



神州生物能源
Shenzhou BioCNG



利用PPP模式建设城乡有机废弃物处理中心，探索 城乡一体化生态环境问题破解之道

——海南车用生物天然气项目经验分享

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一、发展背景

Development background

- 党的十八大报告提出生态文明建设以来，城乡一体化建设发展产生的**环境问题和能源问题**愈加成为社会各界关注的重大问题，各界纷纷寄望于**双向清洁环保的生物天然气产业**，生物天然气被寄望在**改进城镇能源结构、实现废弃物无害化处理、消除城市雾霾、维护能源安全上**“大展拳脚”。

Environmental and energy problems have become a major problem within society. BioCNG projects are supposed to improve the urban energy structure , realize waste harmless treatment, eliminate urban smog, and maintain energy security.



一、发展背景

Development background

- ④ 2014年6月，国家农业部、财政部在全国9个省市选择10个试点项目作为**2014年畜禽粪污等农村农业有机废弃物综合利用试点工程**，按照“**废弃物+清洁能源+有机肥料**”三位一体技术路线，开展农业农村废弃物的综合利用，并安排中央财政专项补助资金给予扶持。
 - 澄迈车用生物天然气示范项目作为**海南省唯一入选项目**，顺利成为国家9省市10个示范试点项目之一，中央财政安排**专项补助资金2000万元**。
- ④ In July 2014, the MA and MF of PRC selected ten pilot projects as demo projects of the 2014-year livestock manure and agricultural waste comprehensive utilization, according to the "waste + organic fertilizer + clean energy" technical route to develop the comprehensive utilization of waste in agricultural and rural areas. Special financial subsidy funds were provided to support these pilot projects.
 - The Hainan Chengmai BioCNG Pilot Project was the only project in Hainan to be selected by the Ministry of Agriculture and the Ministry of Finance, and was granted a total of 20 million.

一、发展背景

Development background

- ④ **2015年4月-6月**，国家发改委、农业部加快推进农村沼气转型升级，积极开展**规模化大型沼气工程**和**生物天然气工程**建设试点，对符合条件的规模化大型沼气工程、规模化生物天然气试点工程予以投资补助。
 - **补助标准为：**规模化大型沼气工程，每立方米沼气生产能力安排中央投资补助**1500元**；规模化生物天然气工程试点项目，每立方米生物天然气生产能力安排中央投资补助**2500元**。
 - 澄迈车用沼气新能源示范项目二期工程入选，获批国家**专项资金3375万元**。
- ④ **In April – June 2015, in order to accelerate the transformation and upgrading of rural biogas, the NDRC and MA carried out large-scale biogas and bioCNG project construction, awarding investment subsidy to large-scale plants.**
 - Subsidies towards: large-scale biogas plants, granted 1500 yuan investment subsidy for per cubic meter of biogas production capacity; large-scale bioCNG engineering, granted 2500 yuan investment subsidy for per cubic meter of biogas production capacity.
 - In June 2015, the second phase of the Hainan Chengmai BioCNG pilot project was selected to be one of the demo projects, granted 33.75 million.

一、发展背景

Development background

- ④ 2016年8月，国家农业部、发改委、财政部、住建部、环保部及科技部印发《关于推进农业废弃物资源化利用试点的方案》。
- 针对畜禽粪污、病死畜禽、农作物秸秆等废弃物，以就地消纳、能量循环、综合利用为主线，采取政府支持、市场运作、社会参与、分布实施的方式，探索构建农业废弃物资源化利用的有效治理模式。
- ④ In August 2016, the MA, NDRC, MF, MHURD, MEP and MST of PRC released the " pilot scheme about promoting agricultural waste recycling use ".
- This scheme promotes: livestock and poultry waste, dead livestock and poultry, crop straw and other wastes, in situ wastes, comprehensive utilization of energy circulation, government subsidies, market operation, societal participation, explore effective governance models regarding agricultural waste resource utilization.

