KAASHYAP ENVERGY INFRASTRUCTURES PRIVATE LIMITED

.....Creating Infrastructures in the realms of Environment and Energy

WELCOME

Confederation of Indian Industry

Energy Efficiency Summit 2024

Hyderabad

Kiran KK ; Managing Director
Sriram Kashyap ; Director

KAASHYAP ENVERGY INFRASTRUCTURES PRIVATE LIMITED

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Kaashyap specializes in

- ✓ Production of BioCNG from organic waste
- ✓ Production of New water from waste water

Kaashyap Operates from

- ✓ Hyderabad ; India
- ✓ Kuala Lumpur ; Malaysia

Kaashyap Envergy Reactors are high rate Bio-methanisation reactors which give higher output of methane rich Biogas based on its modified Continuously Stirred Tank Reactor design.

Kaashyap Envergy Infrastructures Pvt. Ltd.

Kaashyap Envergy provides solutions for Biogas and Bio –CNG

Kaashyap Envergy provides services to its clients and creates Infrastructure by means of Design, Detailed Engineering, Procurement, Construction, Commissioning, Operation and Maintenance of special projects catering to Environment protection combined with generation of non-conventional and Renewable Energy.

Contact Us

Kiran KK

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kaashyap.envergy.infra@gmail.com

www.kaashyapenvergy.com

Kaashyap Envergy Infrastructures Pvt. Ltd.

kaashyap envergy

Kaashyap Envergy creates infrastructures in the realms of Environment and Energy (ENVERGY)

Kaashyap Envergy Infrastructures Pvt. Ltd

Research & Development

The promoters of Kaashyap Envergy are actively involved in Research & Development in these chosen areas of Environment & Energy and work jointly in collaboration with leading Engineering/Technical institutes in India such as Indian Institute of Technology, Hyderabad; Jawaharlal Nehru Technological University, Hyderabad; University of Petroleum and Energy Studies, Dehradun.

Energy and Water

Kaashyap Envergy provides solutions to capture Energy as well as Crystal clear water from the high strength organic wastewaters generated in agro process industries such as sugar, distillery, starch, palm oil mill etc.

Projects

Mr. Kiran KK, promoter-director was involved in projects as Project Director/ Project Manager during his dedicated career exclusively in the fields of Environment & Energy (ENVERGY).

Sugar Factory Effluent

Vijaynagar Sugars Pvt Ltd | Shiraguppi Sugars Ltd.

Distillery Spentwash

Terna SSK Ltd | Sriram SSK Ltd | Srirama Distilleries | Andhra Sugars Ltd | Gauri Industries Ltd | Welcome Distilleries Ltd | Chamundi Distilleries |Kolhapur Sugar Mills Ltd | Karamchand Thaper Group | Jeypore Sugars Ltd

Palm oil Mill Effluent (POME) to Power

Green & Smart Sdn Bhd ; Malaysia

Wastewater to Crystal Clear Water

Bhabha Atomic Research Centre | Synthite Group

2.0 MW CAPACITY WASTEWATER TO POWER PLANT

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Technical Collaboration

- Indian Institute of Technology - Hyderabad
- Indian Institute of Chemical Technology: Hyderabad
- Department of Atomic Energy; Govt of India
- BITSPILANI - Hyderabad
- Indian Institute of Technology: Roorkee
- IIIT Hyderabad - Indian Institute of Information Technology, Hyderabad

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Technologies Developed

- HRCM (High Rate Complete Mix) Anaerobic Digester
- EGSB (Expanded Granular Sludge Bed) Anaerobic Digester
- IITH-Kaashyap-ABT (Algal Bacterial Tower)
- IITH-Kaashyap-n SBR (Novel Sequential Bio Reactor)
- IITH-Kaashyap-CBME (Continuous Bi-Polar Mode Electrocoagulation)

INTELLECTUAL PROPERTY INDIA

क्रम सं/SL No :044164842

सत्यमेव जयते

पेटेंट कार्यालय,भारत सरकार | The Patent Office, Govemment Of India

पेटेंट प्रमाण पत्र | Patent Certificate

(पेटेंट नियमावली का नियम 74) | (Rule 74 of The Patents Rules)

पेटेंट सं. / Patent No.	:	466849
आवेदन सं. / Application No.	:	202041031706
फाइल करने की तारीख / Date of Filing	:	24/07/2020
पेटेंटी / Patentee	:	1.Indian Institute of Technology Hyderabad 2.Kaashyap Envergy Infrastructures Private Limited

प्रमाणित किया जाता है कि पेटेंटी को, उपरोक्त आवेदन में यथाप्रकटित *AN IMPROVED SEQUENTIAL BATCH REACTOR FOR WASTEWATER TREATMENT* नामक आविष्कार के लिए, पेटेंट अधिनियम, 1970 के उपबंधों के अनुसार आज तारीख जुलाई 2020 के चौबीसवें दिन से बीस वर्ष की अवधि के लिए पेटेंट अनुदत्त किया गया है।

It is hereby certified that a patent has been granted to the patentee for an invention entitled *AN IMPROVED SEQUENTIAL BATCH REACTOR FOR WASTEWATER TREATMENT* as disclosed in the above mentioned application for the term of 20 years from the 24th day of July 2020 in accordance with the provisions of the Patents Act,1970.

अनुदान की तारीख : 07/11/2023
Date of Grant :

पेटेंट नियंत्रक
Controller of Patents

टिप्पणी - इस पेटेंट के नवीकरण के लिए फीस, यदि इसे बनाए रखा जाना है, जुलाई 2022 के चौबीसवें दिन को और उसके पश्चात प्रत्येक वर्ष में उसी दिन देय होगी।

Note. - The fees for renewal of this patent, if it is to be maintained, will fall / has fallen due on 24th day of July 2022 and on the same day in every year thereafter.

भारतीय प्रौद्योगिकी संस्थान हैदराबाद
कंडी - ५०२ २८५, संगारेड्डी, तेलंगाना, भारत
फोन : (०४०) २३०१ ६०३३, फैक्स : (०४०) ६००३ / ३२
Indian Institute of Technology Hyderabad
Kandi – 502 285, Sangareddy, Telangana, INDIA
Phone: (040) 2301 6033; Fax: (040) 2301 6003/32

Letter of Authorization

Date: Feb 08, 2021

To whom it may concern:

This is to certify that M/s. Kaashyap Energy Infrastructures Private Limited (CIN: U74900TG2016PTC103818) of Hyderabad is our Industry partner for conducting Joint research in the field of Wastewater Treatment.

The Joint research is being conducted in association with M/s. Kaashyap with an aim of eventual commercialization of the technology so developed or upgraded /modified to benefit and suit the requirements of Industry or Society or user group at large for wastewater treatment.

One such technology, "IITH-Kaashyap:n SBR" has been jointly developed under Uchchatar Avishkar Yojana of Government of India titled "Developing a Novel Sequencing Batch Reactor for In-situ Containerized Wastewater Treatment" as part of Industry – Institute collaborative research programs. The project investigator from IIT Hyderabad is Dr. Debraj Bhattacharyya, Associate Professor, Departments of Civil Engineering & Climate Change. The patent registration for the technology is under process.

We have authorized M/s. Kaashyap to take up marketing and business development activities utilizing this technology with the prospective clients as per requirements and opportunities so developed.

At the time of execution of the wastewater treatment project by our industry partner M/s. Kaashyap, the designs, detailed engineering drawings, and technical details will be checked and verified by us for implementation to achieve the desired technical quality, objectives, and parameters of the wastewater treatment plant.

Sincerely,

Prof. Kiran Kuchi
Dean R&D , IIT Hyderabad

Prof. Kiran Kumar Kuchi
Dean (R&D)
Indian Institute of Technology Hyderabad
Kandi, Sangareddy-502 285
Telangana, India

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GOVERNMENT OF INDIA
DEPARTMENT OF ATOMIC ENERGY
TECHNOLOGY TRANSFER & COLLABORATION DIVISION

Dear KAASHYAP ENVERGY INFRASTRUCTURES PRIVATE LIMITED

Congratulations on a new License Agreement signed!! .

A new License signed for the Technology NISARGRUNA Biogas plant Based on Biodegradable waste resource by a renowned Organization KAASHYAP ENVERGY INFRASTRUCTURES PRIVATE LIMITED ; HYDERABAD on 27-10-2020 11:00.

Technology Transfer and Collaboration Division thank all members who supported in achieving the new agreement and making the transfer and the event a smooth and laudable experience.

We wish all the very best and successful projects to our collaborator and Licensee KAASHYAP ENVERGY INFRASTRUCTURES PRIVATE LIMITED; HYDERABAD.

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1.Vijay Nagar Sugars Ltd ; Gadag –Karnataka- Digester & ETP-Turnkey Project

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2.Shiraguppi Sugars Ltd , Miraj , Maharashtra: Digester & ETP: Turnkey project

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SSWL- Two stage Diffused Aeration : A new process launched at that time

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3.Synthite Industries Ltd , Harihar Karnataka: Digester for A new Feed stock – Marigold Flower Waste

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NSL GROUP- New Algal technology developed Jointly with IIT Hyderabad launched

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Siddhasiri ; Chincholi Karnataka – Digester –EGSB Technology

Expanded Granular Sludge Bed (EGSB) Reactors

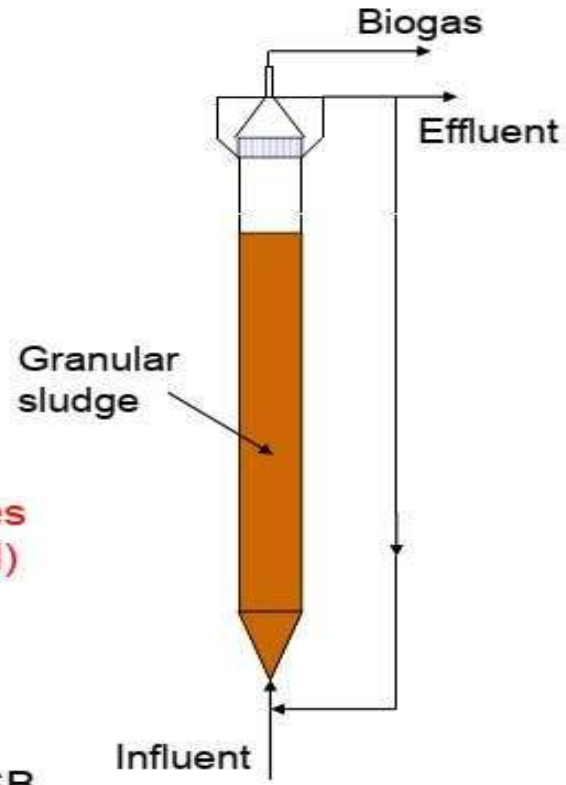
Effective use of granular sludge !!

Main Features

- High upflow velocities (> 8 m/h)
- High concentration of bio-catalyst
- Extreme loading rates (20-40 kg/m^3.d)
- Virtually no mass transfer limitation
- Very small footprint

Application:

- cost effective alternative for UASB (2-3 times higher load)
- Cold wastewaters (< 20°C)
- Dilute wastewaters (< 1 g COD/l)
- Presence of degradable toxic compounds
- LCFA containing wastewaters
- Wastewaters with foaming problems in UASB



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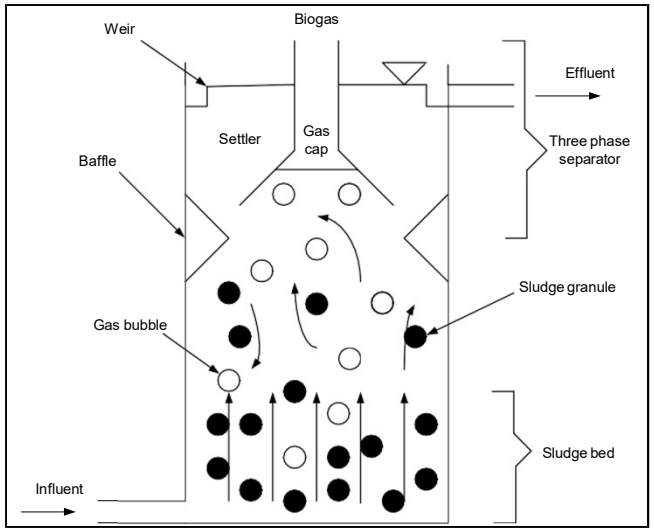
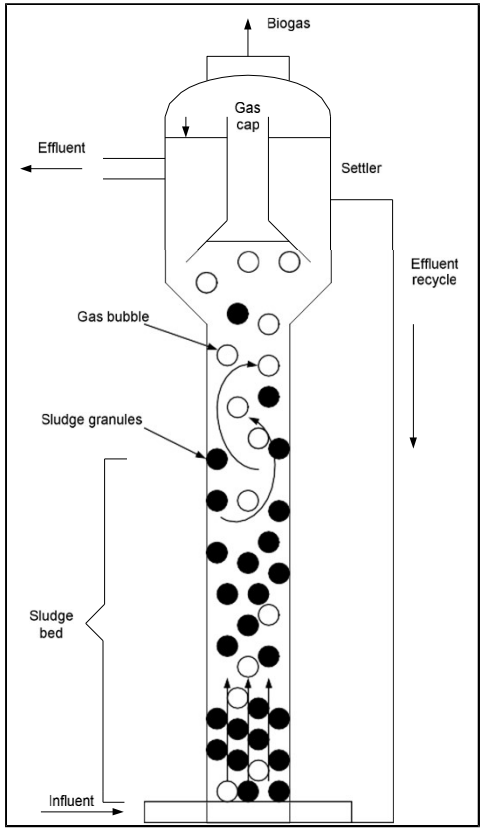
(EGSB) Extended Granular Sludge Bed



UASBR

- **High Rate Anaerobic Reactors**
- **Solid Retention Time >> Hydraulic Retention Time**
- **Cell Immobilization achieved through self-granulation**



EGSBR

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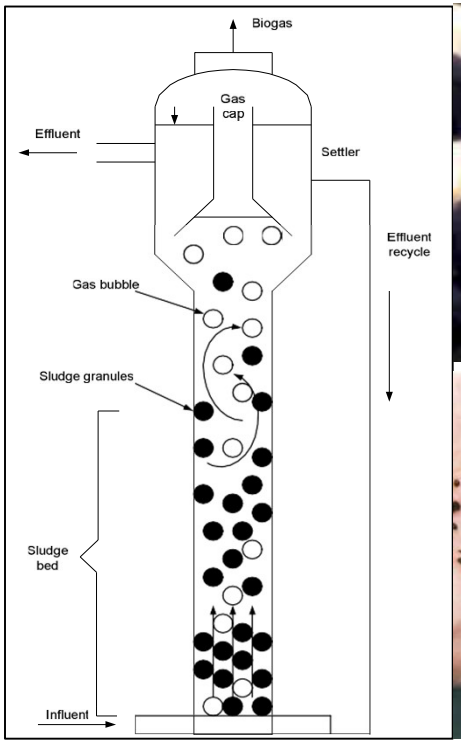

