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MSW/BMW feedstock pretreatment for anaerobic co-digestion and RDF

用于厌氧发酵和垃圾衍生燃料的市政固体垃圾/城市生活垃圾的预处理

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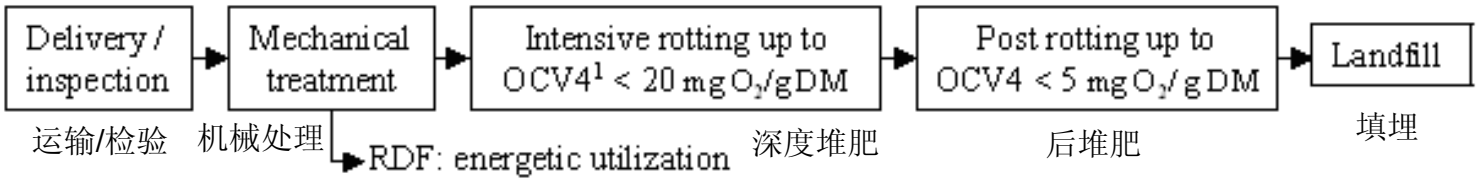
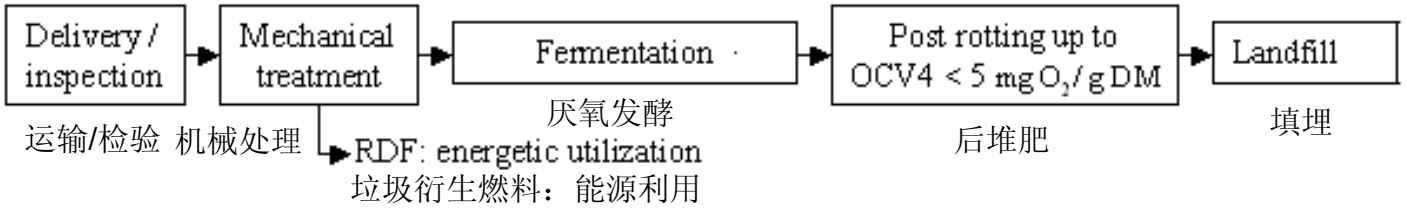
International Best Practice Biogas Purification Technolgy and Bio-Methane Use
国际最佳实践沼气提纯技术和生物甲烷应用
16-20 May 2011
Qingdao, VR China

