

www.agrinz.at

ING GERHARD AGRINZ
GmbH
Engineering & Consulting

Planning a biogas plant



BiG>East
Biogas for Eastern Europe
Riga, 04.02.2009

www.agrinz.at

ING GERHARD AGRINZ
GmbH

The Company

- Private engineering and consulting company
- Leading in the Austrian environmental, energy and infrastructure sector
- Independent of industry and trade
- Integrated in national and international networks
- Independent advice in all areas of business activities
- From project development to financing, planning and construction supervision up to commissioning
- Quality assurance



TÜV CERT
ISO 9001:2008 certified
Zertifiziert bis 20.103.10140

www.agrinz.at

Project management within the autonomous business segments

- Environmental engineering and water management
- Waste water management and water supply facilities
- Surveying
- IT Services
- Facility management
- Consulting
- Renewable Energy

Renewable Energy
Consultation - Planning - Realisation

Consulting Engineers for Drainage Engineering and Water Economy
Serving the Environment!

Consulting Engineers for Surveying
Commitment & Quality!

Mechanical Engineering
Supervision - Maintenance - Repair - Control

Data Processing & Information Technology
Always a Step Ahead!

Subsidiaries

Bio Agros KFT
Consultation - Planning - Realisation

www.agrinz.at

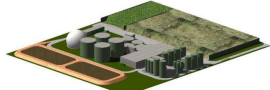
RENEWABLE ENERGY

Use of biomass

- Biogas
- Bioethanol
- Biodiesel
- Wood pellets




- Combination of different technologies
- Other sources of renewable energy



www.agrinz.at

BIOGAS

Heat-, Electrical Power and Fuel Production

Biomass from	Production of
• Agriculture	• Electrical power
• Food industry	• Heat
• Animal feed industry	• Fuel
• Communal waste (biowaste)	• Fertilizer
• Gastronomy	



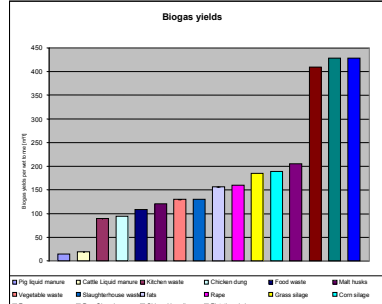
www.agrinz.at

Input material used

Input material

Corn silage, grass silage, pig liquid manure, cattle liquid manure, chicken dung, energy grasses, vegetable waste, pomace, malt husks, food waste, kitchen waste, biowaste, old cooking oil, chip fat, flotation sludge, glycerin, slaughterhouse waste, ...

Biogas yields



Input material	Biogas yield (m³ per ton of dry matter)
Pig liquid manure	~100
Cattle liquid manure	~120
Kitchen waste	~140
Chicken dung	~160
Food waste	~180
Malt husks	~200
Vegetable waste	~220
Slaughterhouse waste	~240
Fats	~260
Pomace	~280
Energy grasses	~300
New Gliparin	~320
Old cooking oil	~340
Flotation sludge	~360
Grass silage	~380
Corn silage	~400

Biogas Process

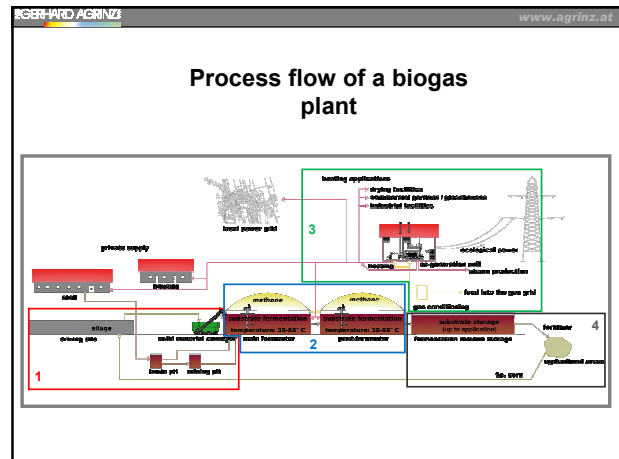
- Multi-step fermentation process
- Breakdown of organic substances with high molecular weight into substances of lower molecular weight until it reaches methane
- Damp anaerobe environment