一、发展背景

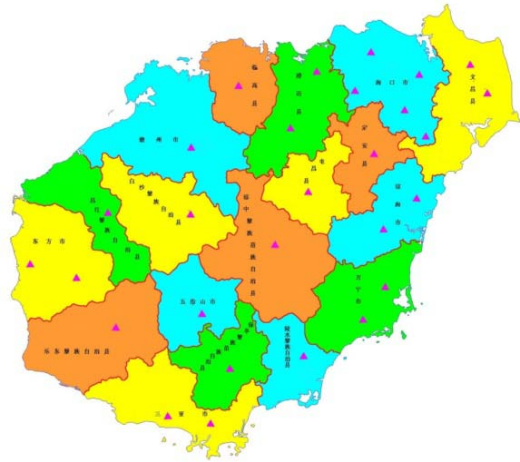
Development background

- ④ 2016年9月，国家能源局向各省（区、市）发改委、能源局以及相关企业等征求对《**促进生物天然气产业化发展的指导意见**》的意见。
- 发展目标为：到2020年，在200个种植养殖业大县建设生物天然气示范县，生物天然气年产量和消费量达到100亿立方米，生物天然气在示范县天然气总体消费中的比重超过30%。
- ④ **In September 2016, the NEA of PRC asked the NDRC, NEA of provinces and companies for opinions about Guidance to Promote the Development of BioCNG production.**
- Development goals : by 2020, construct 200 bioCNG demonstration projects in large farming areas; bioCNG production and consumption should achieve 10 billion cubic meters per year, and the proportion of bioCNG in natural gas consumption overall in the demonstration county greater than 30%.

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二、海南车用生物天然气示范项目介绍

Introduction of Hainan BioCNG Demonstration Project



- 海南车用生物天然气示范项目是中国科技部和瑞典能源署于2008年签署的中瑞生物能源合作示范项目，是海南省“十二五”新能源的重点项目、海南省“十二五”节能减排重点项目。项目以海南当地各种有机废弃物为原料生产车用沼气，作为城市公交车及出租车的燃料，建立覆盖全海南岛的新能源沼气公交系统。
- 项目总投资30亿元，建设20座沼气工厂，年产车用沼气2亿立方。

The Hainan BioCNG Demo Project is the result of the bio-energy cooperation agreement signed by and between the Ministry of Science and Technology of PRC and Swedish Energy Agency in 2008. It is also a key project under the new energy construction and energy-efficient and emission reduction program included in Hainan's "Twelfth Five-year Plan". The project is designed to develop a public-transport system covering entire Hainan with buses and taxis fueled by BioCNG generated from local organic wastes.

Under the project, 20 biogas plants will be built involving a total investment of RMB 3 billion with a capacity of 200 million BioCNG Nm³ / year.

二、海南车用生物天然气示范项目介绍

Introduction of Hainan BioCNG Demonstration Project

发展布局 Development Layout

1

Preparation 准备阶段

- Feasibility study
- Government permit
- 1st round financing
- Process & technical design
- Up- & downstream agreements
- Pilot plant
- 可行性分析
- 各项政府许可
- 完成第一轮融资
- 流程及技术设计
- 上下游协议
- 中试实验室



2

1st demonstration plant 第一个示范工厂

- Construction started in 2012
- Phase 1: 2 digesters, 15.0KNM³ BioCNG
- Phase 2: 3rd digester, adding 15.0KNM³ BioCNG
- 工厂建设始于2012年
- 一期：2个发酵罐，15.0KNM³压缩沼气
- 二期：第3个发酵罐，新增15.0KNM³压缩沼气



3

3 other plants 其他3个工厂

- 3 new plants will be built for the next step
- Capacity: 30KNM³ BioCNG
- Feedstock mix will be adjusted accordingly
- 下一步，3个新生产工厂将建于儋州、文昌海口
- 产能：30KNM³压缩沼气
- 原料组合将根据具体情况调整



4

Expansion to other cities in Hainan 扩展至海南其他城市

- 20 BioCNG plants will be built in total.
- Most of the plants concentrate in Haikou region.
- Other big cities (eg. Sanya) are also chosen for plants.
- 共20个沼气工厂将建于海南省
- 大多数位于海口周边
- 其他主要城市(如海口)也将设厂。



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三、澄迈车用生物天然气项目建设运营情况 Construction & operation situation of Chengmai BioCNG Project