A: Aerobic MB T for landfilling 好氧机械生物处理以填埋

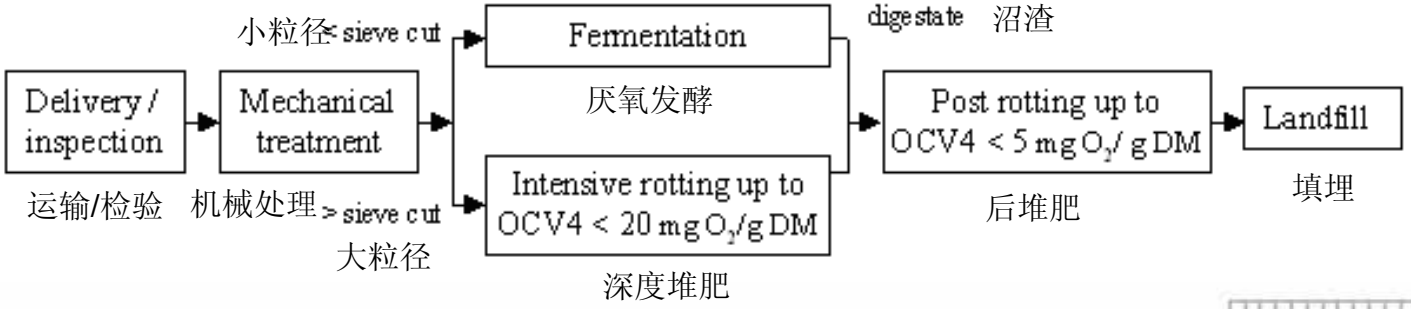


B: Aerobic MB T for stabilization 好氧机械生物处理以稳定化

C: Full-flow anaerobic MB T for landfilling 全厌氧机械生物处理以填埋

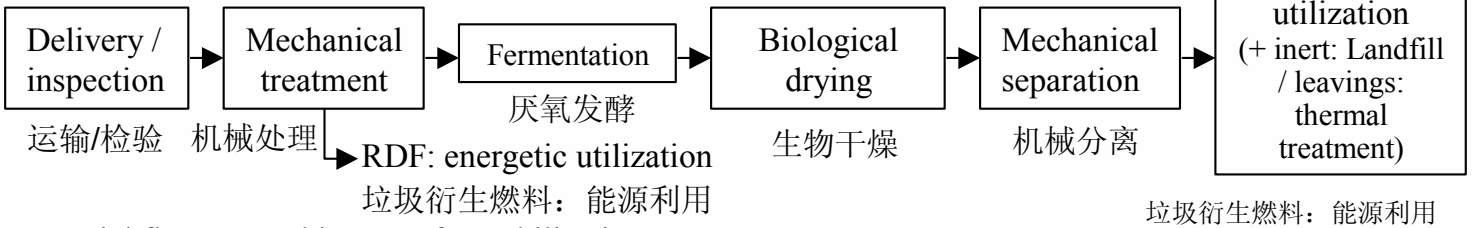


D: Partial flow anaerobic MB T for landfilling 部分厌氧机械生物处理以填埋

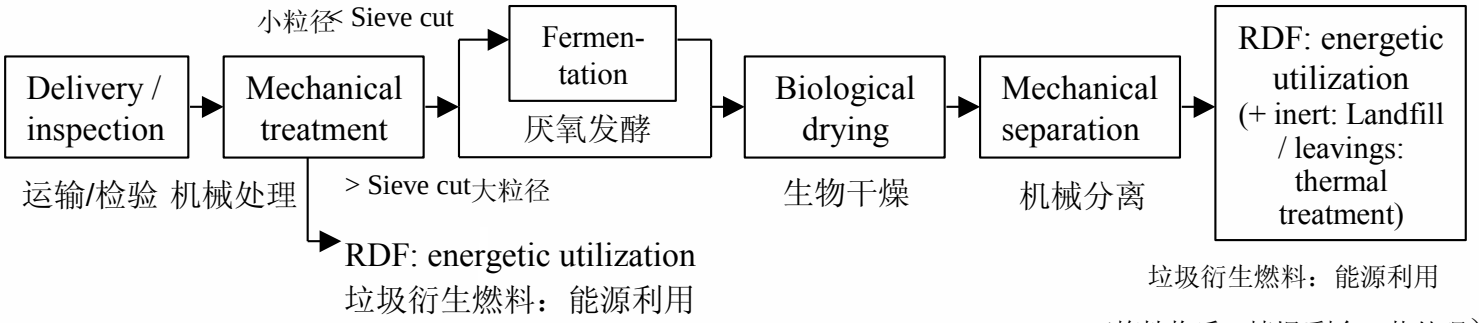


1: OCV4 = Oxic consumption value in 4 days

E: Full-flow anaerobic MBT for stabilization 全厌氧机械生物处理以稳定化



F: Partial flow anaerobic MBT for stabilization 部分厌氧机械生物处理以稳定化



Aerobic = primarily used system in Germany 有氧=德国最初使用的系统

- not energy self- sufficient: use of RDF for energy production is more complex than the use of fermentation gas.
  没有自足能源：用垃圾衍生燃料生产能源比用发酵沼气生产能源要复杂

Anearobic: 厌氧：

- wet fermentation and dry fermentation 湿式发酵和干式发酵
- problems with sand, mixture, staying time, conversion from anaerobic to aerobic, de-watering and the structure of waste for post rotting
  有沙子，混合物，停留时间，从厌氧到有氧的转换，脱水和后堆肥废弃物结构等问题

Technology of the specific extrusion press : 专业挤压技术

Waste is compacted 废弃物被压实
- with high pressure (up to 1,000 bar = 10^8 Pa) 用高压（达到1,000 bar = 10^8 Pa）
- using a horizontally orientated screw extruder and 用水平方向的螺旋挤出机
- compression chambers with cylindrical, wear resistant, replaceable and perforated matrixes压缩腔有圆柱形，耐磨，可更换的穿孔阵列
- diameters of the holes: Possible between 2 and 50 mm 孔径：2-50 mm之间
- 3 compression chambers are arranged in an angle of 120 ° to one another in a rotary drum. 3个压缩腔相隔120度分布在一个转鼓上

With the rotation of the drum each compression chamber passes fully automated through 3 synchronised phases (each needs 20 sec.):
转鼓转动时，每个压实腔全自动经过3个同步的阶段（每个需要20秒）

