

6th CEWEP Congress 2012

Waste-to-Energy

▶ **Energy & Resource Efficiency**

6-7 September 2012, in Würzburg



The CHINA market for Waste-to-Energy

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China population



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China waste

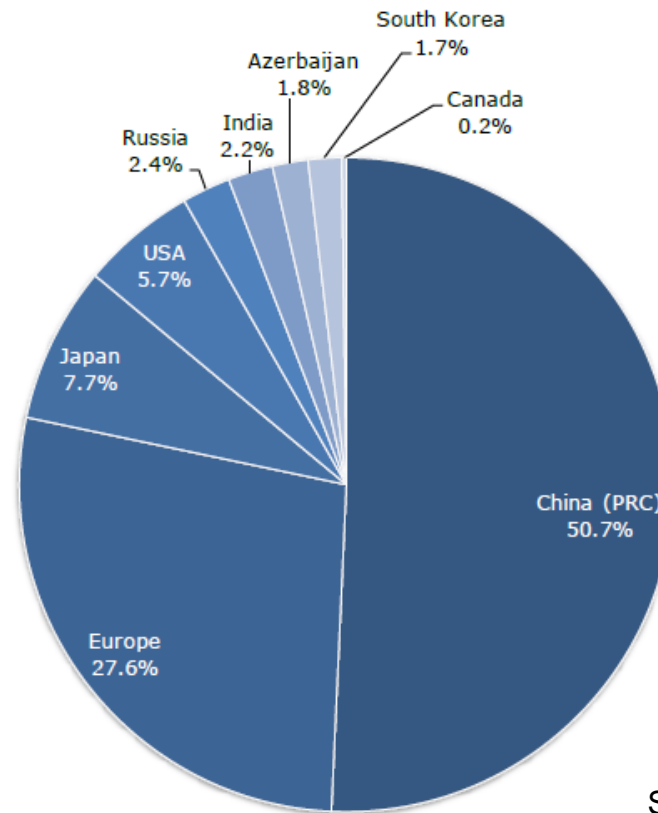


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Market worldwide 2008-2010



Geographic Distribution of Market Share of Plants / Awards in 2008 -2010 (including Europe)

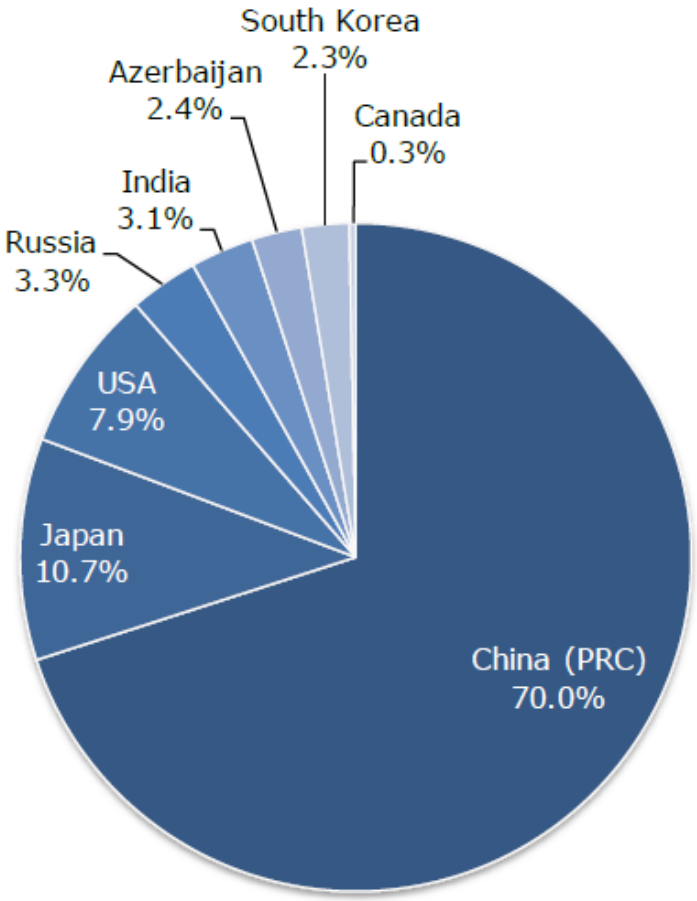


Total: 89'964 tpd

Source: Vaccani, Zweig & Associates



Market size outside Europe (2008-2010)



