

Renewable Energies 可再生能源

‘Pretreatment options at large scale biogas plants’

大型沼气工程预处理办法

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GTZ Training for DESIGN Institutes II

GTZ第二次设计培训



KNOTEN
WEIMAR



AgroTechService



Storage & Feeding liquid feedstock 液态原料储存和进料

Liquid waste: 液态废弃物
Deep bunker 深槽
or storage tanks 储存罐



**submersible
mixers**



**preliminary
storage tank**



A photograph showing a large concrete silo filled with brown corn silage. The silage is piled up, and a concrete channel runs along the bottom. In the background, there are industrial structures and a green building under a clear sky.

Feeding of corn silage for bio-methane generation
玉米青贮原料用于生产生物甲烷



Storage & quantitative Feeding 储存和进料



Walking floor 地面



Receiving, Storage & Feeding 储存和进料

**Flat bunker
for solids**
平地或深槽



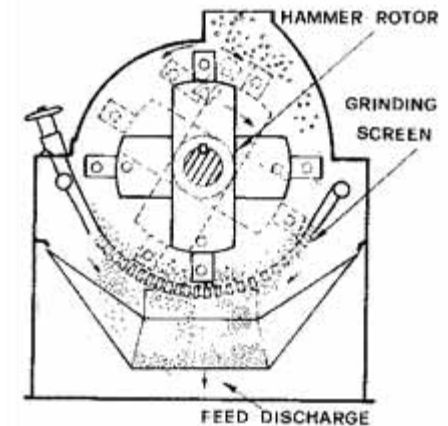
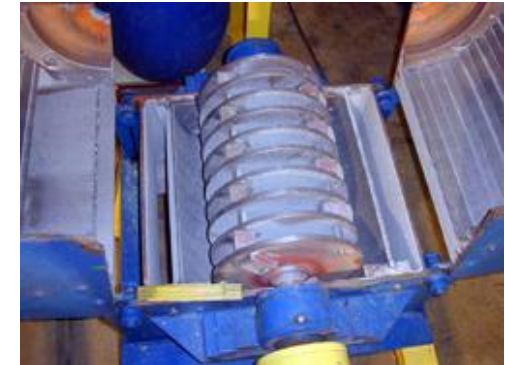
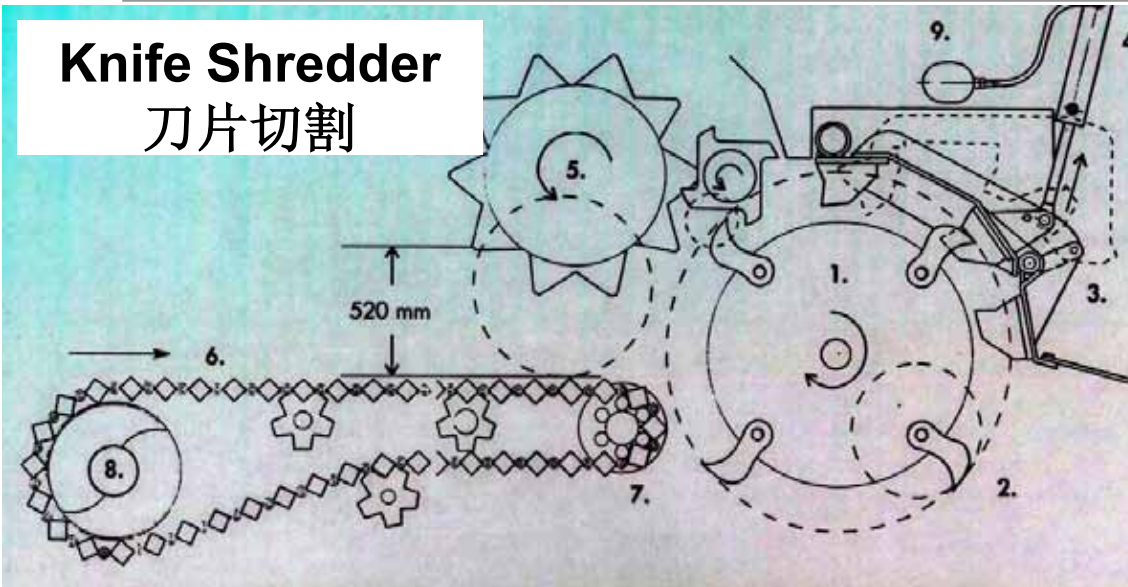
**Screw
grinder –
mixing and
dosing unit**
螺旋混合给料
设备



