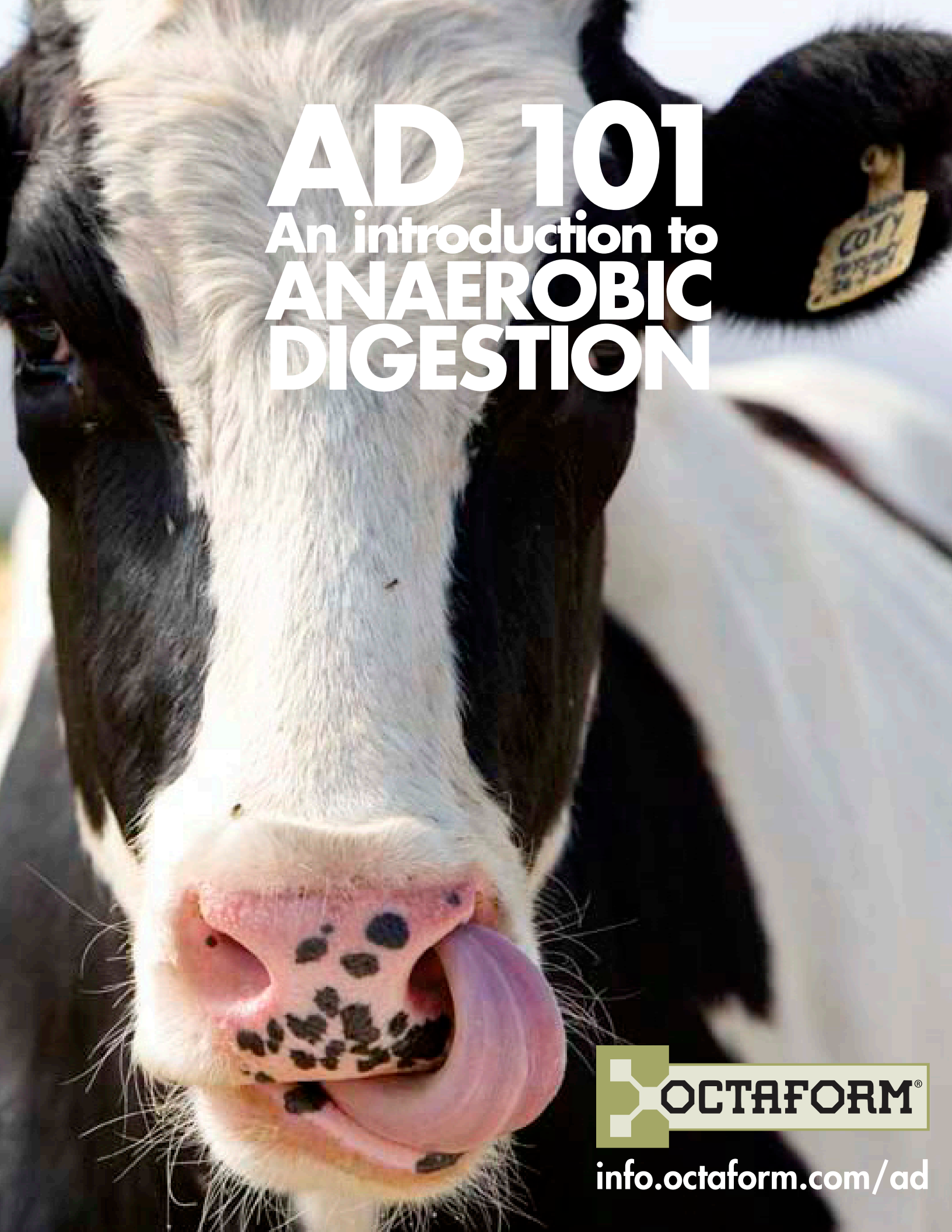

AD 101
An introduction to ANAEROBIC DIGESTION

OCTAFORM®

info.octaform.com/ad

AD 101

An introduction to ANAEROBIC DIGESTION OVERVIEW & ANALYSIS 2011

2nd edition

Prepared for:

into.octaform.com/ad

'The anaerobic digestion (AD) technology/service providers listed in this document have successfully developed at least one AD project at the time this document was prepared and have demonstrated interest in providing their AD services. While these lists were compiled using all reasonably available information, it may not be complete. Any reference to or mention of any products, processes or services does not constitute or imply a recommendation or endorsement'.

1) INTRODUCTION

1.1 Purpose

The primary purpose of this document is to provide a general overview of the anaerobic digestion industry with a specific focus on key areas of growth. Documenting biogas in various regions internationally, this report provides a current synopsis of agricultural anaerobic digestion around the world. This paper examines the key firms, tank technology, funding initiatives, and overall factors affecting the biogas industry in its current markets.

1.2 Methods

Research for this report was predominately based on; industry newsletters, magazines, bio energy associations, government websites, individual firms websites and most importantly, email correspondence. For a full list of references used, see P18.

1.3 Definitions

Anaerobic Digestion (AD) – a naturally occurring biochemical process in which organic material is broken down by bacteria in an oxygen-free environment.[1]

Anaerobic Digester - a device for optimizing the anaerobic digestion of biomass and/or animal manure often used to recover biogas for energy production.[2]

Biomass – sources of organic materials used to create biogas.

