

Organic Waste Task Force

Biogas Presentation

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BTS

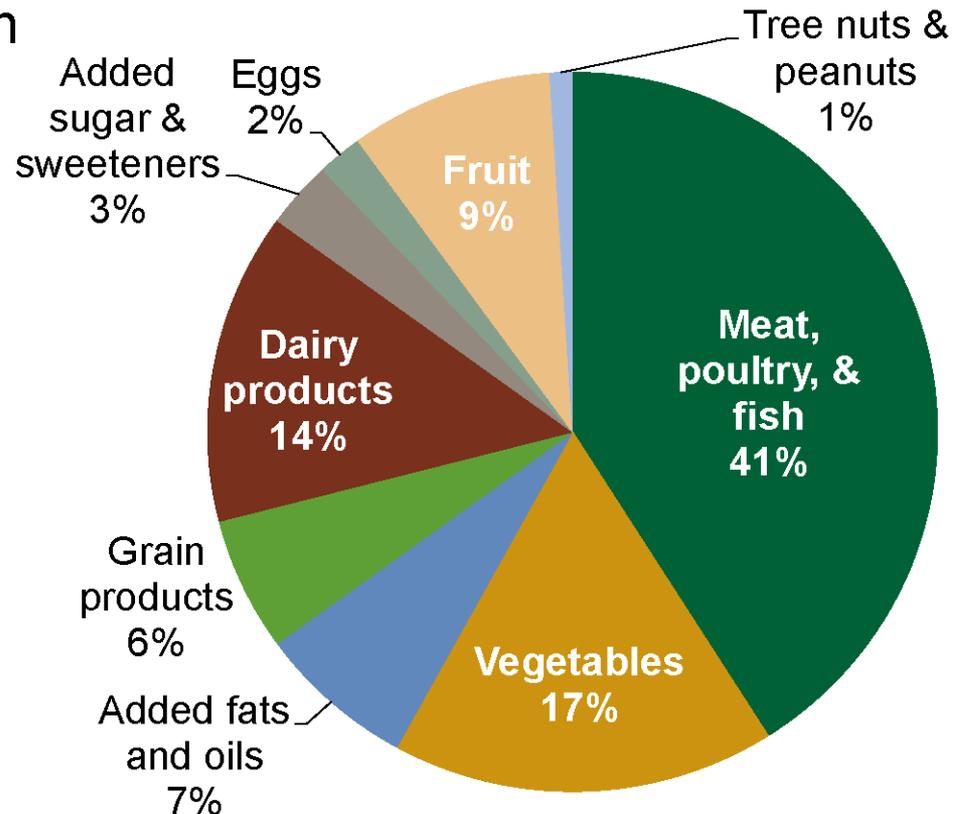
October 8, 2015



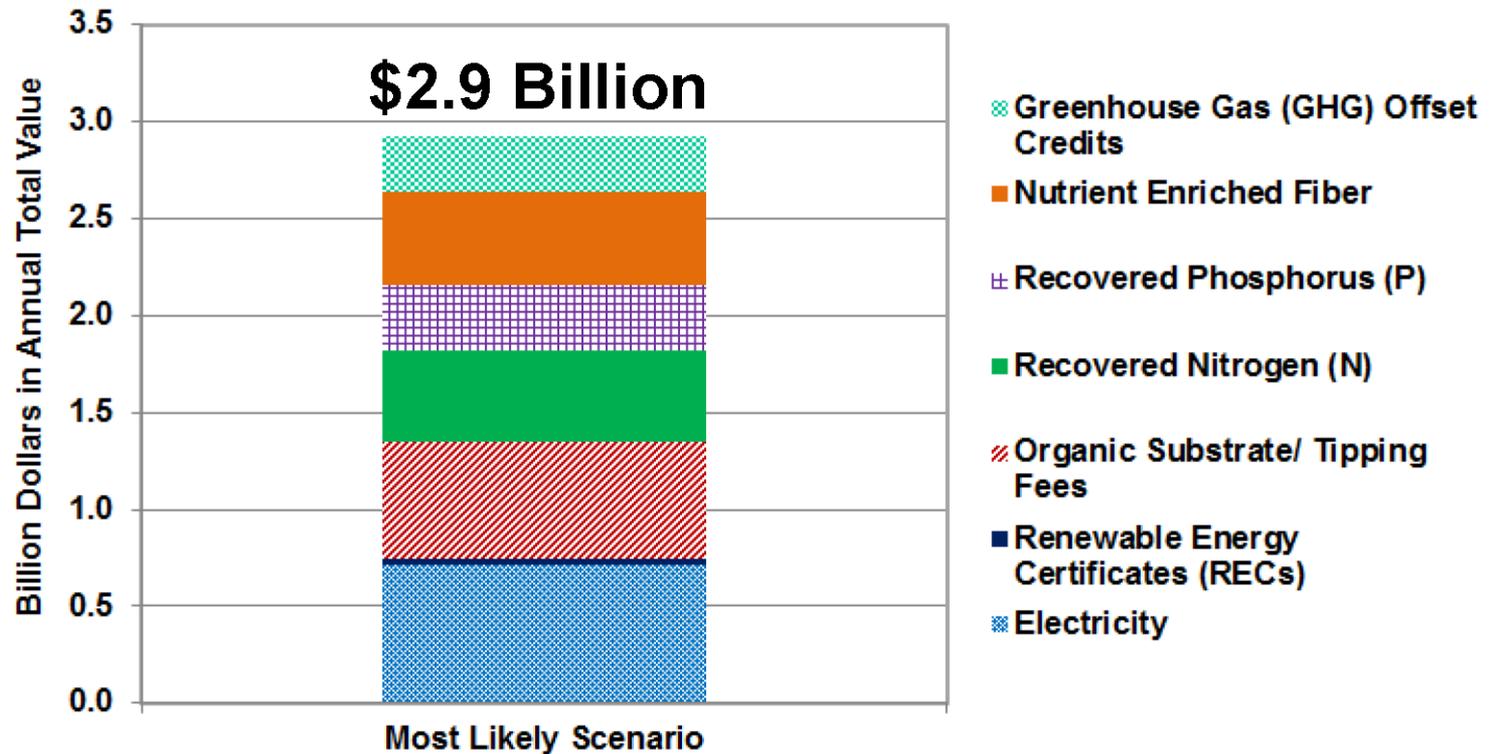
One out of three food calories is wasted

- 29% of America's food supply was lost from human consumption
- Estimated total value at retail and consumer levels was \$165.6 billion
- 273 pounds of food per person
- Disposal costs add one billion dollars in local taxes annually

Food waste by retail value (\$165.6B total)



Digester products market potential



Dairy industry can generate value by repurposing food waste from landfills, converting into renewable energy and providing for ecosystem services; resulting in a business model that enables a 21st century bioeconomy for food and agriculture

Biogas power plant



Top Ten Best Performance Plant

	Pos.	[kW]	kWh Jan-Dec 2012	% of Full production	Full running hours
Soresina	1	634	5.538.512	99,46	8.736
Zambelli	2	996	8.651.679	98,88	8.686
AGT 1	3	999	8.671.338	98,82	8.680
BMZ	4	995	8.634.566	98,75	8.678
Finato	5	700	6.064.662	98,65	8.664
Volpi	6	998	8.640.561	98,58	8.658
Gallmann	7	997	8.626.082	98,49	8.652
Grazioli	8	250	2.162.177	98,44	8.649
Martinoni	9	526	4.543.925	98,28	8.639
Ghione	10	990	8.539.829	98,20	8.626