澄迈生物天然气工厂平面布局图
layout diagram of Chengmai bioCNG plant

三、澄迈车用生物天然气项目建设运营情况

Construction & operation situation of Chengmai BioCNG Project



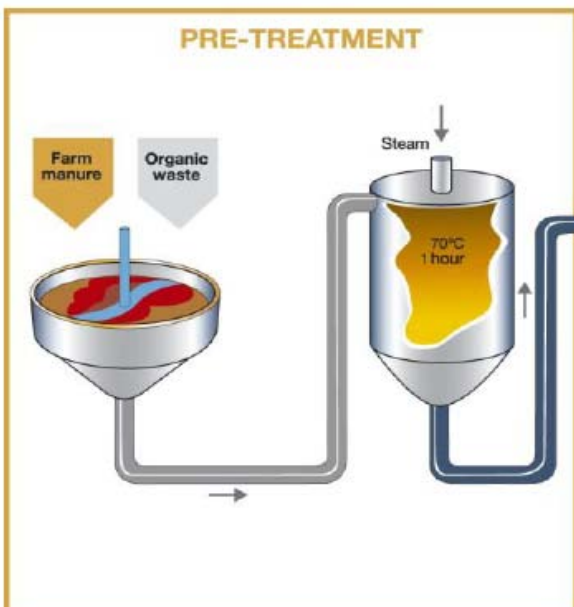
澄迈车用生物天然气项目 Chengmai BIOCNG Project

投资额 Investment	1.88亿元人民币	RMB 188 million
产能 Capacity	3万Nm ³ /日（约1.44万吨/年标准煤）	30,000Nm ³ /d (approximately 14400 tons/y, standard coal)
处理有机废弃物能力 Processing of organic waste	<ul style="list-style-type: none"> ➢ 600吨/日垃圾渗滤液 ➢ 200吨/日餐厨废弃物 ➢ 100吨/日市政粪渣 ➢ 80吨/日畜禽粪便 ➢ 30吨/日农作物秸秆 ➢ 200余吨/日甘蔗渣、木薯渣、能源草、市政污泥等 ➢ 50吨/日有机废水（如：鱼废水、酒精废液等） 	<ul style="list-style-type: none"> ➢ 600 t/d leachate ➢ 200 t/d of kitchen waste ➢ 100 t/d municipal waste slag ➢ 80 t/d livestock manure ➢ 30 t/d crop straw ➢ 200 t/d bagasse, cassava dregs, energy grass, municipal sludge, etc ➢ 50 t/d organic wastewater
可满足的车辆 Vehicle fuel	250余辆公交巴士或750余辆出租车的燃料需求	Over 250 buses or 750 taxis
节能减排效益 Benefits of energy saving and emission reduction	<ol style="list-style-type: none"> 1) 可替代约8700吨/年柴油 2) 减少二氧化碳排放2.68万吨/年 	<ol style="list-style-type: none"> 1) substitute for about 8,700t/y diesel 2) reduction of CO₂ 26800t/y

三、澄迈车用生物天然气项目建设运营情况

Construction & operation situation of Chengmai BioCNG Project

关键技术 Key Technology



Pre-treatment

- Reception and storage of organic waste material.
- Pretreatment and disintegration of organic waste.

预处理

- 接收和储存有机废料
- 预处理及分离有机废料

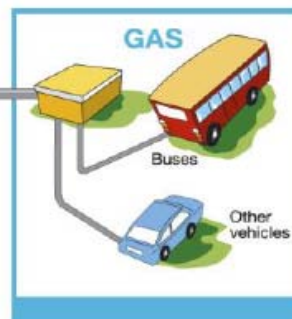


Digestion

- Long retention time in reactor for maximal biogas yield.

分解

- 长停留时间于保证最大沼气产出率

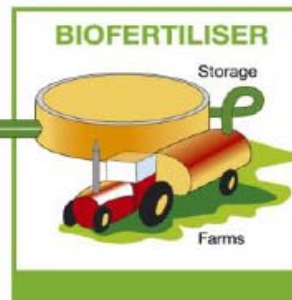


Gas

- Upgrading of biogas to Bio CNG with minimum loss of CH₄
- Odor control system

沼气

- 保证CH₄低损失下提纯沼气
- 气味控制系统



Bio-fertilizer

- Separate digested material to liquid fertilizer (membrane filtrate to 10% DS) and solid fertilizer (dry to 85% DS)

