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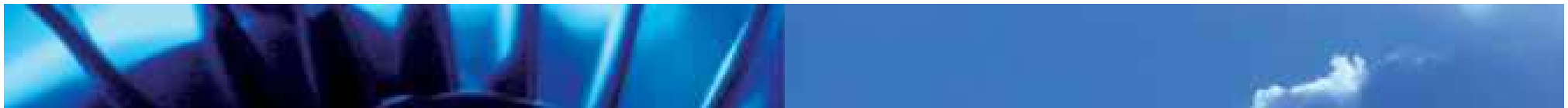
ENERGY DEVELOPMENT PARTNERS



Company profile

April 2011

NOVIS GmbH
Vor dem Kreuzberg 17
DE 72070 Tuebingen



Agenda

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Introduction

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NOVIS – partner of the ‘Rottaler Modell’

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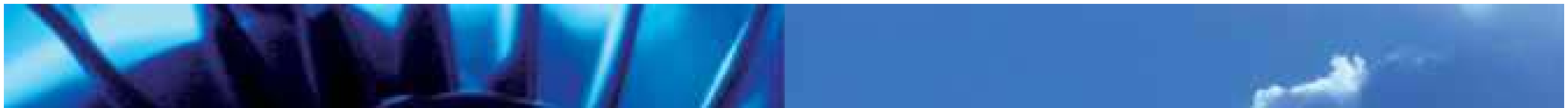
Biogas process and technology

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Advantages of ‘Rottaler Modell’ biogas plants

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References and contact details



Introduction: NOVIS GmbH

Registered office: Vor dem Kreuzberg 17, DE 72070 Tuebingen, Germany
Founding year: 2002
Managing director: Dr. Thomas HELLE
Member of staff: 11 in Germany, 25 in international projects



Business purpose:

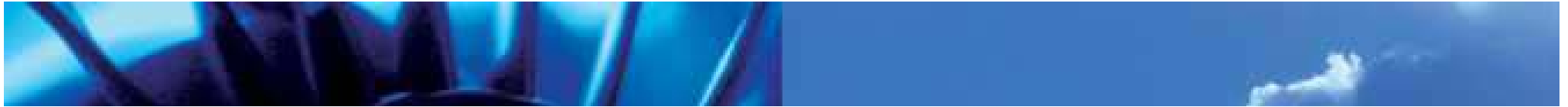
- Conception, development and realisation of energy solutions based on the use of biowaste
- Use of different technologies for the production of renewable energies
- Rural development
- Energie academy: Qualification of local experts in the bioenergy sector
- Partner of the 'Rottaler Modell'

Application area:

- West Africa
- South East Europe
- South East Asia

Holding company:

- ILTIS GmbH, Germany
- Management consulting, project management and development cooperation for more than 20 years
- Website: www.iltis.de



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NOVIS – partner of the ‘Rottaler Modell’ (1/3)

NOVIS is a company of the Rottaler Modell Network, providing:

- Sophisticated more-staged High Performance Biogas Plants with separated hydrolysis and acidification units
- High Performance Temperature Controlled (HPTC) Biogas Plants for rural areas in developing countries
- Portagester: Mobile hydrolysis systems
- Equipment production
- Project development and -management
- After sales service
- Research and development activities

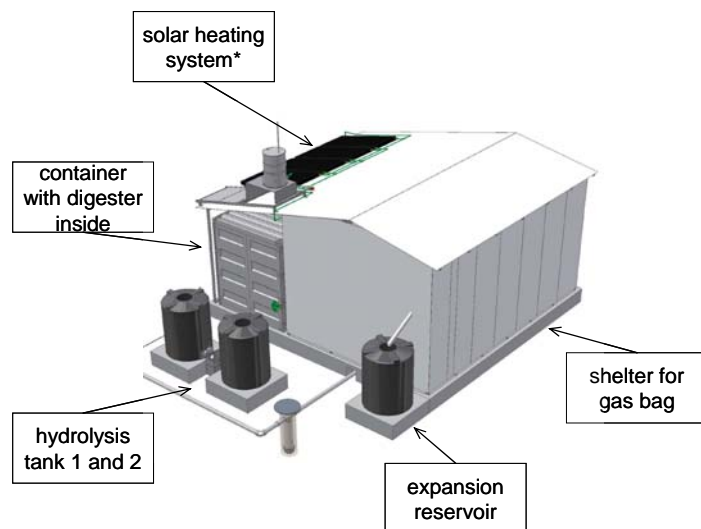
**RUTTALER
MODELL**

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ENERGY DEVELOPMENT PARTNERS

NOVIS – partner of the ‘Rottaler Modell’ (2/3)