– Filling 进料
  using a ram at the bottom of the cone which is filled by a grab crane
  起重机抓斗进料，锥形料仓底部有推动塞
– Compression 压实
  with the extruder => the wet fraction is pressed out of the compression chamber through the matrix
  用挤压机 →湿物质从压实腔的矩阵排列的孔中流出
– Discharge 卸料
  of the remaining dry fraction using a ram 用推动塞将剩余的干物质部分推出

MSW or biological waste needs no pre-treatment (no separation of metal, no crushing, no sieving)
市政固体垃圾或生物垃圾不需要预处理（无需分离金属，破碎，过筛）

Rates in case of MSW: 市政固体垃圾的成分如下：
– 60 - 70 % organic value (biomass) for biological treatment / utilisation
  60-70% 有机值（生物质）用于生物处理/利用
– 30 - 40 % high calorific value (RDF) for thermal treatment / utilisation
  30-40% 高热值（垃圾衍生燃料）用于热处理/利用

With the rise of the pressure the following factors rise as well:
随着压力升高，以下物质也增加
– rate and anaerobic microbiological decomposability of the wet fraction and thus the yield of the biogas,
  湿物质中可厌氧降解的比例和降解速率，以及产生的沼气
– calorific value of the dry fraction 干物质部分的热值

Large-scale VMpress-plant since 4 years in Kaiserslautern very successfull in operation

位于Kaiserslautern的大规模VM挤压厂，已经非常成功的运行了4年

RLK Ingenieurgruppe

Advantages of the specific extrusion press : 专门挤压设备的优势

– simple technology: 技术简单
  - standard components, excepting the extruder
    除了挤压机，都是标准配件

– flexible: 灵活
  - rates and thus quality of the dry and wet fraction can be changed
    干、湿物质的质量可以调节
  - built in stages of completion is possible 可以分阶段完成

– Integrable in existing plants: 配合现有工厂设施
  - no fundamental civil engineering constructions o 不需土建施工
  - extremely low floor space 占地非常小

– in a short period of time realizable 施工周期短

– high availability 运行可靠性高

– cost-effective (about 10 €/Mg) 成本低（约10欧元/Mg ）

Wet fraction = biomass 湿物质部分=生物质



Dry fraction = RDF 干物质部分=垃圾衍生燃料


Dry fraction = RDF 干物质部分=垃圾衍生燃料

– density before braking-up = 0.9 to 1 Mg/m3
破碎前的密度= 0.9 - 1 Mg/m3
=> minimised costs for transport and storage 最小的成本输送和储存

– relevant parameters comparable with RDF produced in any other qualified way from municipal waste
比较用其它高质量方式处理的市政垃圾所产生的垃圾衍生燃料的相关参数
=> can e. g. be used in incineration facilities, cement plants, gasification plants or pyrolyses plants
例如：可以被用在焚烧设施，水泥厂，气化厂或热解厂

– contains about 25 % of the degradable organic material
包含约25%可降解有机物质
=> production of dry-stabilised material with high quality by biological drying is possible. 稳定高质量的干物质可以用生物干燥方法得到

MYT: 1. Step: Mechanical Treatment 步骤1： 机械处理

Technology, f. e.: 技术： 例如

- multifunctional sieving drums 多功能筛鼓
- neodymium magnets 钕磁铁
- manual separation 手工分离
- Fe-separation 分离铁

Aim: 目的：

- effectively elimination of hazardous and foreign material
  有效去除危险物质和异物
- Selectively shredding of the waste 有选择切碎废弃物
- Homogenization of the waste废弃物均质化

Removal of: 去除：

- > 150 mm = RDF, less but with higher value as usual
  > 150 mm = 垃圾衍生燃料，较少但是热值较高
- hazardous and toxic materials 危险的和有毒的物质
- minerals and metals 矿物质和金属

Introduction
介绍

State of the art
工艺

VMpress
Extrusion
VM挤压机

MYT
ZAK-process
MYT

ZAK工艺

2. Step: Biological Treatment 步骤2：生物处理

Technology, f. e.: 技术：例如

- Percolators (length 25 m, width 4,5 m) 渗滤（长25米，宽4.5米）
- Dewatering press 除水压实
- Treatment of the processwater with 处理工艺水
  - Mechanical separation of the included solids
    机械分离其中的固体
  - Anaerobic treatment → biogas generation
    厌氧处理→产生沼气
  - Recirculation to the percolator of most of the water
    循环使用大部分的渗滤液
  - Treatment of the water → public sewer Fe-separation
    水处理→市政污水管道 铁分离