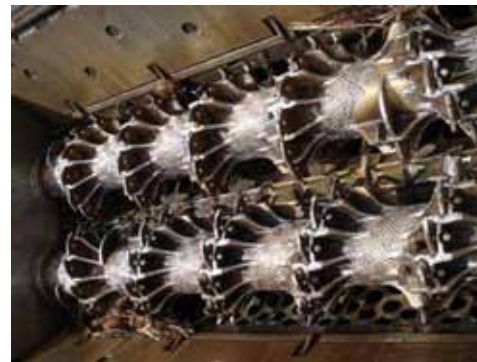


Solid Feedstock: Grinding by Screw-, knife- or hammer mills
固体原料:用螺旋、刀片切割或研磨机使其碎片化

Knife Shredder
刀片切割



Hammer Mills
研磨挤压机





Pretreatment of feedstock materials 原料预处理

(d) Increase the accessibility for microbiological degradation (inner material surface) 增加原料表面积以利于微生物降解



Biogasproduction of grinded straw after 10, 20 & 30 days 碾碎的秸秆10, 20及30天发酵沼气产量

10 days 20 days 30 days
m³ / kg organic substance

小麦秸秆	Wheat straw:			
切碎 (3cm)	chopped (3 cm)	0,11	0,17	0,23
粉碎 (0.1-2mm)	milled (0,1 – 2,0 mm)	0,22	0,33	0,37

	10 days	20 days	30 days
	0,11	0,17	0,23
	0,22	0,33	0,37



Pretreatment of solid and liquid feedstock materials 原料预处理

(a) Improve transport ability and homogeneity for pumping, mixing, flowing
增加运输能力和原料均匀度有利于泵送,搅拌和流动