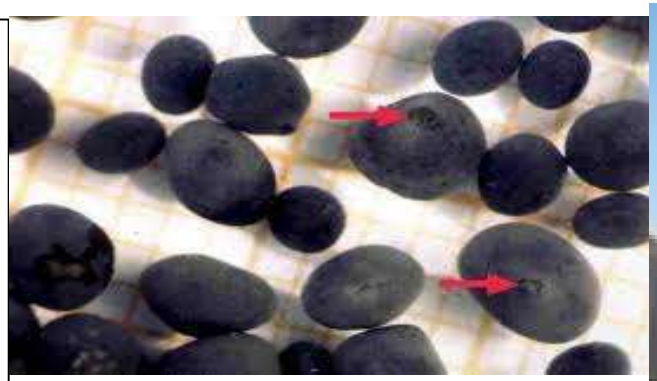

- **High Rate Anaerobic Reactors**
  - **Organic Loading Rate for granular sludge: 12-18 kg COD/cu.m reactor volume per day**
  - **OLR for granular sludge> OLR in conventional CFSTR with flocculent sludge (3-5 kg COD/cu.m reactor volume per day)**
  - **Therefore, volume of EGSB reactor < volume of conventional CFSTR for same degree of treatment**
- **Solid Retention Time >> Hydraulic Retention Time**
- **Cell Immobilization achieved through self-granulation**

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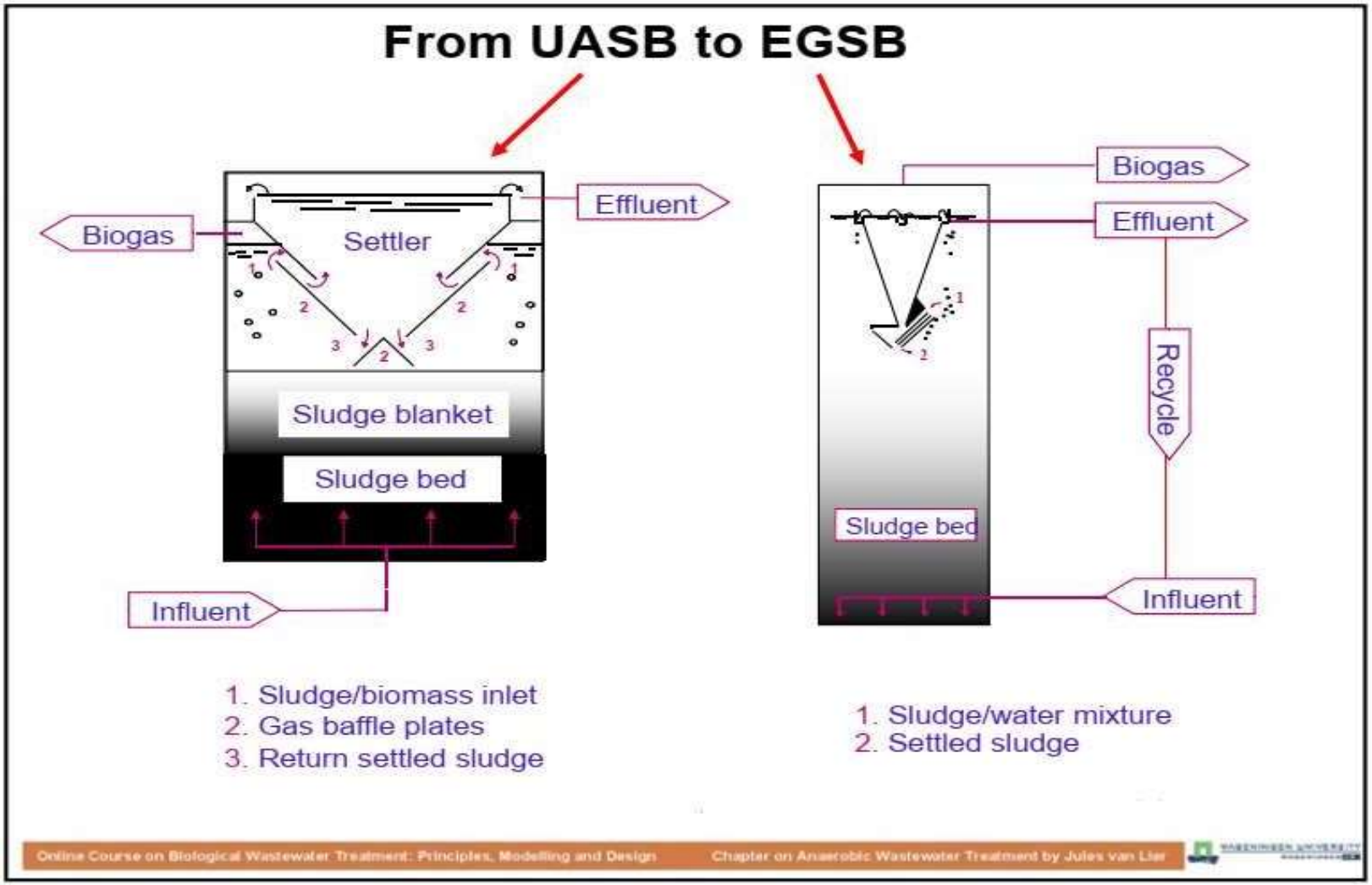

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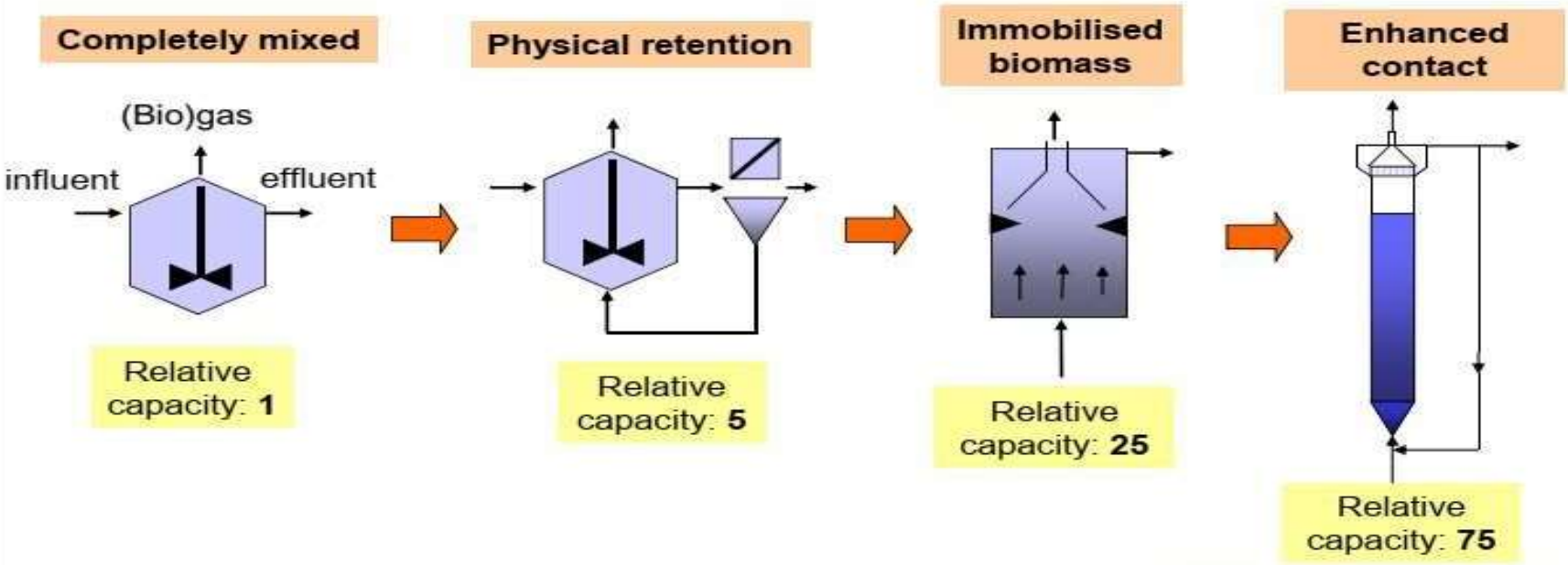
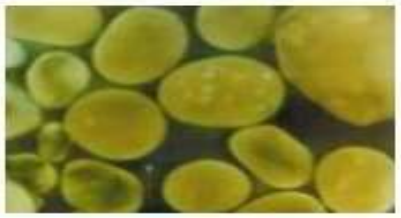
Development of "high-rate" anaerobic treatment systems



CONCLUSION

EGSB Reactors (Relative Capacity :75) are about 3 times more efficient than UASB Reactors(Relative Capacity : 25)



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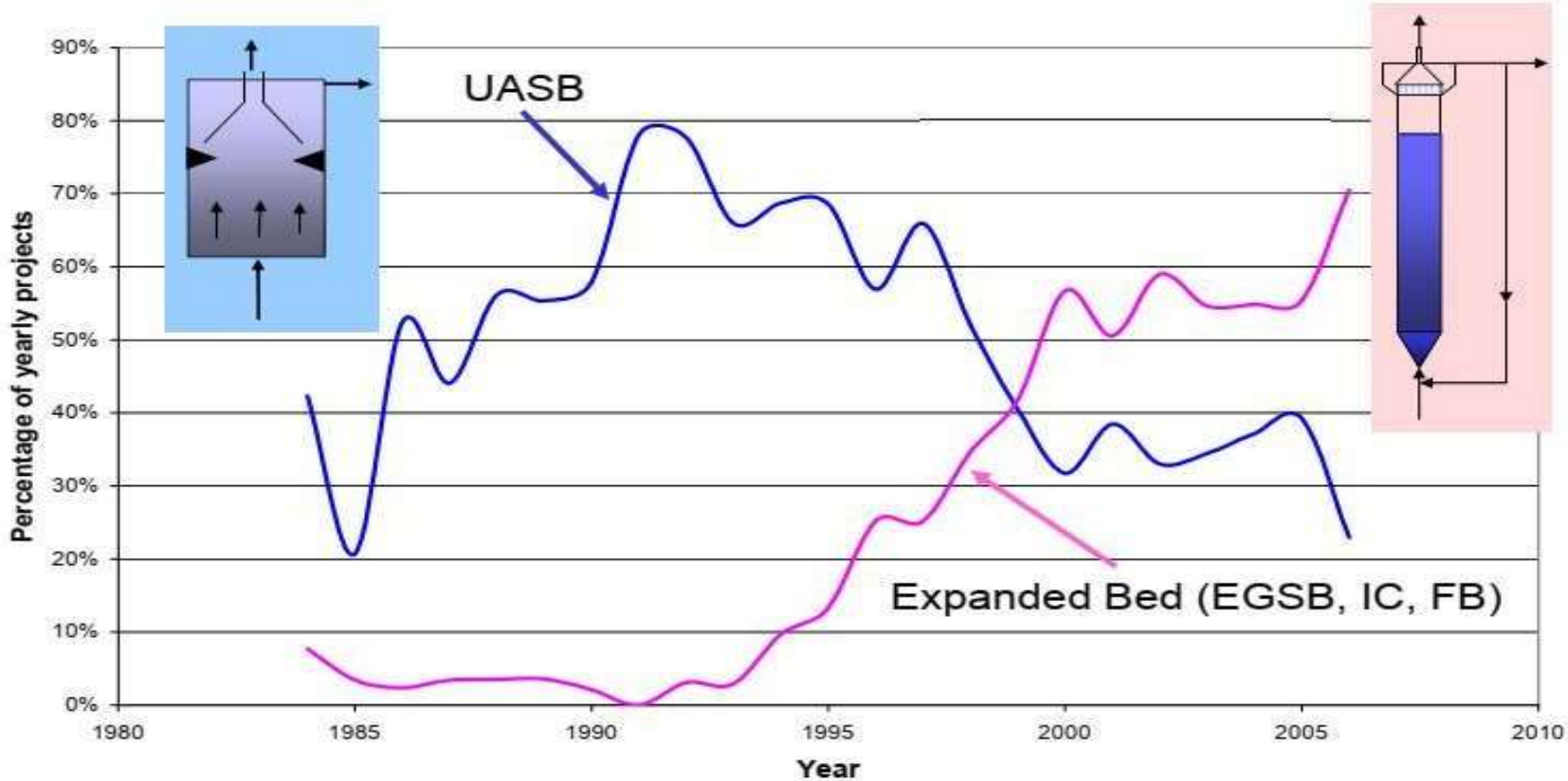
Full Scale Expanded Bed versus UASB Systems



Since Year 2000 more number of EGSB reactors are being constructed all over the world compared to UASB because EGSB reactors are found to be more efficient and cost effective too.