Average:
8.667 h

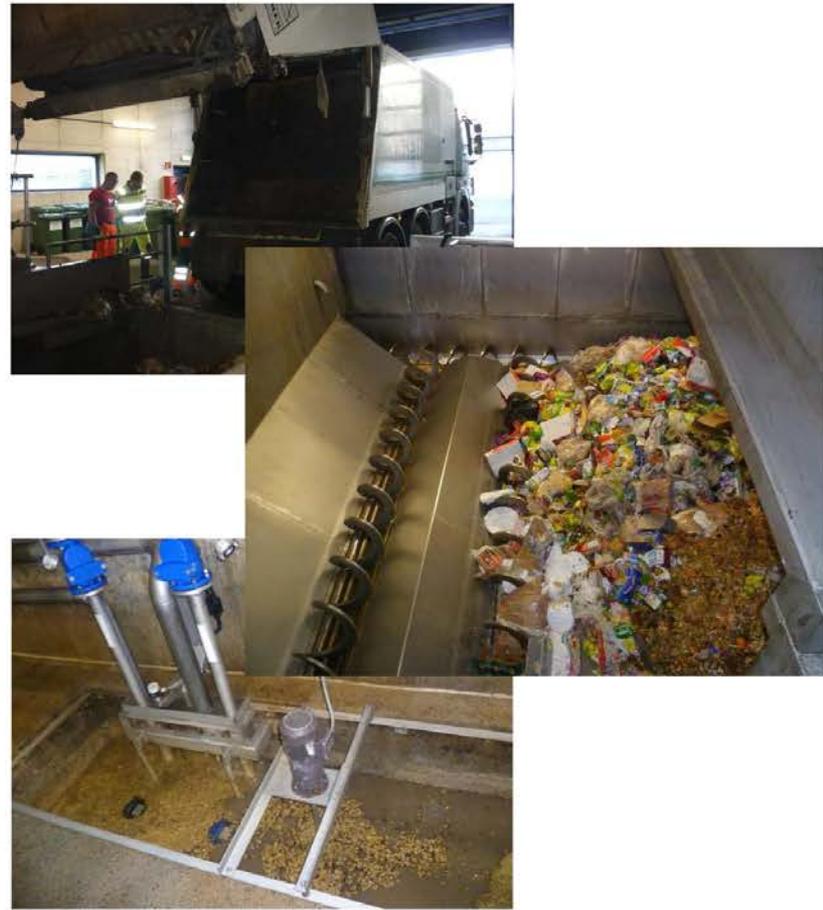


Technologies and Process

Pretreatment	BIO <i>accelerator</i> BIOaccelerator ^Z BIOaccelerator ^S BIOaccelerator ^F BIO <i>separator</i> ^W
Control	METAN <i>control</i> METANload VISUALIZATION dinaMETAN METANspy PLC TECHNICAL MODULE INDUSTRIAL PC serviceBOX INFOmodule servicePLATFORM
Biology	METAN <i>lab</i> METANmax METANmax ⁺ METANmax ⁿ NIRS
Post-treatment	BIO <i>dry</i> NITRO <i>stripp</i> BIO <i>pellet</i>
Biomethane	<i>bio</i> METAN BIOmetan ^m BIOmetan ^w

Feeder

- 20,000 t / a bunker, directly under the feeder with 60m³
- Bunker capacity for 3-day autonomy
- Pit for filtering water and washing water



BIOseparator^W



- Separation of inorganic (plastic) and fermentable material
- 75kW Hammermill
- Fermentation and water recirculation



What is the bioextrusion?



