



固废创造新价值

CREATING VALUE
FROM WASTE

BRIAN VASS 2018

TERAX技术工艺

市政湿垃圾, 园艺, 农业/
森林固体垃圾进入
TERAX™处理

在pH可控的厌氧发酵池里, 利用中温细菌消化来处理垃圾

固体体积减少90%

在水热氧化池里, 高温, 高压和氧气把固体分解为醋酸, 氨, 二氧化碳, 水和粉灰。

通过生成沼气用于电力和燃气, 制造工业原料、氮肥和磷肥等, 实现挥发性有机物, 氨和磷的生物价值回收



Terax 简介

TERAX是由新西兰皇家科学院-SCION和罗托鲁瓦地方政府共同开发的固废转化技术。SCION和罗托鲁瓦政府作为技术共同持有者于2010年起合作并成功研发了TERAX新技术来降低有机固废的最终填埋量。经过6年的开发与应用Terax技术已经顺利的完成了从实验室模型到商业化处理厂的设计。

Terax综合了两种成熟的污泥处理工艺, 厌氧发酵和湿式氧化。

Terax已经做到

- 比厌氧发酵产甲烷工艺大大缩短停留时间和降低投资成本。
- **95%** 被降解（厌氧发酵产甲烷工艺只能降解**50%**）。
- 低廉的处理成本。
- 剩余产物被完全利用而且无病原微生物产生。

TERAX是一种用来降低最终填埋有机固废量的新技术, 能满足当前中国的巨大需求, 有着广阔的市场前景。

Terax 实现了环境清洁和价值再回收

- 生物固体排放是一个全球性挑战
 - 细菌
 - 环境影响
 - 高排放成本
- 重点关注环境保护和保持绿色形象。
- 更加严格的环境标准要求更加先进的垃圾处理技术
- 焚化是不允许的
 - 高成本和对场地的要求
 - 对社区废气排放的顾虑
- 填埋对农业来说也是不允许的
 - 食品出口 市场- 负面影响



需要一种新型的技术来降低排放量
同时创造新的价值



已取得澳洲和新西兰的专利，中国的专利正在审查中



Australian Government
IP Australia

CERTIFICATE OF GRANT

STANDARD PATENT

2013227278

The Commissioner of Patents has granted the above patent on 27 January 2017, and certifies that the following are the particulars of this patent appearing in the Register of Patents:

Name and Address of Patentee(s):

TERAX LIMITED PARTNERSHIP

49 Sala Street Rotorua 3010 New Zealand

Name of Actual Inventor(s):

Gapes, Daniel James; Stuthridge, Trevor Raymond; Strong, Peter James; Lei, Robert Jason and Aggrey, Anderson

Title of Invention:

Treatment of biomass

Term of Patent:

Twenty years from 27 February 2013

Priority Details

Number
598479

Date
28 February 2012

Filed with
NZ



INTELLECTUAL
PROPERTY
OFFICE

LETTERS PATENT

Number 808064

ELIZABETH THE SECOND, by the Grace of God Queen of New Zealand and Her Other Realms and Territories, Head of the Commonwealth, Defender of the Faith; To all to whom these presents shall come, Greeting:

WHEREAS pursuant to the Patents Act 1953 an application has been made for a patent of an invention for **TREATMENT OF BIOMASS**

(more particularly described in the complete specification relating to the application)

AND WHEREAS

Terax Limited Partnership, 49 Sala Street, Whakarewarewa, Rotorua 3010, New Zealand

(hereinafter together with his or their successors and assigns or any of them called "the patentee") is entitled to be registered as the proprietor of the patent hereinafter granted:

Address for service: AJ PARK, State Insurance Tower, Level 22, 1 Willis Street, Wellington 6011, New Zealand

NOW, THEREFORE, We by these letters patent give and grant to the patentee our special licence, full power, sole privilege, and authority, that the patentee by himself, his agents, or licensees and no others, may subject to the provisions of any statute or regulation for the time being in force make, use, exercise and vend the said invention within New Zealand and its dependencies during a term of twenty years from 11 March 2013 and that the patentee shall have and enjoy the whole profit and advantage from time to time accruing by reason of the said invention during the said term:

AND WE strictly command all our subjects whomsoever within New Zealand and its dependencies that they do not at any time during said term either directly or indirectly make use of or put into practice the said invention, nor in any way imitate the said invention without the consent, licence, or agreement of the patentee in writing under his hand, on pain of incurring such penalties as are prescribed by law and of being answerable to the patentee according to law for his damages thereby occasioned:

PROVIDED ALWAYS:

- (1) That these letters patent shall determine and become void if the patentee does not from time to time pay the renewal fees prescribed by law in respect of the patent;
- (2) That these letters patent are revocable on any of the grounds prescribed by the Patents Act 1953 as grounds for revoking letters patent;
- (3) That nothing in these letters patent shall prevent the granting of licences in the manner in which and for the considerations on which they may by law be granted;
- (4) That these letters patent shall be construed in the most beneficial sense for the advantage of the patentee.

