

Presentation



Krieg & Fischer Ingenieure GmbH

Planning & Construction of Biogas Plants

Dezember 2014

Krieg & Fischer Ingenieure GmbH



Krieg & Fischer Ingenieure GmbH

Planning & Construction of Biogas
Plants worldwide

Krieg & Fischer Ingenieure GmbH has
more than 25 years of experience in:

***Planning & Construction
of Biogas Plants***

Company Location



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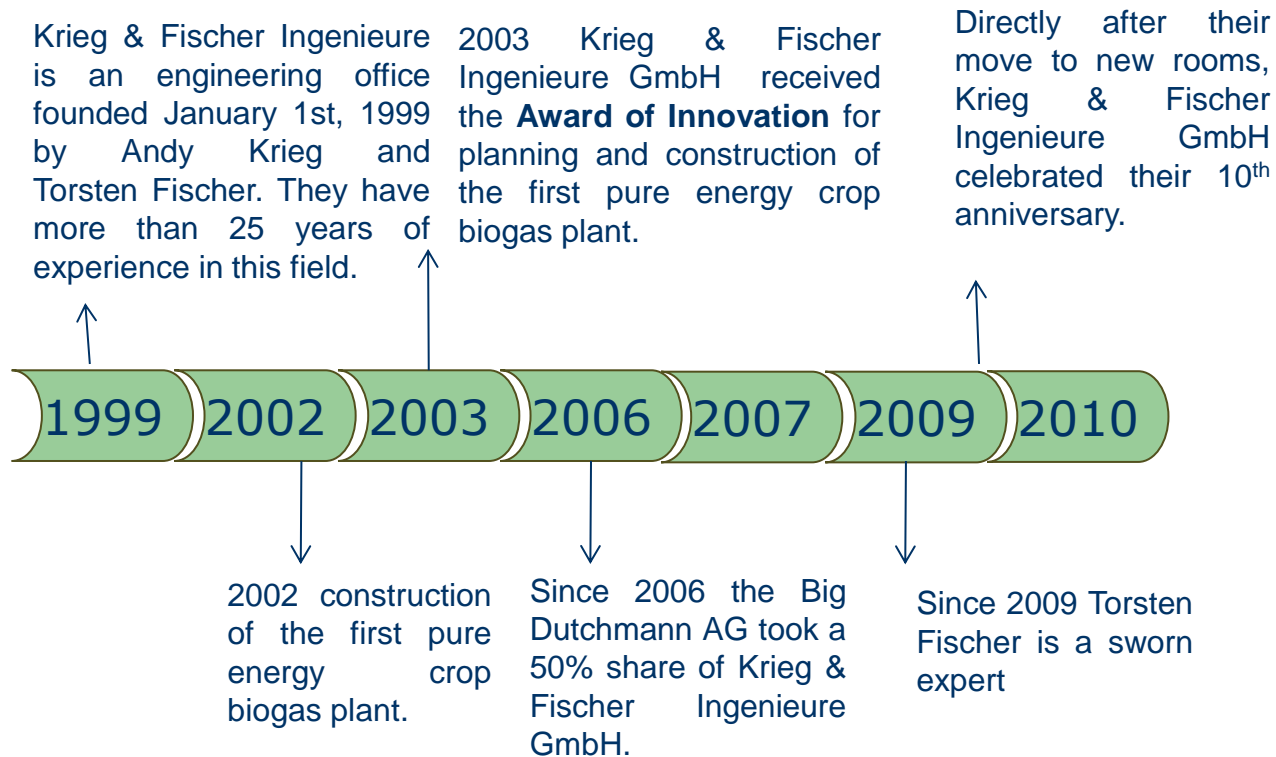




Our Office

Our service spectrum includes provision of all types of service in the field of digestion of anaerobic process technologies and biogas technologies.

1999 - 2010





Our Office

Our service spectrum includes provision of all types of service in the field of digestion of anaerobic process technologies and biogas technologies.

2011 - 2015

In 2011 Krieg & Fischer Ingenieure GmbH entered the agro industrial field of biogas plants in the Netherlands and Germany with the treatment of sugar beets. We were already treating potato starch in Germany back in 2001, and were treating potato residue in Canada in 2007

2013 Consultation on World Bank projects for designing biogas plants in China
2013 First agricultural biogas plant is constructed in Argentina



2011 Construction of the first biogas plant in Russia

2014 Construction of the first two biogas plants in China

Team

Team: 18



general manager:

Torsten Fischer



has been active in the field of biogas since 1993. In this period he worked for two plant construction companies.