HPTC Biogas plants for small scale application



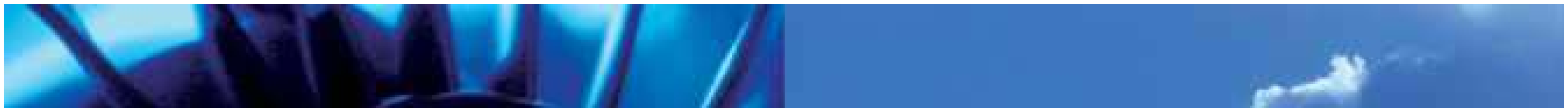
**HPTC = High Performance
Temperature Controlled**



Biogas plants for rural areas in developing countries

- for a stable digestion of waste from markets and agricultural production
- for the production of cooking gas, electricity and heat
- with an electrical output of 11 up to 30 kW
- also as containerized version available (see 3D scheme above)





NOVIS – partner of the ‘Rottaler Modell’ (3/3)

Biogas plants for large scale application

Example

Rottaler Modell reference plant: Simbach, Germany



Engine power:

1. step: GE Jenbacher 526 kWel
2. step: GE Jenbacher 526 kWel

Feedstock (~ 7,500 tons/a):

- Maize silage,
- Duck manure,
- Rye silage





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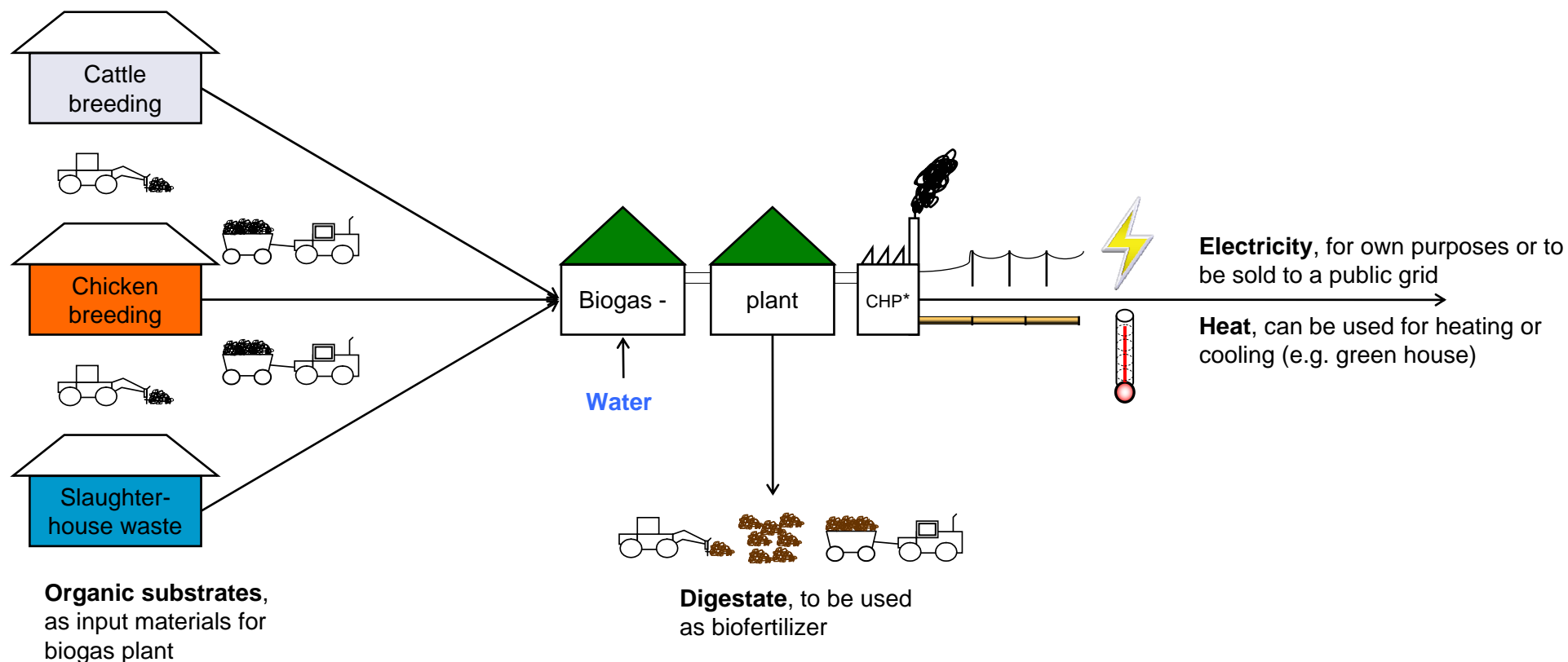
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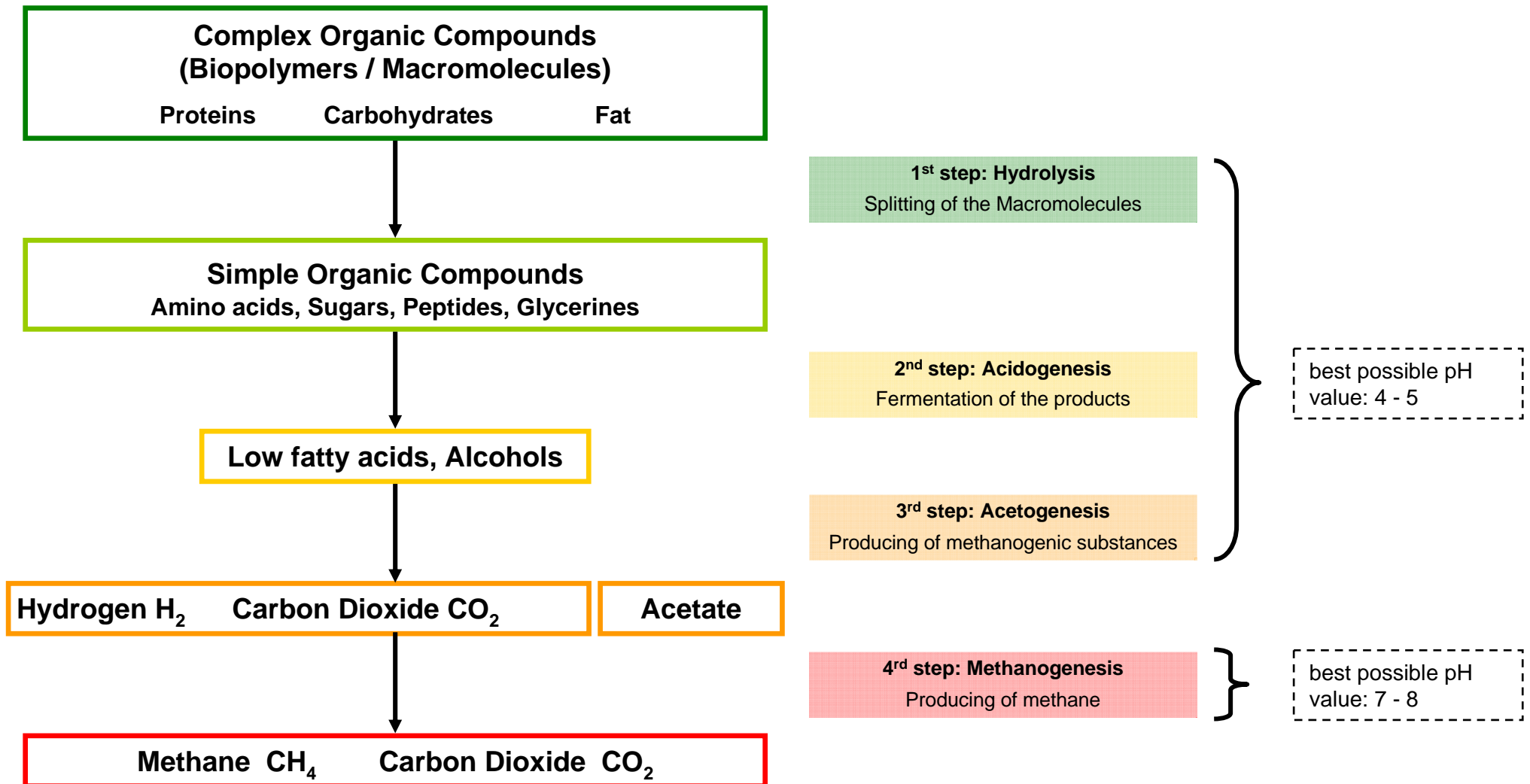
Biogas process and technology (1/3)