Stages of fermentation

- Hydrolysis
- Formation of acid
- Formation of acetic acid
- Formation of methane

1. HYDROLYSIS	2. ACIDOGENESIS	3. ACETOGENESIS	4. METHANOGENESIS
Carbohydrates → Sugars	Carbon acids Alcohols	Acetic acids Carbon dioxide Hydrogen	Methane Carbon dioxide
Fats → Fatty acids			
Proteins → Amino acids			



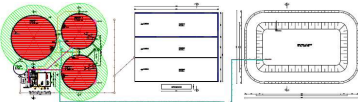
Agricultural Biogas Plant (500 kW)

Biogas Plant Margarethen / Moos (Austria)

Substrate used (9.980 t/a):
Corn silage, Sudan grass, liquid manure

Output:
electrical: 500 kW_{el}
thermal: 535 kW_{therm}

Energy yield per year:
Biogas: 1,4 Mil. Nm³/year
Electricity: 3,9 Mil. kWh/year
Heat: 4,2 Mil. kWh/year

Agricultural Biogas Plant 500 kW

Biogas Plant Margarethen / Moos




Agricultural Biogas Plant 500 kW

Biogas Plant Margarethen / Moos





Agricultural Biogas Plant 500 kW

Biogas Plant Margarethen / Moos



Plant size, quantities, income, investment

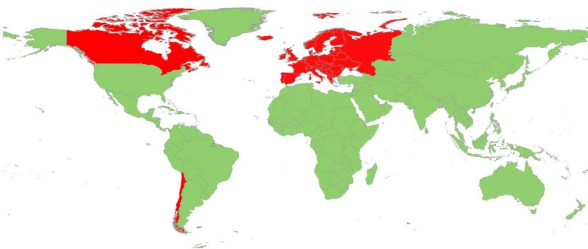
Electrical power	100 kWel	500 kWel	1,000 kWel
Heat capacity	110 kWth	540 kWth	1,090 kWth
Biomass in tons per year (for example)¹:			
Liquid manure (t/year)	1,000	5,000	10,000
Cow dung (t/year)	2,000	10,000	20,000
Corn silage (t/year)	1,000	4,500	9,000
Income:			
Biogas (m ³ /year)	410,000	1,960,000	3,900,000
Current (kWh/year)	800,000	4,000,000	8,000,000
Current (€)/year²	~ 146,000,-	~ 646,000,-	~ 1,256,000,-
Heat (kWh/year)	880,000	4,320,000	8,720,000
Heat (€)/year³	~ 26,000,-	~ 129,000,-	~ 261,000,-
Digestate = fertiliser (t/year)	3,500	16,800	33,900
Plot size, investment:			
Site (ha)	0.4	1.4	2.6
Investment level (€)	800,000,-	2,600,000,-	3,900,000,-

¹ Possible Biomass: grass silage, pig liquid manure, chicken dung, energy grasses, sugar sorghum, food waste, kitchen waste, slaughterhouse waste and so on.
² Current feed-in tariff assumed: 0.182 €/kWh (100 kW), 0.1617 €/kWh (500 kW), 0.1570 €/kWh (1,000 kW)
³ Heat sales price assumed: 0.03 €/kWh

The investment costs depend on the equipment of the biogas plant, utilized biomass, location etc.

On site a connection to the power grid and the possibility for power feed-in is required.

REFERENCES



- 35 planned plants in Austria
- 65 planned plants worldwide
- Projects in Austria, Hungary, Slovenia, Germany, Croatia, Serbia, Bosnia-Herzegovina, Russia, Canada and Chile

ING GERHARD AGRINZ GmbH

Thank you for your attention !!

Consulting & Information

Ing. Gerhard Agrinz GmbH

A-8430 Leibnitz, Emmerich-Assmann-Gasse 6
 E-Mail: office@agrinz.at, Home: www.agrinz.at
 Tel.: +43 3452/73997-0, Fax: +43 3452/73997-9