Biogas production from pig manure and and straw hydrolysis technology
猪场粪污和秸秆水解酸化产沼气技术

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河北京安瑞能环境科技有限公司
Hebei Jing'an Ruineng Environmental Technology Co., Ltd

瑞士第一沼气国际有限公司
First Biogas International AG

2MW猪粪沼气工程
2MW pig manure biogas project



- 年存栏十万头商品猪

100,000 pigs at stock yearly

- 日产沼气1.5-1.8万方，日发电量3-3.5万度

daily biogas yeild 15,000-18,000m3, daily electricity output 30,000-35,000kwh

- 年产固态及液态有机肥25万吨

yearly production of solid and liquid fertilizer 250,000tons

- 河北省唯一一个沼气并网发电的企业

the only biogas project in Hebei connect to state power grid

畜禽粪污综合利用
comprehansive utilization of pig manure

畜禽粪污pig mnaure

厌氧发酵digester

沼气 biogas

储气罐gas storage

燃气入户 houshold use

提纯天然气 upgrading

CNG加气站CNG gas filling station

并网发电 access to grid

沼渣 沼液

固液分离 seperation

固体有机肥 solid fertizlier

液体有机肥 liquid fertilizer

农业种植 agricutural plantation

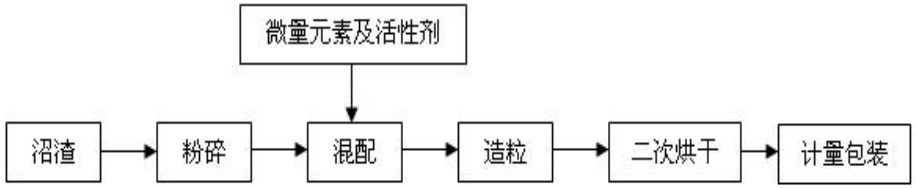
日处理猪粪污1000-1500t，产沼气1.5-1.8万方左右，发电量3万度左右。

daiyl treatment of pig manure 1000m3,TS2%, daily biogas yeild 15,000-18,000m3, daily electricity output 30,000-35,000kwh

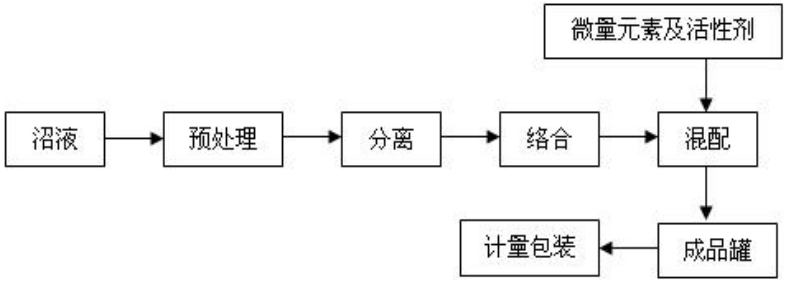
德国曼海姆沼气发电机组
German MAM power generator

全自动电脑控制生产
automatic control system

固肥工艺流程
soilid fertilizer production process



液肥工艺流程
liquid fertilizer production process



粪污经制沼后排出的沼渣沼液通过管道排到有机肥厂，通过固液分离，沼液通过过滤、稳定、螯合、络合、添加微量元素等工序制成水溶肥。沼渣进入掺混车间，按照一定比例掺入玉米芯、菌种、微量元素等，混合发酵20天左右，粉碎制成粉剂有机肥或烘干造粒制成颗粒肥。

via pipe, digeate is sent to fertizlier plant, after separation, filtration, stablization, addition of trace element, liquid fertilizer is made. the solid part after separation, after process of addition of corn cob, bacteria, and trace elements, and 20 days of fermentation, can make solid fertilizer.

