

BIOMETHANE DEMONSTRATION

Innovation in urban waste treatment and in
biomethane vehicle fuel production in Brazil



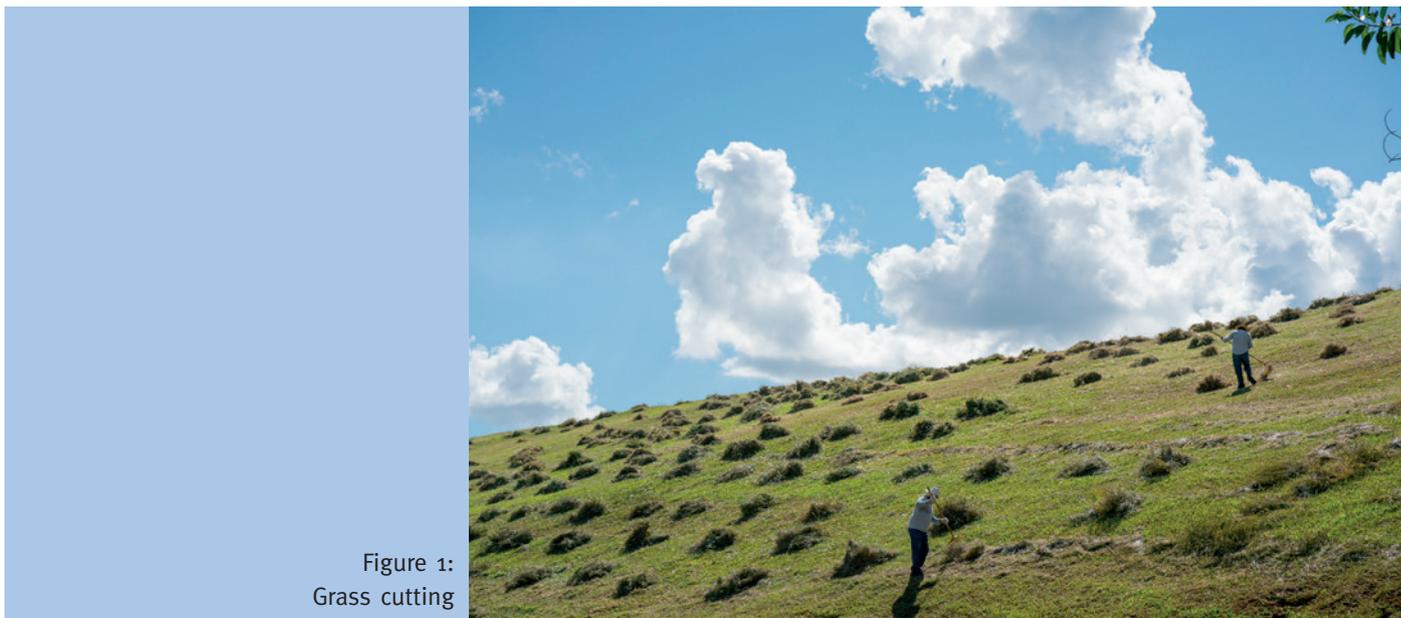


Figure 1:
Grass cutting

MISSION AND VISION

ITAIPU Binacional and the International Center on Renewable Energies – Biogás / CIBiogás are active in renewable energy initiatives contributing to emissions reduction. Together they have established a partnership to develop a biogas plant to digest grass cuttings, food waste and sewage effluent generated at the Itaipu Binacional complex. The demonstration facility will allow research to assess continual improvements of the process for replication elsewhere.

THE CONCEPT

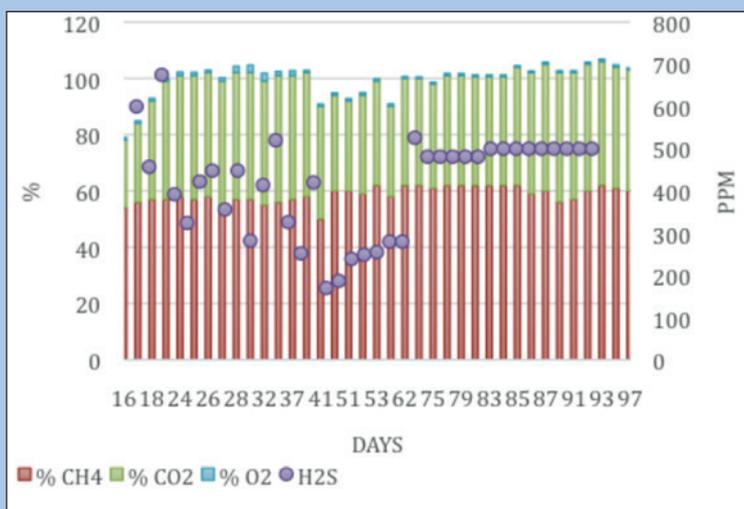
Urban residues have particular characteristics including for seasonality, consistency and volume; these offer different challenges to rural and agricultural substrates. The residues digested here include for: 600kg of food waste per day; 1,200kg per day of grass cuttings from 400 hectares of grass