MSW – municipal solid waste.

FOG – fats, oils and grease.

Net Metering- is an agreement where the energy generator (AD operator) pays electricity distributor only for the net amount of electricity consumed. This allows the AD facility to generate electricity at any time, send it to the grid and then use electricity at any other time.

kW.h: commonly known as the billing unit of energy delivered to consumers by electric utilities.

[1] Rutledge, Brad, "**California Biogas Industry Assessment**". WestStart-Calstart, 2005.
[2] Rutledge, Brad, **"California Biogas Industry Assessment".** WestStart-Calstart, 2005.
<http://www.calstart.org/Libraries/Publications/California_Biogas_Industry_Assessment_White_Paper.sflb.ashx>

2) ANAEROBIC DIGESTION BASICS

2.1 Background

A large portion of the biodegradable waste produced each year is needlessly sent to landfills. Overtime, through bacterial processes, this waste is broken down producing methane gas. A tonne of methane, has about 20 times as much an effect on the climate over a 100 year period, when in comparison to a tonne of carbon dioxide.[3] In addition, waste disposal and manure run-off have become a growing concern for the agricultural sector. The joint issues of sustainable energy and waste management have become core problems, impeding the process of creating sustainable modern societies. As a result, policy makers across the world are currently initiating campaigns, legislation, and initiatives that will allow these joint issues to be addressed. Anaerobic digestion is one such process currently being explored.

2.2 What is Anaerobic Digestion?

Anaerobic digestion is a "Process by which organic materials enclosed in a vessel are broken down by micro organisms, in the absence of oxygen"[4]. As a result of the digestion process, biogas is produced. This biogas (5—75% Methane) can then be used as natural gas, utilized for transportation fuel or combusted to run a generator to produce heat.[5] The digested solids (waste from AD Process), can then be used as organic fertilizers or animal bedding.

2.2 What Feedstock can Anaerobic Digestion use?

There are three potential feedstocks that can go into an anaerobic digestion system. The first can be classified as farm byproducts and includes; manure, bedding, feed waste, and crop residuals. The second is energy crops. Energy crops including corn silage have been utilized in the biogas process but are probably not viable in North America. The third material used in anaerobic digestion is commercial byproducts. The most commonly used source of commercial byproducts comes from the food industry, in which waste comes in the primary form of fats, oils and greases (FOG). Of these feedstock options, the most important is commercial feedstock, because it is "essential to the economic viability of almost all on farm anaerobic digestion systems"[6]

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[3] U.S. Environmental Protection Agency
< http://www.epa.gov/methane/ >

[4] **"Anaerobic Digestion Basics"** Ontario Ministry of Agriculture, Food and Rural Affairs, 2011.
<http://www.omafra.gov.on.ca/english/engineer/facts/07-057.htm#2
[5] **"Biogas Opportunity Wisconsin 2011 Strategic Plan"** Wisconsin Bio Energy Initiative, 2011.
[6] ADIAC, BC Farm Biogas http://www.bcfarmbiogas.ca/Feedstockenergy/feedstock

2.3 Environmental Benefits

Locally, a digester reduces odor, improves fertilizer's value, biologically stabilizes organic wastes, reduces pathogens and provides methane gas that can then be utilized for various energy purposes.[7] Globally, the use of digesters reduces methane emissions (a greenhouse gas), and decreases our dependency on fossil fuels.[8]

2.4 Temperature Ranges for the AD Process

Thermophylic (50-60 degrees Celsius)

Thermophylic systems operate at high temperature. More energy and insulation is required to maintain optimum temperature. Larger centralized systems will typically run thermophylic temperatures.[9] These systems provide the quickest waste to energy turnaround time.

Mesophylic (35-40 C)

Small to midsize agricultural food systems will typically run in this temperature range. These systems have a slower waste to energy turnaround time.

Psychrophylic (15-25 C)

These systems take significantly longer to turn waste to energy; however the systems are easy to manage.

---

[7] Moser, Mark**. "Digestion 101"** RCM International

*<www.rcminternationalllc.com/.../RCM_Farm_**Digester**_and_Digestio_**101**_ EN_CN.pd>*

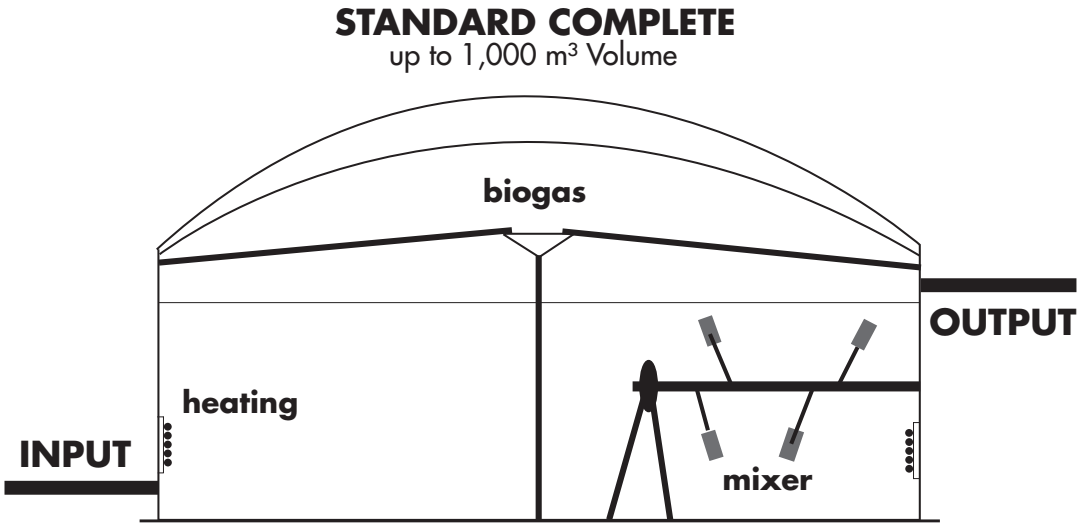
[8] Moser, Mark**. "Digestion 101"** RCM International