生物肥料

- 分离沼渣为液体肥料（过滤至10%固体含量）及固体废料（烘干至85%固体含量）



三、澄迈车用生物天然气项目建设运营情况

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关键技术 Key Technology



- ❑ 满足容积1.2万方的发酵罐搅拌需求
- ❑ 拌器内含3级叶片，无间断搅拌
- ❑ 装机功率：30 KW，
- ❑ 反应池2,5 W/m³，16RPM

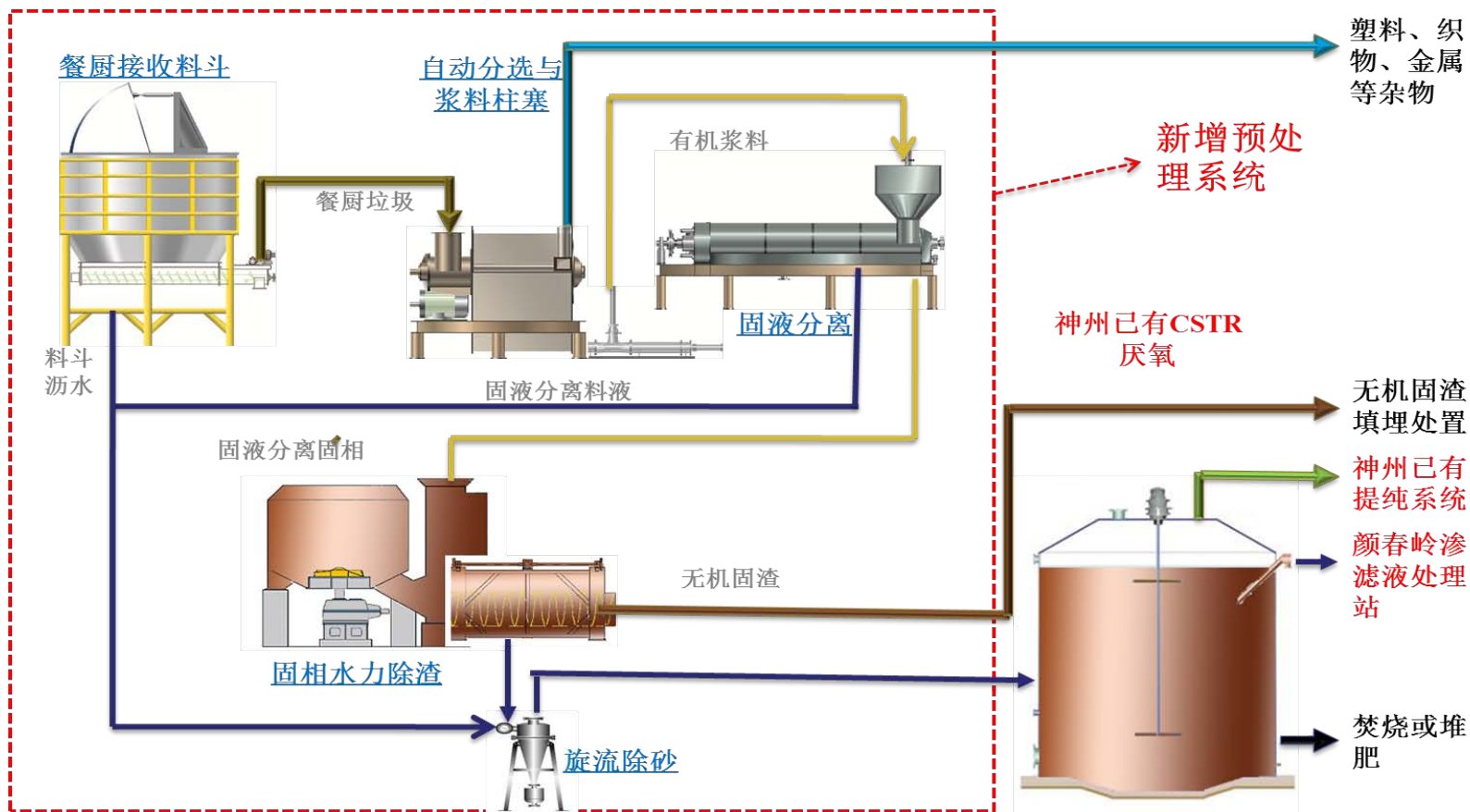
- ❑ Mixing the 12000m³ Top mounted mixer with 3 level mixing blades. Continuous operating.
- ❑ Installed power 30 KW,
- ❑ 2,5 W/m³ reactor, 16 RPM