**Grinding by:
screw-, knife-
or hammer
mills
螺旋切割**



**Pulper, swim-sink
separation 浮渣破碎
沉积分离**



**Rotavapor for
suspensions
悬浮固体切割机**

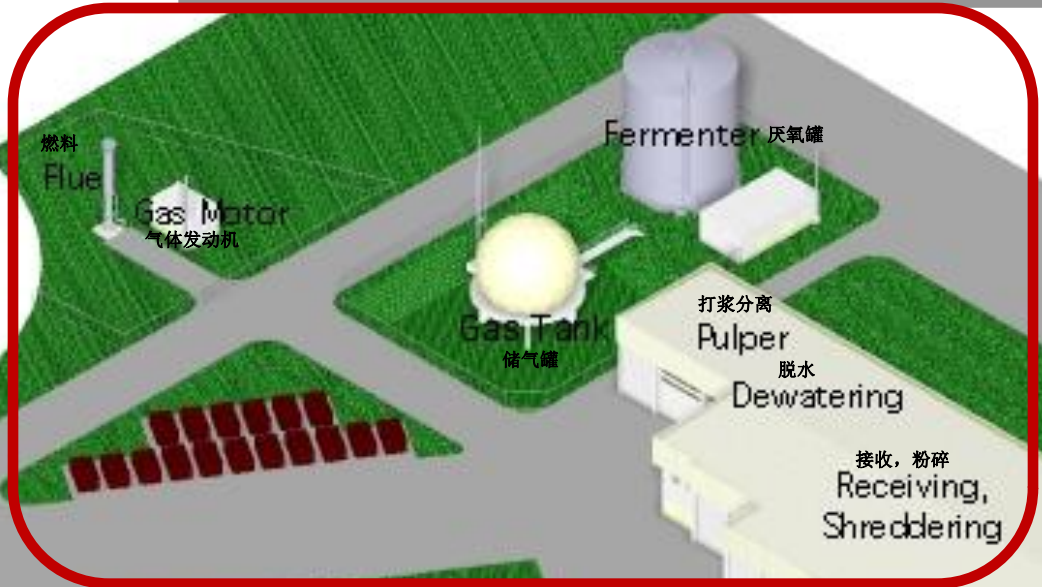


AD of BMW, Wels Austria, 有机生活垃圾的厌氧消化 25.000 t/a, KCA Linde



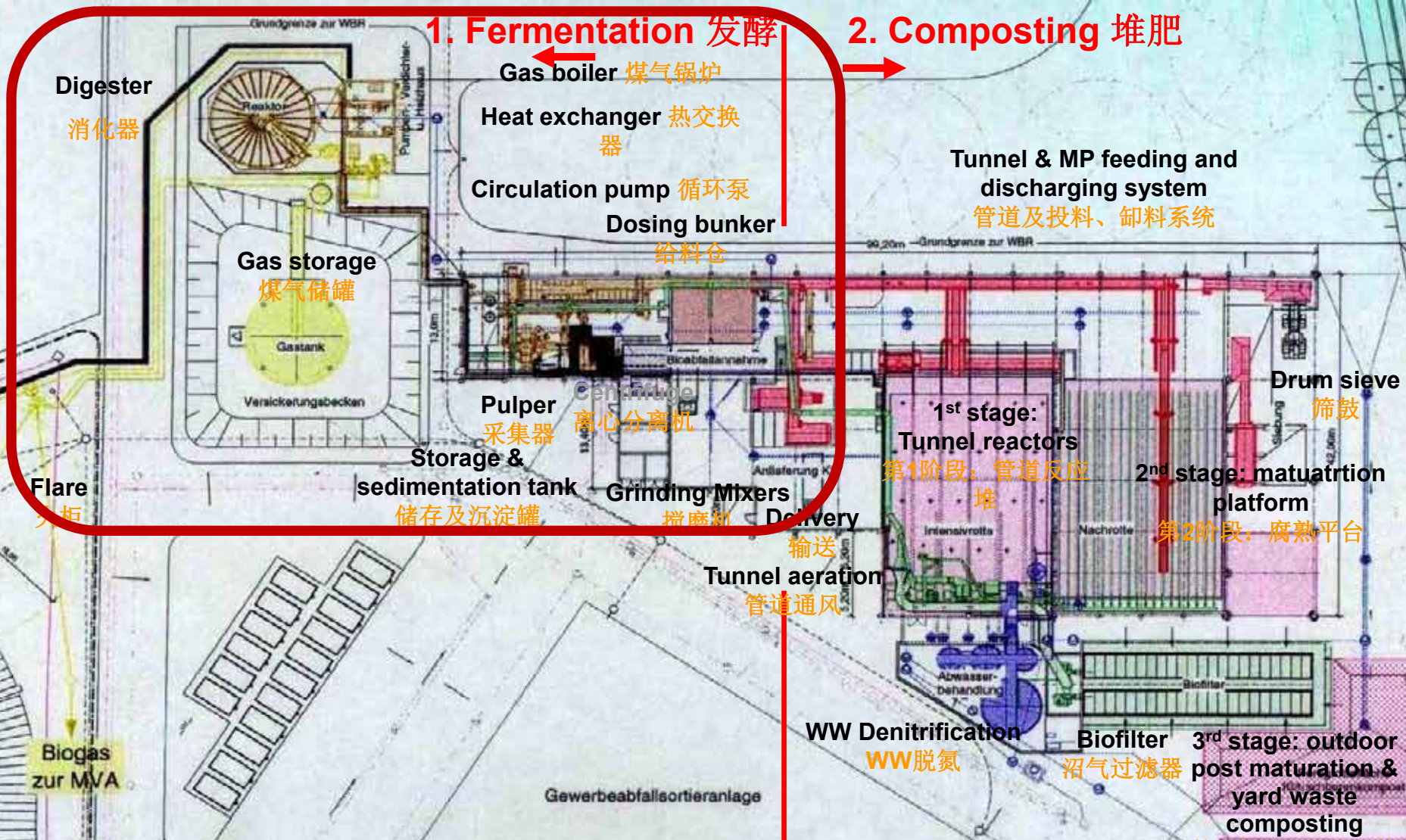


