

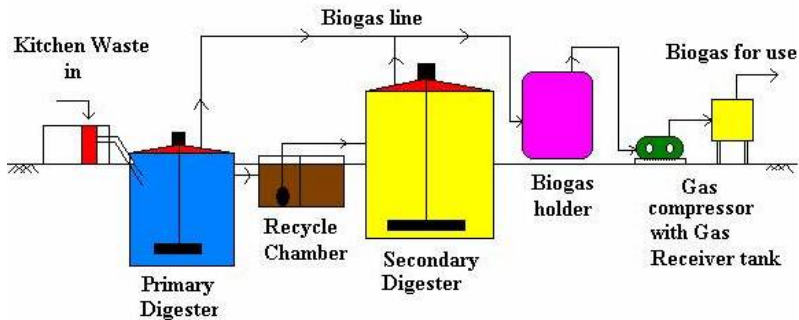
Mailhem's Magarpatta, Pune plant site visit

Mailhem group is the supplier of technology and turnkey contractors for Waste to Energy Projects. The basic concept of their technology is based on a process known as Upward Anaerobic Sludge Blanket (UASB) developed by Dr. Lettingah in the Netherlands. Mailhem Engineers Pvt Ltd has specifically modified it for the waste containing high percentage of suspended solids.



Above Picture taken at the Magarpatta site in Pune, India. Treat 2 ton waste per day capacity, plant is designed for the Magarpatta site. Magarpatta complex is also known as satellite city which has multiplex, IT companies, residential complex, commercial buildings and food courts. Plant was under construction when visited in January 2006. No physical data taken on site. Data presented in the paper is obtained from Mailhem Engineers.

Brief process description



Flowsheet for Biogas Plant based on Kitchen waste

Mailhem Engineers P Ltd.

Source: Mailhem Engineers Private Limited

The segregated wet waste (mainly food waste) is brought to the plant site in bins and containers. It is loaded on a sorting table and residual plastic, metal; glass and other non-biodegradable items are further segregated. The waste is loaded into a Waste crusher

along with the water, which is mounted under the sorting table itself. The food waste slurry is directly charged into the modified UASB primary digester.

This digester serves mainly as hydrolysis cum acidification tank for the treatment of suspended solids. It contains internal proprietary modules, baffles and launders made in fibre reinforced plastic (FRP) reinforced with Mild Steel. It is provided with a stirrer drive assembly with blades for scum breaking. It is provided with an airtight top cover. The overflow of primary digester is collected into pump cum recycle chamber and pumped into secondary digester.

Secondary digester serves as a methane fermentation tank and BOD reduction takes place here. Both states are of proprietary modified UASB construction. The secondary digester too is equipped with proprietary internals, stirrer assembly and top cover. The treated overflow from this digester is connected to the drains. The sludge, which accumulates at the bottom of the digester, is removed once in a year.

The biogas is collected in a neoprene rubber balloon and kept in a suitable enclosure. The biogas compression system comprises of biogas blower with automation, gas receiver tank, pressure switch, pressure gauge. 1” HDPE piping with moisture traps provided up to a distance of 500 m from the biogas plant. With help of modified biogas burners, cooking and heating can be done.

The biogas plant is capable of taking: mixed wastes and treating them for optimum results, Segregated Kitchen waste from residential societies, segregated wet garbage from hotels and canteens, Sewage sludge from STP

Normally Mailhem Engineers manages plant by deputing one full time supervisor/labor at the plant if asked for annual maintenance contract (AMC) – Salary is INR 4000/-.

Technology and Operational Information:

Technology	<ul style="list-style-type: none"> Anaerobic Digestion. Technology is used for Biogas generation from biodegradable organic waste. Mesopheric System which is energy efficient.
Culture used	<ul style="list-style-type: none"> A special type of culture is added at the time of Plant installation, which is rich in anaerobic microorganisms and has the properties of self regenerating.
Water input ratio	<ul style="list-style-type: none"> 1:1
Shredder / Mixer	<ul style="list-style-type: none"> Input is biodegradable organic waste with water. Used for chopping the waste and making it into fine slurry. It has a capacity of chopping 1 tone waste/hr
Recycle chamber	<ul style="list-style-type: none"> Single phase motor is used which is linked with the stirrer/agitator.
Primary Digester	<ul style="list-style-type: none"> Made of 3mm milled steel. Inside coated with Fiber glass. Water pipes are joined from the Inlet cum recycle chamber through which the slurry is fed in this digester.