Anaerobic mixer
厌氧搅拌器

三、澄迈车用生物天然气项目建设运营情况

Construction & operation situation of Chengmai BioCNG Project

关键技术 Key Technology



Pretreatment of kitchen waste

餐厨垃圾预处理

三、澄迈车用生物天然气项目建设运营情况

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关键技术 Key Technology

pure energy
clean water

From biogas
to pure
energy

Malmberg COMPACT GR
Biogas Upgrading Plant

- 1 Biogas in
- 2 Compression
- 3 Absorption
- 4 Gas Drying
- 5 Biomethane out
- 6 Flash
- 7 Desorption
- 8 Off gas

- ❑ 沼气：1250标准方/小时（一期）
- ❑ 沼气的二氧化碳含量40-50%
- ❑ 提纯后甲烷(CH₄)含量高达97-98%
- ❑ BioCNG成品气中因水洗损失的甲烷(CH₄)低于1%（洗涤水温度为15度）
- ❑ BioCNG成品气出气压力：0,3-0,5 Mpa
- ❑ 50% CO₂沼气能耗：0,24 kWh/Nm³（含海南冷却塔和制冷机）

- ❑ Capacity 1250 Nm³/h of biogas (first phase)
- ❑ CO₂ concentration biogas 40-50%
- ❑ Upgraded BioCNG quality CH₄ 97-98%
- ❑ Los of CH₄ in scrubber air below 1% of produced BioCNG (15 degree in scrubber water)
- ❑ Outgoing BioCNG pressure 0,3-0,5 Mpa
- ❑ Energy consumption 0,24 kWh/Nm³ biogas at 50% CO₂ (including cooling tower and chiller in Hainan)

Malmberg Biogas upgrading 高压水洗沼气提纯

三、澄迈车用生物天然气项目建设运营情况

Construction & operation situation of Chengmai BioCNG Project

关键技术 Key Technology



- ❑ 处理量：沼气1000Nm³/h
- ❑ 甲烷回收率：>97%。
- ❑ 产品气甲烷含量:>96%
- ❑ 膜提纯段电单耗：
<0.30Kwh/Nm³沼气

- ❑ Capacity: 1000 Nm³/h of biogas
- ❑ methane recovery: > 97%.
- ❑ product gas methane content : > 96%
- ❑ of electricity consumption of membrane purification section : < 0.30 Kwh/Nm³ biogas

Membrane distillation
膜提纯

工程案例现场图

三、澄迈车用生物天然气项目建设运营情况

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一期工程 Phase 1

2014年3月，按照“**废弃物+清洁能源+有机肥料**”三位一体的技术路线，首个示范项目澄迈车用生物天然气工厂一期工程（日生产物天然气1.5万Nm³）顺利建成。

In March 2014, according to the "waste + organic fertilizer + clean energy" technical route, the first demonstration project in ChengMai (capacity 15000 Nm³/d of bioCNG) was completed smoothly.



澄迈车用生物天然气工厂一期照片
Photo of phase 1st of Chengmai bioCNG plant

三、澄迈车用生物天然气项目建设运营情况

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澄迈车用生物天然气示范工厂一期的成功运营表明：海南车用生物天然气示范项目赖以建立的关键技术得到验证，“废弃物+清洁能源+有机肥”三位一体模式可行，可以大规模推广和应用。

Phase 1 of ChengMai bioCNG demo plant successful operations show: the key technologies of Hainan bioCNG project were verified, "waste + organic fertilizer + clean energy" trinity model is feasible and can be large-scale popularization and application.

所生产的清洁生物天然气产品经广东（国家）天然气产品检测中心现场抽查和实验室检验证明：产品各项指标全部达到或优于《车用压缩天然气》（GB 18047-2000）标准要求。

Results of site test conducted by national competent quality and technology supervision authority show that the BioCNG produced by the Demo Plant meet or are higher than applicable national standard-Compressed Natural Gas as Vehicle Fuel (GB 18047-200).



生物天然气产品检测报告
Test report of bioCNG product

三、澄迈车用生物天然气项目建设运营情况

Construction & operation situation of Chengmai BioCNG Project



二期工程 Phase 2

- 2015年6月，澄迈示范项目二期工程获批**国家发改委、农业部规模化生物天然气示范项目**，在**一期基础上进行产能翻倍至日产3万Nm³生物天然气**，同时增加**600吨/日渗滤液处理功能**。

In June 2015, ChengMai demonstration project phase 2 project approved large-scale bioCNG demonstration projects by NDRC and MA of PRC, increase the capacity of bioCNG to 30,000 Nm³/d, and increase the processing power of 600 t/d leachate.