The main aspects of his work were industrial bio-waste digestion and large-scale co-fermentation biogas plants.

Our Partner



- Japan
- Canada
- France
- Bulgaria
- Poland
- Italy
- Greece
- Spain



Activities world wide



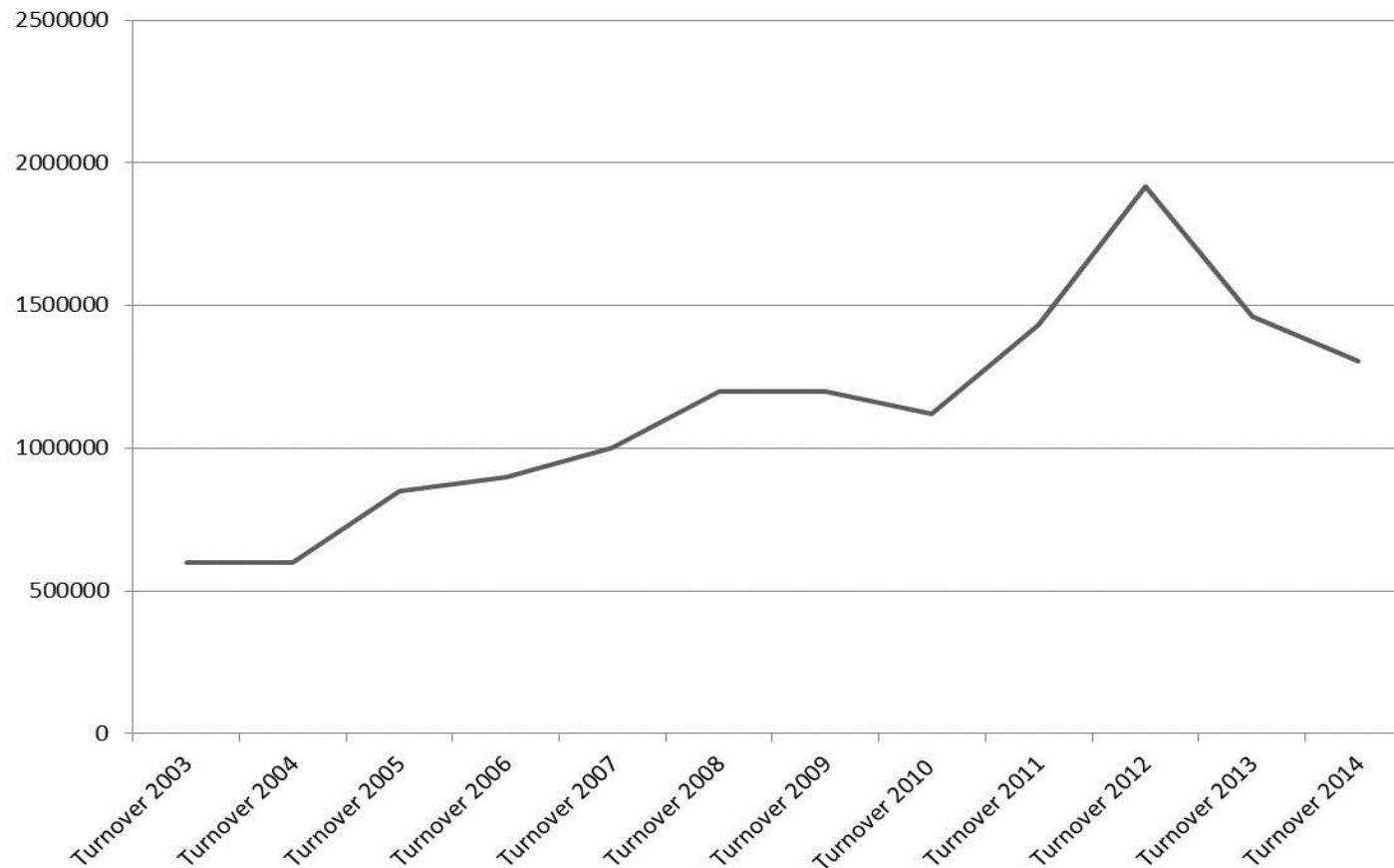
In 25 years

Services provided by Krieg & Fischer

Our team of highly qualified engineers is interdisciplinary and thus provides competent service in the fields of civil and process engineering as well as in the fields of machine and plant engineering.

