in diesel and recovery in palm kernel shells that were sold to the market. In 2020, Aumkar commenced an ultra-low cost biomethane plant to replace diesel trucks and to deliver Gross Carry Weight of 60mt for CPO, PK, FFB, PKS and EFB. Aumkar now successfully operates 16 biomethane trucks capable of hauling 40mt and travelling 200km per day before gas must be refilled. Aumkar has also designed and installed a low- cost medium voltage transmission network from its biogas engine to almost all its labour and staff housing stretching 50km. This has allowed the company to provide 24 hours electricity to its workers and staff. Aumkar continuously works to improve the designs and ensure the lowest operating expenditure.



Rajiv Sadasiban

B.Eng (Hons) Electronics Engineering with 4 years experience in the semiconductor industry in Malaysia and the United States. Rajiv is currently involved in the palm oil and biotechnology industry. He has an accumulated wealth of experience in this field and is the founder and Director of Agrotech Bioenergy. He is solution-oriented with expertise in oil palm methane avoidance and methane capture technologies for more than 15 years. Rajiv has written and published a paper in the field of methane avoidance technology and is actively involved in R&D for process improvement in line with carbon neutral goals towards a green environment.



Martin Campbell-Board

Martin has extensive experience in biogas designs and commenced his career in New Zealand in the milk industry. The milk industry produces significant by-products that need to be well treated to protect the environment. Martin was subsequently based out of Thailand and his design experience includes palm oil mill biogas digestors (32 in operation), starch plants (12 in operation), a distillery project, feed lot waste, H₂S scrubbers and a bio-methane plant. Martin's designs are carefully considered to ensure they achieve the maximum efficiency and can be built using local materials which are simple to operate without complicated and expensive PLC and SCADA systems (however these systems can be incorporated at the client's request). Martin is well regarded as an expert in the biogas industry.



Aum Capital Sdn Bhd

Incorporated in October 2007 to provide consultancy services with current paid up capital of RM800K; Aum Capital is owned by Prashant Patel (Australian Citizen and Malaysian PR) and his wife Tejal Jasani (Malaysian Citizen).

In around 2010 Prashant commenced working on a zero discharge POME solution for palm oil mills. The design incorporates techniques primarily used in Australia, by using mechanical energy to fracture or atomise wastewater to flash evaporate the water component only of wastewater; where the concentrated suspended solids fraction could be allowed to settle and desilted as required. The design was implemented in Aumkar Oil Mill in around 2012 and continues to operate today.

Post the presentation of an EIA and the BOD calculations to Sabah DOE, Aumkar was granted an amended KB allowing use of the evaporation technology where discharge was reduced to 50% the rate of FFB processing. During dryer months where rainfall is restricted to 50mm for the month, the design achieves full zero discharge. During months of rainfall approaching 200mm, discharge is restricted to 70m³ per day when processing 15,000MT FFB per month. The rate of discharge is parallel to the number of machines deployed. Aumkar operates 16 machines at present.



At PIPOC in 2013, Prashant was invited to present his technology in a paper delivered in the Science & Engineering Section. In November 2015, the MPOB published Prashant's paper in the MPOB Bulletin. The following year the technology was purchased by Sime Darby for a trial at their Melalap Mill in Sabah.

In around 2016, Aum Capital invested and commenced a collaboration with a German biotech company known as AutoDisplay Bio-Tech. Autodisplay had designed a technology to hydrolyse cellulose and hemicellulose into C5 and C6 sugars. The significant difference in Autodisplay's technology is that the enzymes could be made using local bacteria already present in Malaysia and later could be easily reproduced on site. This dramatically would reduce the cost of enzymes, especially in logistics costs. The technology is reliant on an effective pre-treatment for fibres like EFB, palm tree trunk or fronds and has stalled as a cost effective solution for this has yet to be found. Aum Capital continues to work on EFB pre-treatment now using Ferric Chloride and Carbonic Acid which can be recycled in a loop. Carbonic acid can be produced from the freely available CO₂ from biogas.



