



# BIOGAS FORUM INDIA (BigFIN)

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Bio-CNG Filling in biogas fuelled passenger car at Enrichment and Bottling Laboratory, IIT Delhi



Prof. V.K. Vijay, IIT Delhi with Hon'ble Defence Minister Sh. Manohar Parrikar at Technology Day program in IIT Delhi celebrated by Unnat Bharat Abhiyan in association with Vijnana Bharati on May 11, 2016



National Training Programme on 'Biogas generation, enrichment and power generation technologies for all applications' 3-5 March, 2016 at BDTC, IIT Delhi

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From the Editor's desk...



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Biogas Forum India's (BigFIN) journey entered into 8th year with it's a lot of new beginnings and exchange of ideas. The motto of publication is to keep the BigFIN members updated with latest news about different segments of biogas research and development sectors and new initiative taken in the country. The year 2016 is a major landmark in bio-waste management technologies with a new challenge to keep our environment clean and green with Swachh Bharat Abhiyan. In the year 2015, BIS standard on bio-methane (Bio-CNG) revised to make at per CNG (BIS 16087) and gazette notification from Ministry of Road Transportation, Government of India about

permission to use Bio-CNG (Bio-methane) in transport vehicles.

Government is encouraging the production of organic manure from bio-waste under the capital investment subsidy scheme (CISS) of "National Mission for Sustainable Agriculture (NMSA)" programme. This startup will be a landmark in the field of waste management and turning waste into useful organic bio fertilizer for organic agriculture production system. The program is having the linkages with various government schemes to promote the initiative and enhancement of its adoption. The details about the program have been discussed in the newsletter.

The bio-digested slurry has not become so popular but recently it has attracted attention of everyone. Therefore, now a special focus is on utilization of bio-digested slurry as a natural fertilizer. This bio-digested slurry can be used directly to the agricultural field or used after enhancement and treatment techniques by value addition into it. Value addition in the digested material will definitely increase its nutrient value and market price. Further it ensures more secure and sustainable outlets for digestate products with potentially reduce the operating cost of the whole facility.

The "National Biogas Mission" proposal is also under consideration in MNRE and to be linked with Swachh Bharat Abhiyan, Ministry of Rural Development & Ministry of Agriculture & Farmer's Welfare.

I will appreciate your feedback and responses. There is need for young entrepreneurs in biogas.

**Virendra Kumar Vijay**  
**General Secretary, Biogas Forum-India (BigFIN)**

## **PRESIDENT'S COLUMN**

### **Increasing availability of 'Cooking Gas, Organic Fertilizer, Insecticide and Pesticide' through Re-vitalizing 'Biogas- Fertilizer Plants' in Villages and Small Towns through 'RESCO' Model**

Biogas-Fertilizer Plants are available in various capacities and sizes and capable of handling different loose, leafy, wet/ dry biomass wastes, animal dung, bird droppings and liquid biomass waste. It needs to be suitably re-engineered and fitted into a sustainable business model, so as to also meet the goal of 'Swachh Bharat Mission by treating such biomass wastes, reducing pollution and producing organic fertilizer and locally available gas as substitute/ supplement to LPG.

For treating every gram of suitable biomass wastes through biogas- fertilizer plants, addressing all types of potential users, rich or poor and households having biomass wastes or not having biomass waste both family size and medium size biogas- fertilizer plants are to be installed but operated, serviced and maintained by a highly decentralized 'Renewable Energy Service Company (RESCO)' model company. Ministry of New and Renewable Energy (MNRE) has to prepare and launch a Policy and Programme by merging and re-engineering existing provisions in different schemes of the govt. and providing 'Viability Gap Funding (VGF)' in association with other concerned Ministries, namely, Agriculture, Rural Development, Chemicals and Fertilizer, Petroleum and Natural Gas and Urban Development. The available provisions to include financial support for gas, fertilizer, waste treatment and pollution control in different schemes of said concerned Ministries and other organizations.

Surplus suitable biomass waste available after feeding family size plants (households having/ opting for such plants) and from those having no biogas- fertilizer plants are to be assessed and size of the plant is to be decided village by village and town by town. There is a potential of at least six lakh medium size biogas-fertilizer plants in the country, which can be installed in villages, small towns and semi-urban areas. MNRE did invite proposals for setting up 'Demonstration of Integrated Technology Package based on biogas-fertilizer plants' for meeting cooking energy needs in villages. It is to be restarted so that it becomes possible to supply gas through village based piped network connecting households through a medium size biogas-fertilizer plants in addition to gas supply through family size biogas plants. The bonus will be increasing availability of organic fertilizer, insecticide and pesticide, which will not be harmful to humans, animals, birds and nature as such. So biogas-fertilizer plants are many benefits in one solution. However, a rational funding and sustainability through govt support and commitment following PPSP (Public-Private-Society-Partnership) model through RESCO route is a must. Incorporating these concepts in '**Biogas/ Bio-energy-Fertilizer Mission**' will be useful.

**Dr. Atma Ram Shukla**

**President, Biogas Forum-India (BigFIN)**

## BIOGAS RELATED ARTICLES

### ❖ Bio-energy Insight

APRIL 26, 2016

#### Xylem launches biogas support system

**Xylem**, a water technology company, has launched a new biogas support system – the Flygt BIS 1 biogas support system - specially adapted for the wall-mounting of submersible mixers in biogas digesters.

“Biogas digesters have a sealed cover which means accessing the tank to change the mixer position is difficult,” said Eilert Balssen, market manager Biogas and Agriculture for Xylem. “The Flygt BIS-1 biogas support system enables operators to move the mixer on the guide bar from the outside of the tank.”

He added: “With the introduction of this equipment to complement our high efficiency biogas mixers, Xylem offers a complete biogas digester mixing system. This will ensure perfect fit and performance.”

As the number one supplier of biogas mixers globally, Xylem has deep application knowledge supported by academic research, enabling its advanced mixing system to fulfil all mixing demands, while ensuring an optimal digestion process and maximising gas production.

“Suitable for use with ‘new-build’ and existing biogas digesters, Xylem’s Flygt BIS-1 biogas support system is corrosion and abrasion resistant. The BIS-1 support system has been engineered to support biogas plant operators by keeping system downtime and maintenance costs at the minimum level,” said Balssen.

### ❖ Biogas Digestate Enhancement and Treatment Techniques

*(Courtesy: <http://blog.anaerobic-digestion.com/>)*

**Bio-digested slurry** is a nutrient-rich substance produced by anaerobic digestion that can be used as a fertiliser. It consists of left over indigestible material and dead micro-organisms - the volume of Bio-digested slurry will be around 90-95% of what was fed into the digester.