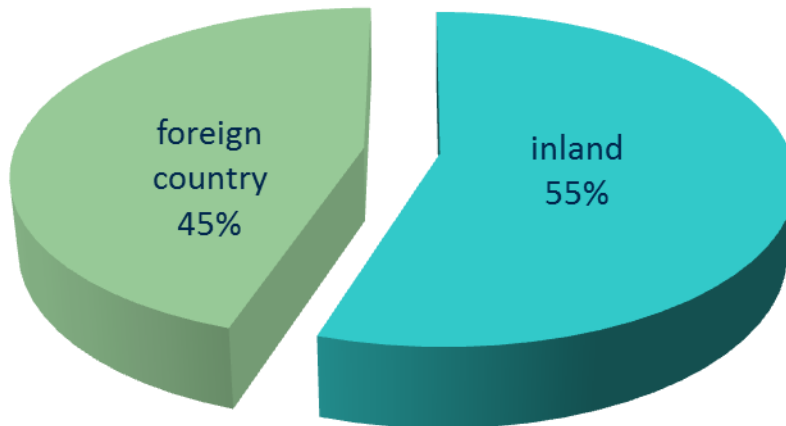
In particular, we have extensive experience in the area of large-scale plant construction and are among the leading providers of such services. Complex anaerobic process technologies for the fermentation of different waste and waste-water flows with large dry substance fractions are our speciality. We provide know-how from preplanning up to initial operation worldwide, both as independent provider and in co-operation with our partners.

Turnover 2003-2014

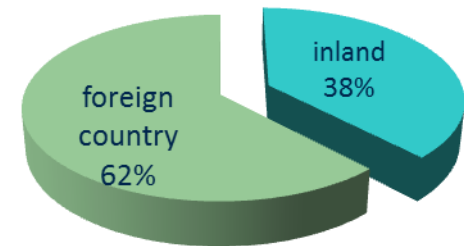


Distribution of Turnover

Turnover 2014



Turnover 2013



Our Clients



- farmers
- private clients
- industry
- general contractors
- engineering consulting offices
- energy suppliers
- municipal clients

Our Service Offering

- Studies
- Concept development
- Process technology
- Cost determination/ Calculation
- Permission
- Planning
- Construction management
- Start-up
- Optimisation
- Due diligence
- Expert Opinion
- Operator Service **new 2014**



Studies

Technical and economical feasibility:

- planning and pre-construction
- effective process – technologies evaluation
- influences of specific input substrates in various digester utilization of solid and liquid digestion residues
- Impacts of spreading digested substrates on fields



Engineering

- complete design – concept through operation
- engineering for process technology
- detail engineering; heat exchangers, process control systems, measurement, etc.
- pre-engineering, detailed and final engineering
- optimisation/ improvement

Honours



2003 Krieg & Fischer Ingenieure GmbH received the award of innovation for planning and construction of the first pure energy crop biogas plant