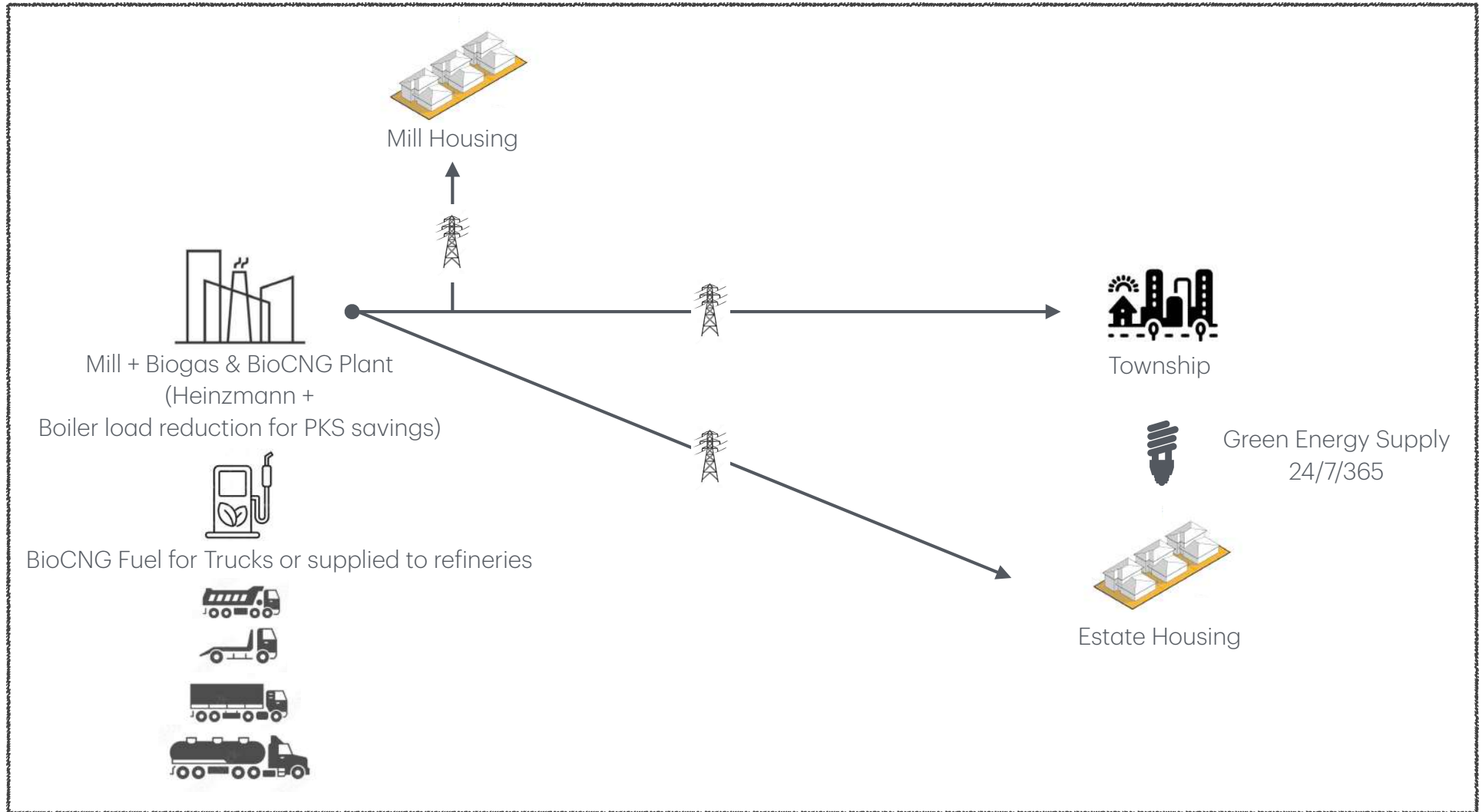
From 2021 onwards, Aum Capital has been working on designs on a pyrolysis method of palm tree trunks, especially for areas with high Ganoderma growth. The complete removal of the palm tree trunk from the area and processing it at 700 degrees ensures the best chance is given for delayed re-attacks of Ganoderma. The Capex cost of the project would be recovered from the sale of carbon credits. The project has now completed the design phase, and is being implemented in Aumkar Oil Mill with processing capacity of 1 hectare per day of palm tree trunk.

In early 2024, Aum Capital put together the framework for a collaboration with the University of Swansea in the UK to develop wide scale algae farming, where effluent ponds in palm oil mills can be used to cultivate oil producing algae, which can be turned into bio-fuels and where the solid fraction of the remaining algae can be hydrolysed into sugars for ethanol.

Prashant via his company Aum Capital continues to develop leading designs to increase profitability for palm oil mills from the processing of by-products.