- Cell lysis / fractionation
- Thermomechanical treatment

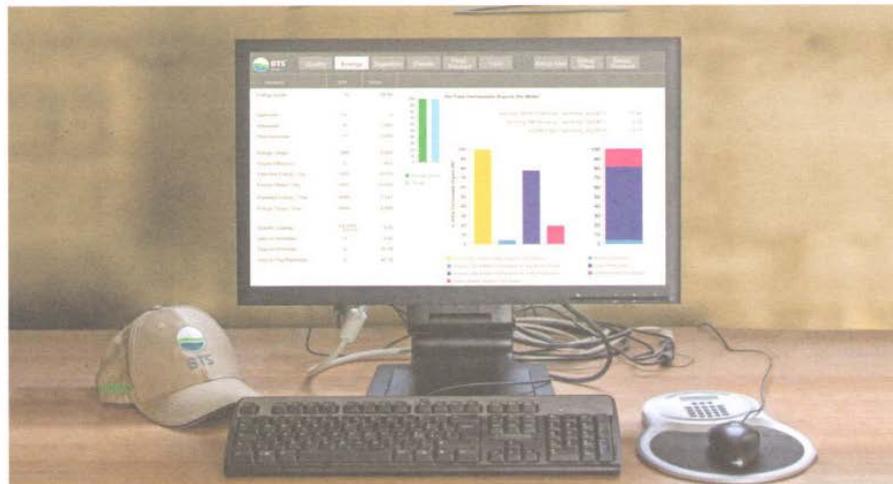
dinaMETAN

- dinaMETAN is based on a system that uses a database containing several parameters. Below is a list of the main parameters:

- Cost
- Dry matter
- Raw protein
- ADIP, NDF, ADF, ADL, and NFC
- Starch
- Ash
- Sulfur
- Lipids
- Sugar
- Digestibility / degradability
- Carbon / nitrogen ratio

Some functions and characteristics of the dinaMETAN software

- Plant management
- Dynamic ration calculation
- Calculation and display of the actual value / nominal value ratio
- Expected annual plant supply
- Biomass storage management
- Graph relating to input degradation in the various stages of the process
- Calculation of the biological yield
- Display of any exceedances of the nominal parameters
- Possibility of expanding the database
- Web-based software

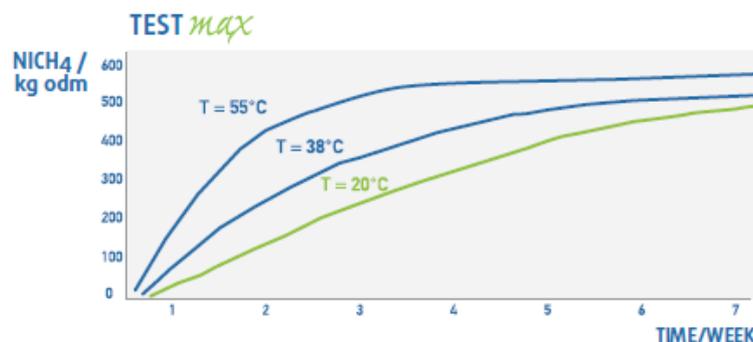


OUR EXPERIENCE

The best solution for the biogas plant: consultation with experts who have years of experience. METANmax offers the best package for the biogas plant for every single situation:

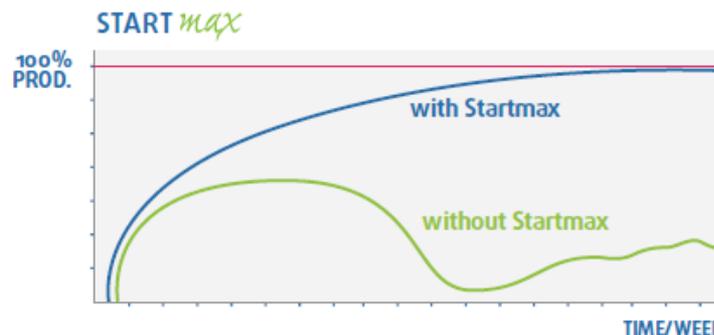
TEST_{max}

By means of a fermentation test of a single product or a mix of products, it is possible to define the biogas yield, the percentage of methane, and the stability of the biological process.



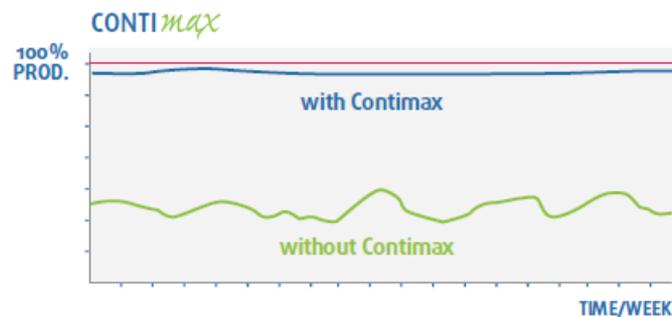
START_{max}

METANmax experts reduce the time for the biological processes to start to a minimum.