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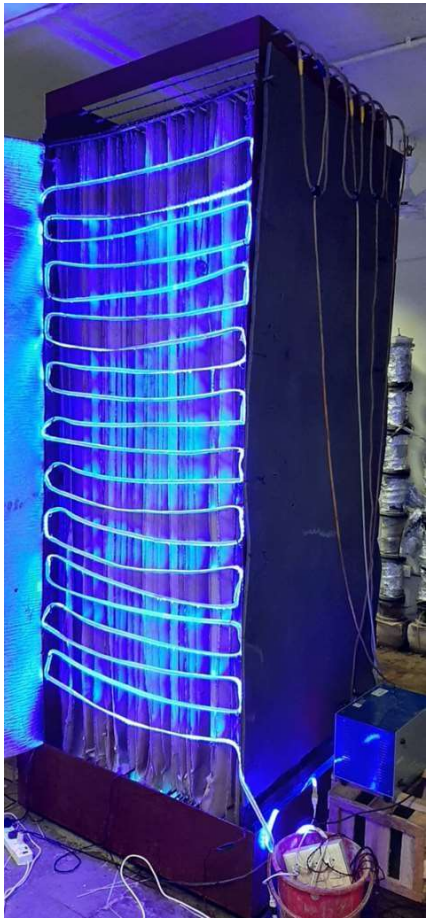
Algal Bacterial Tower

- Aerobic process to remove organic carbon (BOD) and nutrients
- Water is allowed to flow over a surface
- Works on natural aeration
- Algae performs photosynthesis, thereby, further adding dissolved oxygen in wastewater. Thus, algal bio-tower is more efficient than conventional bacteria-based bio-towers.
- Bio-towers are used to reduce the organic load on the subsequent main aerobic bioreactor so that the net aeration requirement in the latter is reduced.
- Particular design of the proposed bio-tower minimizes the clogging issues that are frequently encountered in conventional bio-towers



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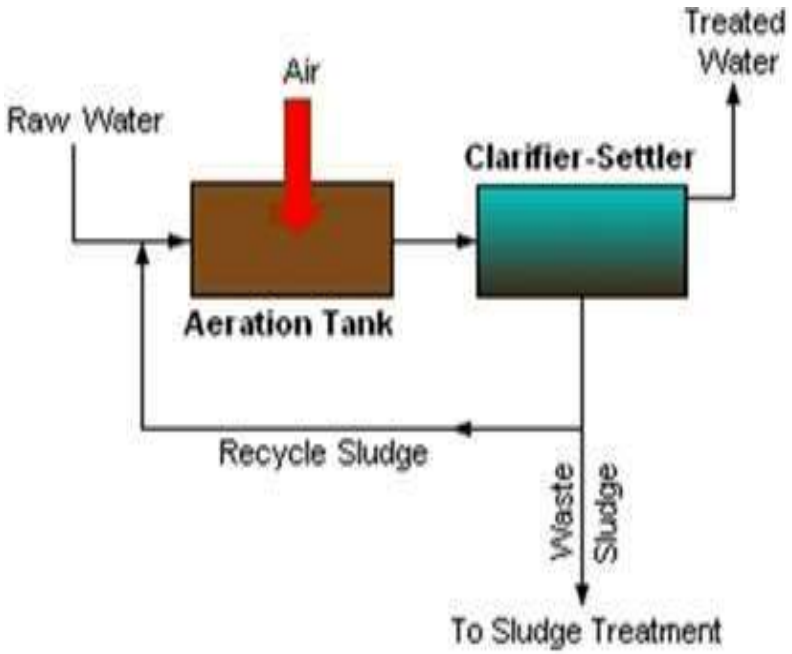
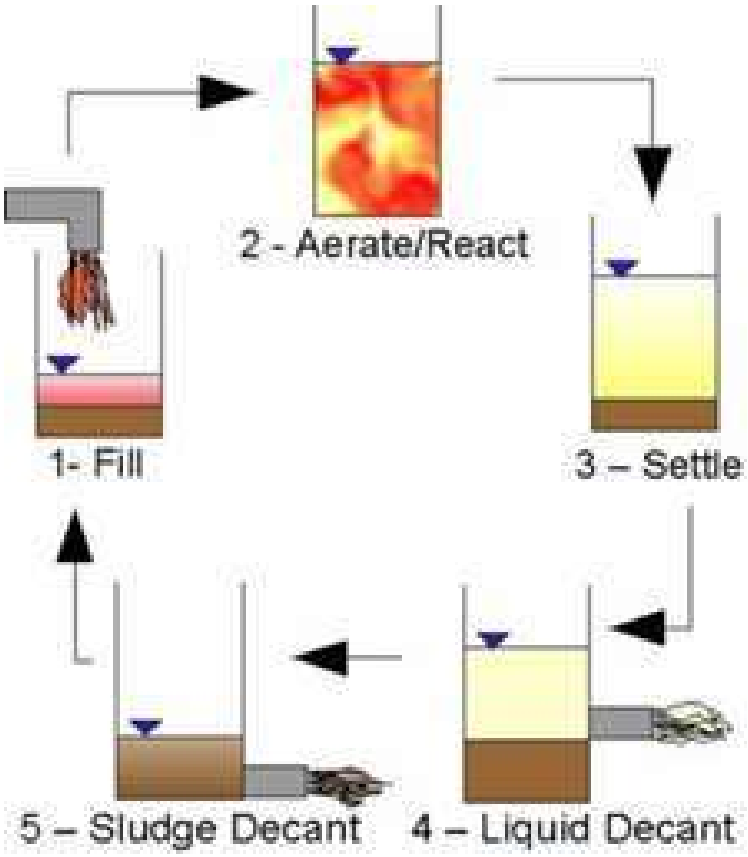
Sequential Batch Reactor (SBR)





- Conventional Activated Sludge Process

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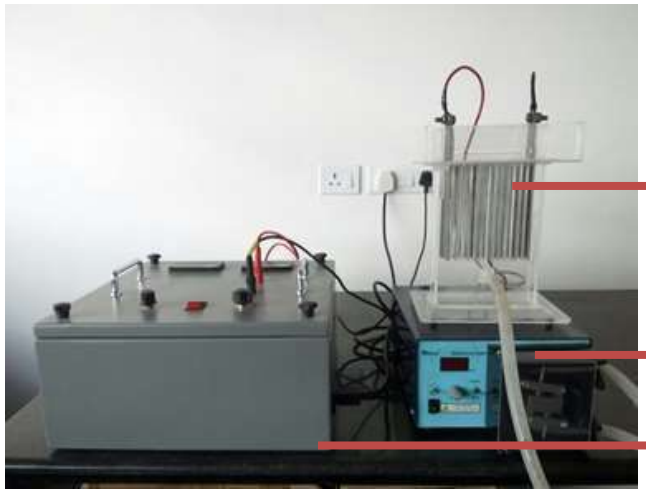
(CBME)Continuous Bipolar mode Electro-coagulation

Field-scale system



Bench-scale system

CBME Chamber

Peristaltic pump

DC-Power supply

- Used for removing recalcitrant pollutants which are difficult to degrade biologically
- The sacrificial electrodes release Fe++ ions which are subsequently oxidized to $Fe(OH)_3$.
- Pollutants are removed following one or more of the following mechanisms – sweep coagulation, adsorption, precipitation, and passive oxidation.
- The process may be improved by introducing aeration/ozonation into the system

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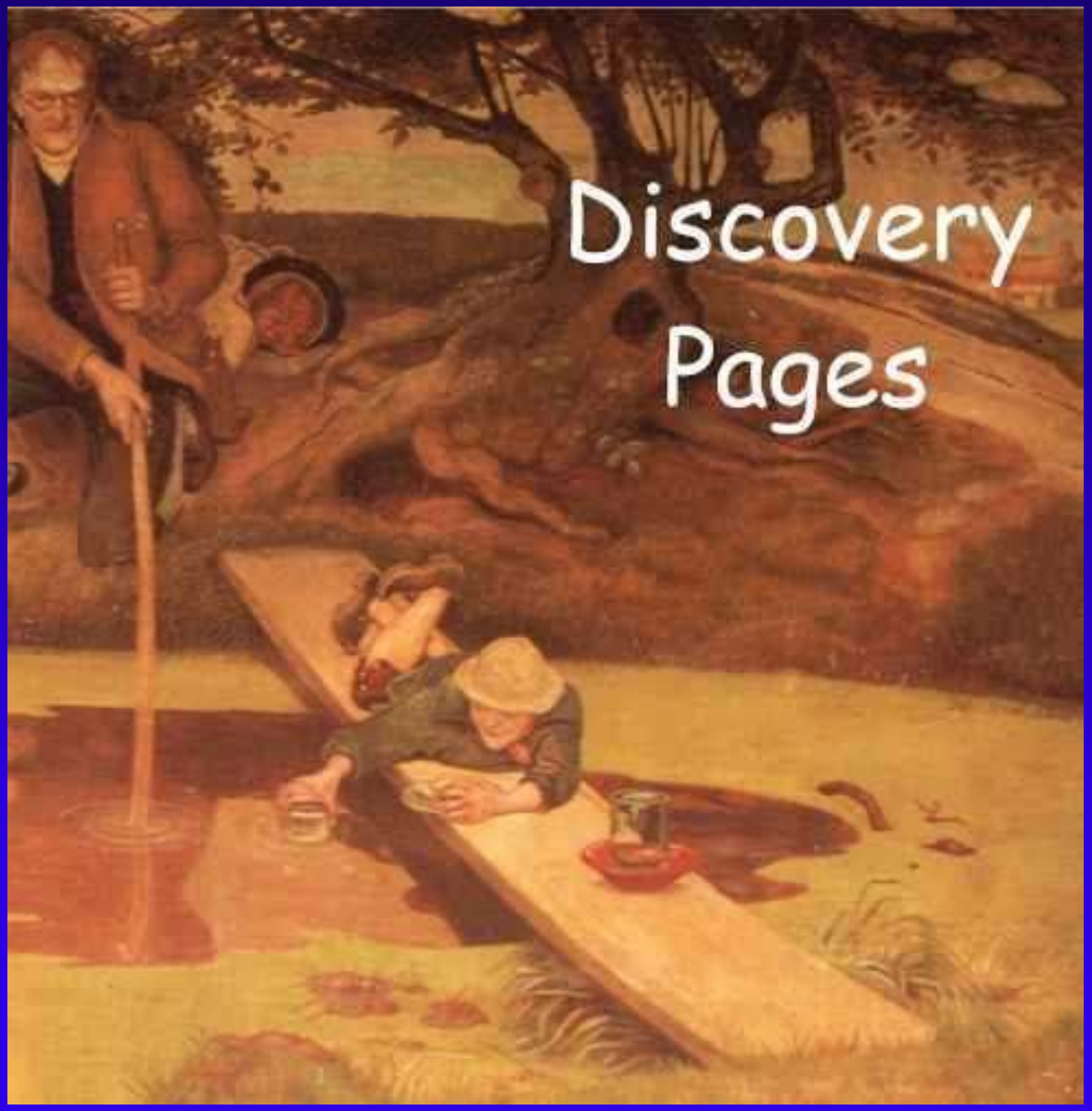
History of Anaerobic Digestion Technologies in India

- Indian parliamentary delegation visit Europe to study Distillery spent-wash treatment technologies in 1980
- Major Technologies imported in India :-

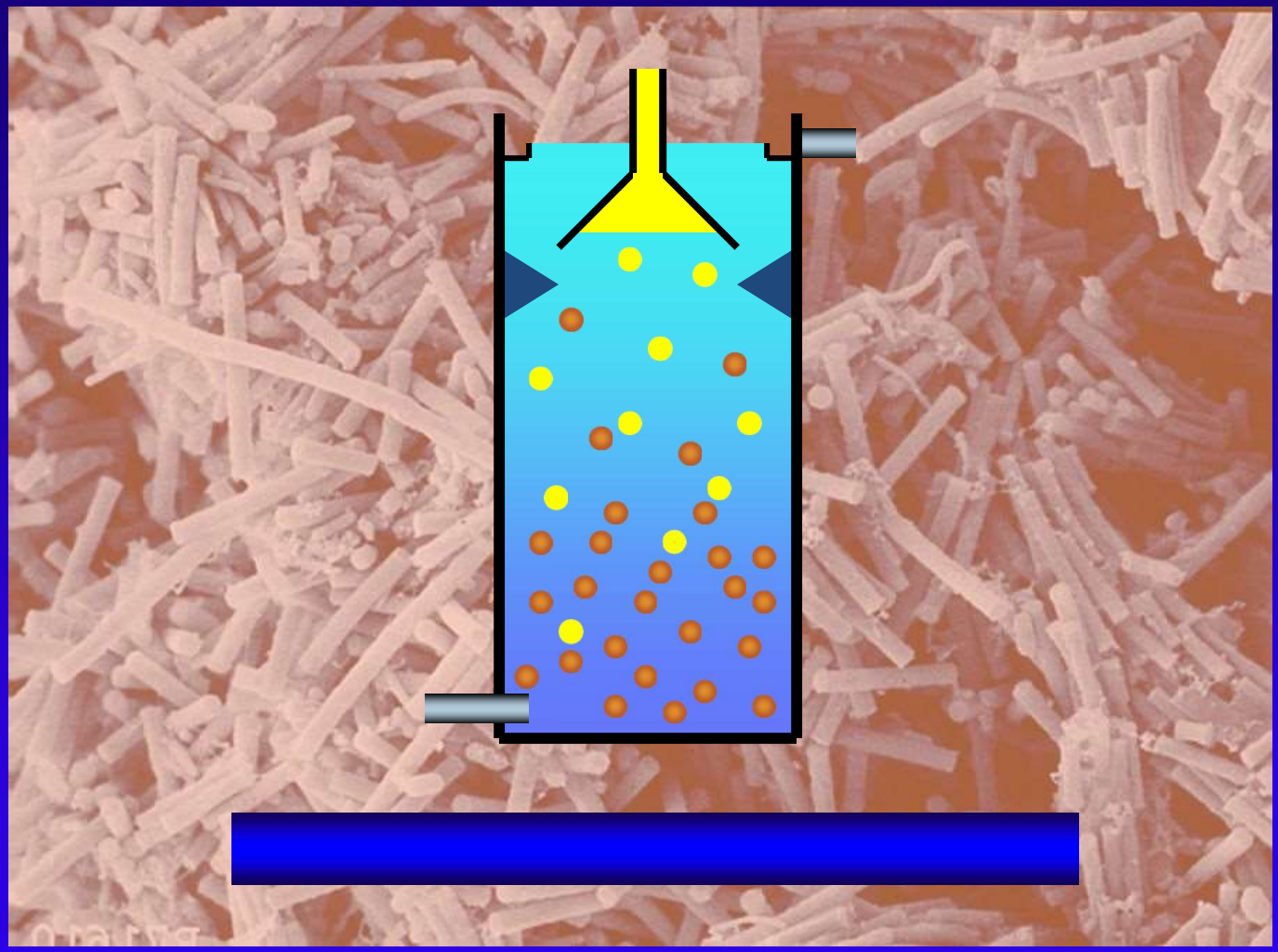
- UASB-Paques BV-M/s.Western Paques Ltd,Pune
- Media Based –Structured Media-Bacardi Tecnology
- Media Based –Random Media-SGN,France
- Bi Phasic-Degremont-Degremont India Ltd
- CSTR-Sulzer Brothers,Switzerland,