There has been very little research work done on Bio-digested slurry enhancement, when compared with other aspects of biogas production. However, 90 to 95% of the original feed material re-appears as Bio-digested slurry from the digester, and if the digester is running correctly the mass reduction is simply the mass of the biogas produced.

*The next frontier for **Anaerobic Digestion** will be the optimization of Bio-digested slurry by enhancement techniques, and treatment, to provide access for this material to much wider and more profitable markets.*

The key **objectives of Bio-digested slurry enhancement techniques** which were adopted for the study, are as follows:

- Increase the value of the Bio-digested slurry
- Create new markets for Bio-digested slurry products
- Reduce dependence on land application
- Ensure more secure and sustainable outlets for Bio-digested slurry products
- Potentially reduce the operating cost of the whole facility.

The **Bio-digested slurry enhancement techniques** were grouped into the following categories of Bio-digested slurry processing methods:

- **Physical:** Thickening by belt thickener equipment and by Centrifuge, dewatering by using a belt press, or centrifuge, or Dewatering using a hydro cell, or a Butcher press. Finally, dewatering by Electro-kinetics, and Purification by Ultra-filtration and Reverse Osmosis.
- **Biological:** Composting, Reed Beds, Biological Oxidation, Biofuel Production (Algae), Biofuel Production (liquor as process Bioethanol), Biofuel Production (hydrolysis of fibre to Bioethanol), or Microbial Fuel Cell.
- **Drying:** Drying by rotary drying, belt drier, J-Vap technology, or solar evaporation (e.g. scraped surface heat exchangers)

- **Conversion:** Conversion by incineration, gasification, wet air oxidation, or Pyrolysis
- **Chemical:** Struvite precipitation, Ammonia recovery (Stripping + Scrubbing), Ammonia recovery (Membrane Contactor), or Ammonia recovery (Ion Exchange), and finally the option of Acidification.

The above are all technologies which the study team identified that are either being applied to biogas Bio-digested slurry or have potential to be applied to Bio-digested slurry.

*“The current cost of installation, as well as the operational costs associated with the technologies the relatively low value of digestate products; and the associated cost of developing outlets or markets for digestate products.”*

❖ **Global Biogas Market to Reach 39,846 KTOE by 2023, Driven by Increasing Adoption of Natural Gas Vehicles.**

*Mar 22nd 2016*

***Global Biogas Market stood at 22,488.00 KTOE in 2014 and is likely to reach 39,845.58 KTOE by 2023, expanding at a CAGR of 6.56% between 2015 and 2023.***

*(Posted via [Industry Today](#). Follow us on Twitter [@IndustryToday](#))*

A research study on the [global biogas market](#), recently published by Transparency Market Research (TMR) estimates this market to expand at a CAGR of 6.56% over the period from 2015 to 2023. The market is expected to witness an increase in its production volume from 22,488 KTOE in 2014 to a 39,846 KTOE by the end of the forecast period. The research report is titled “Biogas Market - Global Industry Analysis, Size, Share, Growth Trends and Forecast 2015 - 2023.”

Biogas is a mixture of various gases produced by the diffusion of organic matters in the absence of oxygen. It consists of methane (40%-70%), carbon dioxide (30%-45%), and small portions of hydrogen sulfide, nitrogen, and siloxanes. It is used as a fuel for cooking, heating, as a vehicle fuel, and in the production of heat and electricity.

According to the report, the increasing emission of greenhouse gases is the key factor behind the rising demand for biogas across the world. In addition, the growing uptake of natural gas vehicles, worldwide, is likely to propel the global biogas market significantly during the forecast period.

The research report evaluates the global biogas market on the basis of application and the regional spread of this market. On the basis of the application, the report has segmented this market into heat and electricity, vehicle fuel, and other application.

In 2014, biogas found the maximum application for the production of heat and electricity, where the majority share of biogas produced in 2014 was consumed. The shifting focus of consumers across the world towards renewable sources of energy has fueled the demand for biogas in this segment. However, the application of biogas for the production of heat and electricity has been restricted by the need for high initial investment. The usage of biogas as a vehicle fuel and in other applications such as the supply to natural gas pipeline and for domestic purposes is likely to remarkably increase over the forecast period, notes the research study.

By its regional spread, the report segments the global biogas market into North America, Asia Pacific, Europe, and the Rest of the World. In terms of production volume, Europe held the leading position of the overall market in 2014 with a share of 60%.

Germany is leading the Europe biogas market with a repute of being the biggest producer of biogas across the world. The U.K. and France have also been exhibiting healthy growth in this market on account of the rising preference for clean energy sources among consumers. Analysts, however, anticipate the Asia Pacific biogas market to record the fastest growth in the overall biogas market during the forecast period, states the report.

Cryonorm BV, Vanzetti Engineering S.r.l., Swedish Biogas, Air Liquide Advanced Business & Technologies, Scandinavian Biogas Fuels, EnviTec Biogas AG, Wärtsilä Corp., Cryostar SAS, Gasrec Ltd., and Biofrigas Sweden AB are the major companies operating in the global biogas market, states the research study.

The global biogas market is segmented into:

By Application

- Electricity & Heat
- Vehicle Fuel
- Others

By Region

- North America
  - U.S.
  - Canada
- Europe
  - Germany
  - U.K.
  - France
  - Rest of Europe
- Asia Pacific
  - China
  - South Korea
  - Rest of Asia Pacific
- Rest of the World (RoW)
  - Brazil
  - Others

**❖ Sustainable GHG Friendly Transportation with Bio-CNG & TML CNG Vehicles with PMPML, Pune**

**Recent Bio-CNG (compressed & purified Biogas) + Pune Tata CNG City Bus Vehicle Trail.**

The following are the salient features of this trail to prove the theme by Pune Municipality: **“City Waste (via Bio-CNG) running City Transport (via CNG Bus)”**

- The Bio-CNG used for the vehicle trail was produced from Pune’s City Bio-Degradable Waste processed at the NEX’s Talegoan facility :<http://nobleexchangesolutions.com/index.html>
- The Bio-CNG was dispensed into the CNG bus’s onboard CNG cylinders to 100 Bar using pressure equalization method from ground cascades @ Max initial pressure of 150 Bar.
- With the dispended fuel, the Bus on Bio-CNG delivered a range of 151 Km @ a fuel Economy of 4.2 Km/Kg on a drive cycle (not standard) as per the city traffic driving conditions

- The engine temperatures as experienced by the driver were normal as with the regular CNG Engine.