CONTI_{max}

METANmax experts deal with the specific situation of the plant and put it into optimal continuous production.

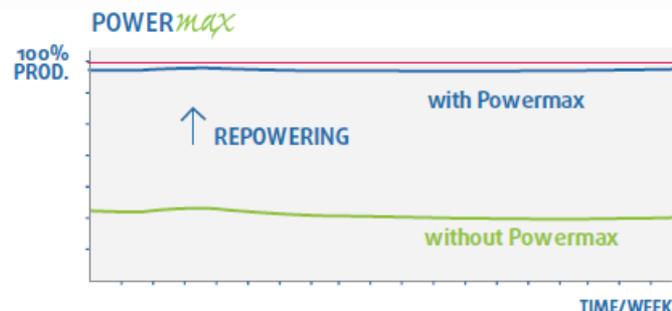


CONTI_{max} LIGHT

The biogas plant is examined periodically by carrying out specific analyses that explain the course of the biogas plant and the situation of the biology.

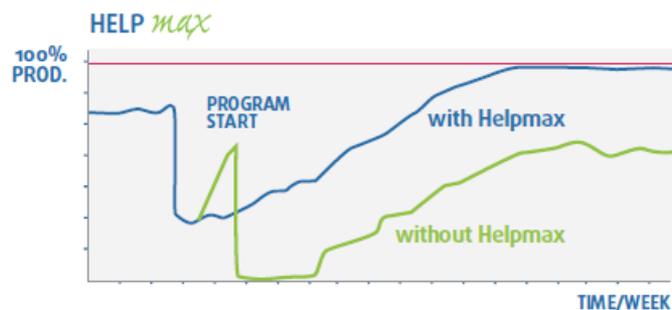
POWER_{max}

METANmax experts deal with the specific situation of the plant and put it into higher continuous production.



HELP_{max}

The METANmax experts help to resolve any microbiology problems with the biogas plant and bring it back to continuous production.