Source: Vaccani, Zweig & Associates



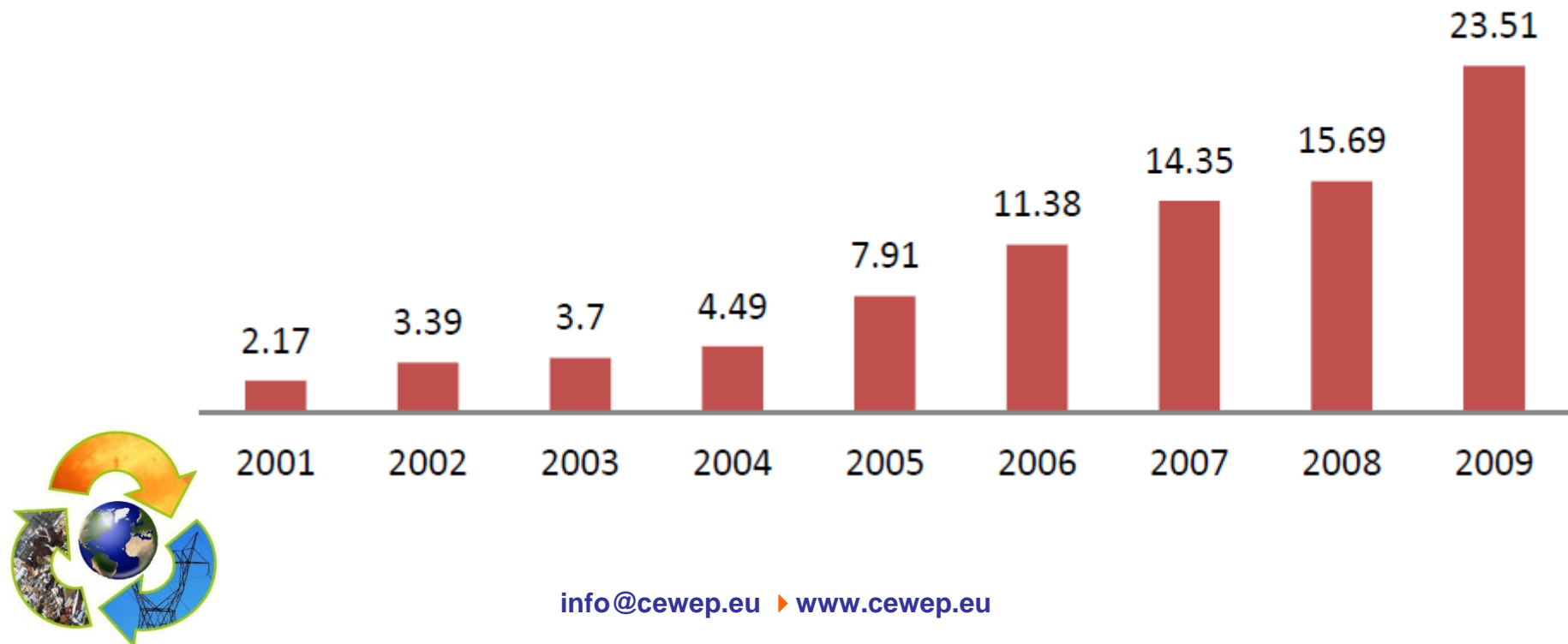
Total: 65'161 tpd

Growth in WTE capacity in China, 2001-2009



- Source : Yani Dong

Total WTE capacity, million tons/y



Market size (source Vaccani, Zweig & Associates)