Comparison of Existing Standards for CNG (15958 : 2012), Bio-CNG & Bio-Methane (16087 : 2015)						
Sl no	Characteristic	Limit	CNG Standard BIS : 15958	Bio-Methane @ Plant	Bio-Methane BIS : 16087	Units
1	Wobbe index	Min	48.8 - 51.0			MJ/ m <sup>3</sup>
2	Water content	Max	5		5	mg/m <sup>3</sup>
3	Hydrocarbons (volume percent of total organic carbon present)					
	a) Methane	Min	90		90	%
	b) Ethane	Max	6			%
	c) C3 and higher HC	Max	3			%
	d) C6 and higher HC	Max	0.5			%
4	Corrosive components					
	a) Total sulphur	Max	20		20	mg/m <sup>3</sup>
	b) Oxygen, volume percent	Max	0.5		0.5	%
	c) Carbon dioxide and nitrogen, volume percent	Max	3.5			%
	d) CO <sub>2</sub> + N <sub>2</sub> + O <sub>2</sub> , volume percent	Max			10	%
5	Other Species (Mole percent)					
	a) Hydrogen	Max	0.1			%
	b) Carbon Monoxide	Max	0.1			%
6	Methane number	Min	90			



❖ Success story of Biogas Plant installed by the LambraKangri Multipurpose Cooperative Service Society Ltd., Village – Lambra, P.O. – LambraKangri, District – Hoshiarpur, State – Punjab (INDIA) for the supply of biogas to different households.

**Details of the project :**

- Capacity of biogas plant = 100m<sup>3</sup>
- No. of families who are providing dung = 26
- Total No. of animals of these 26families = 175
- Daily dung collection (appx.) = 2500Kg.
- Average consumption of gas by one family = 1.5 m<sup>3</sup> – 2 m<sup>3</sup>
- At present No. of gas connections in operation = 20
- Work for providing remaining connections to other 35 – 40 houses is under progress



*Photographs for Inaugural Function for 100m<sup>3</sup> Biogas Plant installed by the Co-operative Society at Village – LambraKangri, District – Hoshiarpur, to supply biogas for 60 – 70 families for their cooking needs.*



**SOME INITIATIVES/ACTIVITIES HELD AT IIT DELHI DURING LAST 6 MONTHS**



*Mr. Leung Chun-Ying, Chief Executive of Hong Kong visited the biogas enrichment and bottling plant at IIT Delhi on 4th Feb 2016.*



*National Training Programme on 'Biogas generation, enrichment and power generation technologies for all applications' 3-5 March, 2016 at BDTC, IIT Delhi.*



*Lecture delivered on biogas production and its importance to Govt. Sr. Sec. school students, Sikkim on 30<sup>th</sup> May 2016.*



*Govt. Sr. Sec. school students, Sikkim visited the biogas enrichment and bottling plant at IIT Delhi on 30<sup>th</sup> May 2016.*



*Prof. V.K. Vijay, IIT Delhi in discussion on 'Energy saving and energy efficiency in line of BRICS nations' working group meeting on energy in India in Lok Manch Program, Visakhapatnam Loksabha TV on 4 July 2016.*



*Prof. V.K. Vijay, IIT Delhi in Vichar Vimarsh program on 'Jaivik Urja-Ek Vikalp' on DD Kisan channel on 17 June 2016.*

<https://www.youtube.com/watch?v=C9fDdHNSe nY>



*Prof. V.K. Vijay, IIT Delhi with Hon'ble Defence Minister Sh. Manohar Parrikar at Technology Day program in IIT Delhi celebrated by Unnat Bharat Abhiyan in association with Vijnana Bharati on May 11, 2016.*



*Prof. V.K. Vijay, IIT Delhi and Dr. Vijay P. Bhatkar, Chairman, Unnat Bharat Abhiyan with Hon'ble minister of Human Resource Development, Govt. Of India Smt. Smriti J. Irani during Inauguration of Unnat Bharat Abhiyan National Cell at IIT Delhi on 29 April, 2016.*



***Biogas Production and Up-gradation Technology Training delivered to the Participants of Peru University, Republic of Peru, 23–27 May, 2016.***



***Prof. V.K. Vijay, IIT Delhi with Dr. Sankalp Chaturvedi, Director, Gandhi Centre on Inclusive Innovation, Imperial College Business School, London for collaborative work June 2016.***



***A 25 m3 biogas plant running from food/kitchen waste at IIT Delhi campus. Free dustbins distributed to residents of faculty apartment for in-house segregation of biodegradable and recyclable wastes- separately for making IIT Delhi campus clean and green, initiative taken in June 2016 by Prof. V.K. Vijay, Coordinator, Working Group on Waste Management, IIT Delhi.***



***Prof. V.K. Vijay, IIT Delhi with his team and GAIL officials visited to Goyala dairy site, South Delhi Municipal Corporation, Najafgarh Zone for discussion on converting/ utilizing cattle waste for energy generation through biogas plant and biogas enrichment and bottling for automotive applications, on 8th February 2016.***

## RECENT ADVANCEMENTS AND INVENTIONS IN THE FIELD OF BIOGAS UTILIZATION

S. No.	Patent Application Number	Date	Title	Inventors
1.	#20160176768	06/23/16	Method and plant for treatment of organic waste	Birgir Norddahl, Anne Kjaerhuus Nielsen
2.	#20160166980	06/16/16	Container-type biogas purification film method purification system	Wenzhi Pan, Changqing Zhou, Xinghua Yang, Hongyan Li, Dawei Wang, Wenjin Li
3.	#20160160239	06/09/16	Method for cycling biomasses between mushroom cultivation and anaerobic biogas fermentation, and for separating and drying a degassed biomass	Svend Kristian Hoff, Lars Jørgen Pedersen
4.	#20160163005	06/09/16	Renewable natural gas rights system and method	Joseph Fritz-mauer, Clayton Thomas Bedwell
5.	#20160138048	05/19/16	Method for generating methane from a carbonaceous feedstock	Seth W. Snyder, Meltem Urgun-demirtas, Yanwen Shen
6.	#20160137562	05/19/16	Lightweight assemblable appliance and respective production of biogas and liquid fertilizer	Oshik Moshe Efrati, Yair Teller, Erez Lanzer, Yariv Miller, Tal Eilon, Shoham Zak
7.	#20160130544	05/12/16	Construction a fermenter for a biogas plant	Hans-peter Kientz
8.	#20160108435	04/21/16	Compositions and methods for identifying and modifying carbonaceous compositions	Matthew Ashby, Ladonna Wood, Ulrika Lidstrom, Christine Clarke, Alison Gould, Dariusz Strapoc, Adewale J. Lambo, Bradley James Huizinga
9.	#20160107946	04/21/16	Bekon Holding Ag patents: Producing liquid fertilizer in a biogas plant	Rolf Liebeneiner
10.	#20160102005	04/14/16	Anaerobic process for treating organic waste materials	Parker Dale, Parker David Dale, Jay M. Johnston
11.	#20160089626	03/31/16	Gas scrubber system and method	Rodolfo E. Kilian, Toshio Shimada
12.	#20160088788	03/31/16	Biogas production from a flexible digester	Dominic F.P. Wanjihia
13.	#20160082400	03/24/16	Toyo Tire & Rubber Co., Ltd. patents - Osaka-shi, Osaka, JP : Separation membrane for treating acid gas-containing gas, and method for manufacturing separation membrane for treating acid gas-containing gas	Tomohiko Kurahashi, Koji Kuraoka
14.	#20160041538	02/11/16	Bioenergy storage and management system and method	N. Ross Buckenham
15.	#20160009579	01/14/16	Silver Fish Llc patents: Novel systems and methods for converting gaseous byproducts of wastewater treatment into energy	Christopher R. Cott