*<www.rcminternationalllc.com/.../RCM_Farm_**Digester**_and_Digestio_**101**_ EN_CN.pd>*

[9] **Anaerobic Digestion Basics"** Ontario Ministry of Agriculture, Food and Rural Affairs, 2011. <http://www.omafra.gov.on.ca/english/engineer/facts/07-057.htm#2

2.4 Typical Anaerobic Digestion Methods and Containment Styles

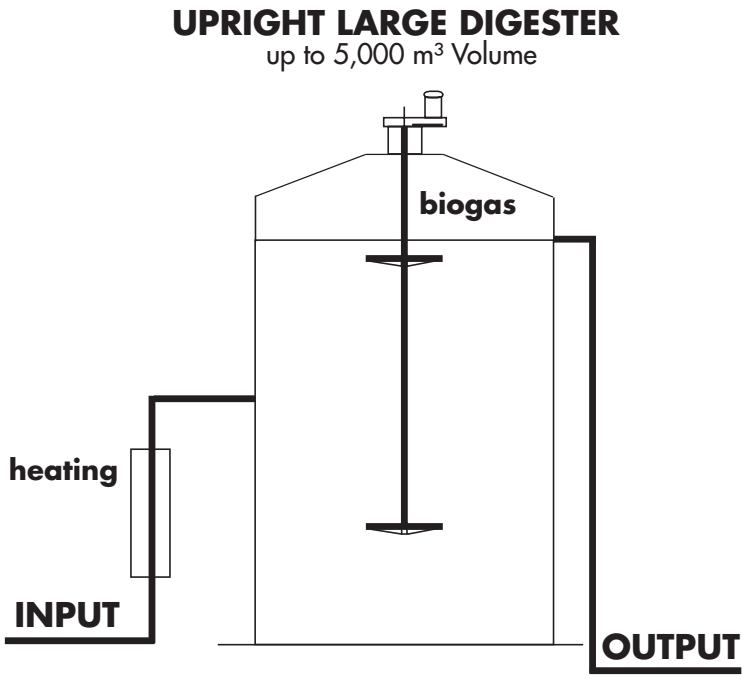
Upright Standard Agricultural Digester Complete Mix:



The standard upright complete mix digester is traditionally made out of a round concrete tank. Its dimensions traditionally have a volume between 500 and 1500 meters cubed.[10] Height is traditionally 5-6 meters and the diameter varies between 10-20 meters.[11] The complete mix method is a high rate production method that retains bacteria biomass by separating and concentrating solids in a separate sector and returning the solids to the influent. The contact reactor can treat both diluted and concentrated waste. This is the most common form of anaerobic digester worldwide, ideal for large farms, farm cooperatives or centralized facilities.

[10] Fischer, Torsen. **"Farm-Scale Biogas Plants"** Krieg and Fischer, 2001. <*www.kriegfischer.de/texte/farm-scale%20biogas%20plants.pdf* >
[11] Fischer, Torsen. **"Farm-Scale Biogas Plants"** Krieg and Fischer, 2001. <*www.kriegfischer.de/texte/farm-scale%20biogas%20plants.pdf* >

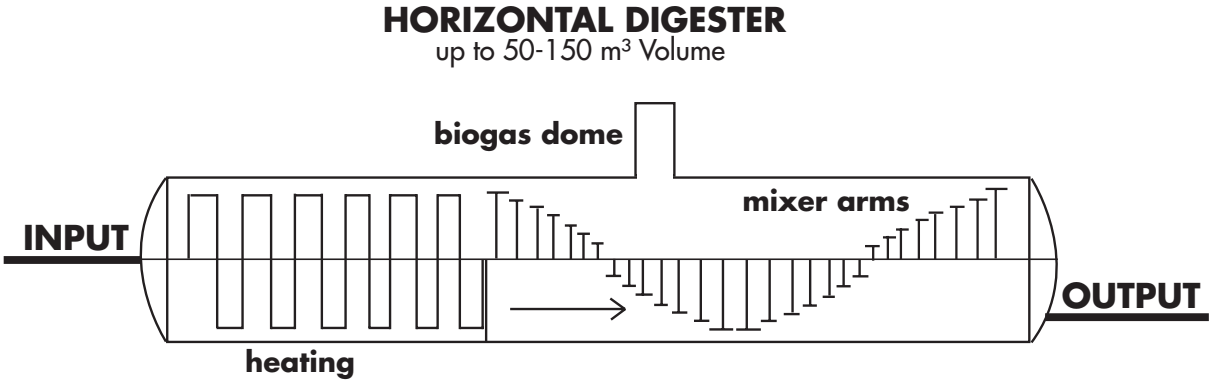
Upright Large Complete Mix Digester:



Large scale upright digesters are traditionally taller than they are wide and are used for large quantities of waste, for example more than 30,000 meters cubed a year.[12] These types of digesters traditionally use glass fused to steel tanks, which are considered the most economical for tanks between 1500 and 5000 meters squared of volume. [13] These tanks traditionally have dimensions between 15-20 meters in height and a diameter between 10-18 meters[14]. These large scale tanks are almost always used in centralized digester facilities often specializing in municipal solid waste (MSW).