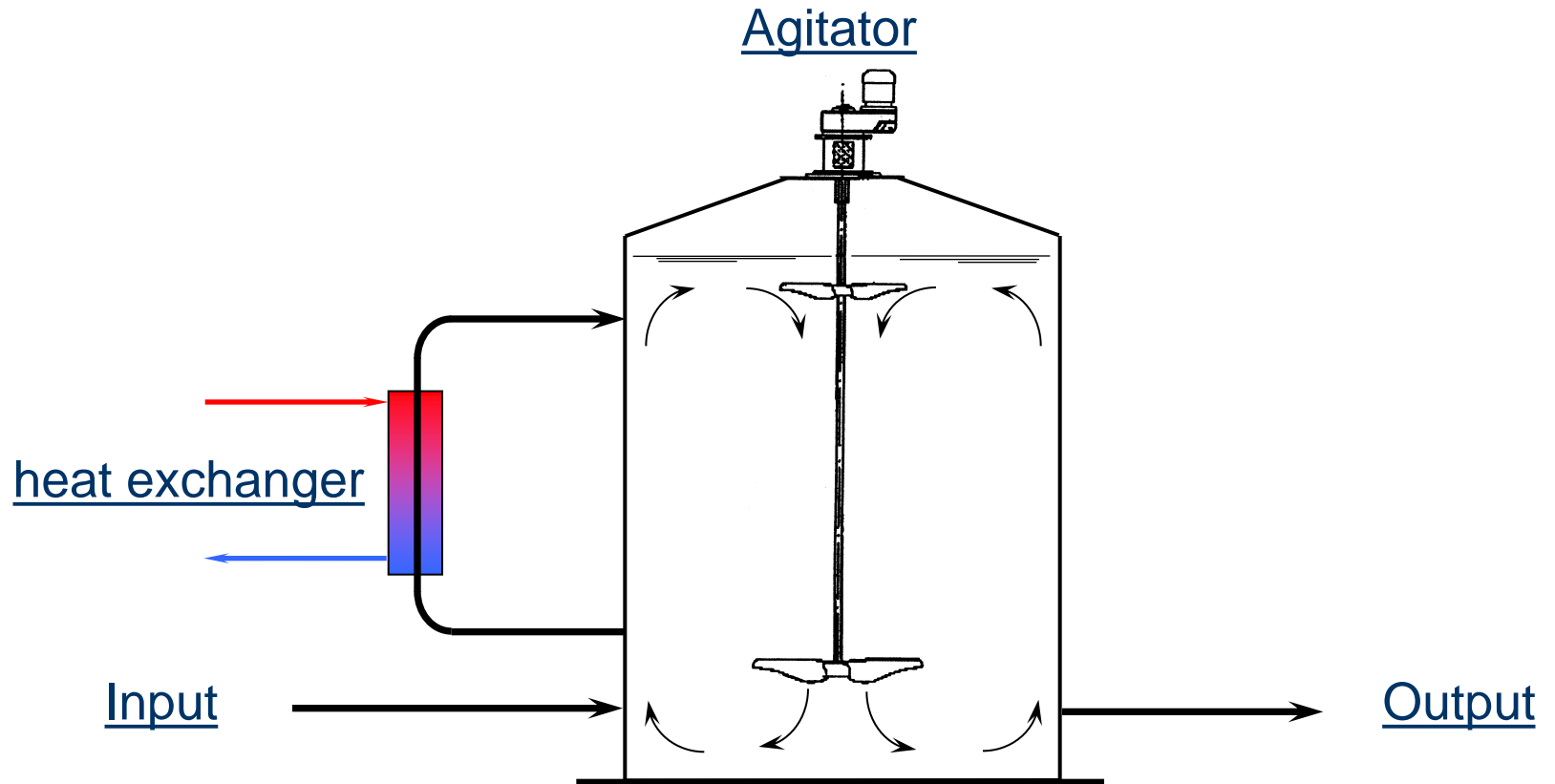
Plant Types



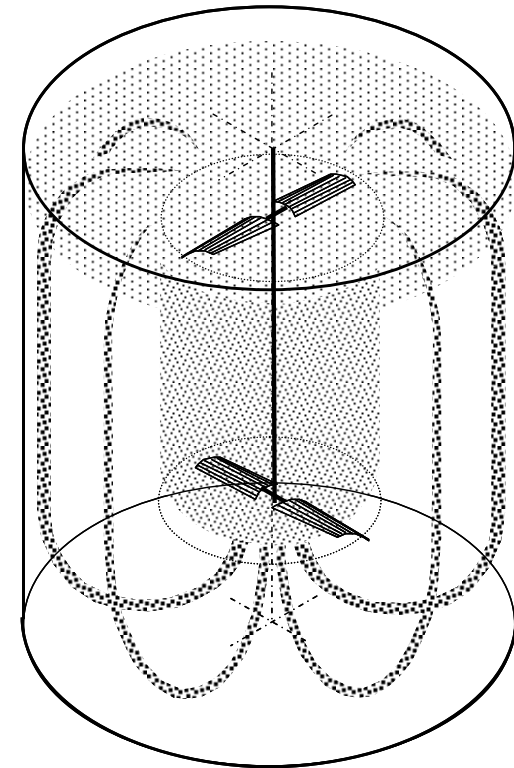
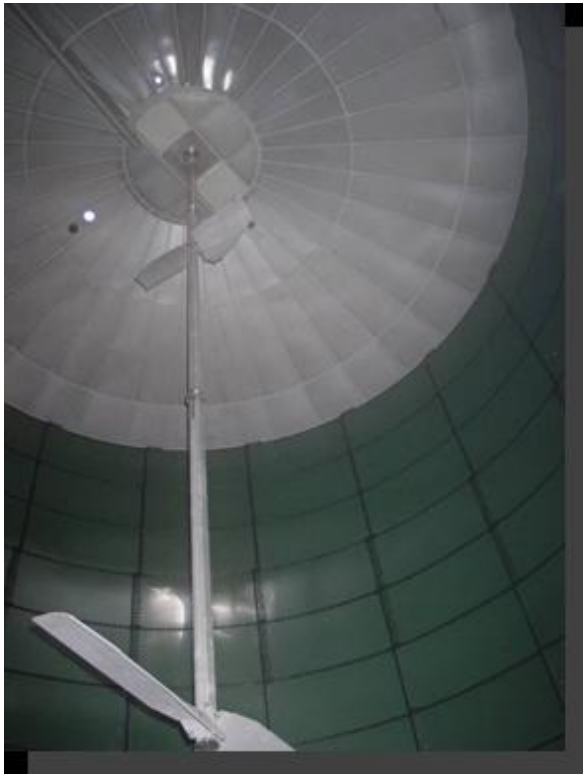
- farm-scale biogas plant until agro industrial biogas plant
- co-fermentation biogas plant
- digestion plant