CSTR Technology survived to be the Best Technology so far

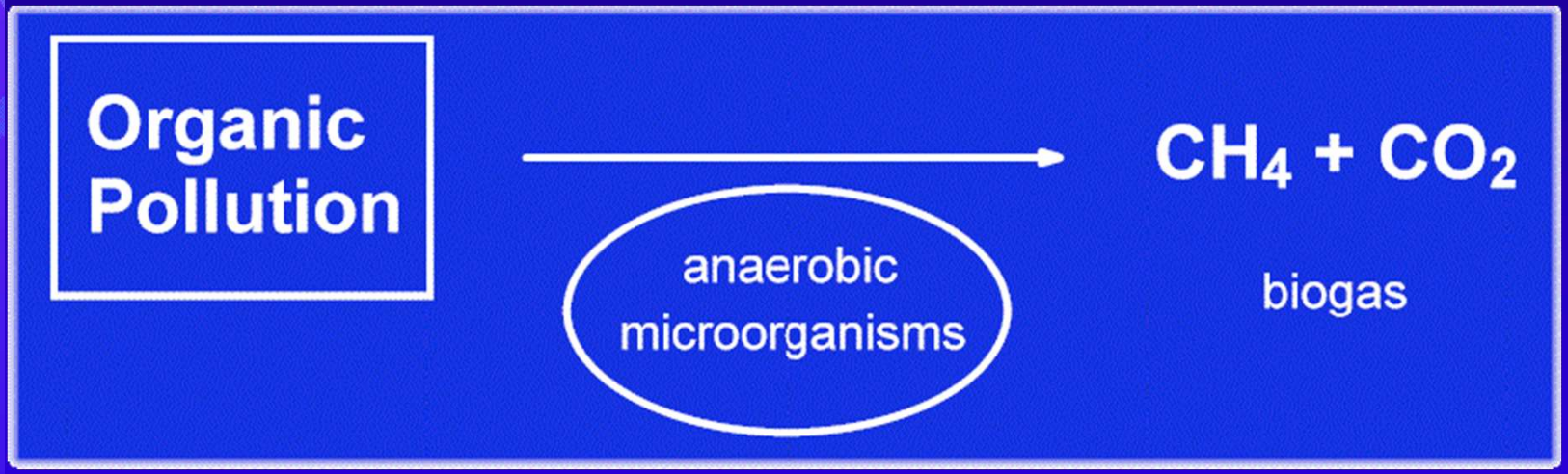
Marsh Gas



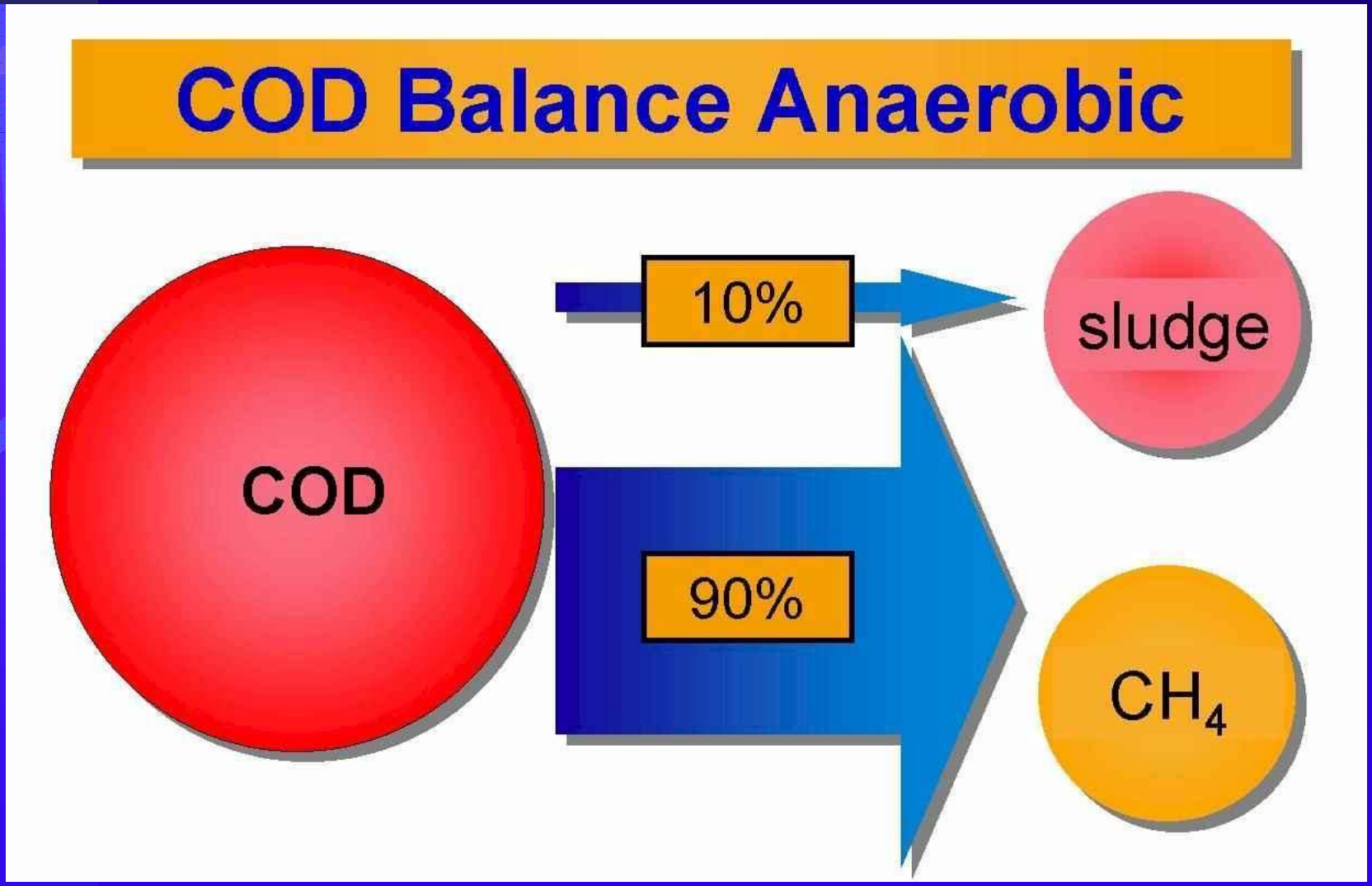
High Rate Anaerobic Wastewater Treatment



What is Anaerobic Biodegradation?

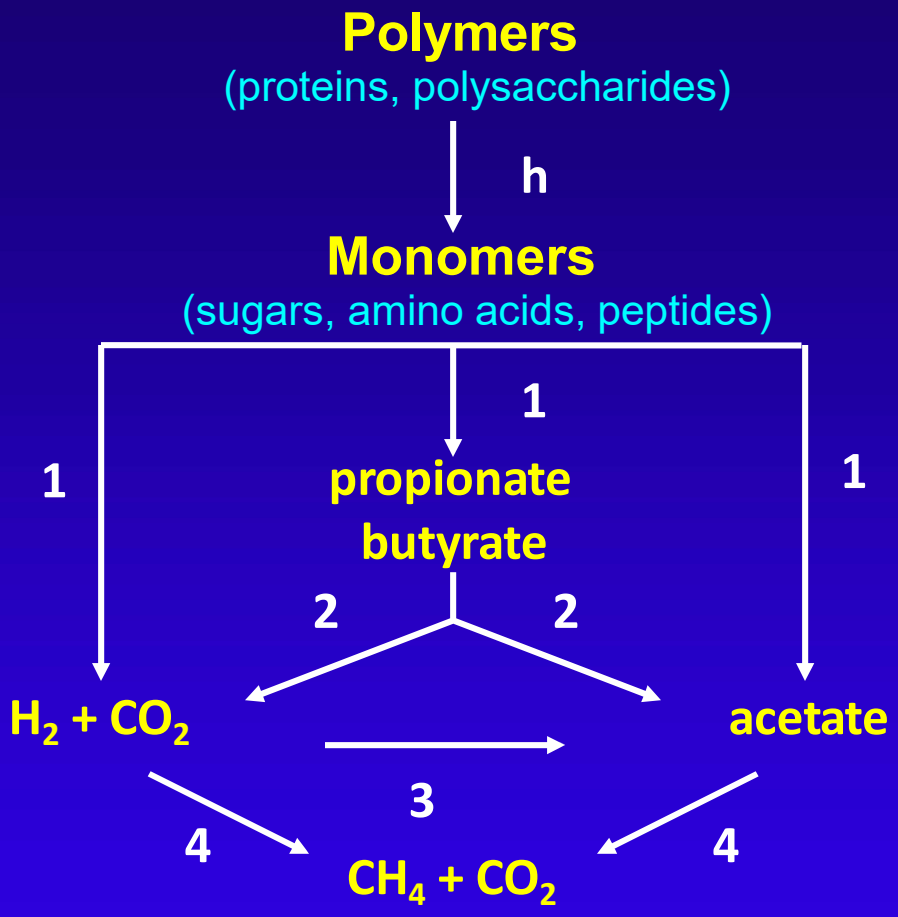


COD Balance Anaerobic Biodegradation



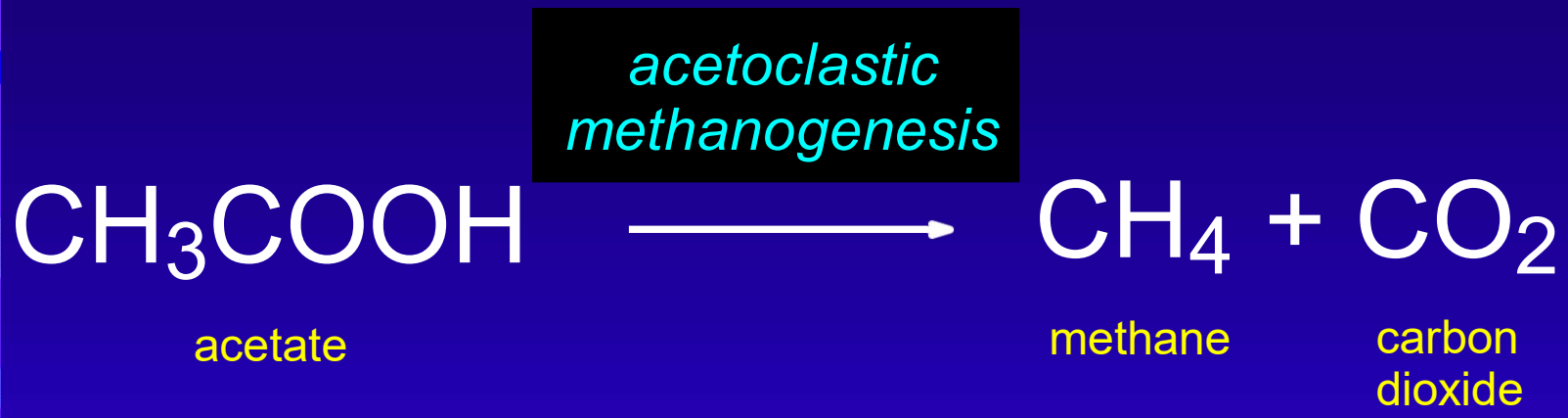
Overview Anaerobic Biodegradation

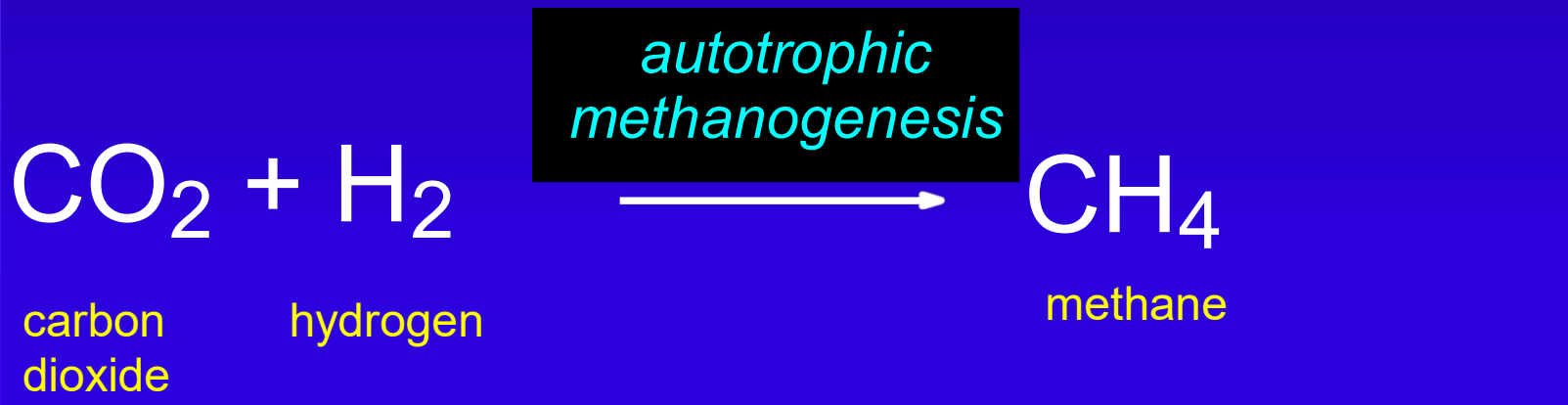
Methanogenic Consortium



h Hydrolytic enzymes
1 Fermentative bacteria
2 Syntrophic acetogenic bacteria
3 Homoacetogenic bacteria
4 Methanogens