- 2015年9月，国家财政部公布**第二批政府和社会资本合作 (PPP) 示范项目**，其中与**我司相关的有两项**：

- 澄迈县神州生物燃气**PPP示范项目**（预计**2016年10月底签约**）
- 海口市餐厨垃圾和粪渣无害化处理**PPP服务项目**（已签约）

In September 2015, MF of PRC announced the second PPP demo project, two project is associated with our company :

- Chengmai shenzhou bioCNG PPP demo project
- Haikou kitchen waste and waste slag disposal service PPP project



三、澄迈车用生物天然气项目建设运营情况

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项目 Project	海口餐厨垃圾和粪渣无害化处理 PPP项目 Haikou kitchen waste and waste slag disposal service PPP project	澄迈神州生物燃气PPP示范项目 Chengmai shenzhou bioCNG PPP demo project
处理对象 process object	200吨/日餐厨废弃物 100吨/日市政粪渣 200 t/d of kitchen waste 100 t/d of municipal waste slag	餐厨废弃物、市政粪渣、畜禽粪便、秸秆类废弃物、市政污泥等，合计处理规模为150吨/日 Kitchen waste, municipal waste slag, livestock manure, straw, municipal sludge and so on, the scale of combined treatment for 150 t/d
特许经营期 concession duration	15年 15year	20年 20year
年度财政补贴 annual fiscal subsidies	2804.4万元 28 Million	约950万元 About 9.5 Million

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二期工程 Phase 2

二期工程主体设施已基本建设完成，
现正进行设备安装调试。

The subject facilities construction of
phase 2 has been basically finished,
equipment are being installed and debugged.



沼气脱硫系统



渗滤液发酵罐



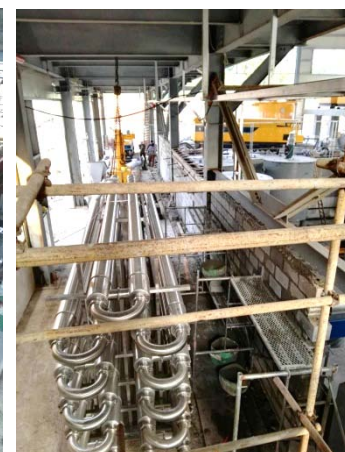
餐厨预处理车间外景



餐厨预处理车间内景



餐厨预处理设备



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Advantages that the PPP model brings to the Hainan Chengmai BioCNG Project

四、海南澄迈车用生物天然气项目运营过程遇到的难题 Problems in operation of Hainan Chengmai BioCNG Project

在承接两个PPP项目前，澄迈生物天然气工厂产能已建成，却因经济问题一直不能满负荷生产，诸多有机废弃物因收运价格超过财务可承受价格，不能收运。

Before the PPP agreement, the Chengmai plants could not reach full capacity due to economic problems, since the price of collecting and transporting organic waste is too high to be financially sustainable.



四、海南澄迈车用生物天然气项目运营过程遇到的难题

Problems in operation of Hainan Chengmai BioCNG Project

原材料收集困难，收运成本较高

- 原材料多为废弃物，来源广但分散，集中和运输的过程就是成本大幅上升的过程；
- 机械化收集程度低，人工收集难度高、成本高；
- 政府没有明确的废弃物处理配套政策，收集、运输和处理成本高于其本身价值，经济性不高。

Raw materials collection is very difficult and involves high costs

- Dispersed waste distribution, costly to collect and transport
- Low degree of mechanization
- No clear government policy for organic waste disposal. Collection, transportation and processing costs are higher than the value of output produced from treatment.

四、海南澄迈车用生物天然气项目运营过程遇到的难题

Problems in operation of Hainan Chengmai BioCNG Project

澄迈示范项目日产1.5万方原料构成及成本
15000 M3/d Chengmai Demoprojects raw material costs

原料名称	每天消耗量 (吨/天)	产气率 (m3/吨)	产气量 (m3/天)	采购成本 (含运费) (元/吨)	政府对原料补贴 (元/吨)	原料成本 (元/天)
Material items	Daily consumption (ton/d)	Gas rate (M3/ton)	Gas production (M3/d)	Procurement costs (RMB/ton)	Government subsidies for materials (RMB/ton)	Mmaterial cost (RMB/d)
畜禽粪便 livestock manure	30	63	1890	120	0	3,600
作物秸秆 crop straw	20	60	1200	260	0	5,200
甘蔗渣 bagasse	50	90	4500	350	0	17,500
木薯渣 cassava dreg	30	75	2250	165	0	4,950
有机废水 organic wastewater	50	50	2500	70	0	3,500
能源草 energy grass	30	60	1800	125	0	3,750
其他 others	30	50	1500	100	0	3,000
	240		15640			41500
			单位生物天然气原料成本 (元/m3) Unit cost of BioCNG in raw material (RMB/m3)			2.65