## RECENT GOVERNMENT INITIATIVES

### Pattern of assistance for promotion of organic farming

Component	Pattern of assistance
<b>NMSA</b>	
Setting up of mechanized Fruit/Vegetable market waste/ Agro waste compost production unit.	100% Assistance to State Govt/Govt. Agencies upto a maximum limit of Rs. 190.00 lakh /unit and 33% of cost limited to Rs.63 lakh/unit for individuals/ private agencies through NABARD as capital investment for 3000 TPA production capacity
Setting up of State of art liquid/ carrier based Bio-fertilizer/ Bio-pesticide units	100% Assistance to State Govt/Govt. Agencies upto a maximum limit of Rs.160.00 lakh /unit and 25% of cost limited to Rs.40 lakh/unit for individuals/ private agencies through NABARD as capital investment of 200 TPA production capacity
Setting up of Bio-fertilizer and Organic fertilizer testing Quality Control Laboratory (BOQCL) or Strengthening of existing Laboratory under FCO	Assistance up to maximum limit of Rs. 85 lakh for new laboratory and up to a maximum limit of Rs. 45 lakh for strengthening of existing infrastructure to State Government Laboratory under Agriculture or Horticulture Department
Promotion of Organic Inputs on farmer's field (Manure, Vermi-compost, Bio-Fertilizers Liquid /solid,Waste compost, Herbal extracts etc.)	50 % of cost subject to a limit of Rs. 5000/- per ha and Rs.10,000 per beneficiary. Propose to cover 1 million ha area
<b>Paramparagat Krishi Vikas Yojana (PKVY)</b> - Adoption of organic farming through cluster approach under Participatory Guarantee system (PGS) certification.	Under PKVY scheme - Fifty or more farmers will form a cluster and their 50 acres of land will be brought under Organic Farming
Support to research for development of organic package of practices specific to state and cropping system	Against specific proposal
Setting up of separate Organic Agriculture Research and Teaching Department	Against specific proposal
<b>MIDH</b>	
Vermi compost Units/organic input production	50% of cost conforming to the size of the unit of 30'X8'X2.5' dimension of permanent structure to be administered on pro-rata basis. For HDPE Vermibed, 50% of cost conforming to the size of 96 cft (12'X4'X2') and IS 15907:2010 to be administered on pro-rata basis (Rs. 100,000/ unit for permanent structure and Rs. 16,000/unit for HDPE Vermibed).

## NEWS HIGHLIGHTS – NATIONAL

### 1. Green initiative pays off for Kakinada hotelier

*The Hans India | Mar 03, 2016*

**Kakinada:** Bandi Satyanarayana, a hotelier at Chandramampalli in Peddapuram mandal of East Godavari, has set a new trend in utilisation of hotel waste in an innovative form. Satyanarayana, who has been utilising hotel waste to generate bio-gas, saved a lot of money on cooking gas since 1998. Now he has taken the initiative as a campaign to motivate fellow hoteliers to go in for bio-gas generation from hotel waste.

Explaining the process, Satyanarayana said that they dump all the hotel waste in the inlet of a plant constructed by bricks. On fermentation, bio-gas is generated which is let into the kitchen pipelines to light up the stoves while the slurry is let out as manure.

He then heard of bio-gas generation from cattle dung. He contacted the Non-conventional Energy Development Corporation (NEDCAP) which is now known as NREDCAP at East Godavari collectorate and the plant was constructed to suit his requirements. Necessary equipment like stove, gas tubes were supplied by the NEDCAP.

“Initially people used to stare at us as they could not believe that the material which is considered as waste can be recycled for a better purpose,” said Satyanarayana. “At an average our gas consumption per day is around 8 and-a-half kilos and half this requirement is met from biogas generation,” he said.

The LPG of 19 kilo for commercial purpose costs Rs 1,051 at present. “By having bio-gas we are saving over Rs 150 per day,” said Satyanarayana. East Godavari district NREDCAP Manager G. Satyanarayana said that they are planning for second plant for the hotelier or construct new one in the existing place to improve generation of the biogas.

### 2. Capacity of biogas plant in Pammal enhanced

*The Hindu, Chennai, March 8, 2016*

Exnora Green Pammal and Sam Foundation, which have been running a bio-methanation plant in Sankar Nagar, Pammal, have enhanced its capacity by 100 per cent.

The biogas plant was started in 2009 for generating 50 cubic metres of biogas per day with a feed of 500 kilograms of food waste, collected from the shops and hotels in Pammal and Pallavaram. The output from the biogas plant is being utilised as cooking fuel and for the generation of electricity to light 3 streets with 75 bulbs each of 11 watts.

Thirty-five families headed by women are involved in the entire operation. Ten women are responsible for the collection of segregated food waste from restaurants in and around Pammal and Pallavaram.

The total cost of expansion was Rs. 6 lakh, which was borne by Sam Foundation and TNPCB.