AD of BMW, Wels Austria 有机生活垃圾的厌氧消化 25.000 t/a, KCA Linde Germany



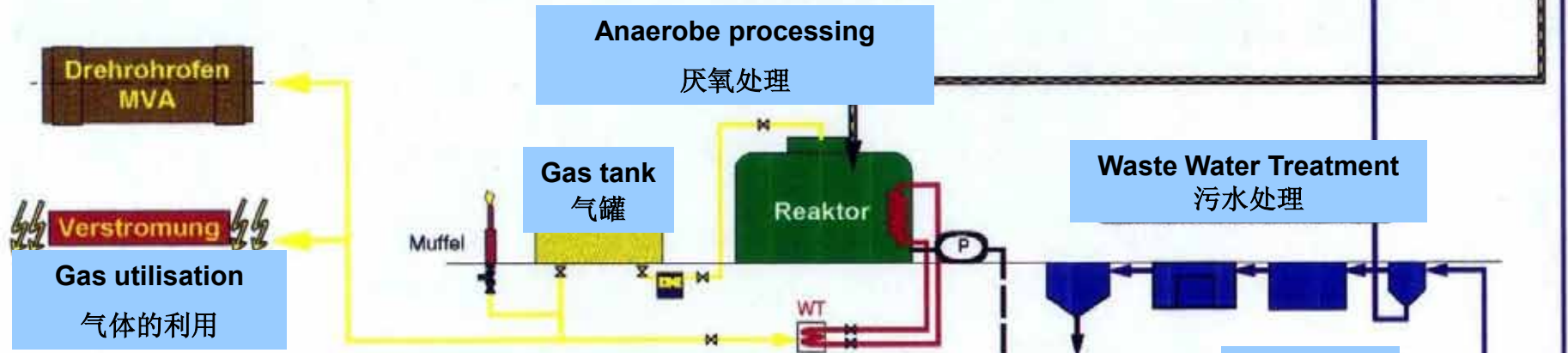
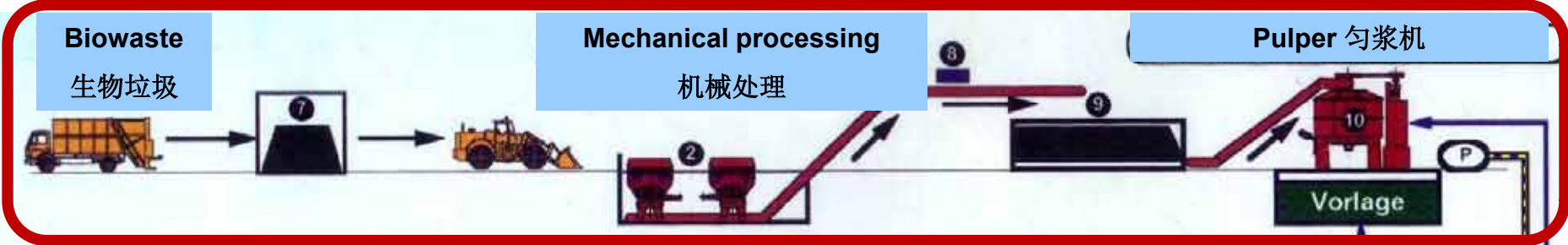


BMW & agro waste AD & Composting 生物质及农业废弃物的发酵及堆肥
WELS Process flow 25,000 t.a – 1 mio m3 Biogas p.a WELS工艺流程 25,000吨/年 - 100万m³生物气/年