Scheme: Input and output of biogas process



* CHP = Combined Heat and Power Plant

Biogas process and technology (2/3)

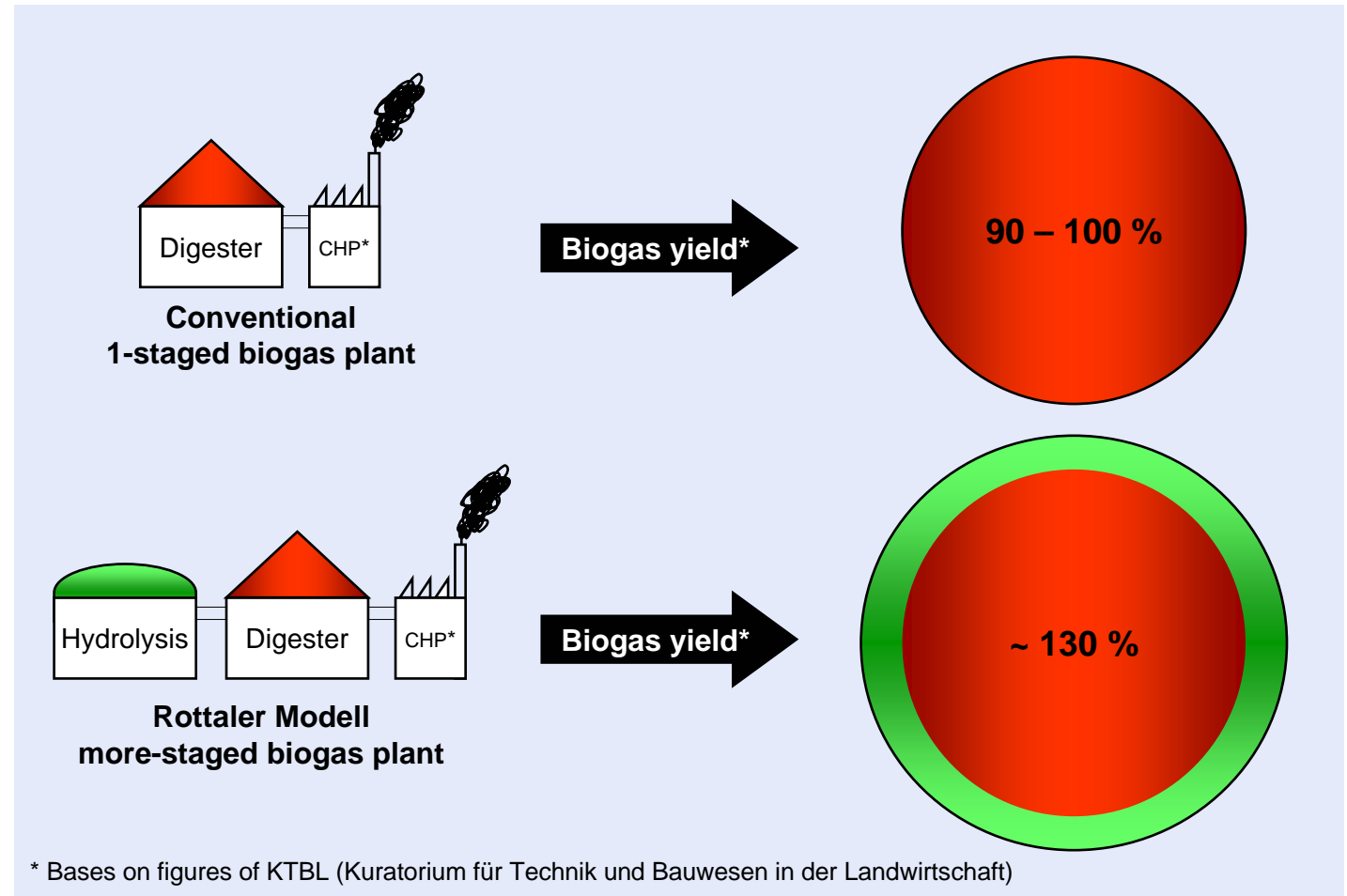


Biogas process and technology (3/3)