长期在中国工作的德国和瑞士专家
experts from Switzerland and Germany

德国专家GerhardSchindele

德国专家Ralf Block

瑞士专家DanielRuch

Herbert Markert博士

mixture of pig manure and straw to produce biogas
猪粪和秸秆混合产沼气

京安二期项目采用猪粪与秸秆混合，利用世行贷款，总投资1.89亿元，每天猪粪100吨，秸秆300吨，日产沼气4万方，采用德国先进的水解酸化技术对秸秆进行前处理。今年开工，明年底建成。

Jing'an phase 2 use 100t of pig manure and 300t corn straw daily, getting loan from the world bank, total investment 189million Yuan, daily gas yield up to 40,000m3. And straw hydrolysis technology will be applide in this project. the construction will start this year, expect to complete in the end of year2017.

效率高和盈利性好的沼气场
The efficient and profitable biogas plant:

1. 沼气产量高
high gas yield → 增加收入Increase income

2.发酵罐体积小
Build little digester volume → 降低投资Decrease investment cost

3.降解有机废物
Digest organic waste → 降低运行成本Decrease operation cost

猪粪和牛粪沼气工程
pig and cow Manure biogas plant:

1. Low TS concentration浓度低 → 产气低Low gas yield
2. Low TS concentration浓度低 → 发酵罐过大Big digester volume
3. Organic waste有机垃圾 → 降低运行成本Decrease operation cost

沼气场如何盈利
Goal to get to the profitable biogas plant:

1. Mix manure with high TS organic waste与高浓度的物料混合 → Increase gas yield提高沼气产量
   → Little digester volume发酵罐小

High TS organic waste高浓度的物料

Corn straw, wheat straw, rice straw, 50 – 80% TS玉米，小麦，稻秆

添加秸秆遇到的问题Problems with mixing in straw:

1. 发酵罐中有结壳Floating layers in the digester
2. 低产气量Insufficient gas yield

解决方案Solution: 半好氧水解技术 semi-aerobic hydrolysis technology:

把发酵过程分为水解前处理和产甲烷过程
Splitting the fermentation process into a hydrolysis pretreatment and a methanification process

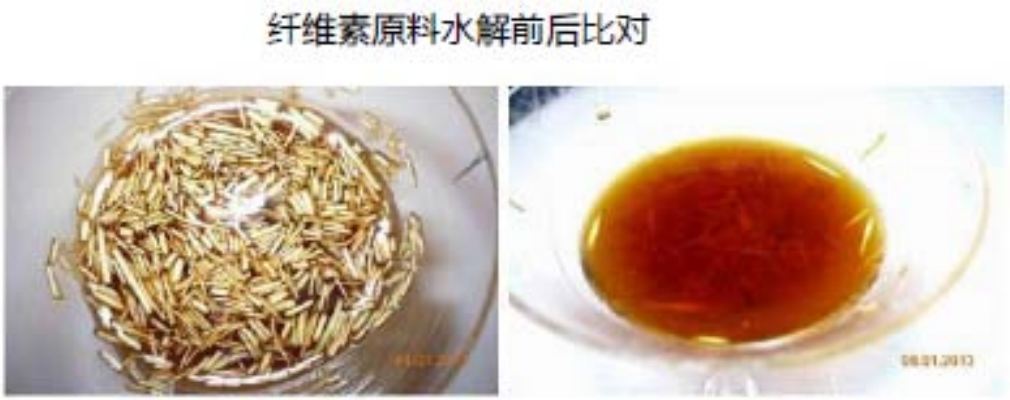
德国wittgensdorf的沼气场
Biogas plant Wittgensdorf

在德国的沼气项目上首次采用这项技术
First experience with semi-aerobic hydrolysis in Germany

秸秆水解酸化技术的优势
technology advantage of straw hydrolysis

- 沼气产量提高15-30%Higher gas yields (15-30%)
- 甲烷含量提高10%Higher methane concentration (10%)
- 发酵罐体积减少一半Only half digester retention time (25 days)