	<ul style="list-style-type: none"> Agitator is used for stirring up the slurry inside the primary digester.
Secondary Digester	<ul style="list-style-type: none"> Body is made up of 3mm milled steel Sealed tops ensure no foul.
Gas balloon (Gas Holder)	<ul style="list-style-type: none"> Made up of Neoprene rubber Balloon is UV protected. Gas collection varies from season to season Balloon is protected in a shed which is non smoking or non fire zone for safety reasons. Gas is stored at NTP conditions The composition of biogas produced with this setup is as follows: Methane (CH₄) 55% - 60% Carbon Dioxide (CO₂) 38% Hydrogen sulphide (H₂S) 1-2% .
Blower (Compressor)	<ul style="list-style-type: none"> Pressurize the gas from the gas holder to the receiver tank.
Moisture Traps	<ul style="list-style-type: none"> Moisture traps are present at the plant and next to the canteen building to trap moisture from the gas and it has to be cleaned once in a week.
Retention time	<ul style="list-style-type: none"> 28 days i.e. Primary digester takes 21 days and Secondary digester takes 7 days.
Manure	<ul style="list-style-type: none"> Sludge is removed once a year Sludge is used in gardens as manure.
Input-Output ratio	<ul style="list-style-type: none"> For Input of 500 kg waste Output of Gas is 40 cubic mt. per day The gas generation is slightly lower in winter in the range of 30-35 cu.mt. Where as gas generation in summer is around 45 cu. mt.
hazard	<ul style="list-style-type: none"> Since Biogas contains moisture, one can easily detect the leakages by its smell.(The smell is due to H₂S) For supplying gas, PVC pipes are used which are non – corrosive.

Installation cost and savings:

Savings calculated by Melhem Engineers in terms of liquefied petroleum gas (LPG)

Savings and Cost of plant calculated in terms of Indian Rupee 1 GBP=78 INR approximately

Food Waste Treatment Biogas Plants

Waste qty in kg	Biogas in cubic meter/da	Manure	Area in Sq	Savings in terms of	yearly savings in INR	Installation cost
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/ day	y		m	equivalent Liquefied Petroleum Gas (LPG) in Kg	1kg LPG=21 INR	In Indian Rupees-less civil works
Residential colonies / hotels / institutions / industries						
100	7 – 9	3.4 tpa	5 x 5	4.5	34492.5	130000-150000
200	13 – 15	4.2 tpa	6 x 6	7.2	55188	180000-230000
300	19 – 23	10 tpa	6 x 9	11.3	86614.5	260000-320000
500	38 – 40	14 tpa	6 x 10	21	160965	430000-480000
800	55 - 65	22 tpa	6 x 12	29	222285	500000-600000
Industrial Canteens / Segregated house hold (kitchen) and Hotel Waste						
1000	80 – 90	0.1 tpd	10 x 10	43	329595	600000-700000
2000	160 – 180	0.2 tpd	15 x 15	78	597870	1,100,000-1,200,000
3000	240 – 270	0.3 tpd	20 x 20	120	919800	1,800,000-2,000,000

- Approximate price (validity till December 2005)
- Civil works price has been considered for normal soil conditions. It will vary depending on site conditions and constraints
- Price are excluding taxes and duties wherever applicable

Merits of the Mailhem’s Plant:

- The Plant is compact hence less area is required.
- Biogas produced can be utilized easily.
- Better Aesthetical look
- Produce less sludge comparing to other plants, sludge removed once in a year.
- Produce no odor.

Demerit:

- Retention time which is more. i.e 28 days.
- Mailhem Technology has proprietary Upward Anaerobic Sludge Blanket (UASB) modified construction which may restrict its transferability.

Comments: Visited plant was under construction. However setup looks compact and good. Overall we can expect its optimum performance by previous project done by

Mailhem for its reputed clients, across the country. Operation looks less manual when comparing with Nisargruna. However gas produced in Nisargruna is much higher than what produce with Mailhem's technology. Nisargruna plant in Mumbai seems to be more sustainable when thinking about its social aspects e.g. generating employment for poor rag pickers.