Technical Details

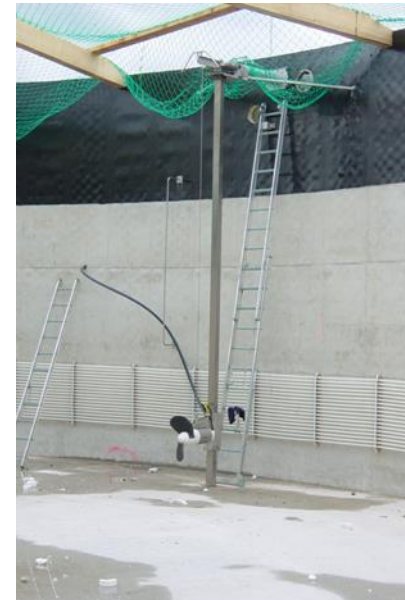
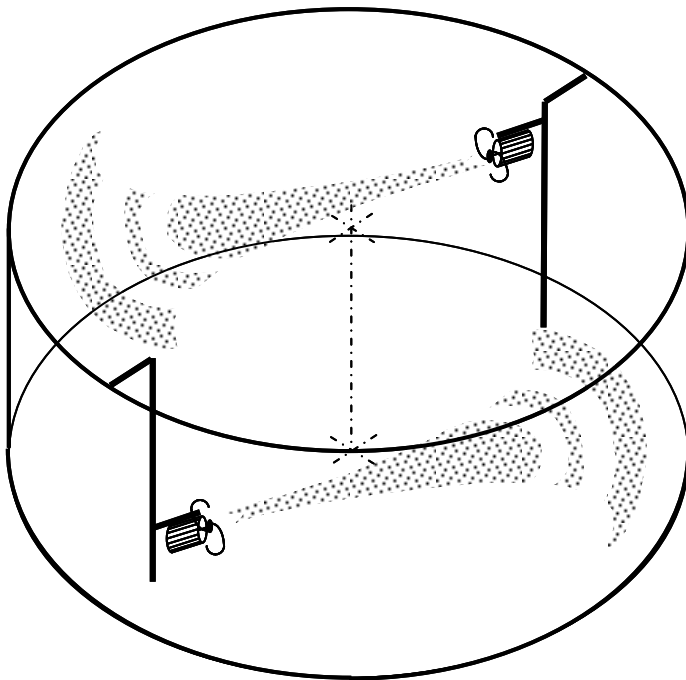


Technical Details



Agitator in the digester tank and its effect

Technical Details



Agitator in the secondary digester tank and its effect

Technical Details



Wood construction in the secondary digester tank



Gas holder on top of secondary digester tank

Technical Details



Pumping room

Pumps, valves and pipes specific to the plant substrate



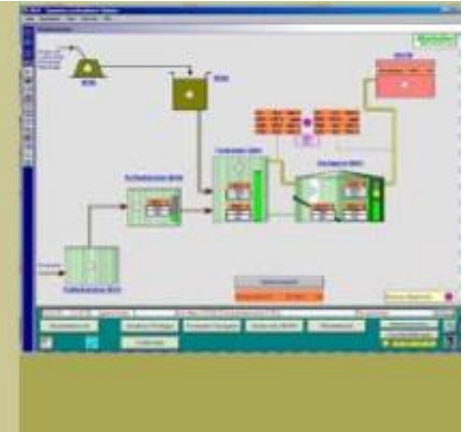
External heat exchanger

to heat the substrate



Overpressure- vacuum relief valve

for safety reasons



Process control system

system control,
monitoring and
worldwide access to
the biogas plant

Technical Details



Solid input devices for farm digesters

Technical Details



Solid input device with liquid input device and storage capacity

Technical Details



Biogas upgrading and injection of bio-methane
into the natural gas grid

Reference of biogas plant



Reference list

(extract of more than 150 biogas plant reference)