Worldwide Plants / Awards per Country and Year, 2008 – 2010 excluding Europe

| Country | Total 2008 - 2010 | | 2010 | | 2009 | | 2008 | |
|--------------|-------------------|-----------------|---------------|-----------------|---------------|-----------------|---------------|-----------------|
| | No. of Plants | Capacity t/d | No. of plants | Capacity t/d | No. of plants | Capacity t/d | No. of plants | Capacity t/d |
| China (PRC) | 35 | 45'839.8 | 18 | 21'090.5 | 10 | 14'499.1 | 7 | 10'050.2 |
| Japan | 25 | 6'989.0 | 9 | 2'363.7 | 10 | 2'981.4 | 6 | 1'624.0 |
| USA | 5 | 5'122.6 | 3 | 3'465.6 | 2 | 1'657.0 | 0 | 0.0 |
| Russia | 1 | 2'160.0 | 1 | 2'160.0 | 0 | 0.0 | 0 | 0.0 |
| India | 2 | 1'998.0 | 0 | 0.0 | 0 | 0.0 | 2 | 1'998.0 |
| Azerbaijan | 1 | 1'584.0 | 0 | 0.0 | 1 | 1'584.0 | 0 | 0.0 |
| South Korea | 6 | 1'488.0 | 1 | 168.0 | 3 | 549.6 | 2 | 770.4 |
| Canada | 1 | 200.0 | 0 | 0.0 | 1 | 200.0 | 0 | 0.0 |
| Total | 76.0 | 65'161.4 | 32.0 | 29'247.8 | 27.0 | 21'471.0 | 17.0 | 14'442.6 |