(Figure 1); and 10m³ / day of sewage. The grass is ensiled after shredding. The food waste is screened to remove non-organic components. The sewage offers dilution to the substrate mix. To reduce costs the digester was pre-fabricated with light material, produced in separate sections and assembled on site (Figure 2). The bioreactors are maintained at 37°C, have a useful volume of 700m³, which provide a hydraulic retention time of 60 days.

Analysis carried out in the first accredited biogas laboratory in Brazil operated by CIBiogás suggested a biogas production of 519m³ per day. The biogas had a typical consistency of about 60% methane (Figure 3), The biogas is refined to biomethane with a patented process developed in Brazil, that integrates water scrubbing and pressure swing adsorption. The biomethane produced (Figure 4) satisfies required standards and is supplied to over 60 ITAIPU Binacional vehicles (Figure 5).



Figure 2:
Modular light weight digesters



▲ Figure 3: Biogas composition

▼ Figure 4: Biomethane composition

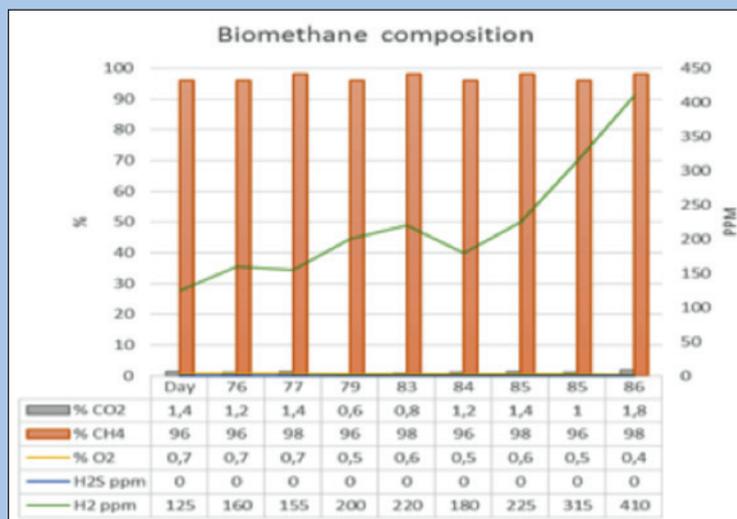


Figure 5: Biomethane fuelled cars



LESSONS LEARNED

Pioneering technology for Brazil

A significant issue encountered in establishing the first digester based on urban residues in Brazil was the need to develop all the processes and reactors within Brazil in co-operation with companies and Universities. The plant was bespoke and could not simply be bought in the market; neither were there local experiences or expertise in these systems to draw off. There was a need to minimise expenditure and optimise operation. This process involved development of the first real time biogas data management system with remote access in Brazil.

Benefits of biomethane demonstration

The demonstration facility proved many benefits including: reduced emissions from the transport fleet operating on biomethane; a reduction in transportation of food waste to the landfill site; a corresponding reduction in volumes of waste sent to landfill; reduction in volumes of sewage sent to wastewater treatment facility. Of great importance to this project was to have a demonstration facility that allows technical references for future facilities of this type in Brazil.

FUTURE PERSPECTIVES

This plant allows ITAIPU Binacional to treat all organic residues produced in its complex. It will accept additional feedstocks including: 15t per month of food waste; 30t per month of grass; 300m³ per month of sewage. It will produce 9000m³ of biomethane per month, which will be used as vehicle fuel. It will lead to a reduction of 10t per month in GHG emissions, whilst saving R\$40,000 per month in fuel bills. It will provide biofertiliser for 200 hectares of grass.

This demonstration will provide evidence-based data for policy makers. It also provides a test bed for industry allowing for development of measurement and control instrumentation; allowing for the assessment of compressors and gasholders. The demonstration is intended to allow replication across Brazil and to facilitate the development of a large number of urban residue biomethane facilities.



IEA Bioenergy task 37
“Energy from Biogas”
http://task_37.ieabioenergy.com

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IEA Bioenergy Task 37



IEA BIOENERGY

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