- Biogas plants of the Rottaler Modell are based on separated process steps of the biomass digestion.
- The separation targets an optimized biogas yield, while providing perfect conditions (pH value, temperature) for all process steps.

RESULT:

It is possible to generate a higher biogas yield of up to 30 % using the same amount of input materials!





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Advantages (1/5)

Possibility to digest a huge range of input materials:

- Biomass with a very low pH value such as fruit juices (e.g. pineapple juice).
- Mono-fractional biomass such as spent grains.
- Organic substrates with a high content of fibrous material such as straw and maize.
- Substrates with a very high energy content such as slaughterhouse waste.



RESULT:

The constructoral separation of different biogas-processing steps allows the efficient use of several different organic substrates, being often not digestable in conventional one-staged biogas plants!



Advantages (2/5)

Automated and stable biogas digestion process

- The biogas digestion process goes very swimmingly and stable due to a constructoral separation of the different process steps, (e.g. while using a separated hydrolysis and acidification unit).
- After feeding the biogas plant, the whole process is computer controlled and automated.
- Using a modern software and an internet based monitoring, allows the possibility of remote control and maintenance.



RESULT:

The Rottaler Modell biogas plant offers a very stable biogas production process and is safe against overfeeding and a resulting collapse of the biogas digestion biology



Advantages (3/5)

Air-tight digestion process: No odour nuisance and gas volatility

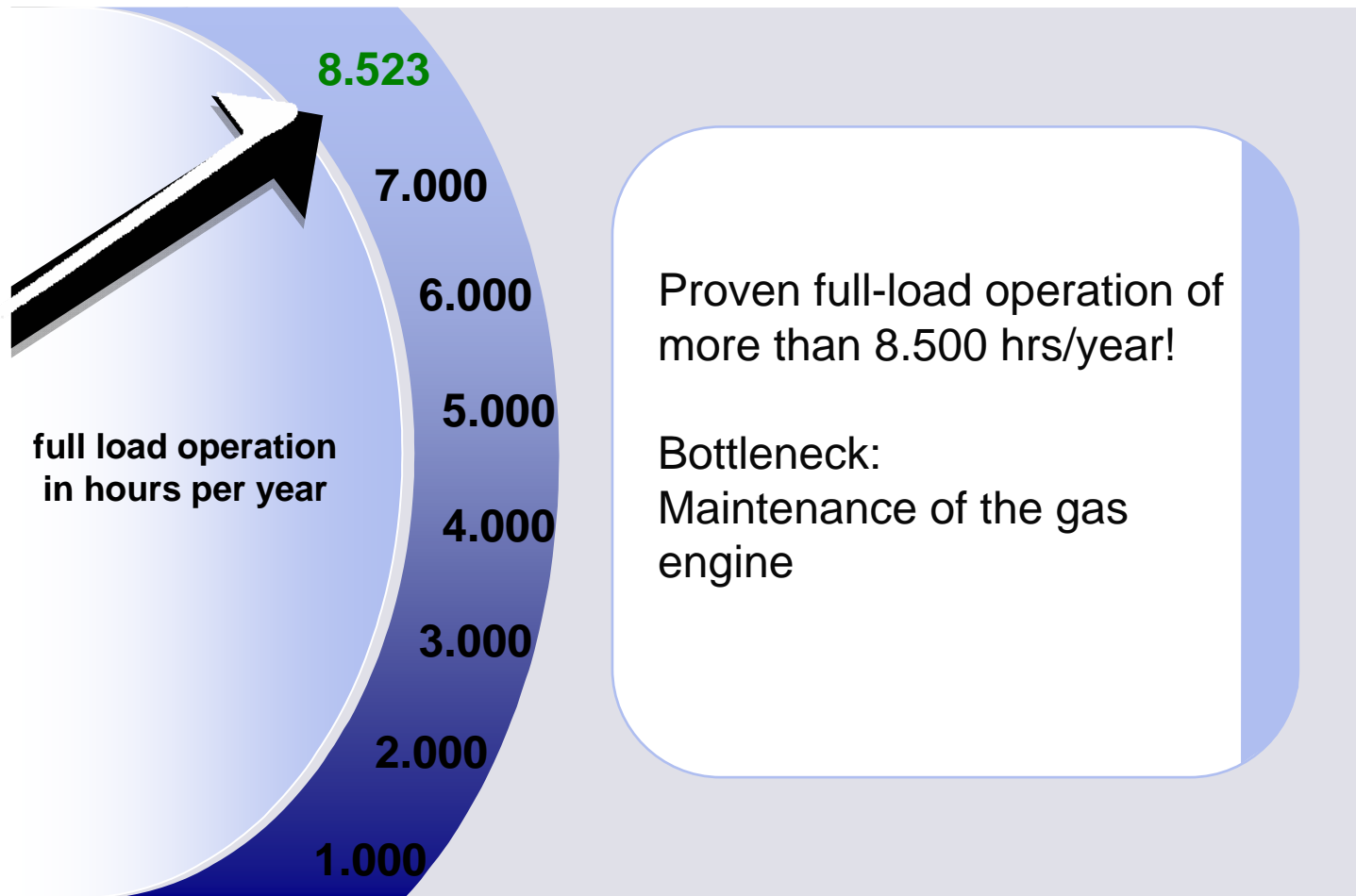
- Even if the original substrate is a very smelly substance, such as pig manure, the separated digestate will no longer smell badly after passing the digestion process.
- After insertion of the biomass into the mixing tank, the whole process is air-tight.
- No bad odours and no methane (as gaseous substance being harmful to the climate) are able to exhaust during the digestion process.