THE ROAD TOWARDS NET-ZERO

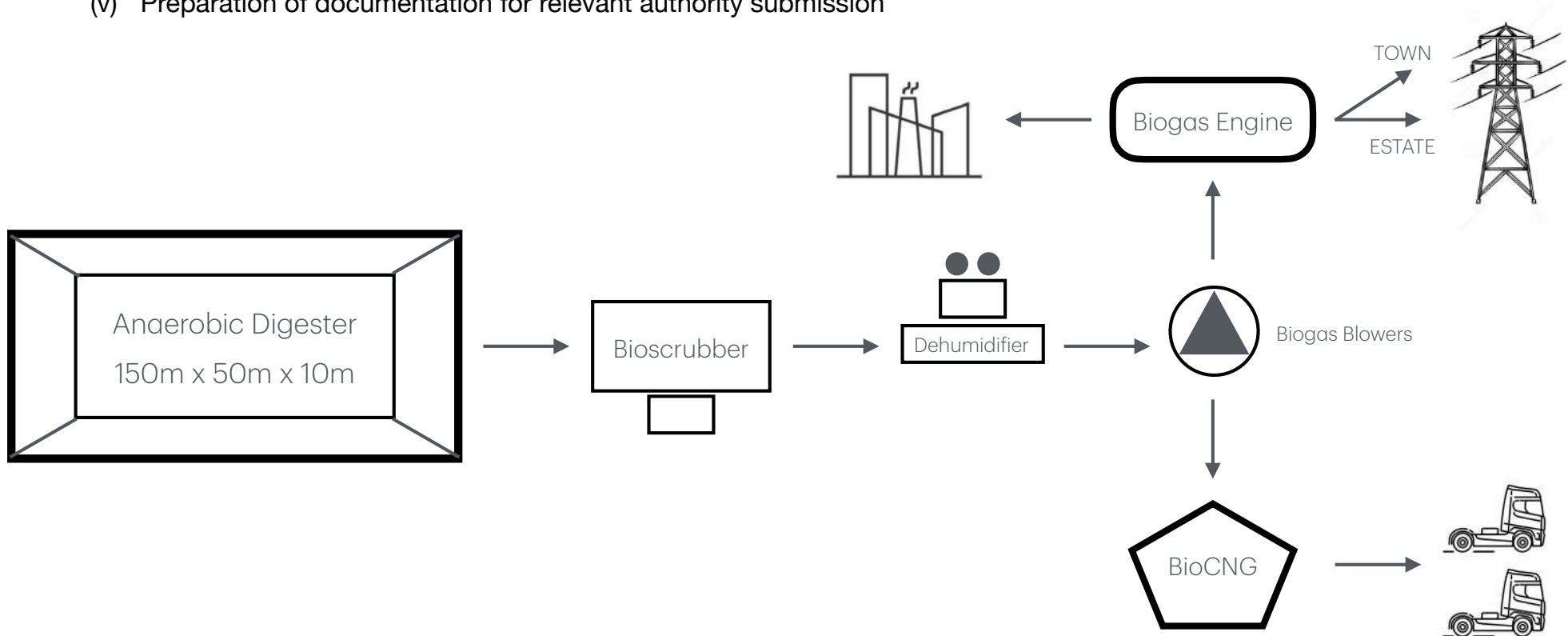




BIOGAS DESIGN AND IMPLEMENTATION

Prior to commencement of works, Agrotech Bioenergy will need to carry out the following preliminary works :

- (i) Acquiring data on the new or existing mill (layout plan, topography diagram, location, process information, mill data, and site accessibility)
- (ii) ETP sampling for influx and bio-scrubber utilization
- (iii) Site design study to incorporate potential for biomethane implementation
- (iv) Preparation of relevant design drawings
- (v) Preparation of documentation for relevant authority submission





ANAEROBIC DIGESTER

The digester design allows for sufficient retention time to digest the organic load and maximize the generation of biogas per m³ of POME influx. The internal design enhances the efficiency of the microbial processes to generate biogas with a high percentage of methane, to ensure optimal conversion to electricity.

The digester is covered with a HDPE membrane and can store biogas even during mill shutdown durations (of up to 7 days or more). Additionally, the digester is designed to prevent sludge sedimentation and to maintain homogeneity of the digester content.

Tank systems are also available on special request (due to space or soil limitations).

BIO-SCRUBBER (H₂S REMOVAL)

Hydrogen Sulphide is a contaminant in biogas and has to be efficiently removed to prevent any corrosion in plant equipment. The proprietary biological scrubber design can be equipped with an oxygen generator (if biomethane plant is installed) and utilizes treated POME as a nutrient wash, to reduce **H₂S to less than 5ppm.**

The scrubber design is proven and has been in operation for more than 7 years in Aumkar Palm Oil Mill, and has also been installed in multiple sites around Malaysia and Indonesia. The design requires minimal maintenance and is low in OPEX.



DE-HUMIDIFIER & CHILLER (MOISTURE REMOVAL)

Moisture removal is an important part of the biogas treatment post H₂S removal. Whether the biogas is used in a gas engine or directly in a boiler, dry gas is essential to protect spark plugs in a gas engine and preserve efficiency if being used in a boiler. The process involves chilling the gas to a dew point below 10 degrees.