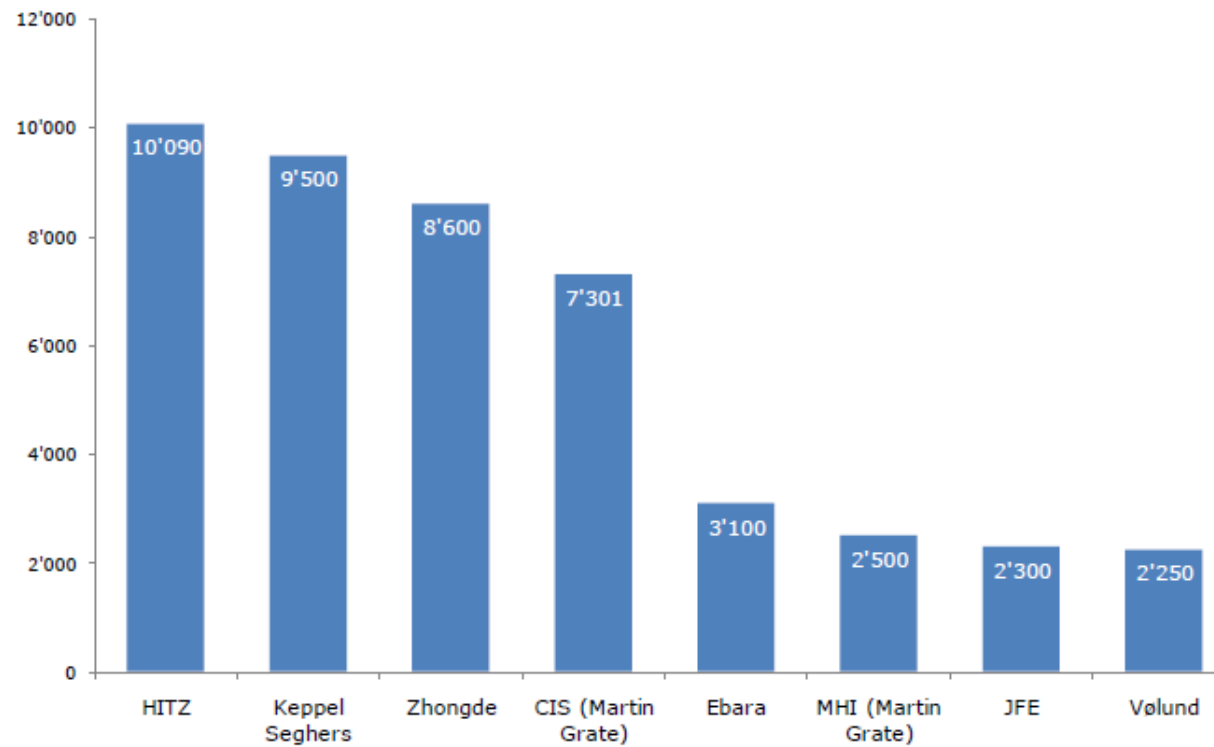


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Market share



Capacity Awarded in 2008 – 2010 in China by Supplier / Developer



Total: 45'640 tpd



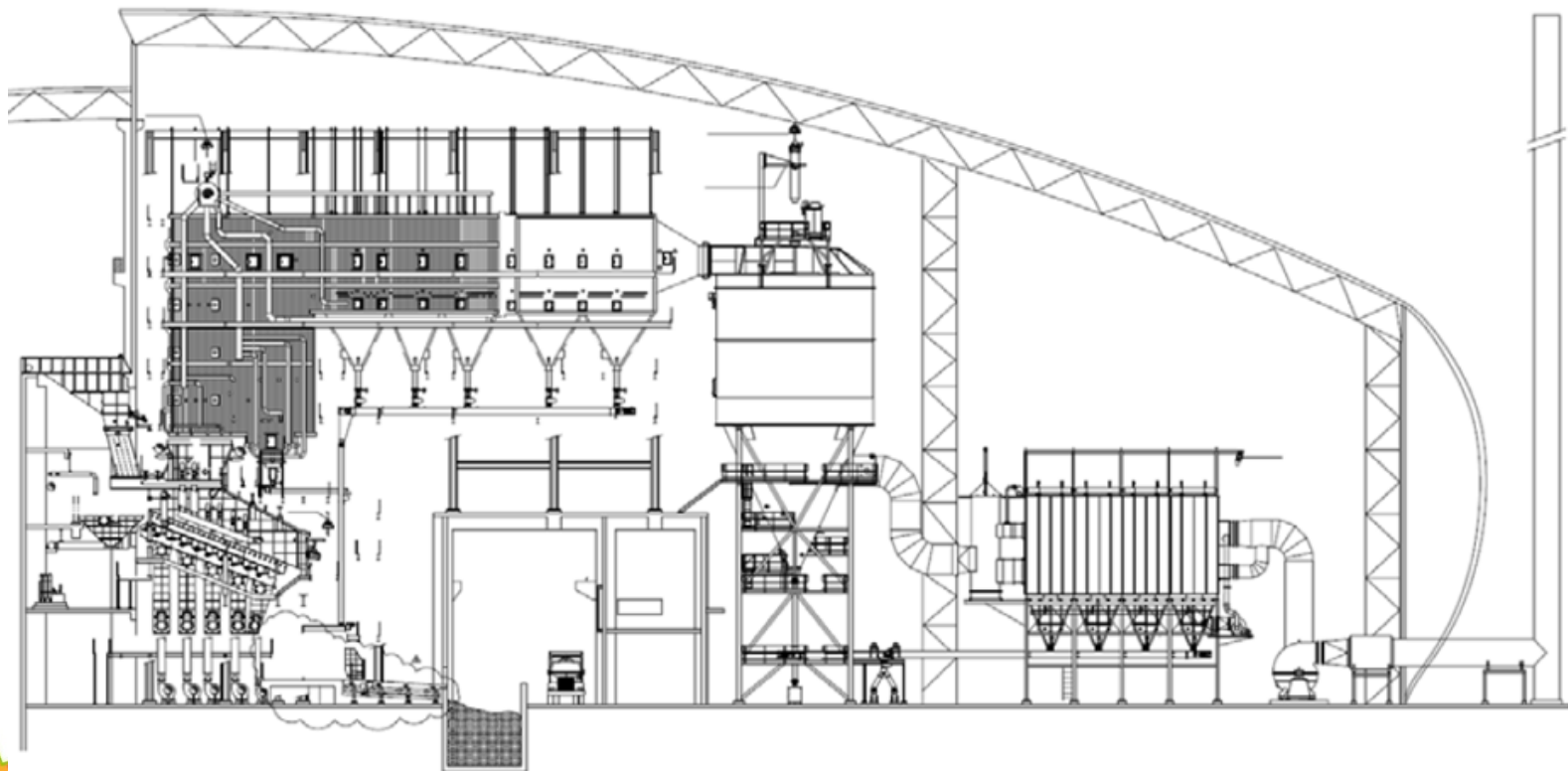
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China 12th five year plan (2011-2015)

- RMB 3.1 trillion (400 billion €) investment in the 'environment protection' related area.
- 800 billion RMB (100 billion €) for WtE plants.
- > 100 new WTE plants to be built