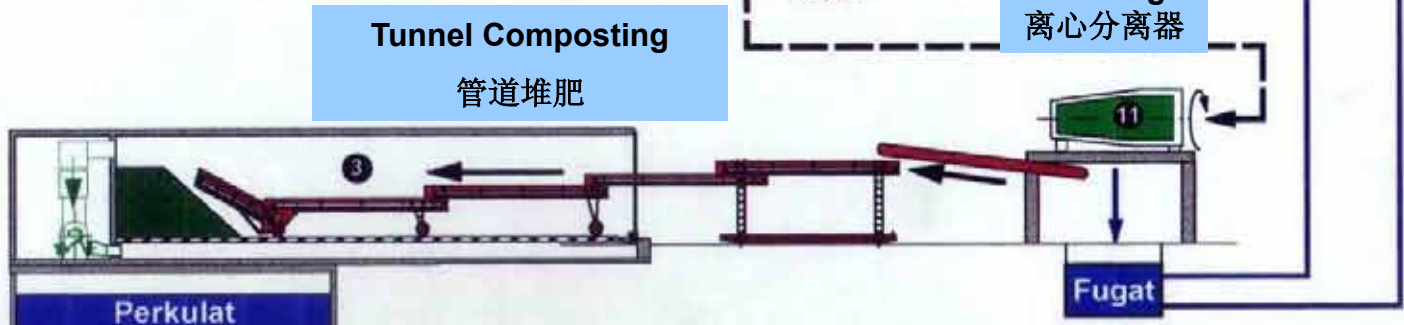




Preprocessing at WAV Biowaste Biogas Plant 生物垃圾沼气厂预处理



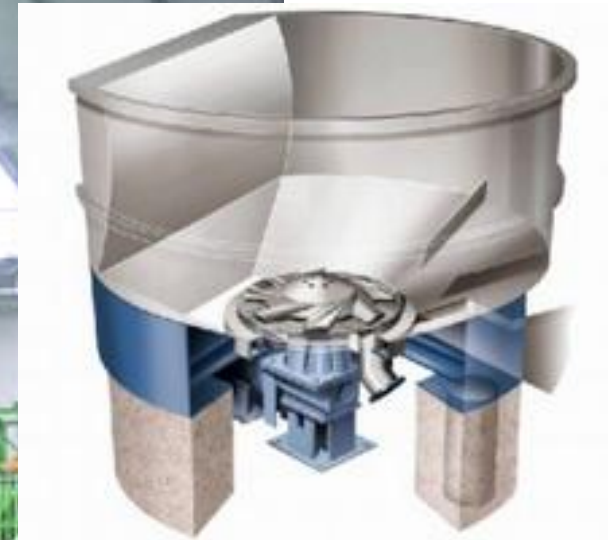
- ② Mischung/Zerkleinerung
- ③ Intensivrottetunnel
- ⑦ Flachbunker Bioabfall
- ⑧ Eisenabscheidung
- ⑨ Zwischenspeicher
- ⑩ Anmischung
- ⑪ Entwässerung