[12] Fischer, Torsen. **"Farm-Scale Biogas Plants"** Krieg and Fischer, 2001. <*www.kriegfischer.de/texte/farm-scale%20biogas%20plants.pdf* >
[13] Fischer, Torsen. **"Farm-Scale Biogas Plants"** Krieg and Fischer, 2001. <*www.kriegfischer.de/texte/farm-scale%20biogas%20plants.pdf* >
[14] Fischer, Torsen. **"Farm-Scale Biogas Plants"** Krieg and Fischer, 2001. <*www.kriegfischer.de/texte/farm-scale%20biogas%20plants.pdf* >

Horizontal Plug-Flow Digester:



Plug-flow digesters are the simplest form of anaerobic digestion. It is the least expensive and is typically used in small farm projects. A plug flow digester is typically long and narrow, five times as long as it is wide. Plug flow digesters usually digest raw livestock manure. Plug flow digesters are less efficient than a traditional complete mix method. The benefit of a plug flow digester is reduced upfront capital costs.

3) DIGESTIONOMICS

Economic Considerations of Anaerobic Digestion for Farm Scale Projects.

3.0 Economies of Scale

While there are many simple small-scale digesters operating internationally, in order to be economically feasible to produce energy, there is typically "a rough threshold size of 300 cows or 2000 swine due to economies of scale in construction and operation."[15]

3.1 Financing

Capital costs are typically around 400 a Cow or higher for Dairy systems[16]. Government programs including agricultural grant or loan programs can help attain the necessary capital. Higher premiums on energy produced through biogas can help regain high upfront capital costs.

3.2 Connection to the Energy Grid

Anaerobic digestion systems designed for energy processes produce more energy than what can be used on site. In addition, seasonal and daily variation in biogas energy production promotes the interconnection to a grid. Interconnection with the grid, guarantees a constant source of power to the farm, acting "as a large battery, with the AD system putting energy in and the local facility drawing energy out "[17] While connected to the grid a farmer will need to set up a contract with the electric utility the excess electricity from the farm.

Farm energy use contracts are typically negotiated in two ways. In the first situation, "*the utility company buys all electricity from the farm at a negotiated wholesale price, then sells the farmer back electricity needed for farm operations at normal retail price"*.[18] This is the least economic contract method for a farmer because the farmer may produce twice the electricity needed to run its farm, while still owing money to the utility company.[19]

The most preferential contracting method for farmers is when; *"the utility buys only the excess power at wholesale price, and allows the farmer to offset the electricity use on the farm"*. This arrangement is called "**Net Metering**".

---

[15] **Profits from Manure Power?"** The Minnesota Project, <http://www.mnproject.org/pdf/AD%20economics.pdf
[16] **Profits from Manure Power?"** The Minnesota Project, <http://www.mnproject.org/pdf/AD%20economics.pdf
[17] **Anaerobic Digestion Basics"** Ontario Ministry of Agriculture, Food and Rural Affairs, 2011. <http://www.omafra.gov.on.ca/english/engineer/facts/07-057.htm#2
[18] **"Profits from Manure Power?"** The Minnesota Project, <http://www.mnproject.org/pdf/AD%20economics.pdf>
[19] **"Profits from Manure Power?"** The Minnesota Project, <http://www.mnproject.org/pdf/AD%20economics.pdf>

In addition, premiums are sometimes paid on energy produced through biogas. For example, British Columbia's Cow Power Program, provides a 4 cent per kW.h premium on AD-produced Energy.

3.3 Understanding the Whole Economic Picture

When considering anaerobic digestion, it is important to look at the entire cost/benefit picture. It is important to consider the non-monetary economic benefits of having a digester system. These include but are not limited to: reduced odors and pathogens.