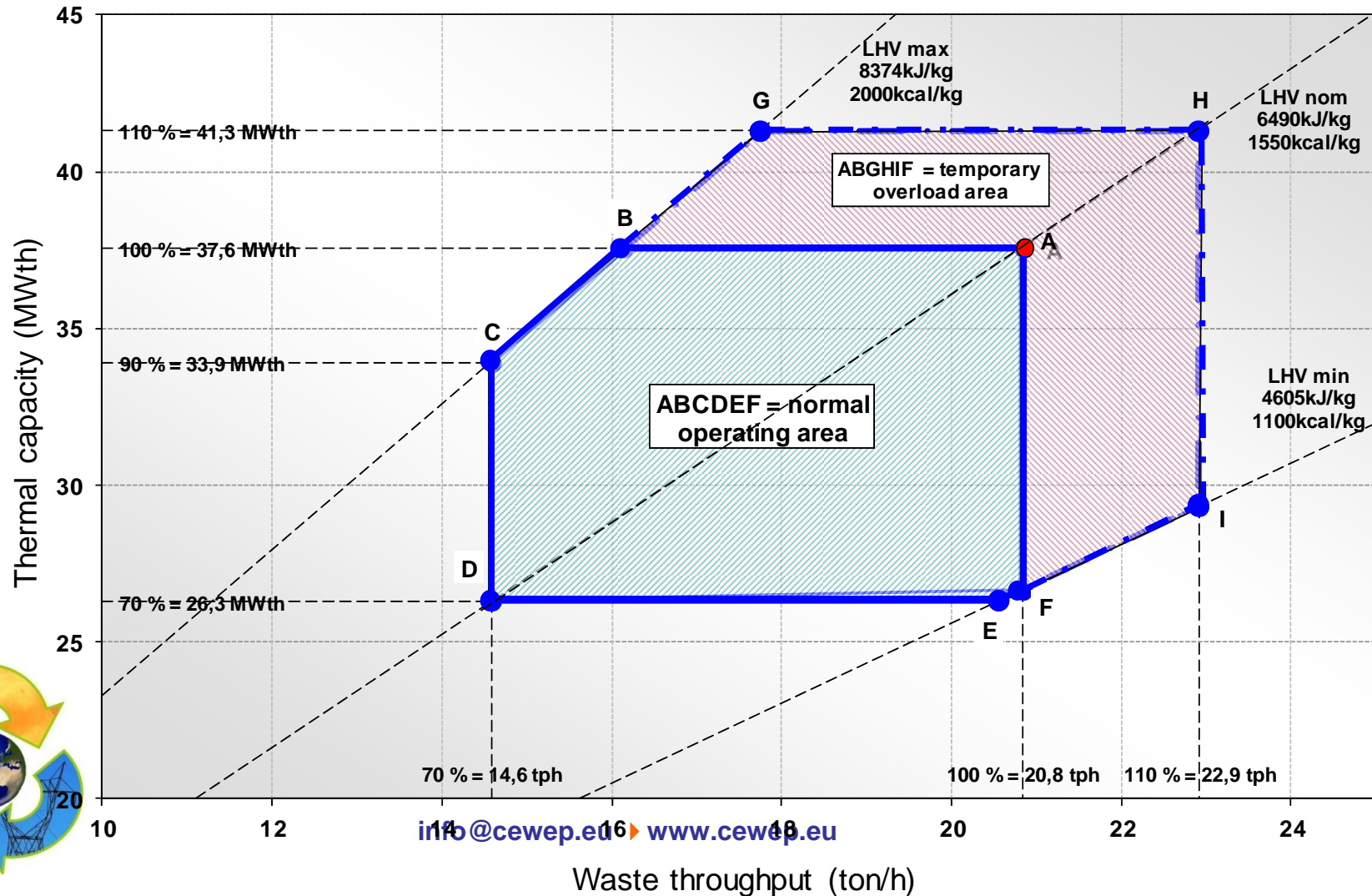


Typical Chinese Plant Layout

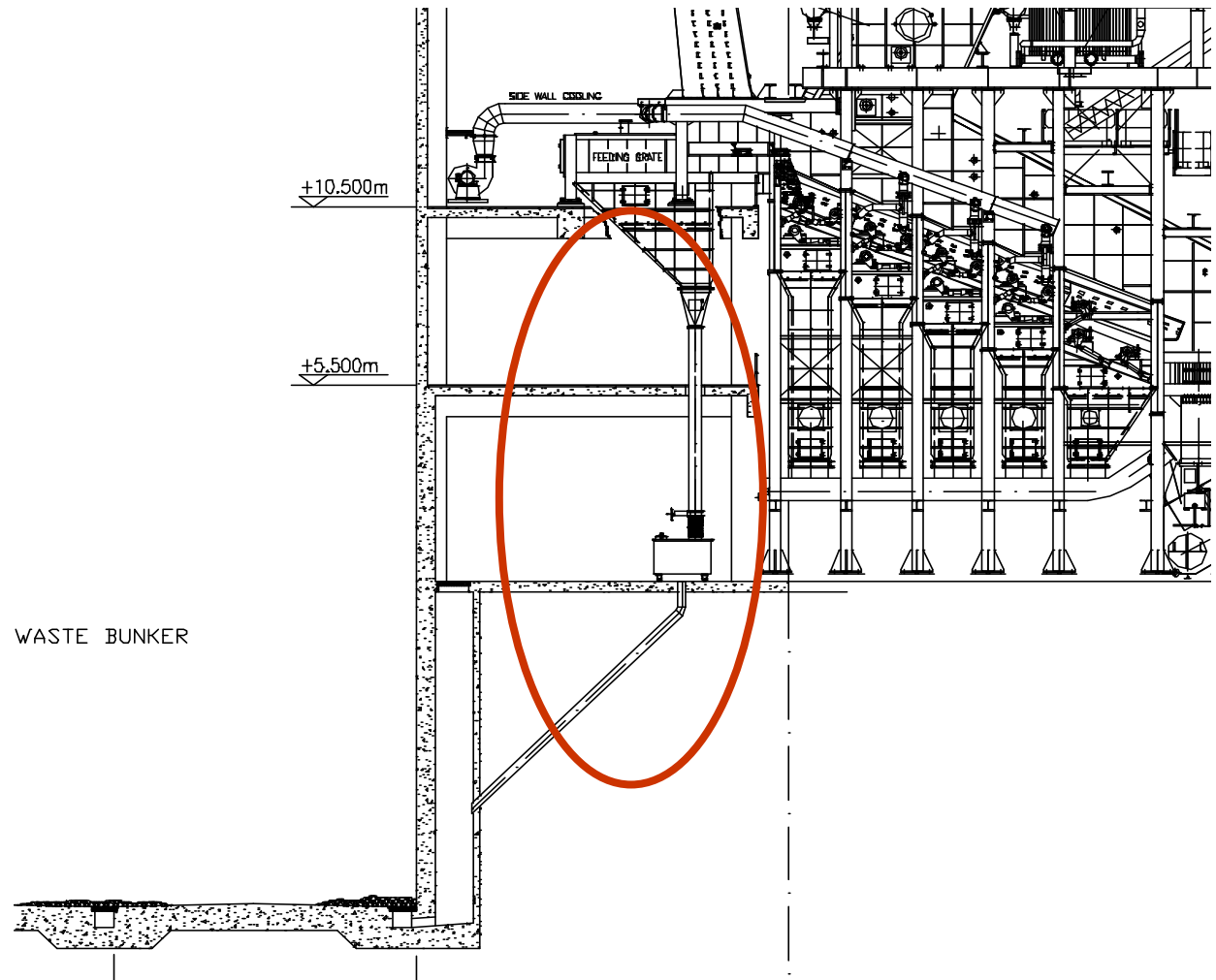


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Typical Combustion Diagram 500 TPD