- **BLÜMEL** 1994 **Germany**, bio-waste, 2 x 800 m³ digester volume, HPP 2 x 160 kWel
- **BARZ** 1996 **Germany**, pig manure, kitchen waste, 230 m³ digester volume, HPP 45 kWel
- **STANGE** 2000 **Germany**, pig manure, turkey dung, 450 m³ digester volume, HPP 45 kWel
- **PRAD** 2001 **Italy**, cattle manure, co-fermentation products, 2 x 735 m³ digester volume, I
- **WERLTE** 2002 **Germany**, pig and cattle manure, fats, 2 x 3,000 m³ digester volume, HPP 2 x 1,3 MWel
- **OBERNJESA** 2003 **Germany**, energy crop, 400 m³ digester volume, HPP 100 kWel
- **IM BRAHM** 2004 **Germany**, pig manure, kitchen waste, fats, 1,205 m³ digester volume, HPP 2 x 190 kWel
- **BÖCKERMANN II** 2005 **Germany**, cattle manure/dung, energy crop, 4,070 m³ digester volume, HPP 2 x 536 kWel
- **WIESENAU** 2005 **Germany** cattle manure, dung, energy crop, 2,615 m³ digester volume, HPP 526 kWel
- **FREY** 2005 **Germany** energy crop, 1,530 m³ digester volume, HPP 330 kWel
- **INLAND EMPIRE** 2006 **USA**, manure, waste, 2 x 4,500 digester volume, biogas distribution systems
- **PORTA** 2006 **Spain**, pig manure, waste, 1,360 digester volume, HPP 191 kWel
- **NOYON** 2007 **France**, sewage sludge, food residuals, cofermente, 3,500 digester vol., HPP 716 kWel
- **PRINCE EDWARD I.** 2007 **Canada**, potato raw material, oil, potato sludge, 22,000 m³ digester volume
- **FALKENSTEIN** 2008 **Germany**, corn silage, wheat silage, sweet sorghum, 2 x 3,126 digester vol., 2 x 726 kWel
- **OS DE BALAGUER** 2009 **Spain**, pig manure, fats, sludge of slaughterhouse, 1,209 m³ digester vol. , 370 kWel
- **SEMD** 2010 **Germany**, corn silage, 2,473 digester vol., injection of bio-methane
- **SUIKER UNIE** 2011 **Netherlands**, sugar beet, vegetable waste, 4 x 4,480 m³ digester vol. injection biomethan
- **BELGOROD** 2011 **Russia**, corn silage, slaughterhouse sludge, 2 x 3,035 m³ digester vol., 2 x 1.2 MWel
- **ANKLAM** 2012 **Germany**, sugar beet, vinasse, 4 x 4,610 m³ digester vol., injection of bio-methane
- **RIO CUARTO** 2013 **Argentina**, corn silage, cattle manure, 4,580 m³ digester vol., HPP 1,2 MWel
- **QUINHUANGDAO** 2014 **China** kitchen waste, 2 x 3,400 m³ digester vol., gas upgrading, using in household

Biogas Plant Qinhuangdao

Waste Digestion plant in China

Location:	China
Construction Period:	2014
Input:	kitchen waste
Fermenter:	steel tank, 2 x 3,400 m ³
Co-generator:	gas upgrading,



Krieg & Fischer Ingenieure GmbH **Responsibilities:**

Conception, preplanning, permission
detailed and final construction plans,
supervision of construction, start-up



Biogas Plant Anklam

Biogas plant with bio-methane injection in Germany (agro-industrial sector)

Location:	Germany
Construction Period:	2012
Input:	sugar beets, vinasse
Fermenter:	steel tank, 4x4,480 m ³
Co-generator:	gas upgrading, gas injection



Krieg & Fischer Ingenieure GmbH Responsibilities:

Conception, preplanning, permission
detailed and final construction plans,
supervision of construction, start-up