4) CURRENT AD INDUSTRY: COUNTRY PROFILES

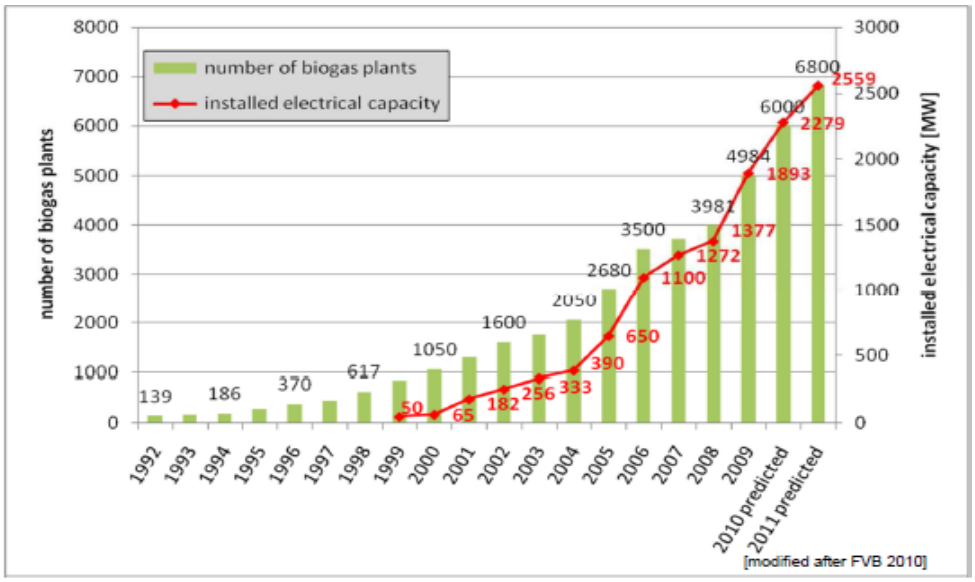
4.0 Industry Profile; Europe

The European market is predicted to see significant growth over the next 50 years. Growth in the European market can be attributed to a favorable regulatory structure including tax incentives, feed-in-tariffs (FITs), green certificates and loan opportunities. Under the regulatory structure of the Renewable Energy Directive there is an established goal of 20% renewable energy in the European Union by 2020.[20]

Based on predicted growth rates, current size of the market, and influence on digestion globally, the key markets in Europe include; Germany, Italy, United Kingdom, and the Czech Republic.

4.1 Germany

Germany is the world leader in anaerobic digestion. Today, there are at least 5000 bio digester plants operational in Germany. The number of biogas plants in Germany is predicted to increase to about 9500 operational projects by the year 2020.[21] As part of the National Renewable Energy Action Plan (NREAP), Germany has committed to 18% Renewable Energy by 2020. [22] In addition, under NREAP, the government of Germany has created incentives for the AD industry through: simplified permit procedures, available financing, grants and feed in tariffs.



Source: Fachverband Biogas E.V.

[20] **"Renewable Energy Technology Roadmap"** EREC, 2010. <http://www.erec.org/fileadmin/erec_docs/Documents/Publications/Renewable_Energy_Technology_Roadmap.pd>
[21] **Biogas Production in Germany"** Fachverband Biogas E.V. <http://www.biogas.org/edcom/webfvb.nsf/ID/DE_Homepage>
[22] **"National Renewable Energy Action Plans"** European Energy Commission, 2009. <http://ec.europa.eu/energy/renewables/transparency_platform/action_plan_en.htm>

Germany maintains an International corporate presence in the biogas industry. Germany is the primary exporter of biogas technology, including the design, construction, maintenance and technical services for biogas plants designed and operated internationally. German biogas firms provide turnkey solutions to countries such as Canada, United States, Greece, Poland, Czech Republic, United Kingdom and many others.

German Firms: Construction, Design and Service

REUS Energy
www.reus-energy.com

MT- Energie GmbH
www.mt-energie.com

Schmack Biogas
www.schmack-biogas.com

agriKomp
www.biogastechnik.de

Biogas Nord
www.biogas-nord.com

PRV
www.rossow.de

Biogas Weser Ems
www.biogas-weser-ems.de

Krieg and Fischer
www.kriegfischer.de

PLANET
www.planet.de

Agraferm Technologies
www.agraferm.org

Bio Construct GmbH
www.bioconstruct.de

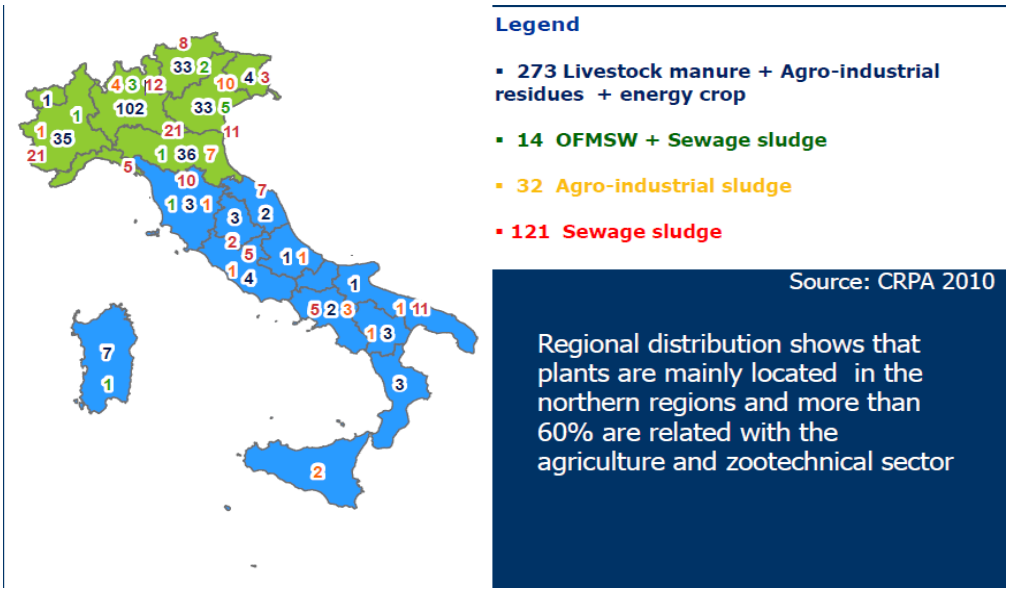
Finsterwalder Umwelttechnik
www.fitec.com