IN WITNESS whereof We have caused these letters patent to be signed and sealed on 3 February 2015 with effect from 11 March 2013.



Mandy McDonald

Mandy McDonald
Commissioner of Patents, Trade Marks, and Designs

Intellectual Property Office of New Zealand
P.O. Box 1024, Market Square, Wellington 6141, New Zealand or GPO 10109, Wellington
International: +64 3 342 2457. Freephone within NZ: 0800 447 464. Freephone from Australia: 1800 796 333

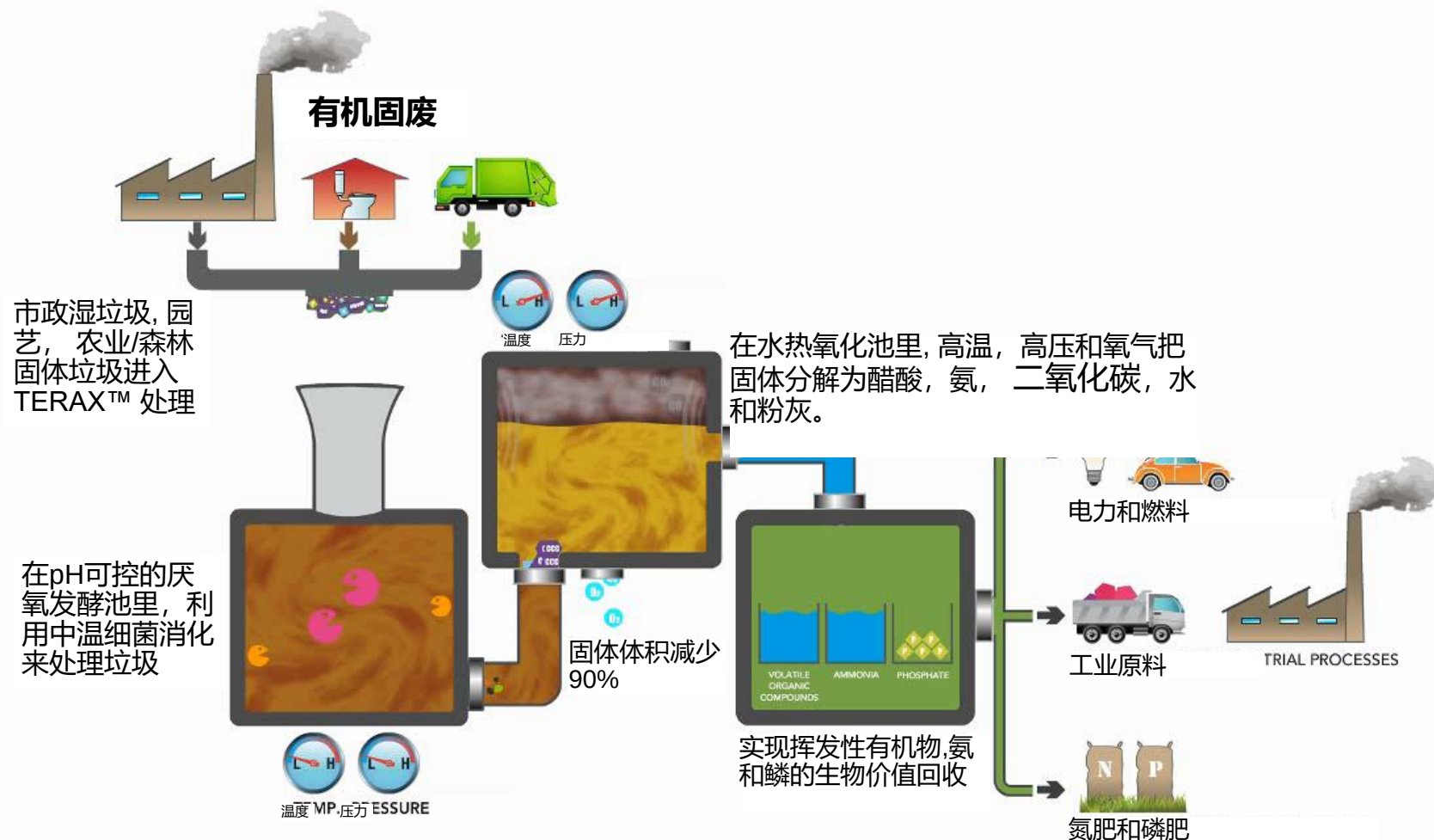
www.iponz.govt.nz



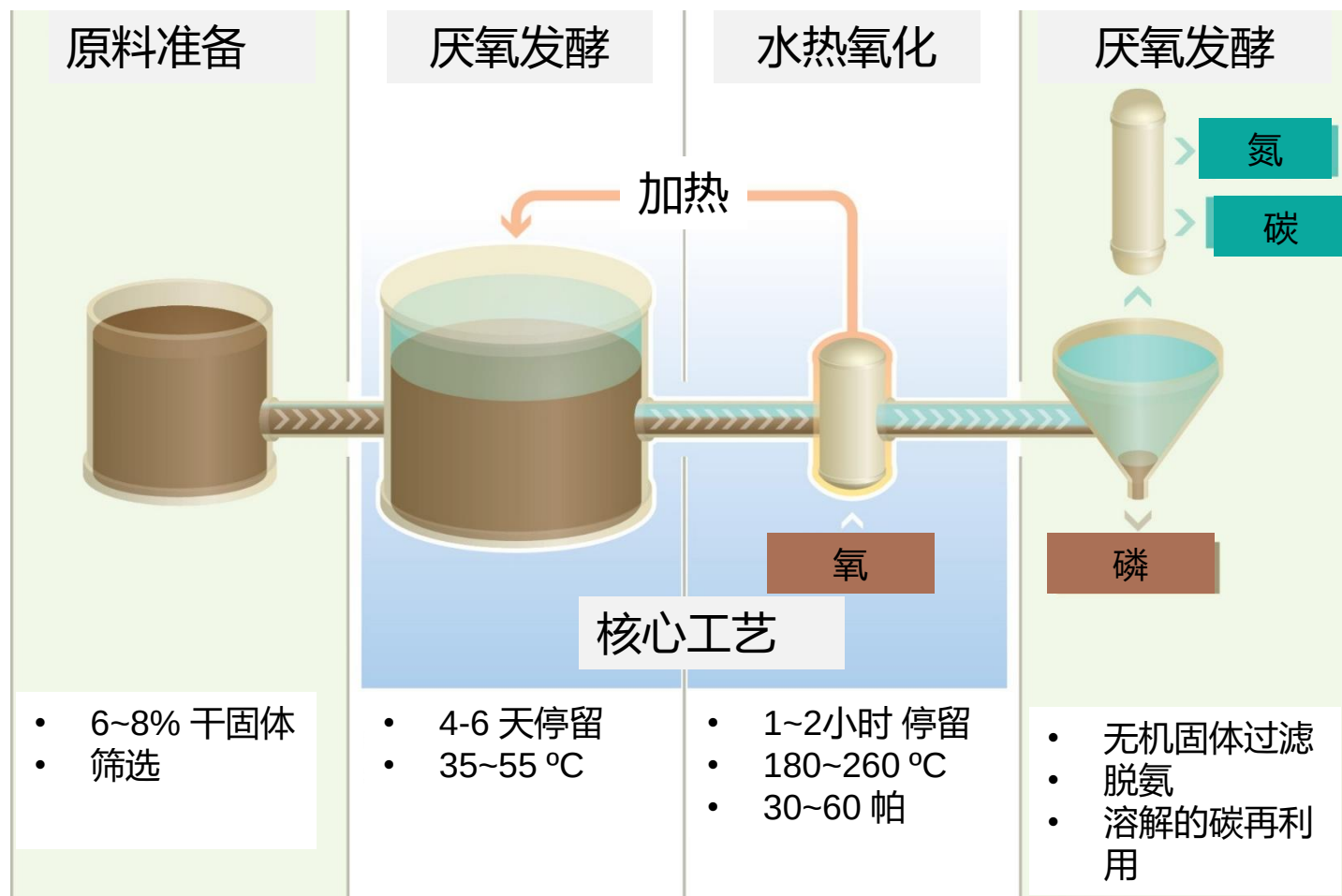
根据广东省科学技术情报研究所对Terax 污泥处理技术的检索报告得出的结论：

- 目前中国有三个主要方式处理固体垃圾：卫生填埋场：（81.8%），焚烧（14.5%，通常在沿海地区）和堆肥（3.7%）
- Terax综合了两种成熟的污泥处理工艺，厌氧发酵和湿式氧化。通过综合这些成熟的技术，Terax已经做到：比厌氧发酵产甲烷工艺大大缩短停留时间和降低投资成本。95% 被降解（厌氧发酵产甲烷工艺只能降解50%），低廉的处理成本，剩余产物被完全利用而且无病原微生物产生。
- 从技术检索的结果看，本项目技术在国内未见同类型报道。
- 其他技术包括生物处理（即厌氧发酵）和化学处理（等离子气化，水热气化，热解）和资源再利用。
- 得出的结论是：“Terax是一种减少有机固体垃圾最终填埋量的新技术。它能够满足目前在中国的大量需求，具有广阔的市场前景”