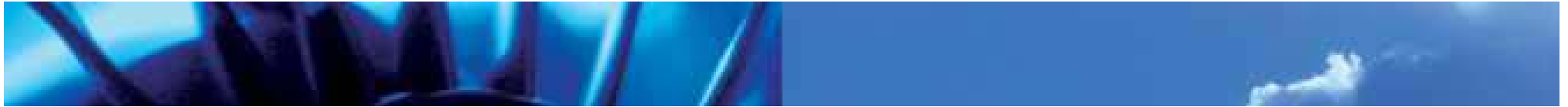
RESULT:

The biogas digestion process reduces bad odours and the air-tight construction avoids the exhaustion of environmentally harmful methane gas.

Advantages (4/5) - Higher efficiency in biogas production



RESULT: High efficiency with an expected operational time of more than **8.500** hours/year.



Advantages (5/5)

Summary:

- Short start-up phase based on longtime experience
- Higher biogas yield due to separation of different process steps
- Possibility to digest a huge range of input materials
- Automated and stable biogas digestion process
- Air-tight digestion process: No odour nuisance and gas volatility
- Higher efficiency due to an annual operational time of more than 8.500 hours

**RESULT: NOVIS provides ideal basic conditions
to operate a biogas plant highly profitable!**



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Place	Input	Capacity	Starting	Remarks
Dingolfing, Germany	Bio waste, leftovers, fruit market waste	4 installations, total capacity: 30,000 t/p.a.	1995	4 installations instead of a single one, to save transportation costs
Pairojsompong Panich Co., Thailand	MSW, fruit waste	6,000 t/p.a.	2003	First pilot plant under Southeast Asian conditions
KCPL Pvt. Ltd., Kerala, India	Sludge from the Ossein factory		2002	Pilot project
Green Energy GmbH, Landshut, Germany	Energy crops	1MW el	2007	Industrial estate biogas system No odor emission Heat utilization for industrial purpose
Schlienig, Italy	Cattle manure, grass	60 kW el	2008	Heating of hotels - rooms and hot water - with the excess heat of the genset
City of Baden-Baden, Germany	Food waste, fat waste, sewage sludge	536 kW el	2009	
HBS Energiá, Chile	Cattle manure, maize silage, grass silage	Project levels: a) 1 MW el b) 2 MW el c) 4 MW el	2010	Under construction, Heating of tomato green houses



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