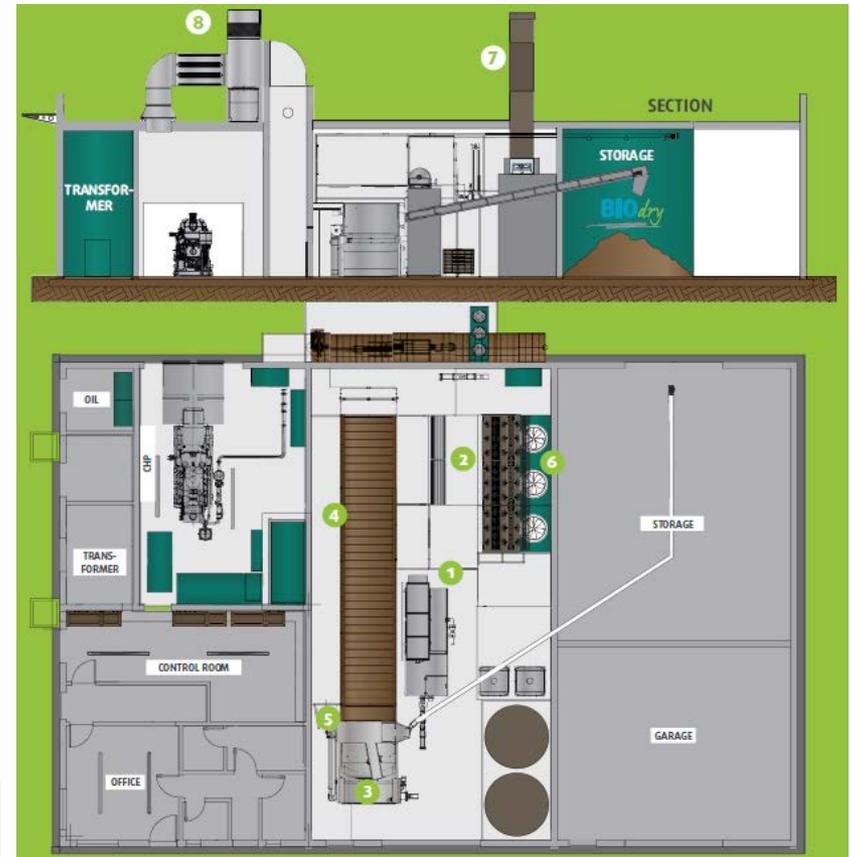
METAN*max*



The drying process is the most efficient method to exploit excess heat in the bio gas plant, and transform effluent into a valuable fertilizer.

A solid fertilizer and ammonium sulfate are obtained through this process. The drying process allows us to optimize the bio gas plant and add another source of income.

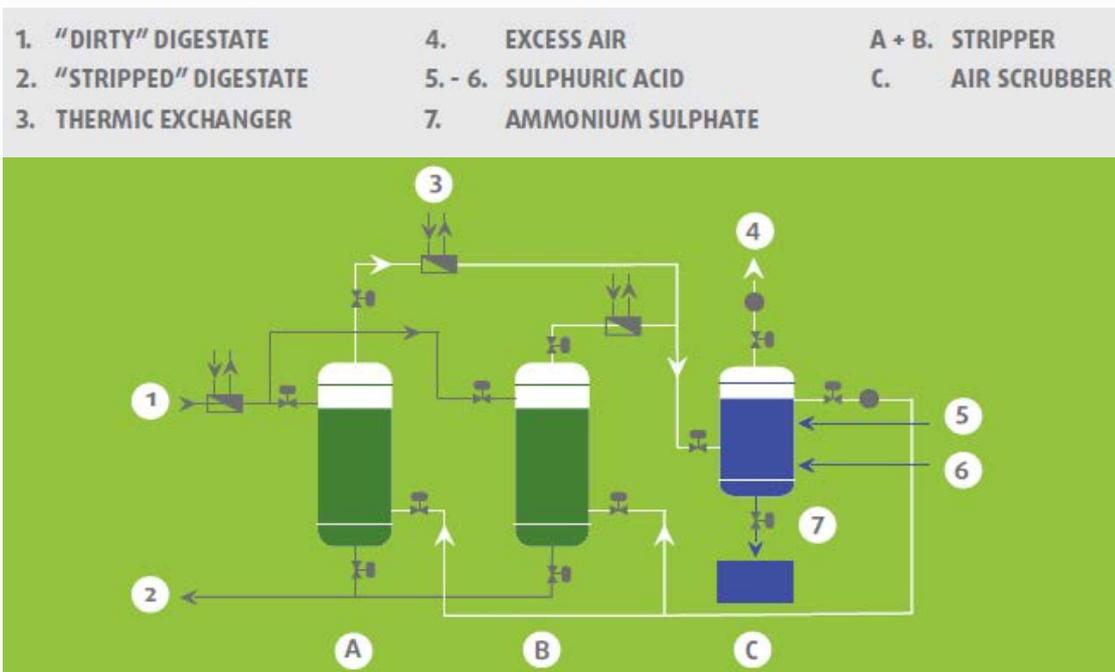
Thanks to the high organic content of the fertilizer we can improve the quality of the land and its components have a lasting effect.



- | | |
|--------------------------|--|
| 1. Trammel | 5. Dryer Front View |
| 2. Thickener | 6. Washer and Ventilators |
| 3. Mixing & Distributing | 7. Chimneys |
| 4. Channel for Hot Air | 8. Hot Air Channel & Thermic Exchanger |

Stripping is a new method for combatting the problem of nitrogen. This method is used primarily in bio gas plants which use a lot of effluent.

The stripping process can be carried out even without the use of chemical additives. The product obtained is ammonium sulfate.