*The entire land for setting up the biogas plant was gifted by Appaswamy Real Estates.*



Photo: G. Krishnaswamy

### 3. Amul starts bio-CNG generation plant

*The Times of India Mar 7, 2016*

**Vadodara/ Anand:** The Kaira District Co-operative Milk Producers Union Limited popularly known as Amul Dairy has become the first in India's food industry to start a fully automated bio-CNG generation and bottling plant to utilize energy from its plant's waste. Earlier, the dairy union used to flare the biogas into the atmosphere by burning it. While burning raw biogas some elements like carbon dioxide and hydrogen sulphide used to get released into atmosphere harming the environment. But a few months back as part of its green initiative, Amul decided to reutilize the biogas and adopted medium pressure swing adsorption (MPSA) technology to convert biogas into bio-CNG. For every liter of milk that is processed at the dairy, one liter water (two million liter a day) is used for chemical cleaning of plant and machinery. This water has residual milk solids which earlier emitted 2,500 cubic meters of methane per day with 60 to 65 % purity. Now, the raw biogas from digesters is first collected in double membrane raw biogas balloon having capacity 1,000 cubic meters. From raw biogas balloon, it is transferred for purification.

### 4. A clean and affordable cooking fuel

*The Hindu, March 18, 2016*

**Tirupati:** *wo young entrepreneurs have come up with innovative project.*

‘Sustain Earth Energy Solutions’, a startup launched by Y. Koushik and Piyush Sohani, has embarked on an initiative, Gau Gas, roughly dubbed as Cow’s Gas, to provide cleaner cooking fuel to the rural populace. The idea emerged as an offshoot of a college project during the duo’s masters in Renewable Energy Engineering at The Energy and Resources Institute (TERI).

“Biogas, in a cattle-rich country like ours, is one of the most affordable sources of energy. According to statistics, there are over one lakh biogas plants across the country. However, a

preliminary survey has revealed that only 1 per cent of rural households have adapted to the technology” maintains the organisation's COO and Field Operations Director Y. Koushik.



*A view of the 'Gau Gas' unit in Tirupati*

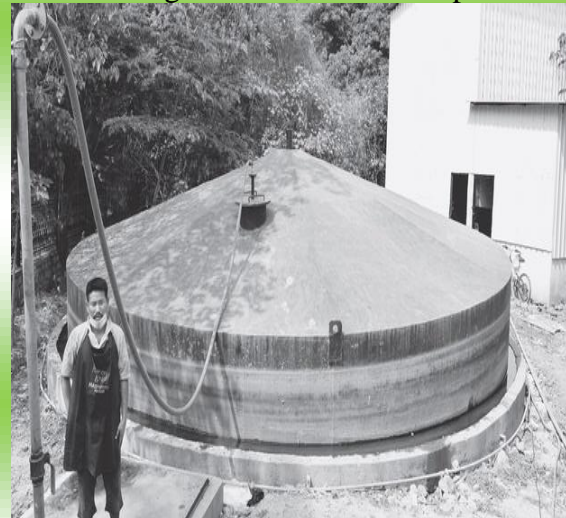
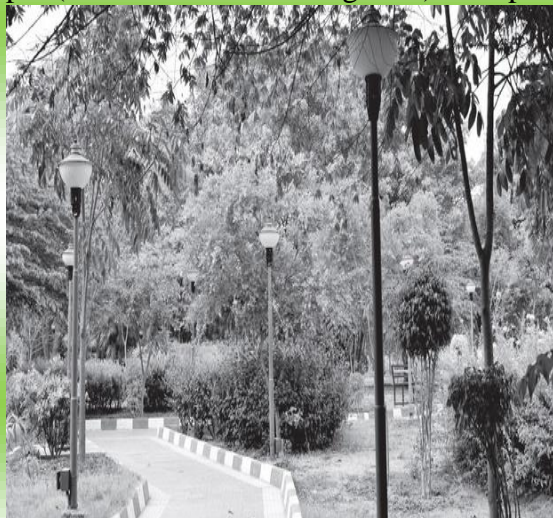
### **5. Use Your Trash, Light up a Park**

The New Indian Express, 26 March, 2016

**Bengaluru:** The city shows time and again that much can be done with waste. In Domlur, the residents use biogas to light up a park and the waste-processing unit.

With the help of the former corporator Geetha Srinivas Reddy, the Domlur Residents Welfare Association (DLRWA) developed a waste-seggregation unit and a biogas plant on a 9-acres land near the Domlur bus depot.

About two tonnes of garbage are collected from the residents every day and power is generated for the lighting at Suvarna park and for the garbage centre for four hours, between 6 pm and 10 pm (two hours after closing time). The park, located near the biogas centre, closes at 8 pm.



*Biogas plant workers segregating waste at the garbage bin (Pics : Jithendra M)*



## 6. BARC bucket can process kitchen waste

Apr 15, 2016 - [Sadaguru Pandit](#) | [Mumbai](#)

<http://www.asianage.com/>

Scientists at the Bhabha Atomic Research Centre said they are about to launch a project using a bucket that can turn domestic waste into compost within two days.

Nisargadoot is a bucket, treated with chemicals and bacteria that turn a kilogram of biodegradable garbage into compost within 48 hours. Easy to use and reusable for years, the process has the potential to resolve dumping problems forever, said the scientists.

A larger version of Nisargadoot is the Nisargaguna, a large-scale, self-sustainable plant that turns four tonnes of garbage into 100 kg manure and 60 kg biogas daily.

Scientists from BARC said that the idea of Nisargadoot came from the need for a small-scale domestic procedure which could resolve the segregation issue and stop biodegradable waste from going to the dumping yard.

## 7. Biogas startup turns food waste into fuel

TOI, Apr 27, 2016

**Bengaluru:** 1 tonne of organic waste generated in Bengaluru doesn't go to landfill - it gets converted into biogas every day. The Art of Living, Akshaya Patra, TVS and Infosys are some bulk generators here which are generating biogas from the food and kitchen waste they generate on their campuses.

City-based startup GPS Renewables has provided the technology and set up the biogas units on their premises. The biogas company converts over 20 tonnes of food waste in 30 biogas generating plants across 11 states which generate 1400 kg LPG. In April 2015, IIM-Bengaluru graduates Sreekrishna Sankar and Mainak Chakraborty set up the company which has set up units in Bangladesh, Japan and Malaysia too.

The prediction is that if Bengaluru segregates its waste effectively and strictly follows the 2-bin 1-bag concept, the city can generate over 20 million kg of LPG equivalent every year. Along the way, Bengaluru can mitigate over 6 lakh tons of Green House Gases every year which is a major reason for climate change.

## 8. BEL's canteen waste returns as cooking gas

*The Hindu April 30, 2016*

**Bengaluru:** Defense electronics major Bharat Electronics Ltd. says it has started converting several kilos of canteen waste into biogas every day for cooking, which equals 70 kg of LPG.

Installed at its Bengaluru complex in February, "the new plant has already helped replace about 1,800 kg of LPG with biogas. This has resulted in [potential] saving of Rs. 11.7 lacs a year for BEL," the Central public sector company said.