Electrigaz
www.electrigaz.com

UTS Residual Processing LLC
www.uts-residuals.com

4.2 Italy

According to the Italian National Agency for New Technologies, Italy has a huge energy potential that could derive from AD in the form of MSW and the Agro-industrial industries. There are currently 440 AD plants in Italy[23]. In addition there were 74 new plants under construction in 2010[24]. There is a foreseen 400% growth in electricity from biogas utilized in Italy, from 2005-2020[25]. These statistics indicate a strong growth rate for years to come. The incentive structure, similar to Germany, includes; feed in tariffs, funding programs, energy efficiency certificates.



Source CRPA 2011[26]

While there is a growing biogas technology export market in Italy, it is still in its infancy. The Italian construction, design and service of biogas plants are still dominated by German firms. Below is a list of Italian firms that specialize in biogas production.

Italian firms: Construction, Design, and Service

BTS, TS Energy Group
www.bts-biogas.com

EnviTec Biogas Italy
www. envitec-biogas.it

Intergen
www.imlimpianti.it

[23] Colonna, Nicola **."State of Biogas, Italy 2009",** ENEA (Italian National Agency for New technologies and Sustainable Development , 2009 <http://www.sede.enea.it/com/ingl/default.htm>
[24] Colonna, Nicola **."State of Biogas, Italy 2009",** ENEA (Italian National Agency for New technologies and Sustainable Development , 2009 <http://www.sede.enea.it/com/ingl/default.htm>
[25] Colonna, Nicola **."State of Biogas, Italy 2009",** ENEA (Italian National Agency for New technologies and Sustainable Development , 2009 <http://www.sede.enea.it/com/ingl/default.htm>
[26] **"Plant Distribution in Italy"** Animal Production Research Center, < http://www.crpa.it/nqcontent.cfm?a_id=1109&lang=en>

4.3 United Kingdom

While the market size within the United Kingdom is sizably smaller than that of Germany, or Italy, it possesses significant potential because of its strong history of industry associations and trade shows and its well-established biogas technology industry. Currently, there are about 54 anaerobic digesters in the United Kingdom. Of these digesters, 32 are medium to small-scale farm or cooperative based businesses and 22 are larger centralized facilities mostly for municipal solid waste (MSW). The United Kingdom has an increasingly growing corporate AD presence, with the combination of well established and start up firms providing AD service to the UK and abroad.

In addition, government renewable energy incentive programs including the Renewable Heat Incentive (RHI) support this growing industry. Under this incentive program RHI payments are made to the biomass owner. In addition, tariffs are structured to gap the difference between conventional and renewable energy sources.[27]

U.K. firms: Construction, Design and Service

BiogenGreenfinch
www.biogen.co.uk

CH4 Power Ltd.
www.ch4power.co.uk

Kirk Environmental Ltd.
www.kirk-environmental.com

SI Energy Limited
www.sienergy.co.uk

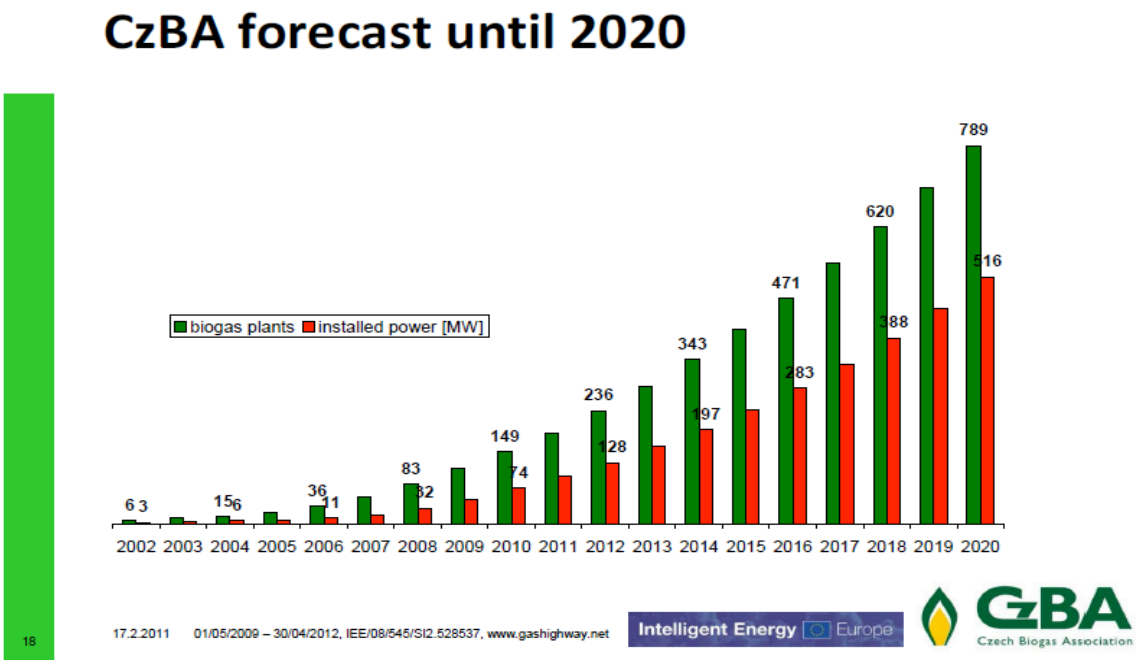
UTS Biogas Ltd
www.uts-biogas.com

BioG UK Ltd.
www.biog-uk.co.uk

[27] "**Renewable Heat Incentive"** Renewable Heat Incentive, 2011 < http://www.rhincentive.co.uk/, 2011 >