秸秆水解酸化技术的效果
effect after hydrolysis



稻杆处理4天后的效果
rice straw after 4 days of hydrolysis

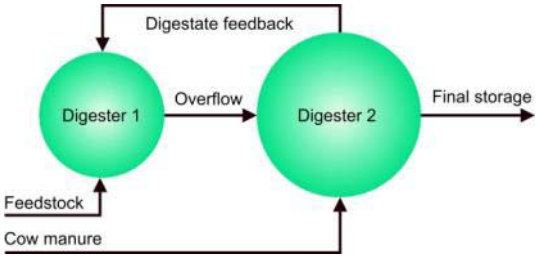
结论The result:

☐ 物料变得更液态化
The substrate is more liquid.

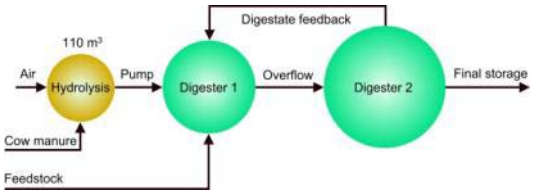
☐发酵罐中没有壳
No floating layers in the digesters.

☐ 更易于输送
Easier hydraulic processes.

没有水解酸化技术
Without hydrolysis technology

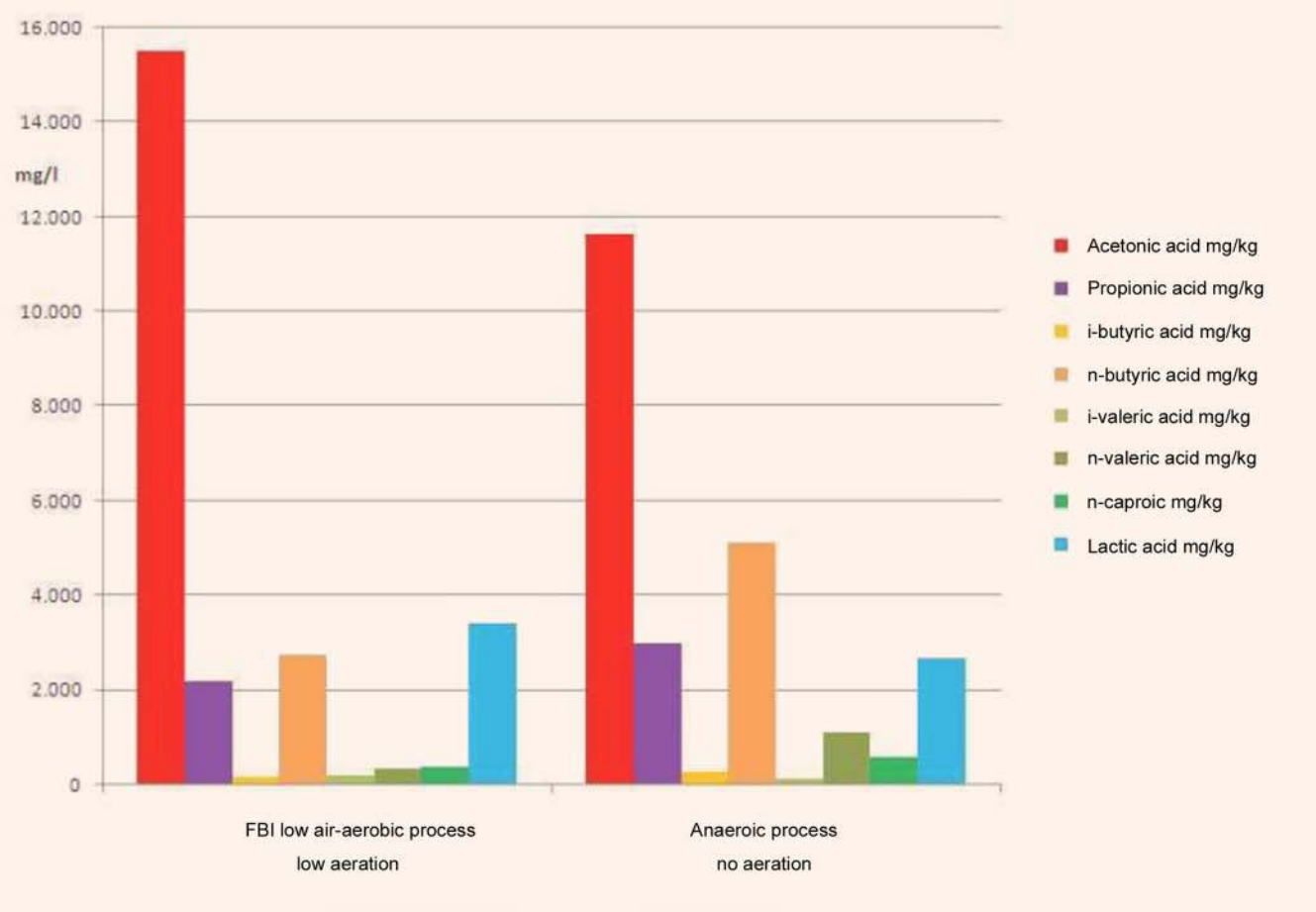