The canteen prepares food for approximately 10,000 employees. The plant uses an anaerobic biomethanation technology called 'Upflow Anaerobic Sludge Blanket' to convert discarded food into sustainable, clean energy. It supplies biogas back to the canteen at LPG-like pressure. Installed at a cost of Rs. 40 lakh, the plant can potentially digest two tonnes of waste a day to produce 160 cubic metres of biogas.

### 9. Civic body to set up two biogas plants

*TOI, May 9, 2016*

**Kolhapur:** The Kolhapur Municipal Corporation (KMC) has decided to set up biogas-based power plants at two places on build operate and transfer basis. The civic administration has finalized sites at Kasba Bawda and near Kalamba jail for the purpose.

Each plant will have the capacity to utilize five tonnes of waste every day. On Sunday, the KMC floated tenders inviting firms to install, design, commission and maintain the plants for five years from commissioning.



### 10. Infosys to build 7620 household biogas plants over a period of 10 years

*The Economic Times, May 30, 2016*

**Bengaluru:** Software major [Infosys BSE 0.30 %](#) today announced the launch of Rs 22 crore household biogas project in Ramanagara district in Karnataka. Under the project, Infosys will build 7,620 household biogas units and provide an equal number of biogas stoves to as many families in the district. Over a 10-year period, the project is expected to generate biogas equivalent to about 1 million cylinders of domestic LPG, the company said in a release here. SKG Sangha, a Karnataka-based NGO with experience in implementing biogas projects, will be the implementation partner for the project, it said. The project was inaugurated by Sudha Murty, Chairperson of the Infosys Foundation, [India](#), in Channapatna

### 11. 750 biogas plants installed in Jalandhar during past 5 years

*Hindustan Times, Jun 03, 2016*

**Jalandhar:** As many as 750 biogas plants were set up in the district under the Central government's National Biogas and Manure Management Programme (NGMMP) during the past five years. The Punjab Energy Development Agency (PEDA), that looks after the renewable energy resources in Jalandhar, informed that the number has been quite satisfactory, but more is needed to be done. Officials said that Sangrur records the largest number of plants in the state while Nakodar and Shakhkot are two places in the Doaba region where many villagers are coming forward for biogas plants. PEDA officials informed government-approved self-employed workers are being provided training from at Punjab Agricultural University (PAU), Ludhiana.



*A labourer at work at a biogas plant at Loharan village in Jalandhar. (HT Photo)*

## **12. Centre asks states to set up biogas plants to provide clean fuel**

*The Hindu, 27 June 2016*

**New Delhi ,MNRE:** The Centre has asked states to set up one lakh small biogas plants this year in a bid to provide clean fuel for cooking. The move is expected to result in a saving of 21.9 lakh LPG cylinders, according to an official statement. “With an objective to provide clean gaseous fuel for cooking and organic bio-manure as a by-product, Ministry of New and Renewable Energy has allocated to the States/UTs an annual target of setting up one lakh family size biogas plants for the current year, 2016-17,” according to the statement.

## **NEWS HIGHLIGHTS – INTERNATIONAL**

### **1. Swedish Firm Ships First Biogas Membrane Upgrading System**

*Ben Messenger 03.03.2016*

Purac Puregas, a Swedish manufacturer of biogas upgrading equipment, has shipped its first BGS membrane upgrading plant from its Kalmar facility this morning, bound for Rybjerg in northern Denmark. The company explained due to the nature of the site it wasn't possible to install one of its CAPure biogas upgrading plants, so instead it took the opportunity to supply one of its new line of Membrane Upgrading Plants.



*Image © Purac Puregas*

**2. Anaeriga: Biogas is the cheapest form of ‘firm’ power for utilities**

The Maui News, March 6, 2016

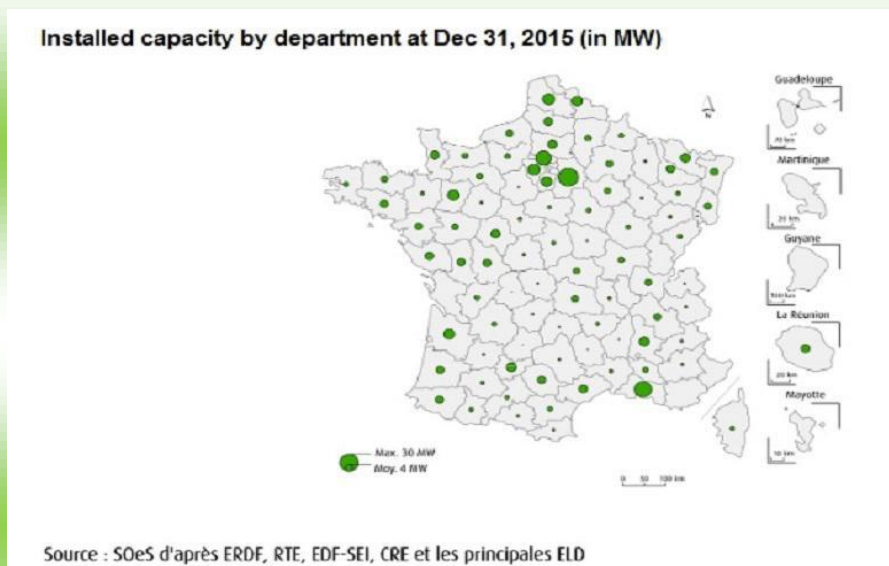
Anaeriga's proposed Maui Resource Recovery Facility will use biogas made from agricultural crops such as sorghum and the organic waste component of trash to produce renewable energy and will not only make Maui one of the most environmentally "green" counties in the world but will also serve an essential public purpose, create jobs, foster economic growth and preserve agricultural lands that are fallow today or potentially fallow in a few years.

In 2015, the Hawaii Legislature passed legislation that would require significant increases in renewable electricity generation. Hawaii set a 100 percent renewable portfolio standard by 2045. To achieve this goal, the state must look beyond fossil fuels to homegrown renewable energy, such as solar, wind, and biogas.

**3. French biogas-fired power generation capacity grows to 365 MW**

CET, Mar 9, 2016

March 9 (SeeNews) - France closed 2015 with 421 biogas-fired plants with a combined 365 MW of electricity generation capacity, recently published data of the ministry of energy shows. Last year, France added 40 MW of new capacity, confirming the steady growth levels observed from 2011 to 2014. The regions of Ile-de-France, Aquitaine-Limousin-Poitou-Charentes, Nord-Pas-de-Calais-Picardie and Alsace-Champagne-Ardenne-Lorraine are home to more than half of the installed capacity. The same four regions also accounted for nearly two thirds of the new capacity last year. Ile-de-France is the leader with 71 MW installed, up by 26% from an year earlier. Biogas-fired power plants produced 1.7 TWh in 2015, up by 21% from a year ago, though still accounting for just 0.4% of the overall electricity consumption in France. The pipeline grew by 18% quarter-on-quarter. At the end of December, the ministry also counted 162 projects with a combined capacity of 116 MW that are being planned for construction in the near future.