Anaerobic Digestion of Bio-Waste 生物垃圾的厌氧发酵

Hydro-pulper for liquid digestion technology 水体碎浆机用于液体发酵



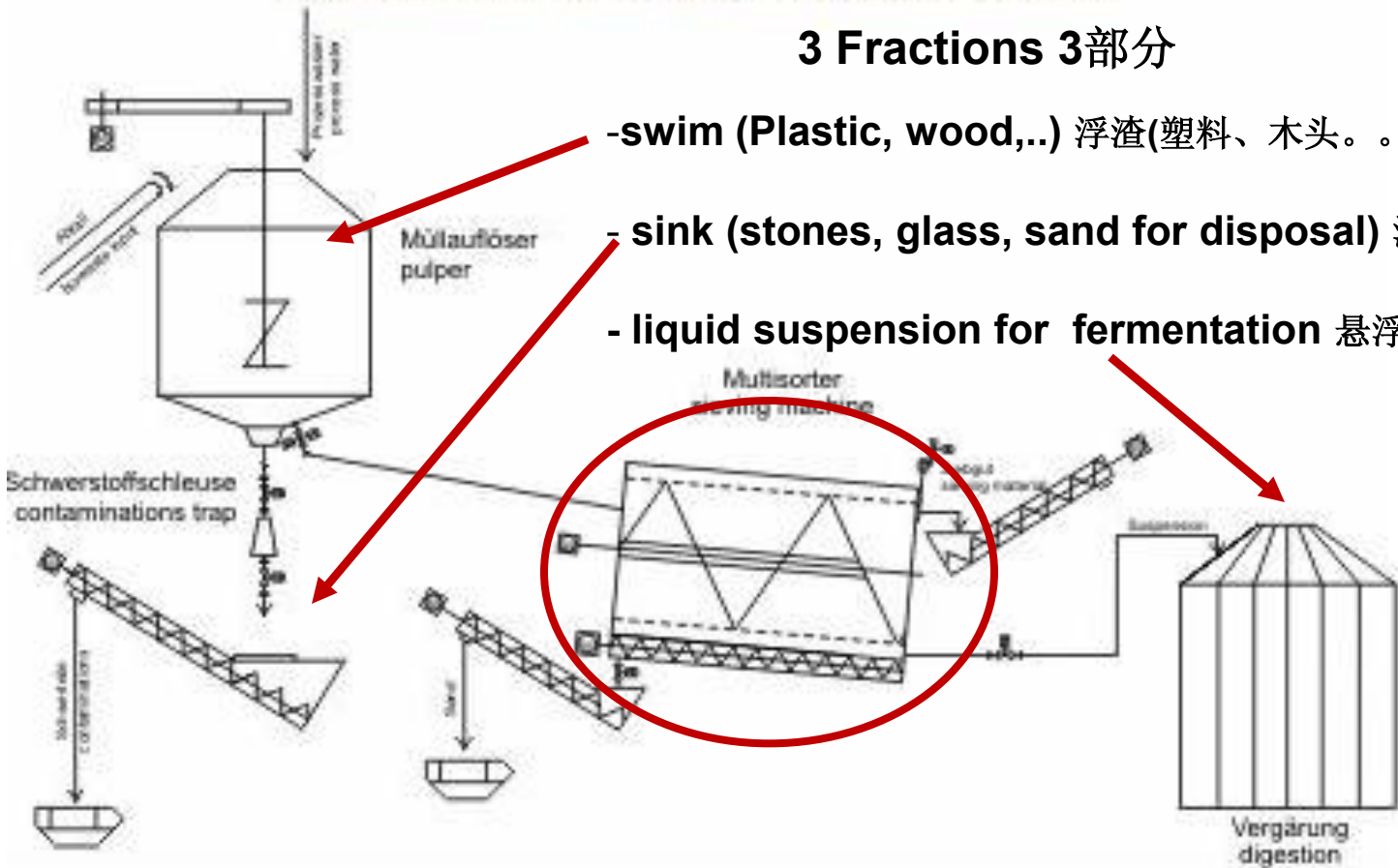
With leachate circulation
滤液回旋



Pulper option a: Anaerobic digestion of Bio-Waste suspension for liquid digestion technology 生物垃圾的厌氧发酵 水体碎浆机用于液体发酵