Methanogenic Reactions



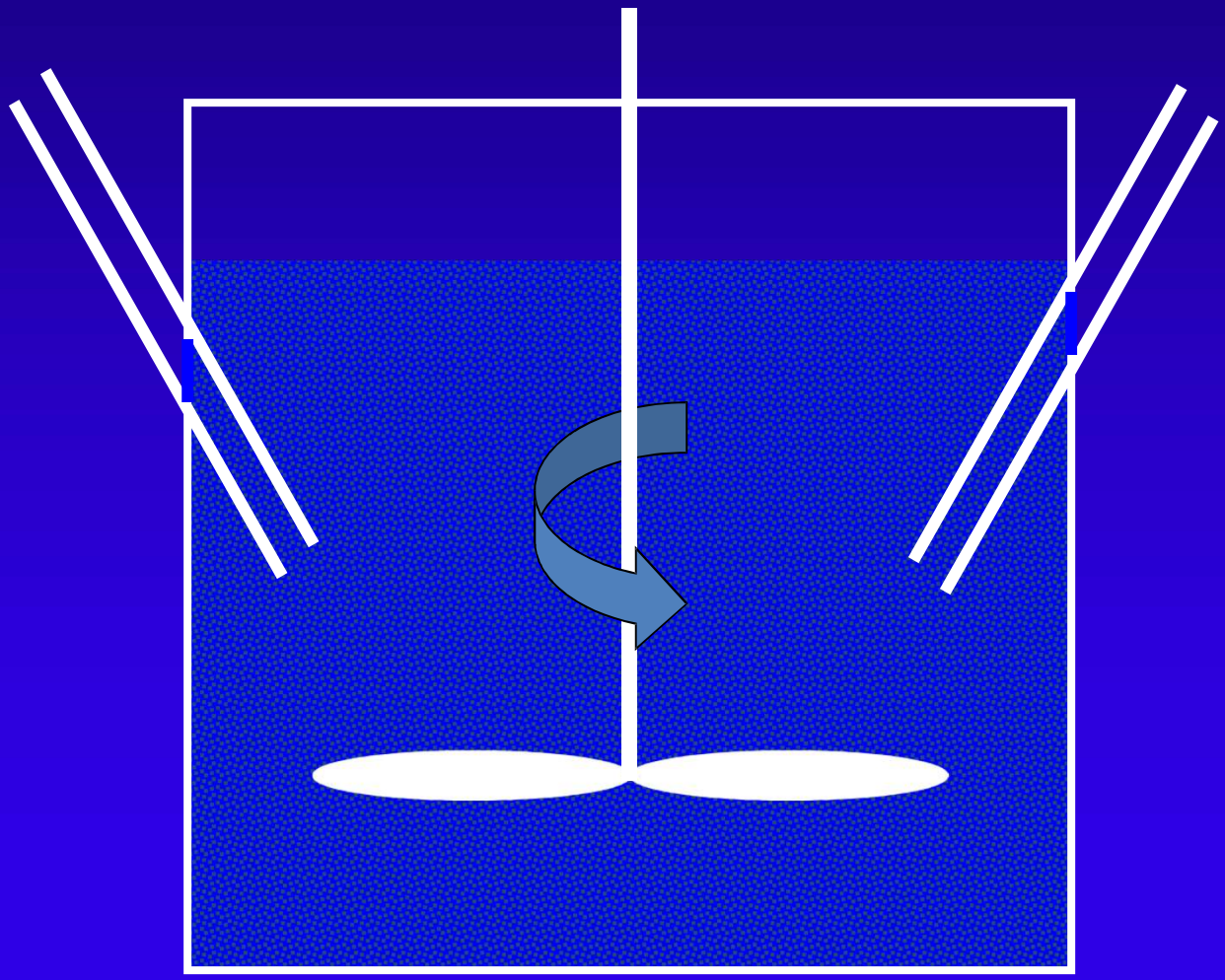


CSTR

Dilution Rate (1/HRT) Time < Growth Rate

Methanosaete (t_d =7 d), growth rate = $\ln(2)/t_d$ = 0.1 d^{-1}

so minimum HRT = 10 days

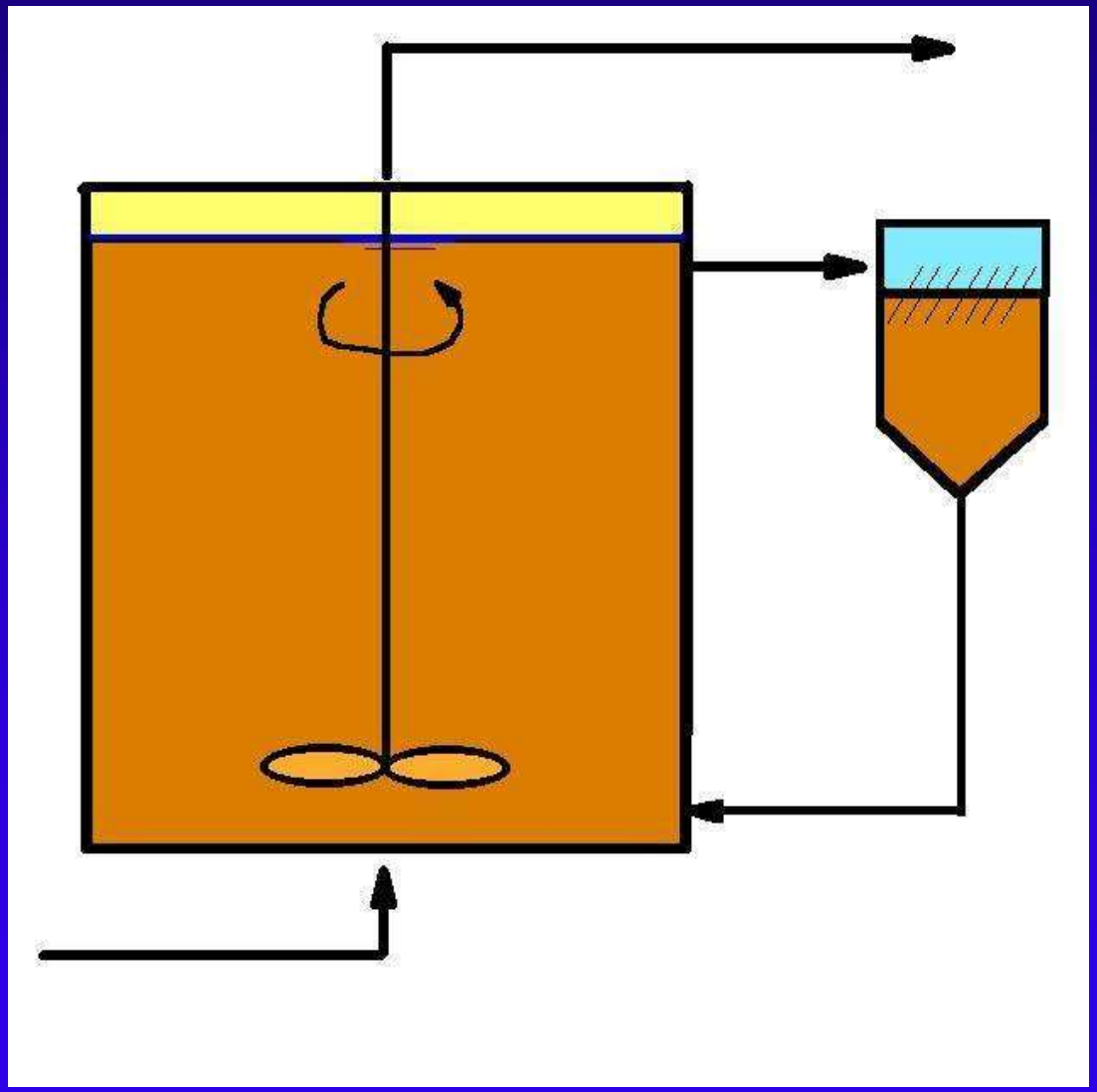


Recycle of Active Biomass

Dilution Rate (1/HRT) Time > Growth Rate

sludge retention time uncoupled from hydraulic retention time

Contact Process



Anaerobic Sludge Granules

Physical:

dense compact biofilms

high settleability (30-80 m/h)

high mechanical strength

Microbial:

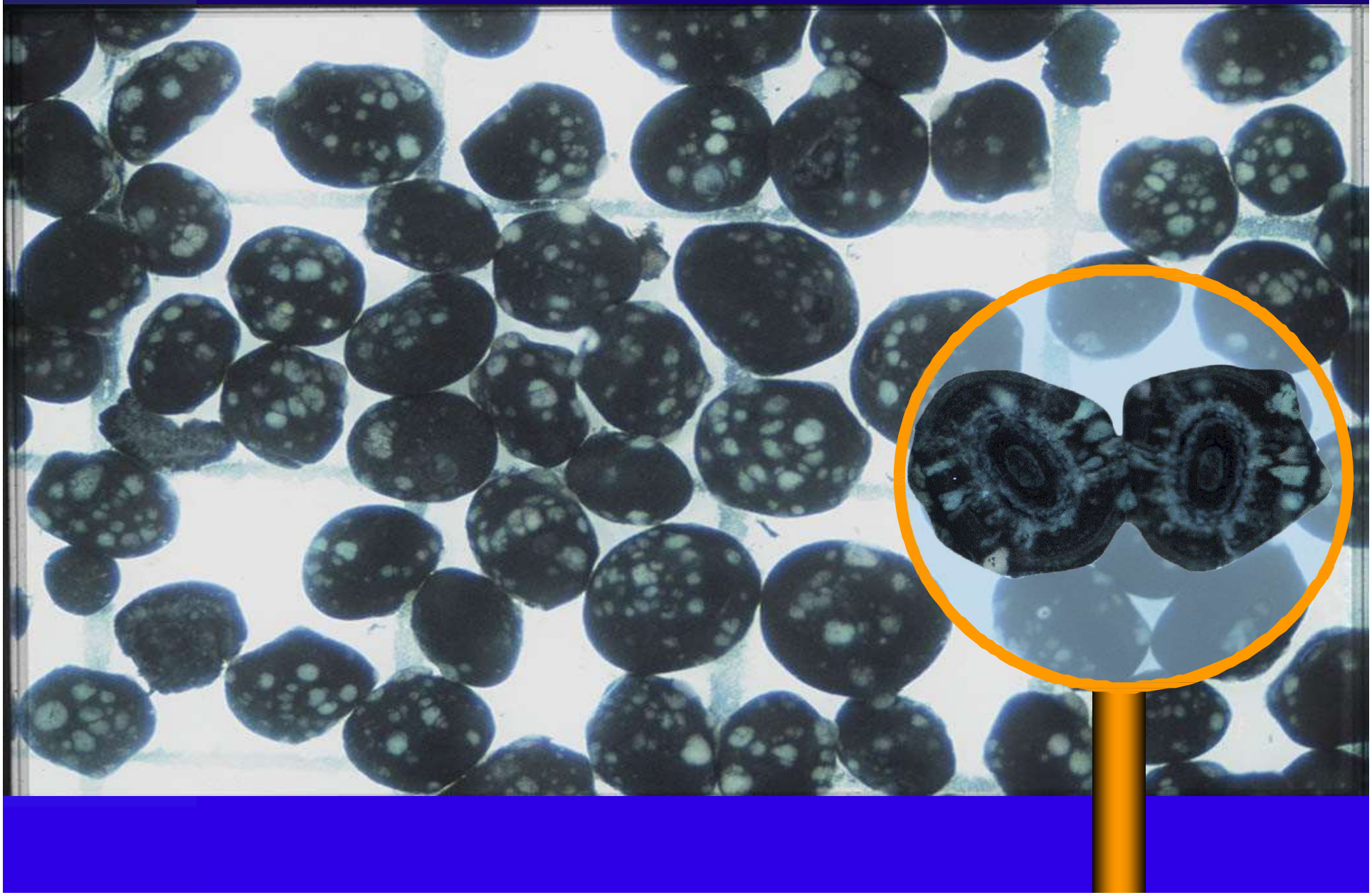
balanced microbial community

syntrophic partners closely associated

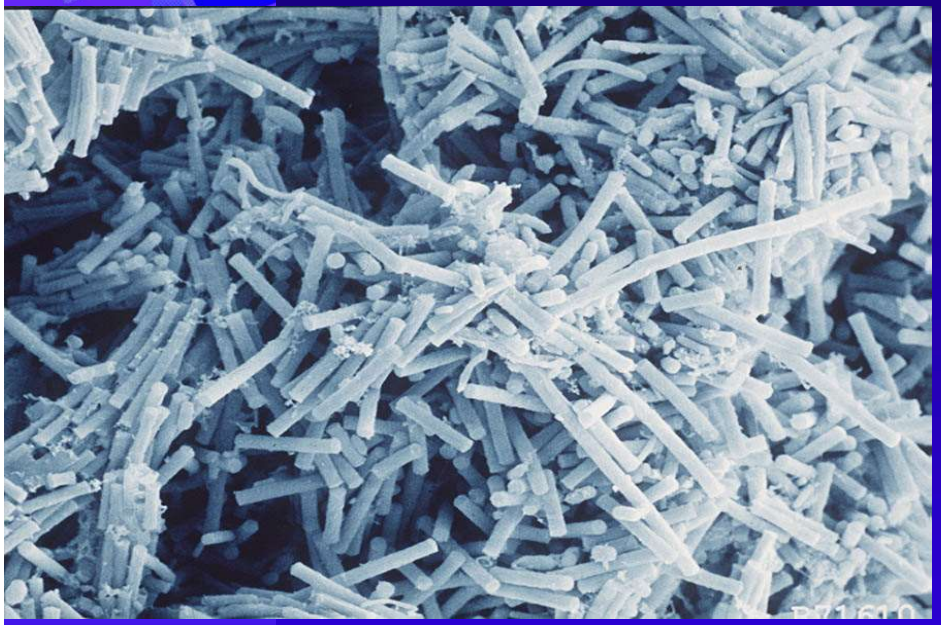
high methanogenic activity
(0.5 to 2.0 g COD/g VSS.d)

protection from toxic shock

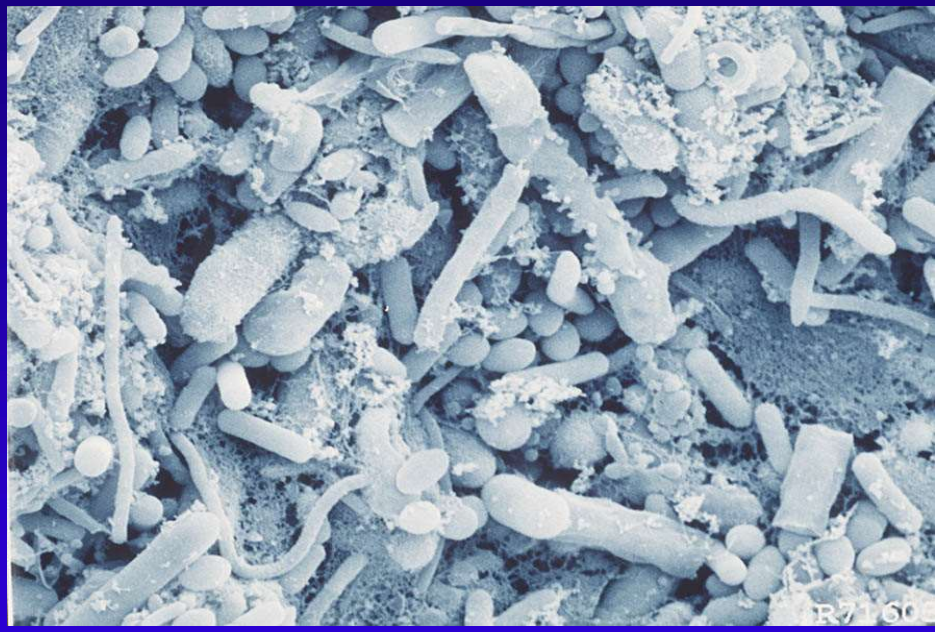
Anaerobic Sludge Granules (close up)



Anaerobic Sludge Granules (SEM)



Acetate as Substrate
(*Methanosaeta*)



Sucrose as Substrate
(mixed culture)

Anaerobic Sludge Granules (settling)

granular flocculent dispersed

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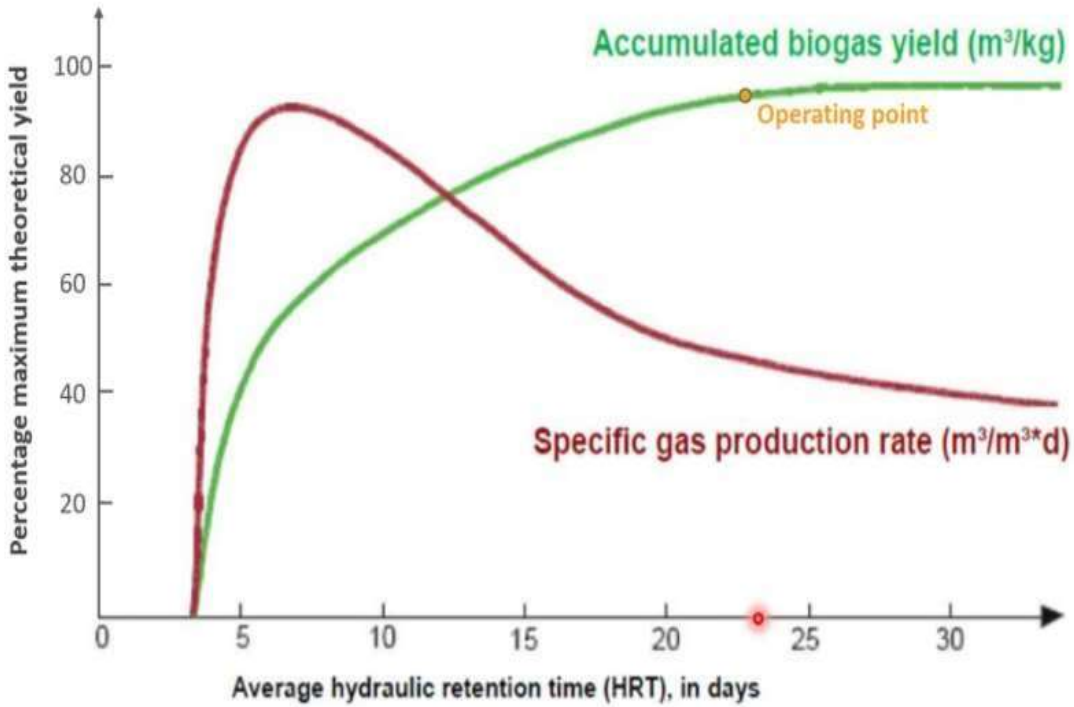
Click to save a picture to your desktop.