商业模式- 工艺



Terax – 综合厌氧发酵和湿式氧化



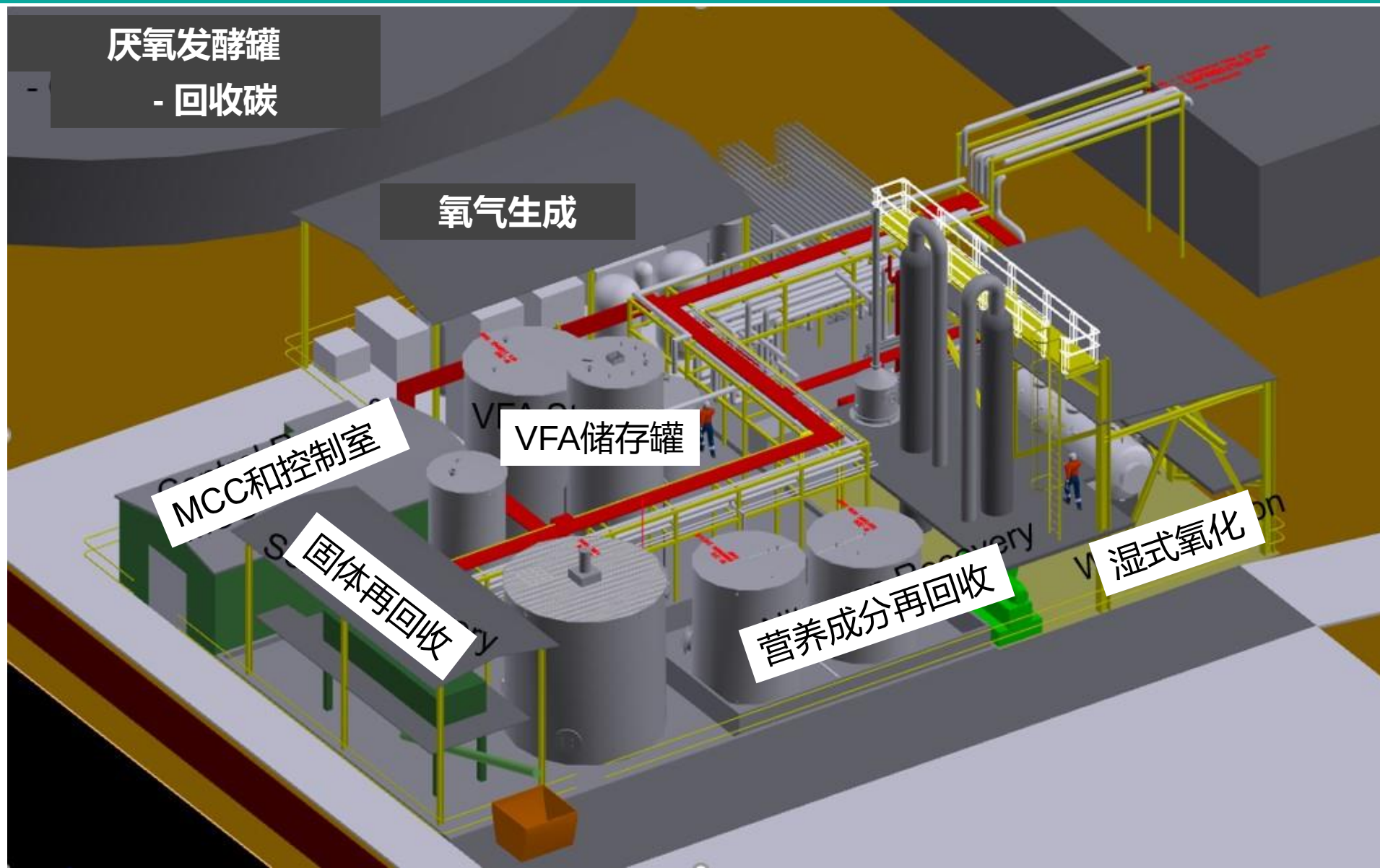
Terax综合了两种成熟的污泥处理工艺

- 厌氧发酵
- 湿式氧化

通过综合这些成熟的技术，Terax 已经做到：

- 比厌氧发酵产甲烷工艺大大缩短停留时间
 - 降低投资成本
- 95% 被降解（厌氧发酵产甲烷工艺只能降解50%）
 - 低廉的处理成本
- 剩余产物被完全利用
 - 无病原微生物产生