System for pulping organic waste

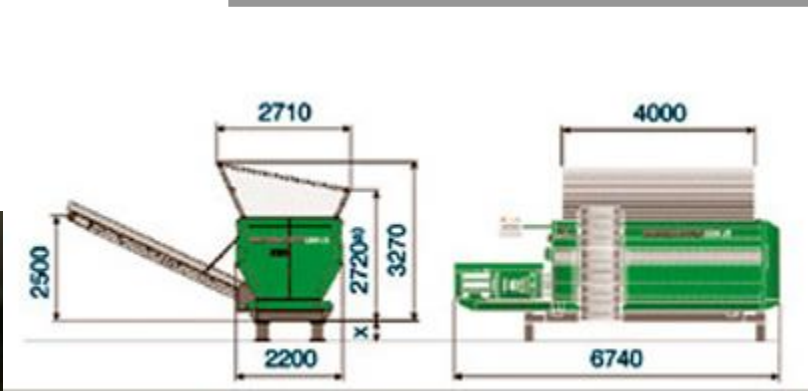
3 Fractions 3部分



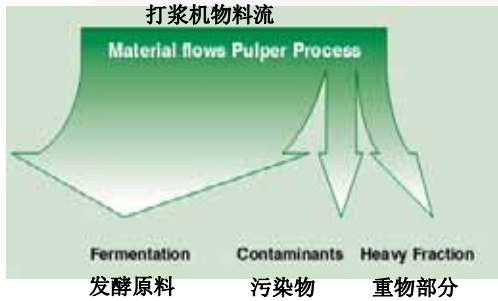
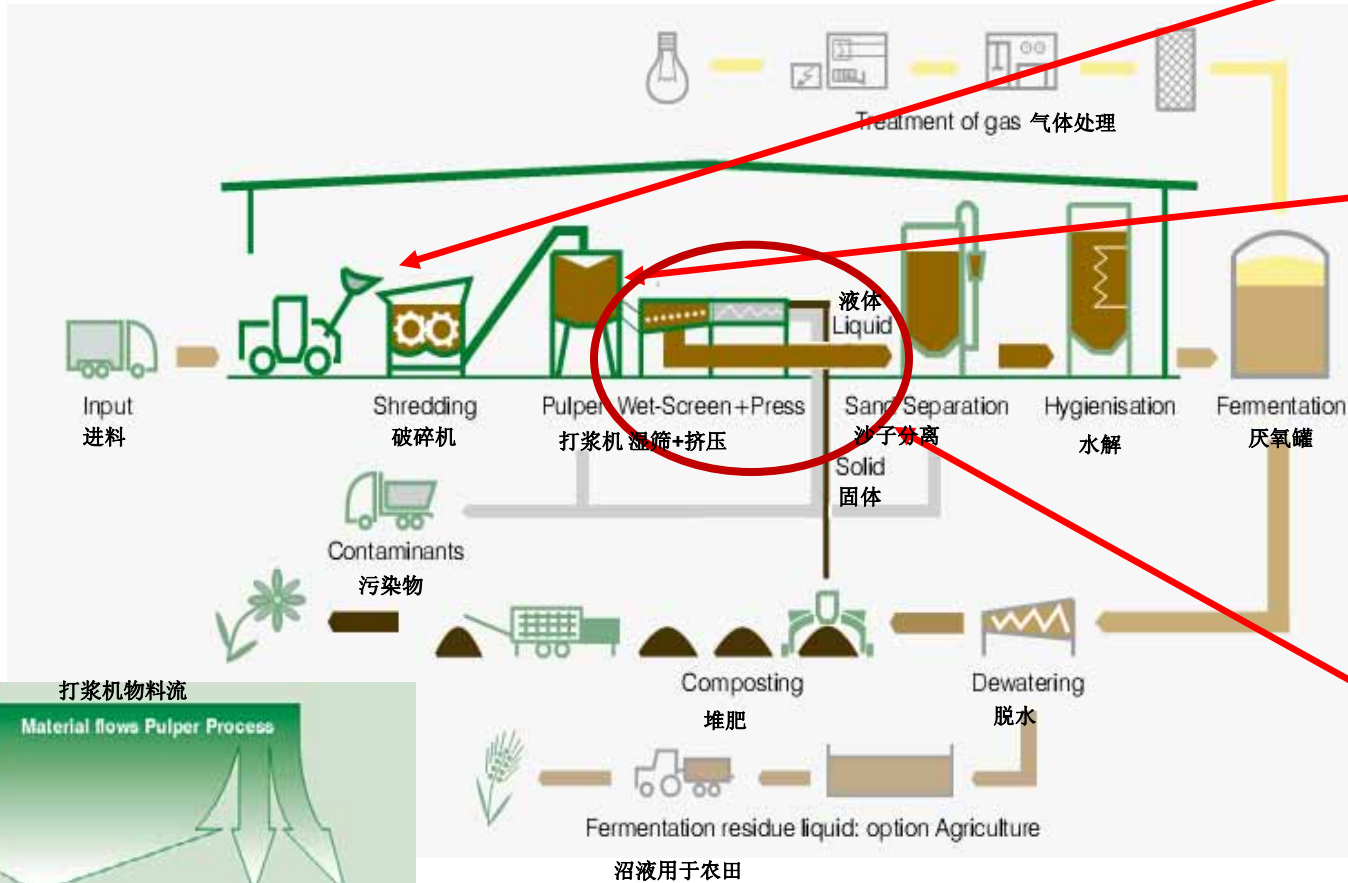
- swim (Plastic, wood,..) 浮渣(塑料、木头。。)
- sink (stones, glass, sand for disposal) 沉淀 (石头、玻璃、沙子)
- liquid suspension for fermentation 悬浮液 — 发酵



Processing of BMW for Biogas Plant – Screw grinder 生物垃圾沼气厂预处理-螺旋磨床



Pulper option b: Anaerobic digestion of liquid pulper effluent 打浆机应用 b: 打浆机液体出料厌氧发酵





Technology of the specific extrusion press: 挤压工艺:

BioPress/Co

accumulation of Biomass
in a Press-process +
Co-fermentation digestion

同时生物挤压
生物质在挤压过程中积累并发酵



BioPress/

accumulation of Biomass
in a Press-process +
each other form of fermentation

生物质在挤压过程中积累，发酵单独进行





Technology of the specific extrusion press 挤压工艺:

Waste is compacted 废弃物被压实

- with **high pressure** (up to 1,000 bar = 10^8 Pa) 通过高压（最大可达1,000 bar = 10^8 Pa）
- using a **horizontally** orientated screw **extruder** and 使用**水平螺旋挤压机**
- **compression chambers** with cylindrical, wear resistant, replaceable and **perforated matrixes** 压力舱中有圆柱形耐磨损可替代的有空的**基质**
- diameters of the holes: Possible between 2 and 50 mm 孔的直径：2到50mm
- 3 compression chambers are arranged in an angle of 120° to one another in a **rotary drum**. 3个压力舱以120度角放置在一个**滚筒**内。