Theoretical Biogas production



Source: SlidePlayer

www.biogas-india.com

Intrinsic Buffer system in digester

Common Buffer Reactions

a. $CO_2 + H_2O <-> H_2CO_3 <->$

$HCO_3^- + H^+ <-> CO_3^{2-} + 2H^+$

b. $NH_4^+ <-> NH_3 + H^+$

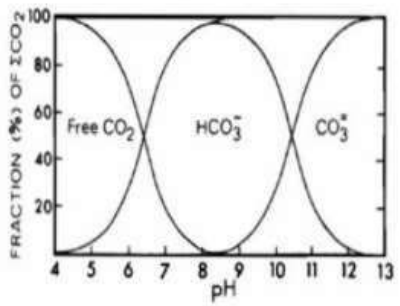
c. $CH_3COOH <-> CH_3COO^- + H^+$

The bicarbonate buffer system

$Pk_a = 6.7$ $Pk_a = 10.3$

$$CO_2 + H_2O \leftrightarrow H_2CO_3 \leftrightarrow H^+ + HCO_3^- \leftrightarrow 2H^+ + CO_3^{2-}$$

pH



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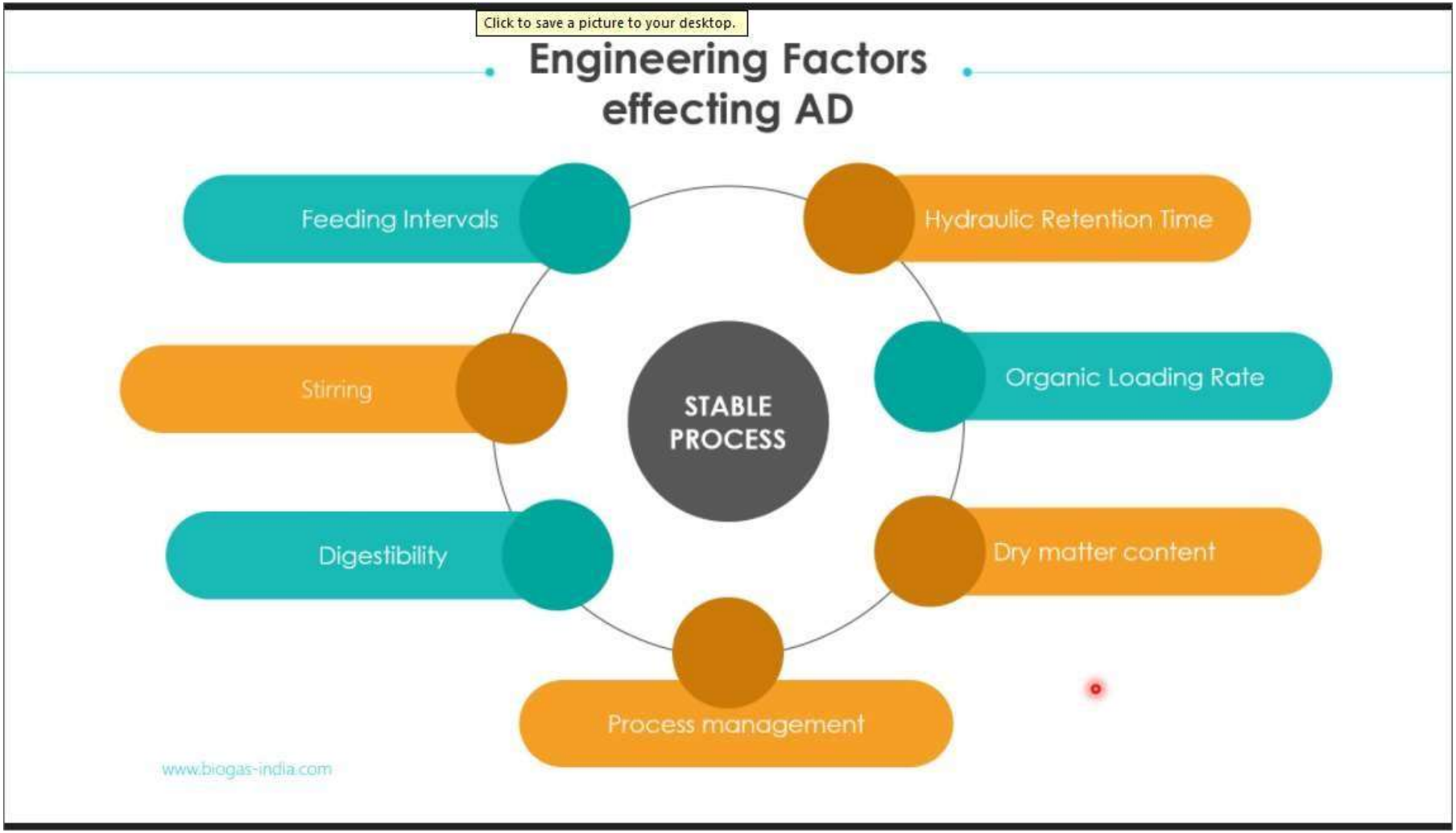

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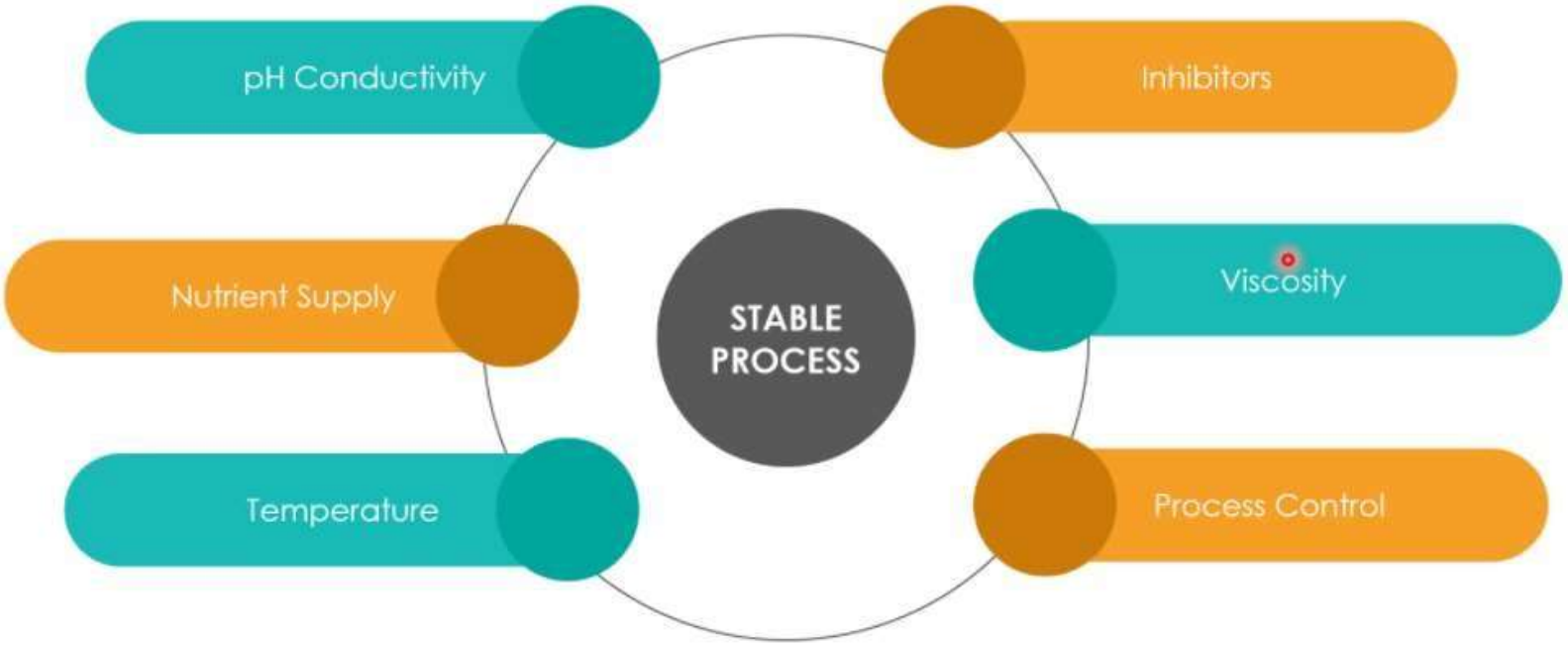
Process Factors effecting AD



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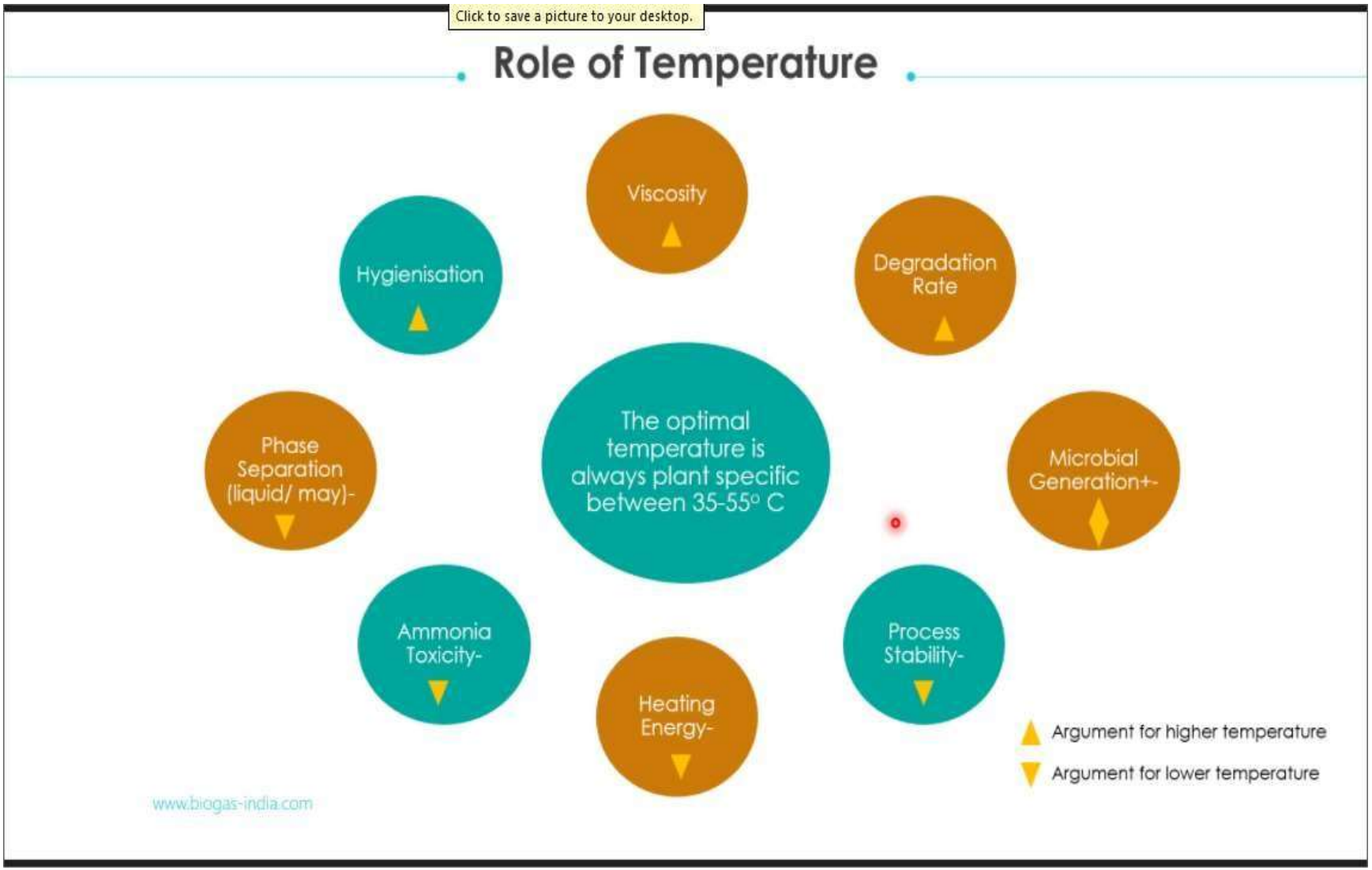

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Case Study -1 : A project In India

Industry : Marigold Flower Processing Industry

Synthite Industries Ltd
Harihar, Karnataka , India

Tagetes Erecta
Marigold Flower

Lutein Powder extract from Marigold Flower

Uses of Marigold Lutein :
1.Pharmaceutical
2.Dietary Supplement
3.Pet Food
4.Animal & Fish Feed

International Price :
US Dollar 500 / Kg
(INR 37,000/Kg) approx.