France map of biogas installations 2015, Source: Energy Ministry, All Rights reserved.

#### 4. Gas from swine, poultry waste will power 4 Duke plants

The Charlotte Observer, March 20, 2016

Duke Energy has signed an agreement with Carbon Cycle Energy to buy methane gas produced from swine and poultry waste and use it to generate electricity at four of its natural gas plants in North Carolina. Duke filed with the North Carolina Utilities Commission to register the L.V. Sutton Combined Cycle Station in New Hanover County, the H.F. Lee station in Wayne County, the Dan River station in Rockingham County and the Buck station in Rowan County as new renewable energy facilities. The four stations will combust “directed biogas” produced by Carbon Cycle Energy of Boulder, Colo. The gas would be injected into a pipeline system for Duke Energy Progress and/or Duke Energy Carolinas LLC. The utility estimates it should get about 125,000 megawatt-hours of energy a year from the arrangement – enough to power about 10,000 homes for a year.

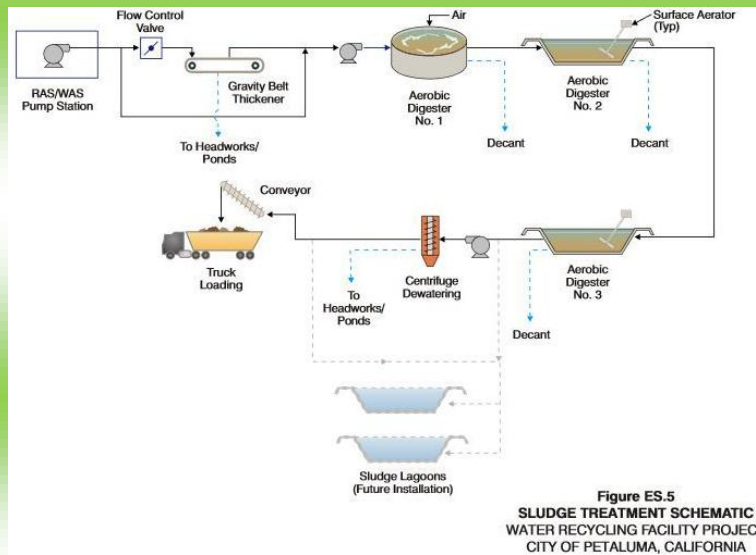


*Duke Energy's Dan River Steam Station. (by: John D. Simmons [jsimmons@charlotteobserver.com](mailto:jsimmons@charlotteobserver.com))*

#### 5. California Energy Commission invests \$3 million in biogas project

Biomass Magazine (by [Katie Fletcher](#)), March 22, 2016

The California Energy Commission approved \$4.3 million in grants this month for projects to increase the efficiency of natural gas technology used in industrial, agriculture and water processes. Amongst the projects receiving grants was an anaerobic digestion (AD) project in the city of Petaluma. The \$3 million grant is for the design, construction and operation of an AD system at the Ellis Water Recycling Facility to produce 150,000 gasoline gallon equivalents (GGE) of renewable natural gas (RNG) made from food and beverage waste. The RNG will be used as a fuel replacement in up to 19 diesel waste hauling trucks, displacing the consumption of approximately 21,200 gallons of diesel annually associated with hauling wastes



Press Release

### 6. Chilean Winery Opens First Biogas Plant To Run On Harvest Waste

by Arabella Mileham, 1st April, 2016

Chilean wine producer VSPT Group has opened a biogas plant that runs using waste from its own harvest, the first winery to do so. The new Viña San Pedro biogas plant at Molina in the Maule Region was opened this week by the Minister of Energy and the CEO of parent company VSPT, Pedro Herane, eight years after the company first proposed the idea. The facility will supply around 60% of the energy of one of its biggest facilities in Molina, using two biodigesters to convert organic harvest waste to methane gas. Waste that passes through the biodigester will also be transformed into nitrogen-rich organic matter, which will be used to improve soils in the vineyard.



*VSPT CEO Pedro Herane (centre) and Chile's Minister of Energy Máximo Pacheco (second from right) opened the new VINA San Pedro biogas plant*

### 7. Contract for Biogas Upgrading Technology at Dagenham Food Waste Plant

<https://waste-management-world.com>, 04.04.2016

UK based biogas to biomethane upgrading specialist, Greenlane Biogas, has received a multi-million pound contract from [ReFood Ltd](#), part of the German firm SARIA Group which also

owns waste and recycling firm Remondis, to supply and install gas upgrading equipment to a food waste plant in Essex. The company explained that the water-wash Totara' biogas-to-biomethane upgrading plant at a new food waste processing site under development in Dagenham, Essex The system has many similarities to the first one, operating on ReFood's site in Widnes since summer 2014.



Image © ReFood

**8. UK's largest on-site dairy AD plant to generate green energy from Cumbrian cheese**  
[Edie Newsroom](#), 8 April 2016,

One of the UK's largest cheese creameries, First Milk, has announced the completion of a giant on-site anaerobic digestion (AD) plant which is feeding bio-methane to the national gas grid. The £10m project has been designed and built for Lake District Biogas, which will operate the AD plant for two years, taking feedstock from First Milk's Aspatria creamery site in Cumbria. Commissioned by British on-site treatment solutions provider Clearfleau, the facility will produce more than £3m in cost savings and revenue per annum, and supply up to 25% of the creamery's energy requirements. When the plant is operating at full capacity later this spring, it will treat 1,650m<sup>3</sup> per day of process waste and generate around 5MW of thermal energy exclusively by digesting cheese making residues. The plant will generate 1000m<sup>3</sup> of biogas per hour, of which over 80% will be upgraded for injection into the national grid.



*The new AD plant will supply up to 25% of the First Milk creamery's energy requirements*

**9. Q&A with Daniel Bida, entrepreneur behind North America’s first zoo-based biogas plant**

Daily Brew, April 21, 2016

A zoo creates a lot of poop. From bird droppings to giraffe pellets, animals at the Toronto Zoo produce about 3,000 tonnes of solid waste every year. Its famous giant pandas alone poop upwards of a dozen times a day, thanks to their incredibly [inefficient](#) digestive systems. [ZooShare](#) is building a biogas plant at the Toronto Zoo — the first zoo-based plant of its kind in North America. The ZooShare Biogas Co-operative allows people to invest in the project through the purchase of bonds with a minimum investment of \$500, to pay five per cent annual interest over a five-year term.