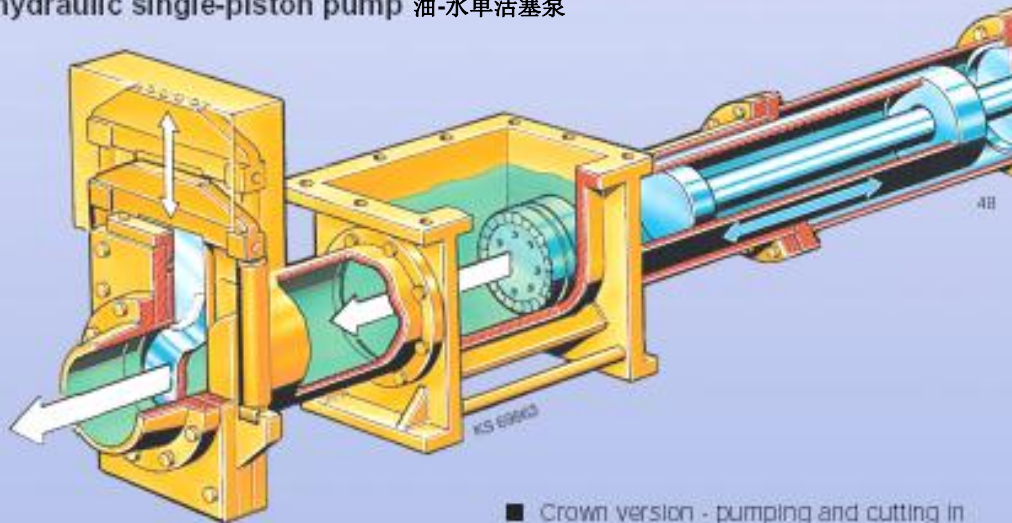




Anaerobic Digestion of Bio-Waste 生物垃圾厌氧发酵

High pressure piston pumps for dry fermentation 用于干发酵的高压活塞泵

oil-hydraulic single-piston pump 油-水单活塞泵



特征和优势

Features and advantages:

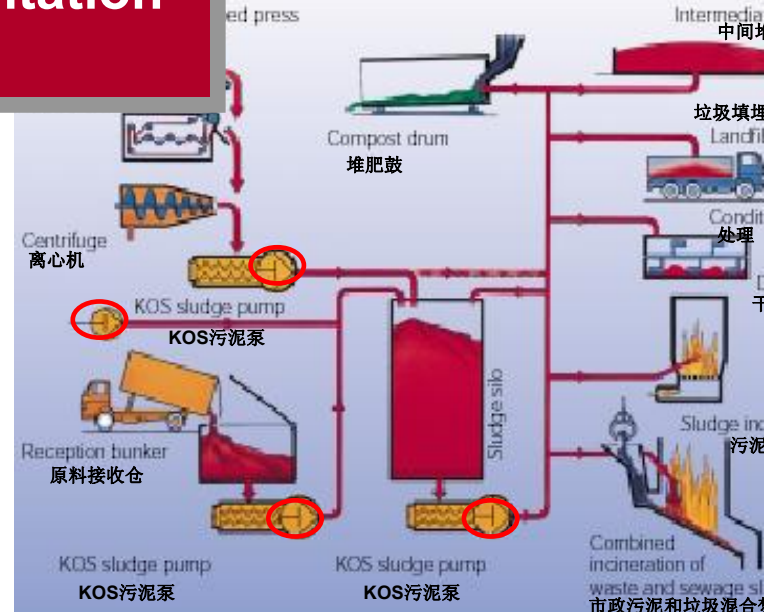
- For conveying large-sized and coarse foreign bodies 传送大颗粒和粗糙原料
- For conveying extremely stiff material 传送极端坚硬的原料

- Crown version - pumping and cutting in one stroke 泵送和切碎同时进行
- Simple design 设计简单
- Delivery pressures up to 60 bar 传送压力达60Bar
- Cutting force up to 80 t 切力达80t
- Outputs up to 14 m³/h 出料达14m³/h

80 –120 bar pressure 压强80-120 bar

- solids pumps are to transport and dose sewage sludge & biowaste (<35 % DS)

- 固体泵主要传送污泥及生物垃圾(<35%DS)





Thank You! 谢谢!

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