Aim: 目的：

- optimum characteristics for the subsequent biological drying process and material separation 满足生物干燥和材料分离的最佳特性
- generation of biogas生产沼气

Removal of: 去除：

- rot- and water-loss 腐烂和水损耗
- biogas 沼气

3. Step: Biological Drying 步骤3：生物干燥

Technology, f. e.: 技术： 例如

- Two-step procedure 两步过程

Aim: 目的：

- homogeneous drying level, 均匀干燥水平
- dry matter for high-quality fuel which can be stored without time-restriction. 高质量的干物质燃料不受保存时间限制

Removal of: 去除：

- rot and water-loss 腐烂和水损耗

4. Step: Mechanical Material Separation 步骤4： 机械物质分离

Technology, f. e.: 技术：例如

- Sieving in 5 branch streams 5条过筛线
- < 25 mm: separation in air separators 小于25 mm，气体分离
- Flexible system 系统灵活

Aim: 目的：

- high-quality fuel
  高质量的燃料

Removal of: 去除：

- RDF 垃圾衍生燃料
- Mineral materials
  矿物质
- residues > 25 mm
  大于25 mm的残渣

Light fraction 轻物质部分

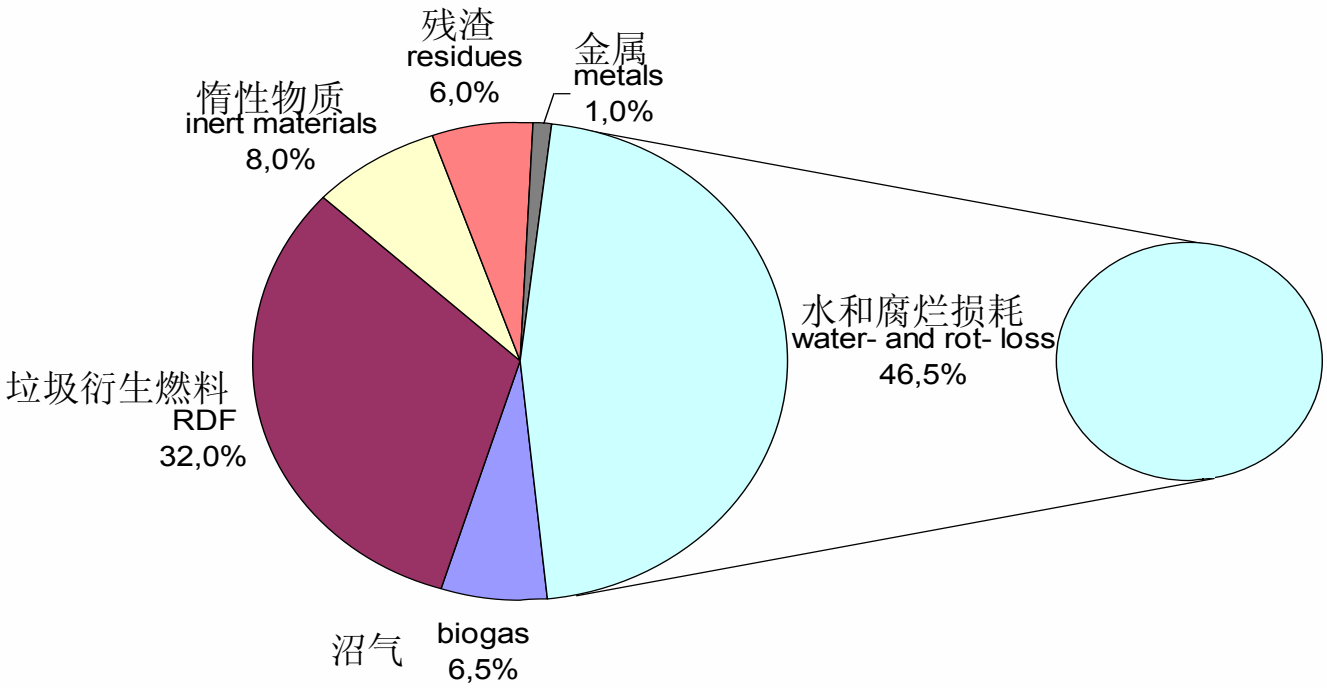
light fraction 15-25 mm

light fraction 8-15 mm

light fraction 4-8 mm

light fraction 0-2 mm

Output mass flow 输出物质组成



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Thank you for your attention!

谢谢 !

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