在没有政府原材料补贴的情况下，单位生物天然气原料获取的成本就达2.65元/m³。

四、海南澄迈车用生物天然气项目运营过程遇到的难题

Problems in operation of Hainan Chengmai BioCNG Project

项目经济效益相对不高，融资困难

- 原料收集难、成本高导致项目经济性不高，受资本的逐利性所决定，银行和社会资本在项目盈利性不肯定的情况下，必然裹足不前或等待观望。
- 海南澄迈项目先后与国内多家金融单位洽谈，金融单位也纷纷表现出对项目的兴趣和支持，但最后都受阻于对项目盈利性的不肯定。

Project economic efficiency is not good; financing and loans are difficult to come by

- Collection is difficult; high raw material costs lead to low project economical efficiency. Banks and social capital are not assured of project profitability.
- Many domestic banks and other financial institutions have expressed interest in/support for the Hainan Chengmai project, but in the end projects are blocked due to profitability uncertainty.

四、海南澄迈车用生物天然气项目运营过程遇到的难题

Problems in operation of Hainan Chengmai BioCNG Project

生物天然气终端销售受限，不得不低价销售

- 加气站用地选址审批、落地困难，使得生物天然气产品不能顺利进入终端应用市场，不得不低价销售给中间商。

BioCNG terminal sales are limited because there are no dedicated BioCNG stations, have to sell at a low price

- CNG station location examination and approval is very difficult; bioCNG product can not enter the terminal application market smoothly; has to be sold to middlemen at a lower price.

- 一. 发展背景
Development backgrounds
- 二. 海南车用生物天然气示范项目介绍
Introduction of Hainan BioCNG Demonstration Project
- 三. 海南澄迈车用生物天然气项目运营情况
Operation situations of Hainan Chengmai BioCNG Project
- 四. 海南澄迈车用生物天然气项目运营过程遇到的难题
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五、PPP模式为海南澄迈项目带来的转机

Advantages that the PPP model brings to the Hainan Chengmai BioCNG Project

两个PPP项目的进入为澄迈生物天然气工厂带来了良好的商业经济模式，解决了原材料和经济性不足两大关键问题。

Two new PPP projects for the Chengmai bioCNG plant have improved project economics and solved two important issues: lack of raw materials and high costs.

- ◆ 实现多元有机废弃物综合处理，增加原料的来源。
- ◆ 海口和澄迈两个PPP项目解决了沼气工厂1/2的原料需求，再加上颜春岭垃圾渗滤液处理，共满足沼气工程3/4以上的原料保障。
- ◆ 多元物料供应实现项目规模效益，减少单位废弃物处理成本。
- ◆ PPP模式使项目获得合理预期收益，对金融机构有较好吸引力。

- ◆ Increased the source of raw materials, co-digestion of multiple organic wastes
- ◆ The two PPP projects account for $\frac{1}{2}$ of raw material requirements in the biogas plant, meet more than $\frac{3}{4}$ raw material requirements of the biogas plant if waste leachate is added.
- ◆ Multiple material supply reduces unit waste treatment costs.
- ◆ PPP mode gives the bioCNG project reasonable expected profits, attractive for financial institutions.