4.4 Czech Republic

Recent trends indicate that there will be significant growth in the use of standard upright agricultural digesters in the Czech Republic over the next 10 years. There are currently 253 biogas plants throughout the Czech Republic. 150 of these biogas plants belong to agricultural firms which use mostly, manure, feed, moss and energy crops. Recent predictions from the Czech Biogas Association, anticipate that 789 biogas plants will be operational by 2020, meaning a growth rate of over 300% in the next 10 years.



The corporate structure of the biogas industry is similar to that of Italy, in which there is a large corporate presence from Germany and only a small, but growing Czech based biogas industry.

Czech firms: Construction, Design and Service

BioProject
www.bioproject.cz

Bioplyn CS
www.bioplyncs.cz

Johann Hochreiter Ltd.
www.johann-hochreiter.cz

4.5 North American Market;

The North American Market provides both unique opportunities for the expansion of biogas, while also providing significant barriers to its growth. Some key areas of growth of the North American Market are: New York, Vermont, Pennsylvania, Wisconsin, Ontario and British Columbia.

4.6 United States

Roughly 80% of all projects in the United States are horizontal mixed plug flow design. Currently, there are 167 operating digesters in 33 states.[28] Of these, 147 run energy generating projects, with 156 farm scale and 11 centralized anaerobic digesters.[29] In the United States most projects are state subsidized. The typical project cost for a standard upright complete mix digester is approximately 1.45 million.[30] However, the industry has not developed to a point where it is profitable to build an anaerobic digester without state funding.

U.S. Growth from 2009-2011

State	# of New Plants	Standard Upright	Horizontal	Unknown
Wisconsin	**14**	**1**	**13**	**0**
Pennsylvania	**11**	**8**	**1**	**2**
Vermont	**9**	**1**	**6**	**2**
New York	**8**	**5**	**3**	**0**

Source: AgStar

[28] **"U.S. Anaerobic Digester Status Report 2010"** Agstar. <http://www.epa.gov/agstar/documents/digester_status_report2010.pd>

[29] **"U.S. Anaerobic Digester Status Report 2010"** Agstar. <http://www.epa.gov/agstar/documents/digester_status_report2010.pdf

[30] **"U.S. Anaerobic Digester Status Report 2010"** Agstar. <http://www.epa.gov/agstar/documents/digester_status_report2010.pdf

Firms who have built in the US since 2008

Firms	# of New Plants
GHD INC.	**50**
RCM International	**14**
Phase 3 Developments	**2**
Various others	**1**

Source: Agstar

Wisconsin

Wisconsin presents a "tremendous opportunity for the construction of anaerobic digesters"[31]. As of 2011, Wisconsin has the most biogas plants of any state with 22 on-farm and 31 total systems in place.[32] However, over the last few years, there has been a plateu of plant construction in Wisconsin. As the Wisconsin Bioenergy Initiative notes, it will "likely take public policy to expand the opportunity in Wisconsin and the region".[33]

Pennsylvania

According the U.S. Department of Agriculture, Pennsylvania dairy cows produce more than 11.3 million tons of manure each year.[34] According to the National Renewable Energy Laboratory, the state has the potential to capture, 123,000 k.Wh of electricity annually from biogas.[35] Recent interests in carbon-offset purchases have renewed interest in anaerobic digestion.[36] Nonprofit groups, such as, the **Pennsylvania Biomass Working Group,** and the **Pennsylvania Energy Harvest Grant Programs**, support the development of biogas through financial incentives and non-financial lobbying.

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[31] **"Policy Analysis"** Wisconsin Bio-Energy Initiative,<http://www.wbi.wisc.edu/policy-analysis/>
[32] **"Wisconsin Bio-Energy Initiative Strategic Report 2011"** Wisconsin Bio-Energy Initiative.
[33] **"Wisconsin Bio-Energy Initiative Strategic Report 2011"** Wisconsin Bio-Energy Initiative.
[34] **"Renewable Energy for America"** National Resources Defense Council. <http://www.nrdc.org/energy/renewables/penn.asp>
[35] **"Renewable Energy for America"** National Resources Defense Council. <http://www.nrdc.org/energy/renewables/penn.asp>
[36] **"Renewable Energy for America"** National Resources Defense Council.
<http://www.nrdc.org/energy/renewables/penn.asp>tp://www.nrdc.org/energy/renewables/penn.asp

Vermont

The main driver behind anaerobic digestion in Vermont is the Central Vermont Cow Power (CVCP) program. It is the nation's first manure based farm to consumer energy program. Under this, consumers agree to pay a $0.4 k.Wh premium, which goes to participating farm producers or helps purchase renewable energy credits. [37]CVCP also provides grants to farm owners.