商业化处理厂流程图



利用Terax® 来解决生物固体处理问题



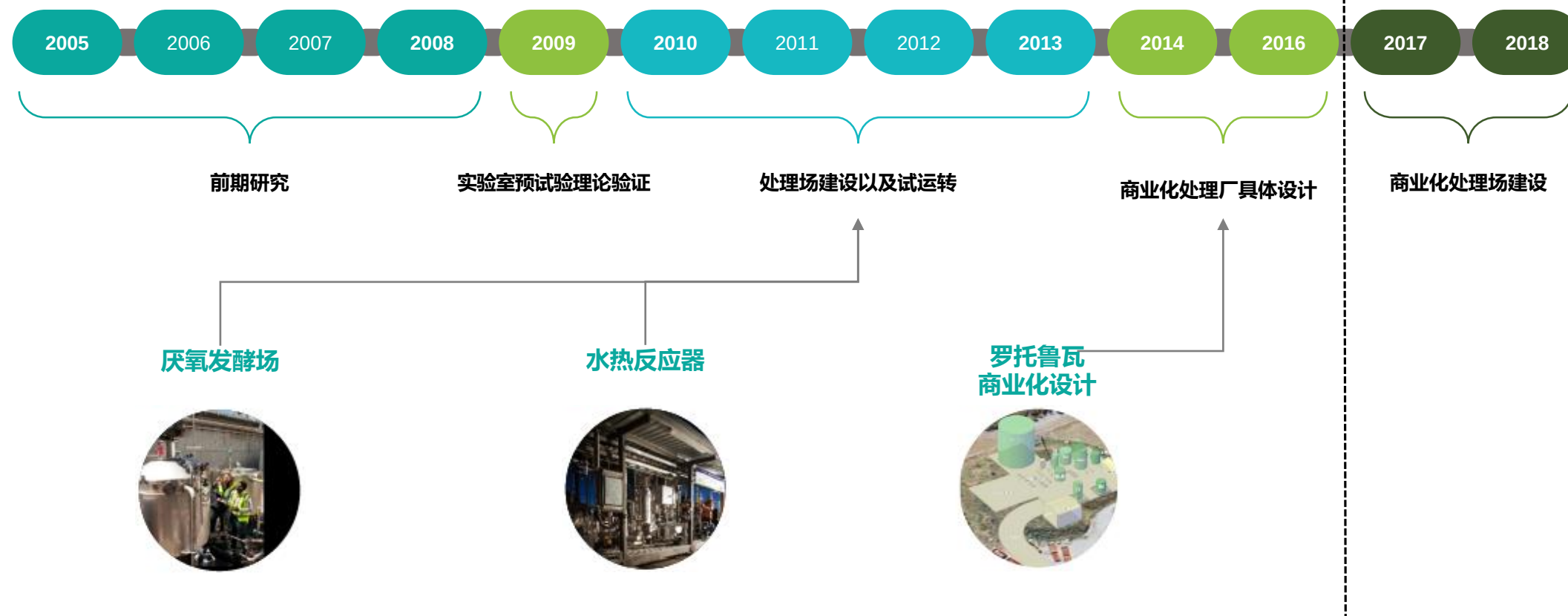
Terax通过以下几个途径可以把成本降低500元：

Terax 使用由处理回收的化学试剂来提高被处理水质量（200元/吨）。

Terax避免了污泥处理所产生的费用（50元/吨）。

同时也排除了生物固体处理的成本（250元/吨）。

时间表

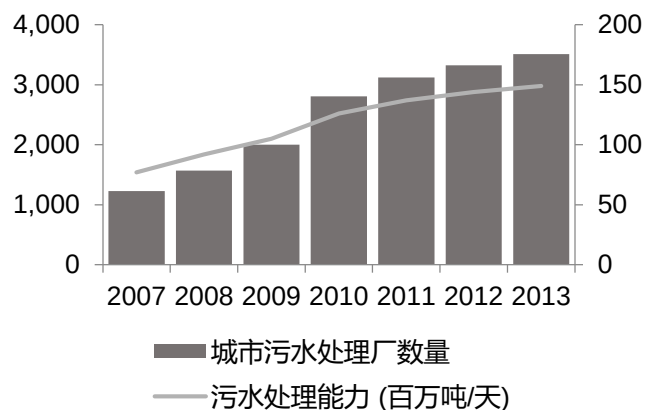


投资回报计算 – 10,000吨 处理厂

资金成本		人民币 (元)	¥ 15,180,000
年度经营成本		¥ 1,800,000	
年度维护成本		¥ 1,200,000	¥ 3,000,000
每年运营成本/吨	(¥ 3,000,000 / 10,000 吨)		¥ 300
减去对污水处理厂的节约成本/吨	聚合物 (避免脱水) 挥发性脂肪酸替代碳源	- ¥ 72 / 吨	¥ 210
		- ¥ 138 / 吨	
净成本/吨	= ¥ 300 (成本) - ¥ 210 (节省)		¥ 90
避免成本/吨	垃圾填埋场的处置成本		¥ 500
节约/吨	¥ 500 - ¥ 90		¥410
每年节约	¥410 * 10,000		¥ 4,100,000
投资回收期	¥15,180,000/¥4,100,000		3.7 年