*[Daniel Bida/PHOTO: ZooShare]*

**10. Power station using biogas from sewage starts in Tochigi**

Keiko Sugiyama/ Staff Writer, May 3, 2016

UTSUNOMIYA--One of Japan’s largest power plants using biogas emitted from treating sewage has started operations here, boasting a power generation capacity of 840 kilowatts. Around 1.7 billion yen (\$16 million) was spent to set up the plant within the compounds of the Kawada Mizu Saisei Center, a water purification station located in the capital of Tochigi Prefecture in eastern Japan. With eight phosphoric acid fuel cell power generators, the plant can produce a maximum 7.17 million kilowatt-hours a year, enough to power 2,000 regular households. 2016 marks 100 years since the start of the water supply service and 50 years since sewage treatment began in Utsunomiya. The city government wanted the biogas power station--a special project--to kick off in the landmark year.





*The digestion gas power plant in Utsunomiya which began commercial operation on April 1  
(Provided by the Utsunomiya city government)*

### 11. Kenyan students design biowaste reactor to harvest dormitory waste

<http://www.treehugger.com/>, May 24, 2016

Take high schooler Leroy Mwasaru, from Maseno, Kenya, who is working with fellow high schoolers to design a human waste biogas digester to help process waste from a 720 student dormitory at Maseno School. Currently, their design is at prototype phase—utilizing food waste, cow dung and other organic matter to feed the microbes that generate the gas. But when they scale up their designs for the dormitory-sized reactor, the students hope to make a significant dent in the schools \$900 p/m firewood bill.



*(Video screen capture [Makeshift](#))*

### 12. EMT Madrid Orders 82 CNG/Biogas Mercedes-Benz Buses

NGT News, Jun 01, 2016

EMT Madrid, a Spanish municipal transport operator, has [ordered](#) a total of 82 natural gas technology (NGT) buses, including 40 Mercedes-Benz Citaro 18-meter articulated buses and 42 Mercedes-Benz 12-meter rigid. According to Daimler's release, the new Citaro NGT features a vertically installed six-cylinder, in-line mono-fuel engine that runs on compressed natural gas (CNG) or biogas. The company asserts that the new buses are approved without restriction for the use of renewable natural gas to DIN 51624, making for an even smaller carbon footprint. EMT Madrid says it currently has a fleet of 1,920 buses, which cover just under 1 million

kilometers each year while transporting 425 million passengers. The network has a length of around 3,600 kilometers, with approximately 10,000 stops.



**THE UK AD & BIOGAS INDUSTRY AWARDS 2015 WINNERS:**

<b>S No.</b>	<b>Category</b>	<b>Winner</b>
1	Innovation in sewage treatment through AD (Sponsored by Edina)	<i>Anglian Water Services Ltd</i>
2	Innovation in community and commercial food waste collection	<i>Oxford City Council Highly commended: Olleco</i>
3	Innovation in process efficiency/optimisation	<i>ENER-G Combined Power Ltd Highly commended: HRS Heat Exchangers</i>
4	Best engineering team	<i>Qila Energy</i>
5	Best installation/commissioning team	<i>Uniflare Ltd Highly commended: Biogen</i>
6	Best maintenance team	<i>Clarke Energy</i>
7	ADBA industry ambassador award	<i>Bruce Nelson, Compass Renewables Angie Bywater, BBSRC and AD Network Tony Fenton, Edina</i>
8	Making the most of biogas	<i>GENeco</i>

9	Making the most of digestate	<i>Nijhuis H2OK Ltd</i>
10	Best supporting service provider	<i>Pegasus Group</i>
11	Best small scale AD project	<i>Evergreen Gas Highly commended: QUBE Renewables</i>
12	Best on-farm AD project: (Sponsored by Vogelsang)	<i>Wyke Farms</i>
13	Best food and drink industry AD project	<i>Olleco</i>
14	Best merchant waste AD project or plant (Sponsored by Clarke Energy)	<i>Agrivert Highly commended: Biogen</i>
15	AD hero/team of the year (Sponsored by Pegasus Group)	<i>Alan Midwinter, SGN Highly commended: Jacqui MacCaig, RUR3 Environmental Ltd</i>

## UPCOMING EVENTS

<b>International</b>	<b>National</b>
<p>1. Biogas Science 2016 <b>21 – 24 August,2016</b>, Szeged, Hungary</p> <p>2. Nordic Biogas Conference <b>7 – 10 September2016</b>, Finland</p> <p>EBA Conference</p> <p>3. BIOGAS Convention and Energy Decentral (with BIOGAS Trade Fair) <b>27 – 29 September 2016</b>, Gent, Belgium</p> <p>4. International trade fair for innovative energy supply, <b>15 – 18 November2016</b>, Hanover, Germany (Biogas Convention)</p>	<p>1. International Conference on Energy Access in Rural Areas, <b>15<sup>th</sup> to 17<sup>th</sup> September 2016</b>, IIT Delhi, New Delhi, India</p> <p>2. International Conference on Water: From Pollution to Purification, <b>12th to 15th December,2016</b> ,Kottayam, Kerala, India</p> <p>3.2nd International Conference on Bioinformatics, Biochemistry and Bioscience 24th to 25th October 2016 New Delhi, Delhi, India</p>

## GOVERNING BODY OF THE FORUM

Dr. A.R. Shukla, Former Adviser, MNRE, New Delhi	-	<b>President</b>
Dr. Anjan K. Kalia, Himachal Pradesh	-	<b>Vice President</b>
Dr. Virender Kumar Vijay, Coordinator BDTC, IIT Delhi	-	<b>General Secretary</b>
Dr. Ram Chandra,IIT Delhi,New Delhi	-	<b>Treasurer</b>
Prof. Rajendra Prasad, Emeritus Professor, IIT Delhi	-	<b>Member</b>
Lt. Col. Suresh Rege,Mailhem, Pune	-	<b>Corporate Member</b>
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Dr. S.P. Singh, BDTC, DAU, Indore	-	<b>Member</b>
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Dr. S.S. Sooch, ,PAU, Ludhiana, Punjab	-	<b>Member</b>
Prof. S.S. Kapdi, Anand Agricultural University, Gujarat	-	<b>Member</b>



*Prof. V.K. Vijay, IIT Delhi was invited in the launch of smart village program by the President of India at Rastrapati Bhavan, June 2016.*