## Advanced Anaerobic Digestion with Thermal Hydrolysis Process in Xiaohongmen Water Reclamation Plant – Experience from Planning to Execution

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## Agenda

- Advanced Anaerobic Digestion (AAD) using THP
- Beijing Drainage Group (BDG) : 5 AAD projects
- Focus on Xiaohongmen AAD project



## Advanced AD using THP



### Cambi provides responsible sludge advanced digestion solutions





### **Cambi Thermal Hydrolysis Process**



# **5 AAD projects at Beijing**



### **Beijing Projects - timeline**

Stage	Period	
Investigation, engineering design	2010-2014	
Construction, installation, commissioning	2014-2016	
Stable operation	2016-present	
Development for forest land application	2017-present	
Upgrading and optimizing	2020-2022	



#### Beijing Drainage Group: owner

Beijing Municipal Engineering Design Institute: design

**Purac**: supply and installation of AD equipment **Cambi**: supply of Thermal Hydrolysis Process





## Beijing Urban Area: 6000 wet tons / day



Alternative imports option

Main imports option

Existing plant

New plant



Indigenous sludge only

Indigenous & imported sludge

北京排水集团 BEIJING DRAINAGE GROUP CO.,LTD



### **Beijing 5 sludge centers**



Plant	Xiaohongmen	Qinghe 2	Gaoantun	Gaobeidian	Huaifang	
Population (PE)	3.60 million	4.68 million	8.16 million	7.12 million	6.24 million	
Capacity tDS/y	65 700	59 422	134 028	99 134	89 060	
Capacity tDS/d	180	163	368	272	244	
THP	3 x CambiTHP B12-5	3 x CambiTHP B12-4	4 x CambiTHP B12-6	4 x CambiTHP B12-5	4 x CambiTHPB12-4	
Digestion	5 x 12000 m3 (existing)	4 x 12000 m3 (new)	8 x 12000 m3 (new)	8 x 7850 m3 (existing)	5 x 12000m3 (new)	





# Focus on Xiaohongmen AAD plant



#### Xiaohongmen, Beijing (Beijing Drainage Group), China

Cambi solution	CambiTHP <sup>®</sup> - B12
Number of trains	3
Status	In Operation
Year of commissioning	2017
Feedstock type	Primary and secondary sludge
Population served	3 500 000 p.e.
Plant design capacity	65 700 tDS/yr
Digester capacity	60 000 m <sup>3</sup>
Biogas utilization	Combined heat and power
Disposal method	Land application
Services	Installation, commissioning, spare parts

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C<sub>1</sub>M:





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### **Changes Before / After THP implementation**





### **Changes Before / After THP implementation**

	Before upgrade	After upgrade: Advanced AD with THP
Design capacity	Up to <b>90tDS/d</b> Only indigenous PS to digesters	Up to <b>180 tDS/d</b> Indigenous mixed sludge + imported cake (mostly WAS), all to digesters
Digestion volume	5 x 12,000 m3 <b>60,000 m3</b> in use	4 x 11,000 m3 (level lowered) 44,000 m3 in use (1 digester in standby)
Pre-dewatering	No	Yes, using centrifuges
Heating / cooling	Heat exchangers for heating	Heat exchangers for cooling
Biogas use	Digesters heating & aeration blowers	THP & aeration blowers (& Gas engines)
Post dewatering	Centrifuges (20-22%DS)	Chamber filter presses, to get >40%DS
Biosolids disposal	Lime stabilization and land application	Land application without liming
Reject water treatment	Back to head works	To ReNoCar process (anammox-type)



### **Process description - Xiaohongmen**



### **Plant description - Xiaohongmen**



## Xiaohongmen, Beijing, China

北排建设 CAM:3'康碧 A AN ANY

北排建设 C1M37康期

. W = Weakly

#### Prime Minister from Norway at the BDG opening ceremony in Xiaohongmen WWTP 2017.04.07





### VS (in) – VS (out) – VSR (Mass balance) - 2020



- DS daily throughput: 120 155 tDS/d (design 180)
- Extremely low VS content for mixed sludge: 46 to 71% VS% (in)
- Leading to 34 to 55% VSR

北京排水集团

### VSR Vs. VS content - 2020



### **Biogas production**





430-530 Nm3/tVS in

15,650,000 Nm3 biogas/y

280-410 Nm3/tDS in (av. 352)

### **Re-use of Final cake**

- Plate filter presses: >40% without lime
- Re-use of stabilized cake in Forestry



Forestry in Fangshan disctrict







各有关区园林绿化局、水务局、环境保护局,市涉林单位,有关 污泥产出企业:

为拓展我市城镇生活污泥消纳出路,逐步有序推进处理达标 后的城镇生活污泥在园林绿化中的应用,从而达到既推进污泥资 源化利用,又在保证生态系统健康安全的前提下促进我市林地绿 地土壤质量的提升。根据国务院《土壤污染防治行动计划》(2016

Official approval of local Beijing government for application of cake on Forest area





Forestry between Tianjin and Beijing

### AAD using Thermal Hydrolysis At Xiaohongmen – BDG: Feedback and performances

- 40-50%DS cake
- Pathogen kill
- Re-use : forestry





Existing digestion cap. approx. tripled VSR = f(VS)  100% availability (365/y - 2020)



Hong Kong (Shek Wu Hui CambiTHP - Commissioning in 2022)

CAMB