有水解酸化技术
With FBI hydrolysis technology

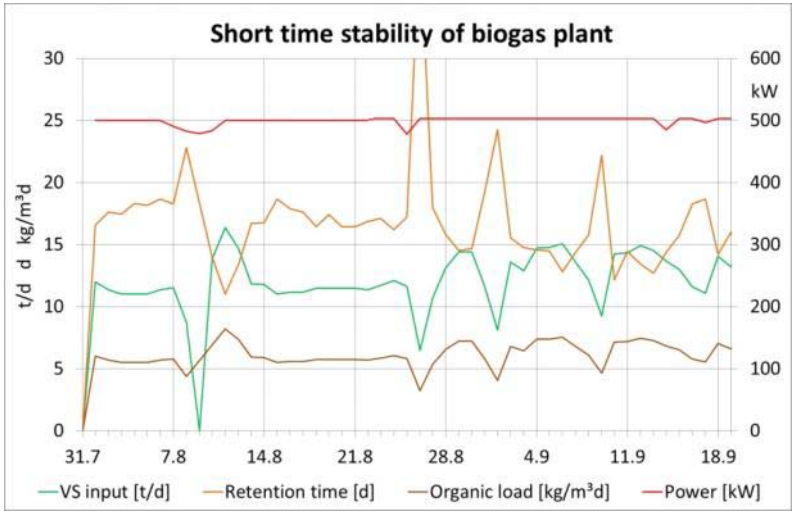


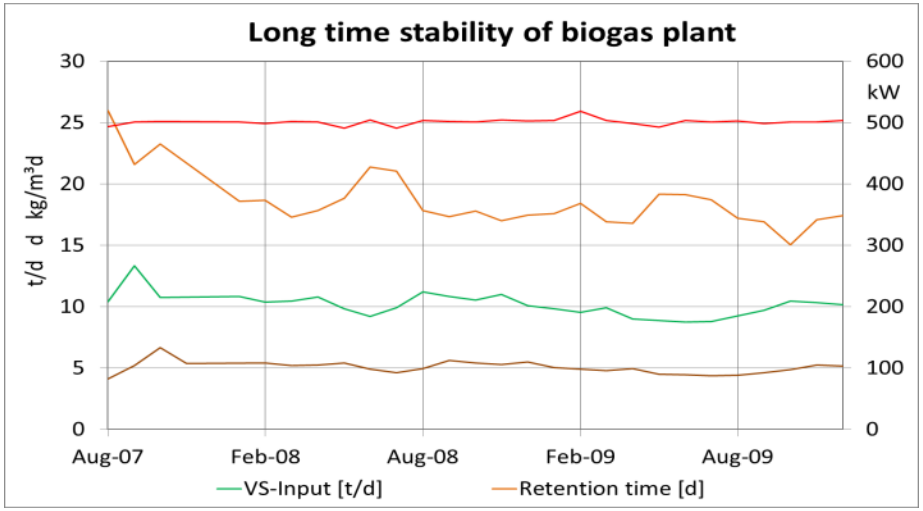
运行期间Period of time	03.11. – 10.12.2003	01.01. – 15.07.2006
物料加入VS input	11,3 t/d	10,6 t/d
沼气产量Biogas production	4.242 m³/d	5.071 m³/d
发电Power	270,8 kW	382 kW
停留时间Retention time	34,4 d	28,9 d
有机负荷Organic load	3,9 kg oTS/m³d	3,65 kg oTS/m³d