四、海南澄迈车用生物天然气项目运营过程遇到的难题

Problems in operation of Hainan Chengmai BioCNG Project

澄迈示范项目日产3.0万方原料构成及成本
30000 M3/d Chengmai Demoprojects raw material costs

原料名称	每天消耗量 (吨/天)	产气率 (m3/吨)	产气量 (m3/天)	采购成本 (含运费) (元/吨)	政府对原料收运补 贴 (元/吨)	原料成本 (元/天)
Material items	Daily consumption (ton/d)	Gas rate (M3/ton)	Gas production (M3/d)	Procurement costs (RMB/ton)	Government subsidies for materials collect and transport (RMB/ton)	Mmaterial cost (RMB/d)
餐厨废弃物 livestock manure	200	42	8400	150	125	5,000
市政粪渣 municipal waste slag	100	3	300	100	90	1,000
垃圾渗滤液 garbage leachate	600	12	7200	0	0	0
畜禽粪便 livestock manure	80	63	5040	120	100	1,600
作物秸秆 crop straw	30	60	1800	260	200	1,800
甘蔗渣 bagasse	20	90	1800	350	0	7,000
木薯渣 cassava dreg	20	75	1500	165	0	3,300
有机废水 organic wastewater	50	50	2500	70	0	3,500
其他 others	30	50	1500	100	0	3,000
	1130		30040			26200
				单位生物天然气原料成本 (元/m ³) BioCNG unit raw material costs (RMB/m ³)		0.87

在有政府原材料收运补贴的情况下，单位生物天然气原料获取的成本就达0.87元/m³，满足产品原材料段单位生物天然气1元/方以下财务盈亏点。

五、PPP模式为海南澄迈项目带来的转机

Advantages that the PPP model brings to the Hainan Chengmai BioCNG Project

项目经验小结:

- ④ 项目地处海口和澄迈交界，可集中处理海口和澄迈所有市政、农业、工业来源的各类有机废弃物，为海口和澄迈共建了一座城乡有机废弃物综合处理平台，为城乡各个来源的有机废弃物找到资源化处理的解决办法。
- ④ 城乡统筹，集中处理，从政府角度讲，原本属于三个甚至是五个的废弃物处理项目集中在一个规模化项目上，减少建设点，易于政府管理，同时集中处理有助于原材料的保障。
- ④ 集中处理才显示规模效益，有足够的量才能吸引社会资本参与，解决融资问题，同时也能引进更好的技术、吸引人才等。

- ④ This project is located in on the Haikou and Chengmai border, meaning that the project can treat organic waste both from urban areas and the countryside.
- ④ Unified processing of urban and rural wastes: from a government perspective, three-five small scale projects have been combined into one large scale project, which helps reduce construction points, easier for government to manage and focus on guaranteeing raw material supply.
- ④ Concentrated disposal can create economies of scale, which attracts capital and solves the problem of financing. Large scale projects also lead to utilization of better technology, attracts higher level talent, etc.

五、PPP模式为海南澄迈项目带来的转机

Advantages that the PPP model brings to the Hainan Chengmai BioCNG Project

项目经验小结:

④ PPP模式解决了项目运营遇到的原材料和经济性不足问题，保障原材料的数量，降低原材料收集的成本，同时通过获取废弃物处理服务费获得合理投资收益，增加了对金融机构的吸引力，使海南生物天然气示范项目商业模式得以完善，形成了一个可复制、可推广、经济性可接受的范例。

- ④ The PPP model not only solved the lack of raw materials but also economic problems.
- ④ Regarding project operation, there is now guaranteed supply of raw materials, reduced cost of raw material collection, and also reasonable investment returns via access to the service fee provided by the government for waste disposal. This adds to the attractiveness of the project for financial institutions.
- ④ The PPP agreement has made the business model of the Hainan bioCNG demonstration project much better. It is currently a replicable, scalable, economically acceptable example.

五、PPP模式为海南澄迈项目带来的转机

Advantages that the PPP model brings to the Hainan Chengmai BioCNG Project

- ④ **2016年10月11日**，国家财政部下达《关于在公共服务领域深入推进政府和社会资本合作工作的通知》（财金[2016]90号），**要求在垃圾处理、污水处理等领域新建项目要强制应用PPP模式。**
 - 此通知的出台为我国未来垃圾处理利用PPP模式推进指明方向，为利用PPP模式建设城乡有机废弃物处理中心提供了政策支持，为城乡一体化生态环境问题提出了破解方案。
- ④ **On 11th October, 2016, the MF of PRC issued “the notice of further advance in the field of public service government and social capital cooperation work”, requiring that new projects construction such as garbage disposal and sewage treatment plants must use PPP models.**
 - This notice indicated the direction for garbage disposal projects using PPP models in the future; provided policy support for the construction of urban and rural organic waste treatment plants using the PPP mode; and put forward a unified plan for solving ecological/environmental problems in urban and rural areas.



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