Biogas Plant SUIKER UNIE

**Biogas plant with biomethane injection in the Netherlands
(agro-industrial sector)**

Location:	the Netherlands
Construction Period:	2011
Input:	sugar beets, vegetable waste (potate, chicoree)
Fermenter:	steel tank, 4 x 4,480 m ³
Co-generator:	biogas upgrading, gas injection



Krieg & Fischer Ingenieure GmbH Responsibilities:

Conception, detailed and final construction plans, supervision of construction, start-up

Biogas Plant SEMD

Agriculture biogas plant with biomethane injection in Germany

Location: Germany
Construction Period: 2009/10
Input: corn silage
Fermenter: prestressed concrete, prefabricated element tank, 2,473 m³
Co-generator: biogas upgrading and injection



Krieg & Fischer Ingenieure GmbH Responsibilities:

functional tender, award and supervision of construction, project management, final acceptance



Biogas Plant NOYON

Waste digestion plant in France

Location:	France
Construction Period:	2007
Input:	sewage sludge, fats, food residuals, co-substrates, process water
Fermenter:	steel tank, 3,000 m ³
Co-generator:	gas engine, 716 kW



Krieg & Fischer Ingenieure GmbH **Responsibilities:**

Conception, Preplanning, Permitting,
Detailed and Final Engineering,
Construction Supervision, Start-up



Biogas Plant PRINZ EDWARD ISLAND

Waste digestion plant in Canada (agro-industrial sector)

Location:	Canada
Construction Period:	2007
Input:	potato raw materials, oil, potato sludge
Fermenter:	steel tank, 22,000 m ³
Co-generator:	thermal use of biogas

Krieg & Fischer Ingenieure GmbH Responsibilities:

Conception, Preplanning, Permitting,
Detailed and Final Engineering,
Construction Supervision, Start-up



Biogas Plant INLAND EMPIRE

Waste digestion plant with biomethane injection in the USA

Location:	USA
Construction Period:	2006
Input:	Manure, waste
Fermenter:	2 Steel Tanks, 4,500 m ³
Co-generator:	Feeding into the gas distribution systems
Special Features:	Feeding into the gas distribution systems

Krieg & Fischer Ingenieure GmbH Responsibilities:

Conception, Preplanning, Permission,
Detailed and Final Engineering,
Construction Supervision, Start-up



Biogas Plant IM BRAHM

Cofermentation biogas plant in Germany

Location:	Germany
Construction Period:	2005
Input:	pig manure, kitchen waste, fats, grain
Fermenter:	Concrete Tank, 1,205 m ³
Co-generator:	gas engine, 4 x 190 kW
Costs:	about. € 1,000,000



Krieg & Fischer Ingenieure GmbH **Responsibilities:**

Conception, Preplanning, Permitting,
Detailed and Final Engineering,
Construction Supervision, Start-up
and several enlargements



Biogas Plant HEHLEN

Agriculture biogas plant with energy crop in Germany

Location:	Germany
Construction Period:	2005
Input:	corn silage
Fermenter:	Concrete Tank, 2 x 2,000 m ³
Co-generator:	gas engine, 2 x 536 kW
Costs:	about. € 1,900,000



Krieg & Fischer Ingenieure GmbH **Responsibilities:**

Conception, Preplanning, Permitting,
Detailed and Final Engineering,
Construction Supervision, Start-up



Biogas Plant FREY

Agriculture biogas plant in Germany

Location:	Germany
Construction Period:	2004/05
Input:	corn silage, grass silage, wheat silage
Fermenter:	Concrete Tank, 1,530 m ³
Co-generator:	gas engine, 330 k
Costs:	about. € 900,000

Krieg & Fischer Ingenieure GmbH **Responsibilities:**

Conception, Preplanning, Permitting,
Detailed and Final Engineering,
Construction Supervision, Start-up



Biogas Plant EICHENHOFER

Agriculture biogas plant in Germany

Location: Germany
Construction Period: 2004
Input: corn silage
Fermenter: concrete Tank, 508 m³
Co-generator: gas engine, 125 kW

Krieg & Fischer Ingenieure GmbH **Responsibilities:**

Conception, Preplanning, Permitting,
Detailed and Final Engineering,
Construction Supervision, Start-up



Biogas Plant HOLLANDHOF

Agriculture biogas plant in Germany



Location:	Germany
Construction Period:	2004
Input:	pig dung, turkey dung, grass silage, corn silage
Fermenter:	concrete tank, 350 m ³
Co-generator:	gas engine, 60 kW
Costs:	about € 285,000