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A Make in India product earning high foreign exchange for the country
encounters major Challenge
EFFLUENT TREATMENT

RAW EFFLUENT CHARACTERISTICS

SN	Parameters	Unit	Details/Value
1	Nature of effluent	-	Organic
2	Odor	-	Floral
3	Color	-	Dark yellow to Dark brown
4	pH	-	3.5 – 4.0
5	TSS	ppm	2000 -2500
6	TDS	ppm	14000-22000
7	COD	ppm	45000 – 55000
8	BOD	ppm	18000 – 23000

PRIMITIVE METHOD OF EFFLUENT TREATMENT : LAGOONS

Anaerobic Reactor Shell-2

Anaerobic Reactor Roof

Mounting of Central Agitator On Reactor Roof

PRE TREATMENT & PRIMARY TREATMENT STAGES

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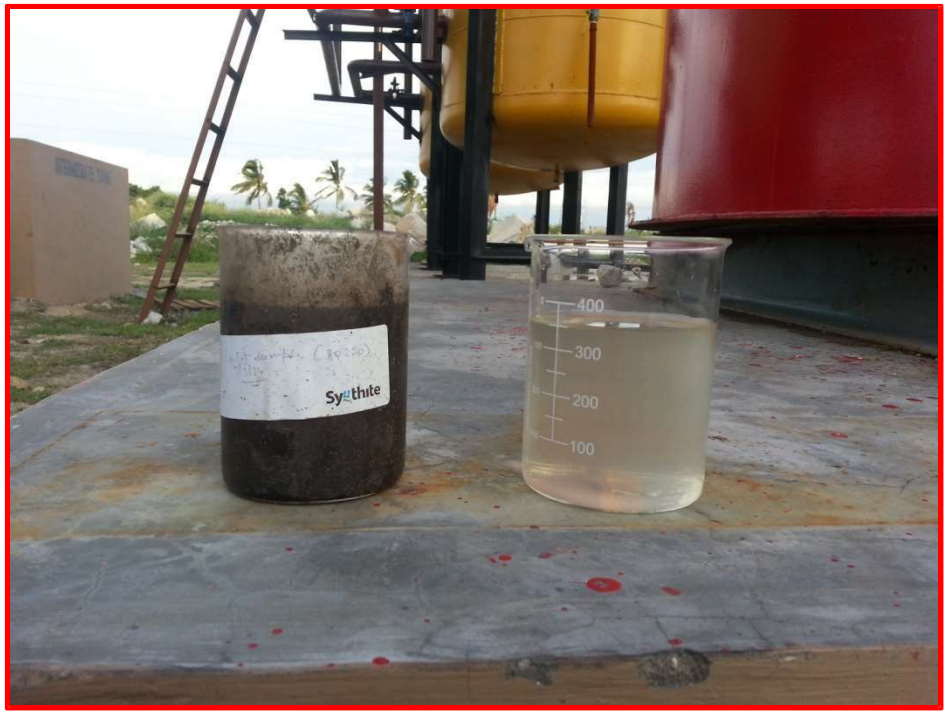
SECONDARY & TERTIARY TREATMENT STAGES



RAW & TREATED EFFLUENT SAMPLES
Location : Site

RAW & TREATED EFFLUENT SAMPLES
Location : Laboratory

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Case Study -2 : A project In Malaysia

Industry : PALM OIL MILL

Green & Smart Sdn Bhd
Kahang , Johor state , Malaysia

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What is Bio-CNG?

Purified Biogas is called Bio CNG

- Bio CNG is ***renewable Natural Gas***
- Bio CNG is exactly similar to Natural Gas in composition and properties
- It is a direct replacement of NG and for applications of LPG

Parameters	Biogas	Bio-CNG
Methane (v/v)	55-65%	92-98%
CO_2 (v/v)	35-45%	2-8%
H_2S (ppm)	500 – 30,000	<20 ppm
Moisture (deg C dew point)	Saturated	< -40 deg
Other Impurities (e.g. Siloxanes)	Present	Not present
Calorific Value (LCV)	~ 19500 kJ/kg	~ 52000 kJ/kg

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Bio-CNG vs LPG for cooking and heating

Parameter	Bio-CNG composition	LPG Composition	
Methane min.	90%	Propane (min)	95%
Moisture (max.)	5 ppm	Butane (max)	4%
Sulfur (max)	16 ppm	C5 and higher	2%
Oxygen (max)	0.50%	Sulfur (max)	5 ppm
CO_2 (max)	4.00%	Free water	None
Net Calorific value (kcal/kg)	11,200 - 11,500	Net Calorific value (kcal/kg)	11,200

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Drivers FOR BioCNG Projects :

- **Government of India has taken a decision to shift the country from the present fossil fuels base to Gas based Economy.**

- **In order to achieve this the Organic waste Biomass available in India to be harnessed to convert as BioCNG to an extent of 15 million tonnes by 2030, enough to reduce the country's CNG import bill by 40 per cent.**

- **Government of India has set a target of setting up 5000 plants to produce CBG by 2030**

Government has mandated all Public sector / private sector Oil Marketing companies to compulsorily ensure at least 1% of sales of CNG per year to come from CBG starting from FY 2025-26 and incrementally increased to 5% within 5 years.

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ENABLERS FOR BioCNG Projects :

- **Inclusion of BioCNG projects under priority sector lending by RBI**

- **Central Financial Assistance from Ministry of New & Renewable Energy . Subsidy available – Rs.4.0 Crore for 4.8MT/Day.(Max Cap – Rs.10 Crore)**

- **Ministry of Agriculture and Farmers Welfare has issued FCO (Fertliser Control Order) Dated 13th July 2020 approving the Fermented Organic Manure as a Fertilizer.**

MDA(Market Development Assistance) of Rs.1500/MT of FOM is implemented by Government of India.

Capital Subsidy of Rs.1.0 Crore announced for Harvesting equipment used in sourcing feedstock for Compressed Biogas Plants.

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Various Feed Stock : Theoretical yield of Biogas

SN	FeedStock	Biogas Yield	Unit
1	Pressmud	95.0	Cu.m Per MT
2	Maize Silage	195.0	Cu.m Per MT
3	Napier Grass Silage	155.0	Cu.m Per MT
4	Organic Fraction of MSW	90.0	Cu.m Per MT
5	Pig Slurry	40.0	Cu.m Per MT
6	Cattle Slurry	50.0	Cu.m Per MT
7	Poultry Litter	90.0	Cu.m Per MT
8	Wheat Straw	140.0	Cu.m Per MT
9	Sewage	65.0	Cu.m Per MT
10	Potato Pulp	120.0	Cu.m Per MT

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Super Napier Grass or Pakchong-1

It is a cross of ordinary Napier grass (Pennisetum purpureum) and pearl millet (Pennisetum glaucum).

This plant developed by the Thailand nutritionist Dr. Krailas Kiyothong.

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What is Special IN Super Napier Grass?

1) **Fast Growth:** It has the fastest growth of 10 feet in 59 days

2)**High Yield:** 25 tons per acre and 8 harvests per year. In other words, 200 tons per acre, which can feed 20 dairy cows, 30 - 35 goats for 12 months.

3)**Best Nutrition:** Presence of 16-18 % of the protein that is very important for the animal's particularly for dairy cows to produce more milk.

4)**All Weather Friendly Growth:** Dr. Krailas Kiyothong says that it is drought resistant and can grow any kind of location irrespective of the wet or dry season. The only need is the soil rich in organic matter that makes it perfectly suitable for the Indian subcontinent.

5)**Easy Storage:** This has water-soluble carbonate 18, which means no need to add additives to store this plant(silage).

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STEPS IN CBG PRODUCTION

- Feedstock pre-treatment
- Anaerobic Digestion
- Biogas purification to convert as BioCNG
- Compression , storage and dispensing
- FOM Processing

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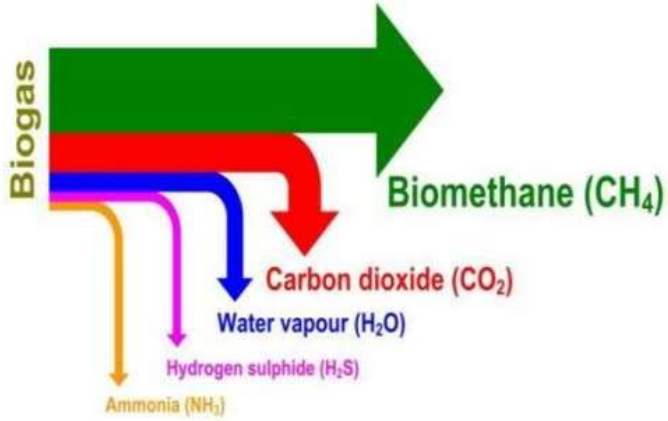
Raw Biogas Composition

Organic matter + anaerobic bacteria ---- CH_4 + CO_2 + H_2S+ NH_3 + other end products + energy



Biogas is a mixture of gases composed of following:

- Methane (CH_4) 40 - 70 % by volume,
- Carbon dioxide (CO_2) 30 – 60 % by volume,
- Other gases 1 – 5 % by volume including hydrogen (H_2) 0-1 % by volume and hydrogen sulphide (H_2S) 0 – 3 % by volume.

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Comparative Analysis:H2S Removal Technologies

Method	Efficiency	Cap Cost	O&M	Complexity
Biological Fixation	Moderate	Moderate	Low	Moderate
Iron chloride dosing	Moderate	Low	Moderate	Low
Water scrubbing	High	High	Moderate	High
Activated Carbon	High	High	Moderate	Moderate
Iron Hydroxide or Oxide	High	Moderate	Moderate	Moderate
Sodium Hydroxide	High	Moderate	High	Moderate

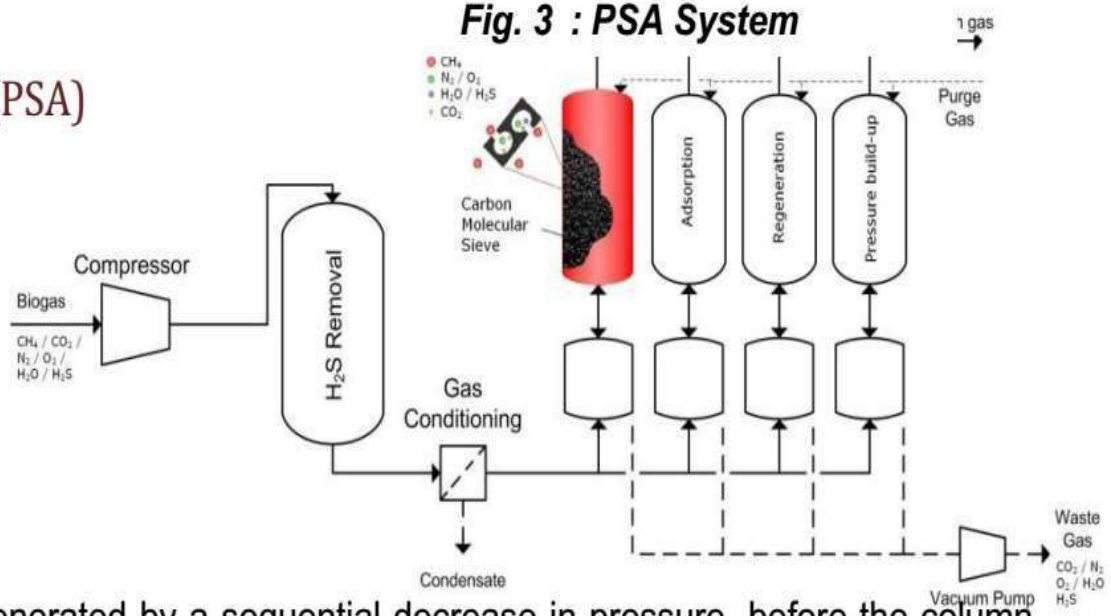
C02 Removal Technology:

1.PSA(Pressure Swing Adsorption)

- PRESSURE SWING ADSORPTION (PSA)

This technology is most prevalent for large bio-gas systems in India. With this technique, carbon dioxide is separated from the biogas by adsorption on a surface under elevated pressure. The adsorbing material,

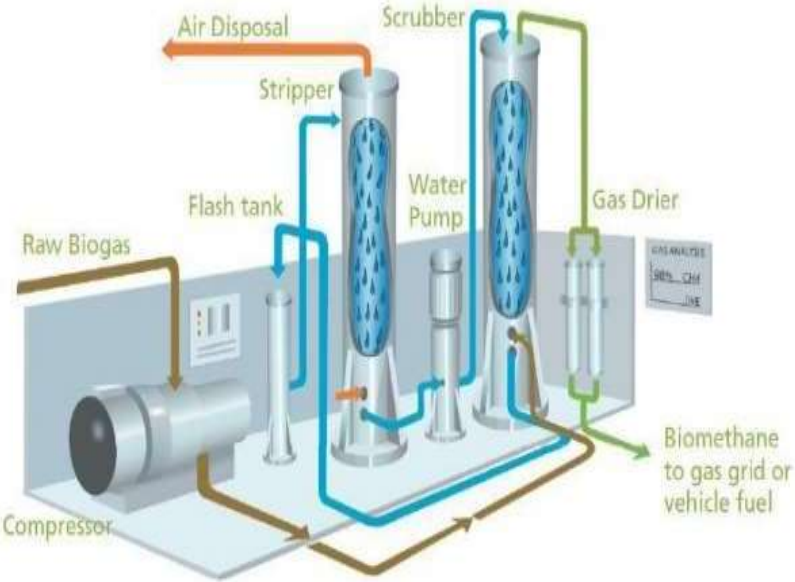
Fig. 3 : PSA System



usually activated carbon or zeolites, is regenerated by a sequential decrease in pressure before the column is reloaded again, hence the name of the technique. Hydrogen sulphide and water needs to be removed before the PSA-column. There is significant loss of methane (20-30%) in this process.

C02 Removal Technology:
2.Water Scrubbing

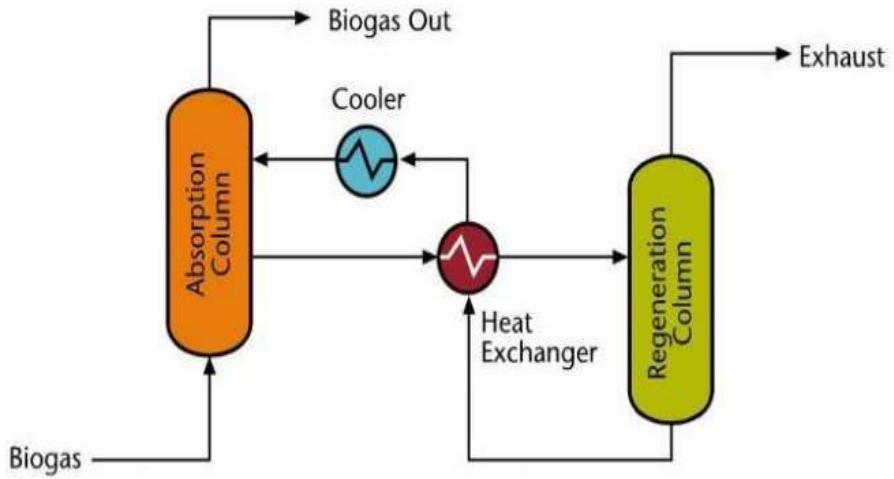
Carbon dioxide has a higher solubility in water than methane. Carbon dioxide will therefore be dissolved to a higher extent than methane, particularly at lower temperatures. In the scrubber column carbon dioxide is dissolved in the water, while the methane concentration in the gas phase. There are technologies available through which 97% purity of methane can be achieved with minimal (<5%) methane loss.