Final products





Carbon Offset Trading for Revenue



White Paper | Google's Carbon Offsets

Google's Carbon Offsets: Collaboration and Due Diligence

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Google Green

For more information visit:
www.google.com/green

Introduction

At Google, we reduce our carbon footprint through efficiency improvements, generating on-site solar power and purchasing green power. To bring our remaining footprint to zero, we buy carbon offsets.

Purchasing carbon offsets means investing in green projects that have very little to do with our core business. When we purchase a carbon offset, we rely heavily on research, collaboration, standards and due diligence to guarantee we're getting a quality offset that provides long-term global benefit. This paper describes the process we use to select carbon offset projects and apply carbon credits to our carbon footprint.

What are carbon offsets?

A carbon offset is an investment in an activity that reduces carbon emissions. The reduction in carbon emissions is represented by a carbon credit. The credit, usually verified by a third party, signifies that greenhouse gas emissions are lower than they would have been had no one invested in the offset. One credit equals one metric ton of carbon dioxide prevented from entering the atmosphere.¹ The credit purchaser can use the credit for carbon accounting.

Here's a hypothetical example: Say there is a Google data center in an area with little renewable power. First, we reduce our data center electricity usage through energy efficiency improvements. We then talk to the local power utility about purchasing more green power. Unfortunately, we discover that there aren't additional green energy sources close to our data center, nor are there plans to build more in the near future.

Until we can power our operations entirely with renewables or reduce our emissions in other ways, we can use the offsets to fund projects that reduce greenhouse gas emissions, indirectly reducing our total carbon footprint. For example, close to our data center, we discover a large farm that produces a lot

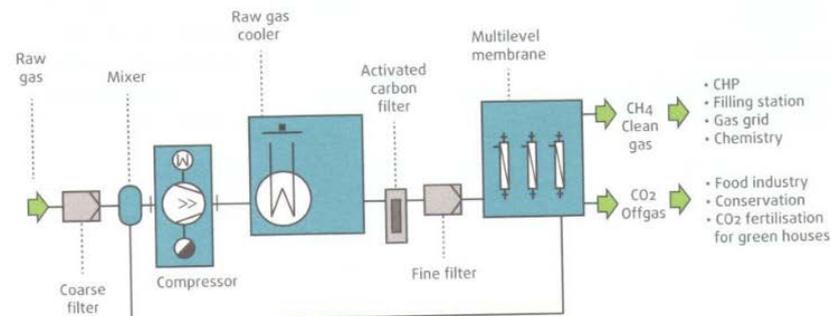
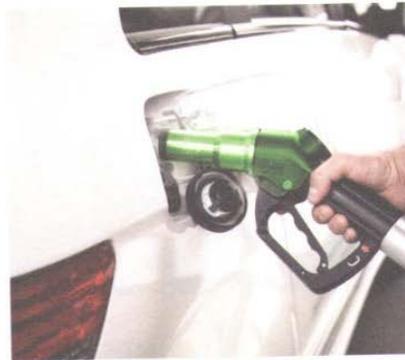
bioMETAN

Processing biogas into biomethane

Biogas generated by BTS biogas power plants can be used not only to produce electricity, heat, cold and fertilizer but also biomethane. Through biogas upgrading (biogas processing), methane is separated from all other gases, chiefly CO_2 . This upgraded gas discloses two new possible applications, on the one hand the typical supply into the existing methane network, on the other the use of biomethane as fuel for vehicles. Moreover 100% pure CO_2 (bioMETAN[™]) can be

produced, a gas which can be used especially in the food industry.

Biogas can be upgraded either with bioMETAN[™], a process involving pressure water washing, or with bioMETAN[™], i.e. by means of membranes. Pressure water washing proves profitable to large size plants (>2MW), whereas membrane processing is rather used in small and medium plants.





TS energy GROUP

ENERGY TRANSITION

The village with
100% renewable energy
from biomass

CO₂

*harvesting
energy!*



BIOseparator^W



BTS[®]
part of
TSenergy GROUP

Technology container