Krieg & Fischer Ingenieure GmbH Responsibilities:

Conception, Preplanning, Permitting,
Detailed and Final Engineering,
Construction Supervision, Start-up



Biogas Plant CUDWORTH PORK

Agriculture biogas plant in Canada

Location:	Canada
Construction Period:	2003
Input:	Pig Manure
Fermenter:	Steel Tank, 2,000 m ³
Co-generator:	Micro gas turbines, 4 x 30 kW
Spezial Features:	Gasholder above secondary digester tank



Krieg & Fischer Ingenieure GmbH **Responsibilities:**

Conception, Preplanning, Permission,
Detailed and Final Engineering,
Construction Supervision, Start-up

Biogas Plant OBERNJESA

First biogas plant with energy crop in Germany

Location:	Germany
Construction Period:	2002/2003
Input:	Energy Crops
Fermenter:	Concrete Tank, 680 m ³
Co-generator:	Dual Fuel Co- generator, 160 kW
Costs:	about. € 680.000



First energy crop biogas plant in Germany

Krieg & Fischer Ingenieure GmbH Responsibilities:

Conception, Preplanning, Permission,
Detailed and Final Engineering,
Construction Supervision, Start-up



Biogas Plant BÖCKERMANN

Waste digestion plant in Germany

Location:	Germany
Construction Period:	2002
Input:	manure, other organic waste
Fermenter:	glass coated steel Tank, 2,500 m ³
Co-generator:	dual fuel co-generator 2 x 170 kW
Costs:	about. € 750,000



Krieg & Fischer Ingenieure GmbH **Responsibilities:**

Conception, Preplanning, Permitting,
Detailed and Final Engineering,
Construction Supervision, Start-up

Biogas Plant WIETZENDORF

Waste digestion plant in Germany (agro-industrial sector)

Location:	Germany
Construction Period:	2001/2002
Input:	potato pulp
Fermenter:	Steel Tank, 4 x 2,500 m ³
Co-generator:	gas engine, 2 x 2,1 MW
Costs:	about € 25,000,000



Krieg & Fischer Ingenieure GmbH **Responsibilities:**

Conception, Preplanning, Permitting,
Detailed and Final Engineering,
Construction Supervision, Start-up



Biogas Plant PRATO allo STELVIO

Agriculture biogas plant in Italy

Location:	Italy
Construction Period:	2001
Input:	Manure, straw other organic waste
Fermenter:	2 Concrete Tank, 735 m ³
Co-generator:	Integration in central energy system for electricity and heat production
Special Features:	Biogas Plant of 53 farmers
Costs:	about. € 900.000

Krieg & Fischer Ingenieure GmbH **Responsibilities:**

Conception, Preplanning, Permission,
Detailed and Final Engineering,
Construction Supervision, Start-up



International Trade Fair



Course of Instruction



Publication (extract)

- FISCHER, T and Dr. K. BACKES, 2011:
Start-up of biogas plant, 3rd Annual Canadian Farm & Food/ Biogas, Conference and Exhibition, London, Ontario, Canada; February 28 - March 1, 2011
- KAISER, K and Dr. K. BACKES, 2009:
Optimizing Biogas Yields with Substrate Selection in: BioCycle, June, 2009
- FISCHER, T and Dr. K. BACKES, 2009:
Industrial Big Biogas Plant Design and Construction in North America in: Canadian Farm and Food Biogas Conference, London, Ontario March 10, 2009
- FISCHER, T. und A. KRIEG; 2006:
Monofermentation of grass silage – possibilities and experiences
in: Leipziger Biogas-Fachgespräche 2005/2006
- KRIEG, A.; 2004:
Gas from Gras - Bio Energy Farm Obernjesa
in: 13. Jahrestagung "Biogas und Bioenergie in der Landwirtschaft" am 2.-4. Dezember 2004
- FISCHER, T. und A. KRIEG; 2003:
Examples of plants for the digestion of gras and energy crops in: Biogas Journal Nr. 2, November 2003, S. 28-30
- FISCHER, T., RILLING, N. und R. STEGMANN; 1994,
Anaerobic Dry-Fermentation - The ATF-Process
Fresenius Akademie, Schloß Herten, 17. Nov. 1994
- KRIEG, A.; 1993,
Fermentation of Manure together with Residues from industrial Food Processing,
in: Tagungsband 2. Biogastagung des Fachverband Biogas
Hrsg.: Kirchberg/J: Eigenverlag

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