水解过程中的产酸情况
Acidification in Hydrolysis

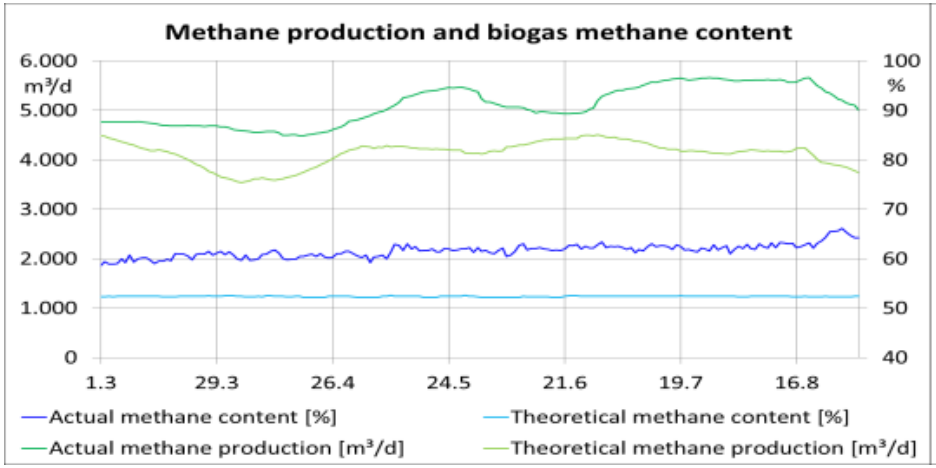


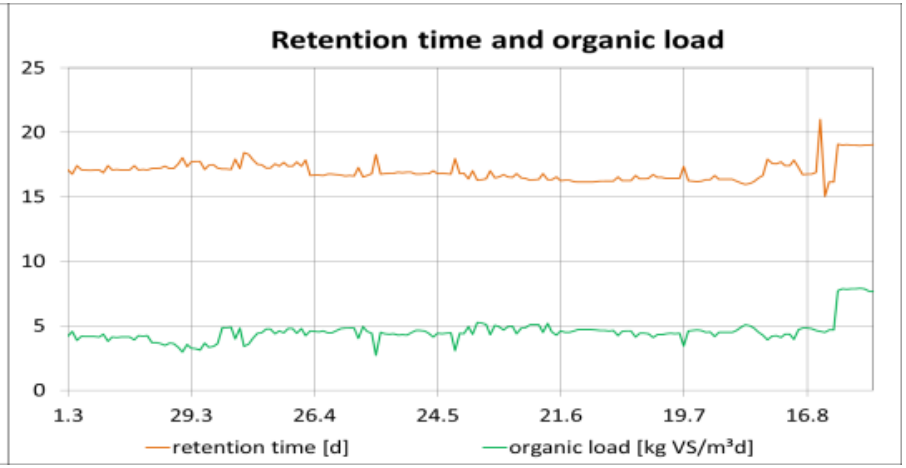
长期和短期运行沼气场稳定性对比
Comparison of short and long term stability





主要参数The main indicators





Naumburg, data for 2013

德国专家-秸秆水解酸化技术
German expert
Gerd-Rainer Vollmer 教授

微生物工程博士

- Experience with hydrolysis technology and commissioning of biogas plant more than 20years从事沼气项目工艺设计及水解酸化技术调试经验超过20年
- Design and erect 55 biogas plants worldwide在全球亲自设计和建设55座沼气厂