American Firms: Construction, Design and Service

Andgar Corporation - GHD
www.ghdinc.net

RCM International
www.rcminternationalllc.com

Phase 3 Developments – Quasar Energy Group
www.quasarenergygroup.com

YIELD, Renewable Energy Producers
www.yieldenergy.com

4.7 Canada

Canada is an untapped market for anaerobic digestion. The AD market in Canada has large potential, but has not significantly developed. The economic viability of anaerobic digestion in Canada remains uncertain. Areas of foreseen growth include Ontario and British Columbia.

4.8 Ontario

The anaerobic digestion industry in Ontario originated in the 1980s but failed due to poor economic returns and/or operational difficulties. With higher gas prices, an emphasis on green energy and financial support from the Ontario government, the industry is again beginning to grow. Currently there are four operational anaerobic digesters in Ontario, with several more in the planning/construction phase of development.[38] New support from the Ontario provincial government in the form of the **Canadian Farm Business Advisory Service**, **Community Power Fund**, and **Ontario Biogas Systems Financial Assistance Program** are making it easier for Ontario farmers to get involved in the Ag-energy business.

[37] **"Manure-Based Cow Power Program Keeps Growing**" National Hog Farmer, 2008.
<http://nationalhogfarmer.com/nutrition/news/1208-cow-power-program/>
[38] **"Anaerobic Digestion Basics** " Ontario Ministry of Agriculture, Food and Rural Affairs, 2011.
<.http://www.omafra.gov.on.ca/english/engineer/facts/07-057.htm#1>

4.9 Cow Power: British Columbia.

While there is virtually no existing biogas market in British Columbia, with the **BC Cow Power Initiative**, this is poised to change. The Cow Power program assists agricultural producers in B.C., to build anaerobic digester systems. Under this program, B.C. electricity consumers will have the option to buy their electricity from an on-farm anaerobic digester system, by paying a premium on their electricity bill (an additional ¢4/k.Wh)[39]. The majority of the premium, in combination with the price paid for renewable energy by B.C. Hydro, will be passed back to the agricultural producer. This will increase profitability and therefore, the number of AD systems built in British Columbia. There is a projected increase of 20-50 anaerobic digesters over the next 5 years. Octaform Systems is a proud sponsor of this program.

Potential BC Cow Power Technology & Service Providers

'This list is of anaerobic digestion (AD) technology/service providers that have successfully developed at least one AD project at the time this document was prepared and have demonstrated interest in providing their AD services in BC. While this list was compiled using all reasonably available information, it may not be complete. Any reference to or mention of any products, processes or services does not constitute or imply a recommendation or endorsement'.

Andgar Corporation (Rep. GHD Digesters)
www.andgar.com

Avatar Energy
www.avatarenergy.com

Bio-En Power Inc.
www.bio-en.ca

BIOFerm Energy Systems
www.biofermenergy.com

Catalyst Power Inc.
www.catalystpower.ca

CH-Four Biogas Inc.
www.chfour.ca

CCS Agrikomp
ccs-agrikomp.ca

Octaform Systems
www.octaform.com

PlanET Biogas Solutions Inc. (CA sub)
www.planet-biogas.ca

[39] "**Cow Power**" ArdCorps,<http://www.ardcorp.ca/index.php?page_id=49>

YIELD, Renewable Energy Producers
www.yieldenergy.com

RCM International LLC
www.rcminternationalllc.com

Electrigaz
www.electrigaz.com

UTS Residual Processing LLC
www.uts-residuals.com

Valbio Canada
www.valbio.ca

4) CONCLUSIONS

It is clear that anaerobic digestion as a practice makes sense. It not only reduces green house gas emissions, but also disposes of manure in a safe, appropriate manner. In addition, it is abundantly clear that the impressive demand and growth of the biogas industry is paralleled by few resource-based industries. While it is easy to determine that there will be growth, the places that will show the most growth are unclear. Best estimates predict that Europe will continue to lead the way with Germany always at the forefront of the anaerobic digestion industry. Expansion of German technology into peripheral areas of Europe is expected. Countries such as Poland, the Czech Republic, Hungary, and the UK are poised to make significant increases in Biogas infrastructure. In the North American market, the future is uncertain. A number of initiatives, programs, associations and organizations in Canada and the United States are pushing for biogas. However, until the economic viability of the industry is more certain, the necessary private capital to increase infrastructure will be lacking.

FIRMS AND ASSOCIATIONS MENTIONED

Agraferm Technologies
www.agraferm.org

agriKomp
www.biogastechnik.de

Agstar
www.epa.gov/agstar

Andgar Corporation - GHD
www.ghdinc.net

BC Agricultural Research & Development Corporation
www.ardcorp.ca

Bio Construct GmbH
www.bioconstruct.de

BioG UK Ltd.
www.biog-uk.co.uk

Biogas Nord
www.biogas-nord.com

Biogas Weser Ems
www.biogas-weser-ems.de

BiogenGreenfinch
www.biogen.co.uk

Bioplyn CS
www.bioplyncs.cz

BioProject
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