C02 Removal Technology:

3.Chemical Scrubbing :MonoEthylAmine

This is one of the best systems for bio-gas purification achieving 99.9% purity with negligible loss of methane. The systems are being extensively used in Germany for purification of bio-gas. Carbon dioxide is not only absorbed in the liquid, but also reacts chemically with the amine in the liquid. Since the chemical reaction is strongly selective, the methane loss might be as low as <0.1%.



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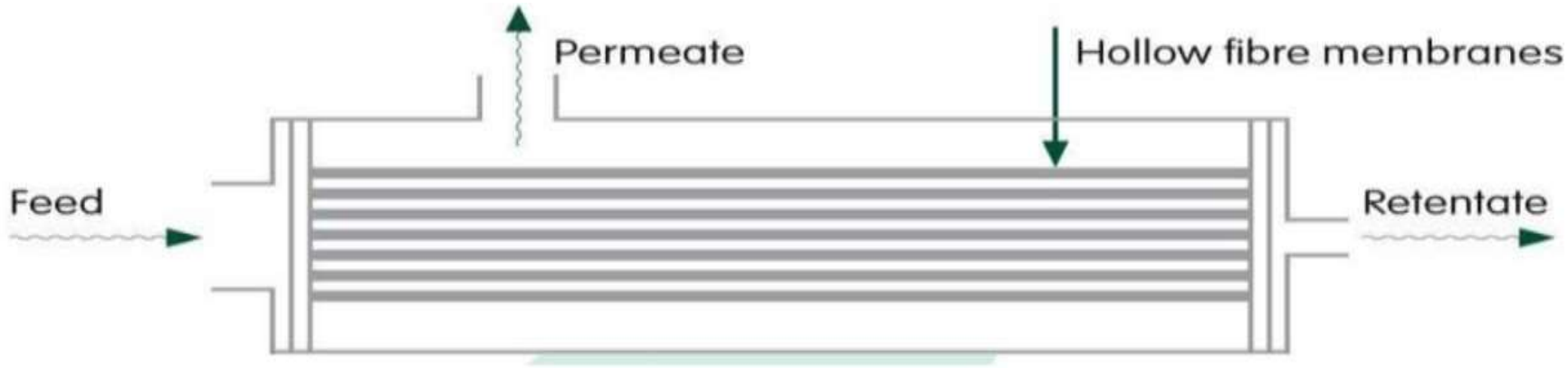
C02 Removal Technology:
4.Membrane Systems

Dry membranes for biogas upgrading are made of materials that are permeable to carbon dioxide, water and ammonia. Hydrogen sulphide, and oxygen permeate through the membrane to some extent while nitrogen and methane only pass to a very low extent. Usually membranes are in the form of hollow fibers bundled together.



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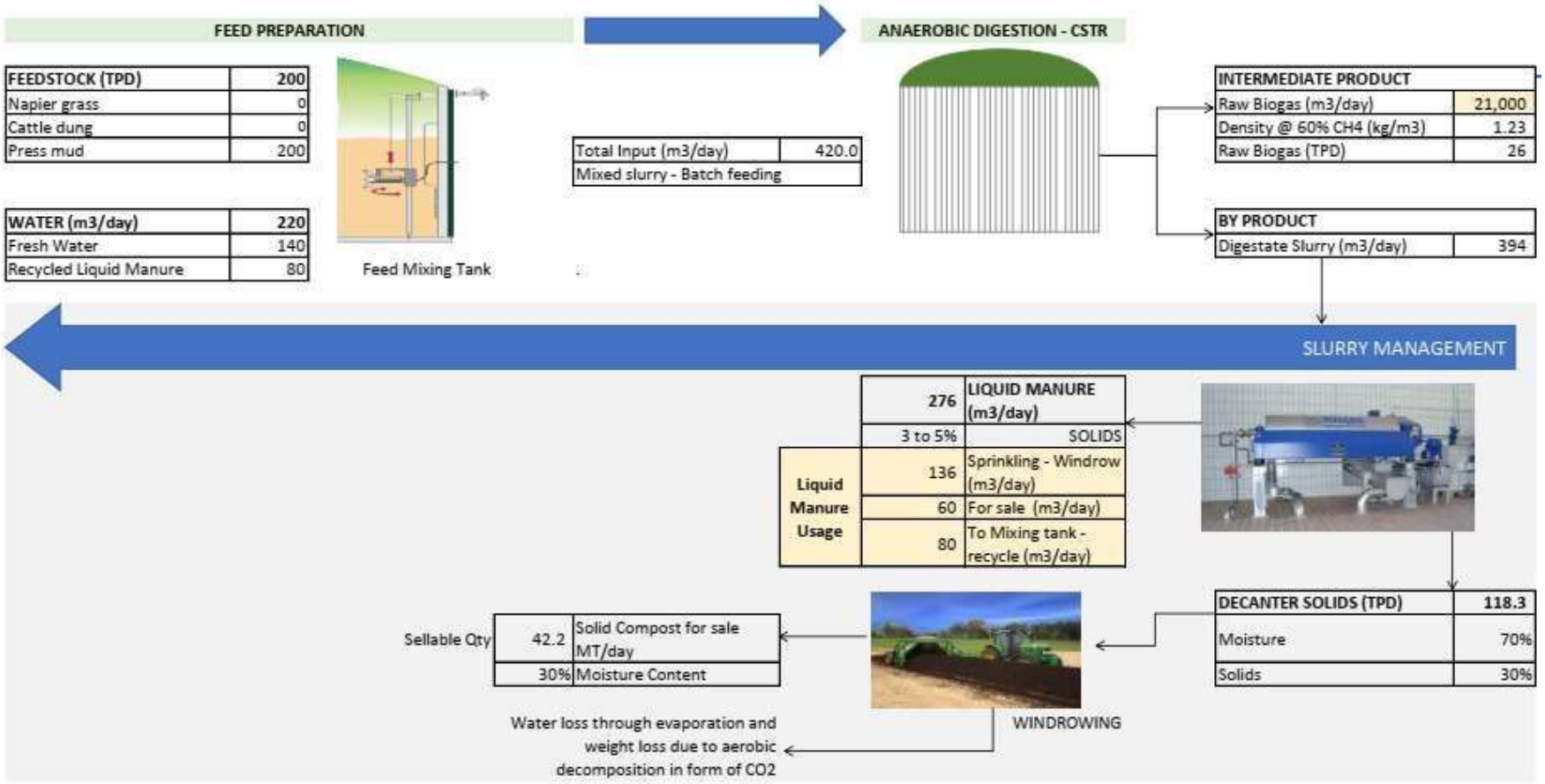
BIOGAS MASS AND WATER BALANCE DIAGRAM (INDICATIVE)



Pressmud / Napier Grass to Raw Biogas

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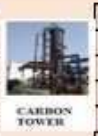
BIOGAS SCRUBBING & POLISHING

RAW BIOGAS	DATA
Quantity (m3/day)	21,000
Flow rate (m3/hr)	875
CH4 % (v/v)	55%
CO2 % (v/v)	41%
H2S ppm	3,000
Moisture	4.0%

SCRUBBED BIOGAS
21,000
875
55%
41%
200
4%

DRIED BIOGAS
20,160
840
57%
43%
200
2-3 ppm



POLISHED / SWEET BIOGAS
20,160
840
57%
38%
< 10 ppm
2-3 ppm

SULPHUR RECOVERY (from Scrubber)	
H2S Reduced (ppm)	2,800
Sulphure recoverd (kg/day)	65

Available for Sulphur recovery

BIOGAS UPGRADATION & CBG

CBG	DATA
Quantity (kg/day)	8,201
Flow rate (kg/hr)	342
CH4 % (v/v)	96.0%
CO2 % (v/v)	4.0%
H2S ppm	< 10
Moisture	Traces
Pressure (bara)	250
Dew point is -40 deg C	

FILLING STATION & BOTTLING

DATA	BIO- METHANE
11,550	Quantity (m3/day)
481	Flow rate (m3/hr)
96.0%	CH4 % (v/v)
4.0%	CO2 % (v/v)
< 10	H2S ppm
Traces	Moisture
12 to 16	Pressure (bara)
Dew point is -40 deg C	

DATA	BIO CO2
8,610	Quantity (m3/day)
359	Flow rate (m3/hr)
4%	CH4 % (v/v)
96%	CO2 % (v/v)
10 - 20	H2S ppm
2-3 ppm	Moisture

Raw Biogas to Compressed Biogas

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Pricing Framework of BioCNG

- The long term procurement price of CBG as per IS 16087: 2016 standards (**or its latest version**), compressed at 250 bar pressure and delivered to CGD Retail outlets in cascades shall be as under:

1. The procurement price of CBG will be based on the principle "The Retail Selling Price (RSP) of CBG in a market shall be at par with RSP of CNG (as provided by the authorized CGD entity)".
2. Rs. 54/Kg plus applicable GST shall be the minimum procurement price of CBG delivered at Retail Outlet situated at any distance (up to 75 km one way) as per IS 16087 2016 specification (**or its latest version**) and compressed at 250 bar pressure and delivered to OMC Retail Outlets in cascades w.e.f. from 01.06.2022. Further, the procurement price of CBG will vary as per the RSP of CNG.
3. The CBG procurement price shall be as per the following slabs, which will be the minimum procurement price of CBG delivered at Retail Outlet situated at any distance (up to 75 km one way) as per IS 16087 2016 specification (**or its latest version**) and compressed at 250 bar pressure. The slabs have been formulated starting from Rs.70.01/Kg with Rs.5 intervals. For markets where CNG is not available the CBG RSP shall be considered in lieu of CNG RSP.

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S No	Lower Retail Selling Price of CNG in Slab	Higher Retail Selling Price of CNG in Slab	Procurement price of CBG	Procurement price of CBG
	including tax	including tax	Without GST	With GST
	Rs./kg	Rs./kg	Rs./kg	Rs./kg
1	Upto 70		54.00	56.70
2	70.01	75.00	55.25	58.01
3	75.01	80.00	59.06	62.01
4	80.01	85.00	62.86	66.01
5	85.01	90.00	66.67	70.01
6	90.01	95.00	70.48	74.01
7	95.01	100.00	74.29	78.01

Note: For further populating the slabs beyond Rs.100/Kg same formula will be followed.

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CBG SALES

- Oil Marketing Companies under SATAT
- GAIL and CGD Companies
- Direct Retail under own brand
- Industries and commercial establishments

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BioCNG PROJECT- Capacity : 8 MT/DAY

- ✓ Annual Turnover –INR 25.79 Crores
- ✓ Capital Cost – INR 35 Crores
- ✓ Profit after Tax – INR 9.89 Crore
- ✓ DSCR-Avg Net – 2.39
- ✓ Payback – 2.27 Years
- ✓ IRR – 39%
- ✓ Capital Subsidy – INR 6.67 Crores

BioCNG Project: Financial Snapshot

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Composition of BioCNG for sale

IS 16087 : 2016 Standard		
S No.	**Characteristic**	**Requirement**
1	Methane percentage (CH_4), minimum	90.0 %
2	Only Carbon Dioxide percentage (CO_2),, maximum	4%
3	Carbon Dioxide (CO_2)+ Nitrogen (N_2)+ Oxygen (O_2) percentage maximum	10%
4	Oxygen (O_2) percentage maximum	0.5%
5	Total sulphur (including H_2S) mg/m^3, maximum	20 mg/m^3
6	Moisture mg/m^3, maximum	5 mg/m^3

Also as per the IS 16087:2016 specifications, the following shall also be met

i. CBG shall be free from liquids over the entire range of temperature and pressure encountered in storage and dispensing system

ii. The CBG shall be free from particulate matter such as dirt, dust, etc.

iii. CBG delivered shall be odorized similar to a level found in local distribution (ref. IS 15319)

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Transportation of Compressed BioCNG

TROLLEY MOUNTED

LORRY MOUNTED

BULK TRANSPORT

Description of FOM

One ton of slurry provides 44 kg of nutrients as compared to 19 kg through farmyard manure and 27 kg by compost. Micro nutrients such as zinc (Zn), copper (Cu) and manganese (Mn) present in the original material are also recovered in biogas slurry and can proved useful to crops when used as organic manure. The nutrient composition of slurry manure is shown in Table:

S. NO.	PARAMETER	AMOUNT
1.	Total Nitrogen (%)	1.40 – 1.84
2.	Total Phosphorous (%)	1.10 – 1.72
3.	Total Potash (%)	0.84 – 1.34
4.	Organic Carbon (%)	35.0 – 38.4
5.	Zinc (mg/kg)	103 – 116
6.	Copper (mg/kg)	51 – 68
7.	Manganese (mg/kg)	231 – 295
8.	Iron (mg/kg)	3200 – 3600
9.	Carbon / Nitrogen ratio	10 – 15
10.	Organic matter	65%

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LIST OF IMPORTANT & MAIN STATUTORY APPROVALS REQUIRED

Pre-Construction:

1. Obtaining Land Ownership Documents from Panchayat/Municipal/Revenue
2. Town & Country Planning – Change of Land Use OR NOC if exempted
3. Forest Department – NOC regarding the said land out of their jurisdiction
4. Pollution Control Board – Consent to Establish
5. PESO – Prior Approval
6. Town & Country Planning – Building Plan Approval
7. Fire Department – Provisional Fire NOC
8. Municipal Corporation – Permission for mining
9. Electricity Board – Temporary/Permanent Electrical Connection
10. Water Supply – Ground/Surface Water Extraction for construction
11. Labour Licenses & Insurance for construction

Pre-Operation:

1. Pollution Control Board – Consent to Operate
2. Fire Department – Final Approval
3. PESO – Final Approval
4. Electricity Board – Permanent Electrical Connection
5. Water Supply – Ground/Surface Water Extraction for Operation
6. Sewage Disposal related permissions
7. Factory Plan Approval / Registration / Completion
8. Labour related Licenses
9. Product Sale related Licenses (CBG / Fertilizer etc)

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FLOW OF ACTIVITIES FOR THE PROJECT :

•MOU between Developer & M/s.Kaashyap as Technical consultant for the project

•Application to be submitted as Expression of Interest attaching the above MOU to GAIL / Oil Marketing Companies

•Receipt of Letter of Intent from GAIL /Oil Marketing Companies confirming Long term purchase of BioCNG

•Entering into commercial contract with GAIL /Oil Marketing Companies

• DPR Preparation by M/s.Kaashyap and application for approvals from PCB , PESO etc

•Application to Bank under BioCNG Loan product and obtaining sanction Letter

•BioCNG Project execution by M/s.Kaashyap

•Launch of BioCNG Product for commercial sales

•Realization of subsidy from MNRE ; M/s.Kaashyap to facilitate with Technical support

•Operations & Maintenance by M/s. Kaashyap

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