典型工程demo project
- Hohenreda 6000m³/d corn siliage and cow manure原料为玉米青贮和牛粪
- Uthleben 19200m³/d corn siliage and cow manure原料为玉米青贮和牛粪
- Nordhausen 14400m³/d cornsiliage and chicken dung原料为玉米青贮和鸡粪

德国专家-秸杆水解酸化技术
German expert
Herbert Markert博士

从1995 到2004 年德国Thuringen 州能源咨询协会主席。自从2004 年德国沼气协会专门工作组成员。

- eperience in biogas processes more than 25 years超过25年的沼气工程设计经验
- Projected and constructed more than 70 power plants worldwide设计和建设70多座沼气工程

References with semi aerobic hydrolysis采用**水解酸化**技术典型案例

BGA Naumburg, **11100**m³/d pig manure and corn siliage猪粪和玉米秸秆
BGA Seubtendorf,8**00**m³/d cow manure and corn siliage牛粪和玉米青贮
BGA Vachdorf,10**00**0m³/d cow manure and grass siliage, corn siliage牛粪，草和玉米秸秆
BGA Helmershausen, 5000m³/d chicken dung and corn straw鸡粪和玉米秸秆
BGA Gompertshausen, 4400m³/d cow manure and corn siliage牛粪和玉米青贮
BGA Rippershausen, **1200**0 kW cow manure and corn siliage牛粪和玉米青贮

德国专家-酶制剂和水解酸化技术
German expert

Dipl. -Ing. **Marcel Spahr**

- Experience with biological fermentation more than 10 years十几年微生物发酵技术经验
- Semi aerobic technology Research on following substrates半好氧水解酸化技术对下面物料的研究和工程实践:
o Corn straw玉米秸秆
o Wheat straw小麦秸秆
o Rice straw稻杆
o Cassava stalk木薯杆
o Lignocellulotic materials木质纤维材料
- Expert for biological and chemical additives for biogas 微生物和化学添加剂专家
- processes (Enzymes, trace elements, desulfurization with the add of ferrow materials)工艺专家（酶制剂，微量元素，化学脱硫剂）

德国纳姆堡沼气场
Biogas plant Naumburg

高效率的典范
High biogas yield in small digester

河南天冠集团6000方沼气项目，纯秸秆
6,000m3 biogas plant in Nanyang

山东乐陵5.5万方项目，纯秸秆
Leling 5.5MW project，pure corn straw

山东东营8000方项目

8000m3 biogas plant in Dongying, Shandong province

Reference plant in Germany
德国的示范项目

德国Straelen 2万方牛粪与玉米青贮项目，建于2001年
2MW plant, cow manure and siliage, straelen Germany

德国1.3万方牛粪与玉米青贮混合原料项目，建于2003年
1.3MW pig manure and siliage prject, in Germany, built in 2003

公司介绍company profile

河北京安瑞能环境科技有限公司是中国和瑞士合资的高新工程技术企业，技术来源于瑞士和德国，致力于各种秸秆、畜禽粪便、餐厨垃圾等各种农业和市政废弃物资源能源化暨沼气工程化，并提供有机肥生产线的设计安装，沼气工程发电并网服务。核心技术有：

Jing'an Ruineng is a High-tech engineering company, Sino-Switzerland joint venture, devoted to biogas solution of various of agricultrul substrate, such as straw, manure, food waste, and provide design and installation service of organic fertilizer production, as well as access service to state power grid. core technology:

- 低浓度猪粪产沼气工艺
biogas process from low TS pig manure

- 秸秆和各种粪便混合发酵产沼气工艺
biogas process from mixture of straw and different manure

- 液态有机肥的生产加工工艺
production process of liquid fertilizer from digestate

- 减少沼液排放技术
reductioni of liquid digestate discharge

Thank you for your kind attention!
感谢关注

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