BIOGAS ENGINE

Treated biogas at 60-65% CH₄ content and H₂S between 0-5ppm will be supplied to the gas engine for power generation. The system will be managed by an advanced power management system attached to every generating source to synchronise and provide grid controls to determine which generating source is used and provides frequency control. The result is reducing the load on the boiler to conserve PKS and ensuring savings are achieved in diesel reduction.



BIOMETHANE

- (i) Biogas is received from Biogas plant between 60% to 65% methane content and H₂S as close to zero as possible. The biogas should also be free from dilution with air (if used for H₂S scrubber). If air is mixed into the biogas, Nitrogen is introduced and whilst inert, it becomes harder to achieve > 96% methane content in final bio-methane.
- (ii) The biogas is compressed to 9 bars and sent into the water upgrading columns stage 1. The cleanest effluent water is used from final treatment pond and pushed in the opposite direction of the gas flow in the upgrading column. The effect is CO₂ gets absorbed into the water. The gas from the stage 1 upgrading is sent to stage 2 upgrading for a second pass for residual CO₂ to be absorbed into the water. The water is sent back to the effluent treatment pond where it will naturally degas itself.
- (iii) The upgraded gas (now > 96% methane content) is sent to a no pressure storage pillow which is lined with HDPE plastic. Alternative storage pillows are also available. When it is time to fill up a truck or tube trailer, the 14-bar compressor is switched on. This takes the gas from no pressure to 14-bars and delivers it to the inlet of the 250-bar compressors. As the truck filling commences, the 250-bar compressor will switch on and take the 14-bar compressed gas and compress it to 250-bars for filling into the truck and/or cylinders/tube trailers for transport.



FLARE STATION

Flare station capacity will be determined based on expected gas utilization. Pipes will be made from stainless steel (SS) to withstand the high flare temperatures. The ultimate aim is to maximize utilization of biogas to reduce dependency of fossil fuels. Nevertheless, any requirement for flaring will be done in accordance with environmental control standards.

DATA MONITORING

Primary components will be monitored to ensure parameters are within normal operating range. The Heinzman Power Management System comes with extensive monitoring on the generating sources and inlet steam pressure. The system can also be remotely controlled and configured.

LOW COST ELECTRICAL TRANSMISSION NETWORK

Aumkar has designed a low-cost transmission network to supply power from biogas engines located at a palm oil mill to the nearby surrounding housing estates. There are significant savings from the removal of diesel gensets from housing estates in the plantation from full offset of diesel, genset parts and genset supervisors. The diesel genset is replaced by an electrical transformer that requires no operator. Voltage from the biogas engine is stepped up to 1.9KV, 3.3KV or 6.6KV depending on loads and distances, and low costs cables are installed to the plantation housing estate. Here the voltage is stepped down for use in domestic housing.



BENEFITS OF THE TECHNOLOGY

1. Palm Oil Mills move towards green energy to significantly reduce dependency on fossil fuels. The biogas project can **reduce GHG emissions by >60,000 mt CO₂eq annually**. This further **improves the ESG rating** of the group.
2. Reduction in boiler load, enabling **significant reduction in Palm Kernel Shell utilization** (the additional revenue is 100% to client's benefit). Agrotech Bioenergy to work closely with the mill post commissioning, to ensure the PKS savings target is achieved, with monthly monitoring of mill operations.
3. Medium Voltage Transmission to estates will reduce OPEX by replacing all gensets with gas engine electricity from the mill. This provides for 24 hours biogas power to the estates. The supply of **24 hours of power** to the estates will enhance **worker satisfaction as well as worker retention**.
4. Cost of biogas electricity per kWh is half the per kWh generation cost from gensets. Power generation up to 1.0-1.2MW at full potential, taking into account **future projects** requiring biogas power. In summary, the higher the consumption, the lower the tariff per kWh; hence, the mill and estate will pay lower per kWh with biogas power. The mill and estates can also benefit from CAPEX savings from **not having to replace** older diesel gensets.
5. Agrotech Bioenergy offers both turnkey and zero CAPEX options to select clients with attractive ROI and after sales back-up.



High efficiency digester design (lagoon or tank) enables high gas production with significantly higher CH₄ content, averaging 62-66% CH₄.



Gas treatment ensures significant reduction of H₂S to below 5ppm and outgoing gas temperature at 5degC to ensure higher calorific value and biogas engine longevity.



The biomethane system upgrades the biogas to 97% CH₄ and H₂S to 0ppm. Gas dew point is -45degC and the system is capable of producing up to 100,000MMBTu per year, depending on the volume of biogas input into the system.



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THANK YOU