不同于其他亚洲国家，中国已经开始大力建设废水处理基础设施

中国持续建设废水处理厂。预计在未来五年内数量会再翻一番，同时将产生6千万吨（湿）生物固体。

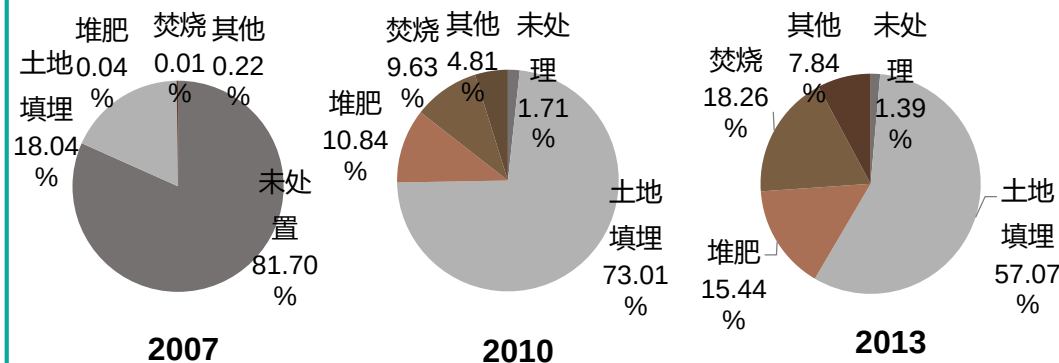


截止2013年，中国的城镇污水厂数达到3500个，总废水处理量达到1.5亿立方米/天。



然而在中国，由于缺乏对市政废水处理产生的生物固体的相关管理政策，一些大城市，比如北京，上海，广州，合肥在农田周围的无节制倾倒生物固体，造成了不少问题。

如何处理持续增长的污泥已经成为政府一项重要工作。然而，作为污泥处理处置的主要手段，土地填埋仍然占有57%的市场比例。



上图所示：中国污泥处理工艺比较 (2007-2013)

目前的处理工艺缺乏可持续性

- 土地缺乏/运输成本过高
- 人口密度增加
- 基础设施老化
- 污染/水溶解/毒素
- 环境政策要求新的可持续的清洁技术来实现循环经济
- (3 Rs 减少使用, 物尽其用, 回收再用)

造成处理成本迅速上升

市场概况

	有机固体 (吨)	处理成本	处置成本	合计 /吨	工艺
新西兰	500,000	375	750	1125	土地填埋
澳大利亚	1,500,000	950	400	1350	土地填埋
中国	30,000,000	\$	300	300**	倾倒