Leachate Collection Under Furnace



Contractual emission standards



| | Suzhou II | Jinan | Bai Ge Hu | Binhai | Chengdu | Bao An II | EU 2000/76 EC | | | unit |
|--------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|----------------|---------------|---|
| | daily average | daily average | daily average | daily average | daily average | daily average | daily average | 30 min average | sample period | |
| Dust | 30 | 30 | 25 | 10 | 10 | 10 | 10 | 30 | | mg/Nm ³ , dry, 11%O ₂ |
| HCl | 50 (1) | 50 (1) | 50 | 10 | 10 | 10 | 10 | 60 | | mg/Nm ³ , dry, 11%O ₂ |
| HF | 2 (1) | 2 (1) | 1 | 1 | 1 | 1 | 1 | 4 | | mg/Nm ³ , dry, 11%O ₂ |
| Sox (as SO₂) | 260 (1) | 260 (1) | 180 | 50 | 50 | 50 | 50 | 200 | | mg/Nm ³ , dry, 11%O ₂ |
| Nox (as NO₂) | 400 (1) | 380 (1) | 200 | 200 | 200 | 200 | 200 | 400 | | mg/Nm ³ , dry, 11%O ₂ |
| CO | 100 | 100 | 80 | 50 | 50 | 50 | 50 | | | mg/Nm ³ , dry, 11%O ₂ |
| TOC | 20 | 20 | 20 | 10 | 10 | | 10 | 20 | | mg/Nm ³ , dry, 11%O ₂ |
| Hg | 0,1 | 0,1 | 0,1 | 0,05 (2) | 0,05 (2) | 0,05 (2) | | | 0,05 | mg/Nm ³ , dry, 11%O ₂ |
| Cd | 0,1 | 0,1 | 0,1 | 0,05 (2) (3) | 0,05 (2) (3) | 0,05 (2) (3) | | | 0,05 (3) | mg/Nm ³ , dry, 11%O ₂ |
| Pb | 1,6 | 1,6 | 1,6 | 0,5 (2) | 0,5 (2) | | | | 0,5 | mg/Nm ³ , dry, 11%O ₂ |
| As, Cr, Co, Cu,... | 6 | 6 | 6 | 0,5 (2) | 0,5 (2) | 0,5 (2) | | | | mg/Nm ³ , dry, 11%O ₂ |
| PCDD/F | 0,1 | 0,1 | 0,1 | 0,1 | 0,1 | 0,1 | | | 0,1 | ng/Nm ³ , dry, 11%O ₂ |
| Flue gas opacity | | 1 | 1 | 1 | 1 | 1 | | | | Ringelmann |

Notes

(1) : hourly average

(2) : average over sample period (30 min - 8h)

(3) : Cd + Tl



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Key Chinese players



Mainly state owned enterprises doing

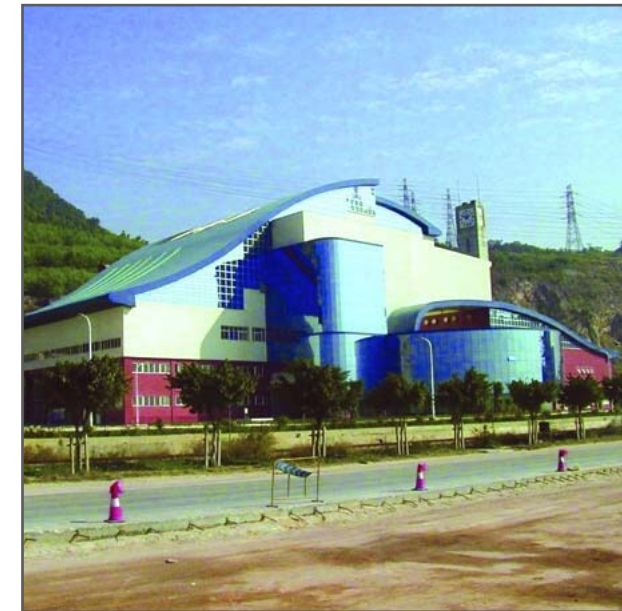
- Investment
- Organising the construction (project management)
- O&M
- (Technology Supply)



Shenzhen Energy China – NANSHAN/BAOAN



Client: Shenzhen Energy
Capacity: 2 x 400 tonnes/day + 3 x 400 tonnes/day
Start-up : 2004



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Shenzhen Energy China – Baoan II



Client: Shenzhen Energy
Capacity: 4 x 750 tonnes/day
Start-up: 2012



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China Everbright International

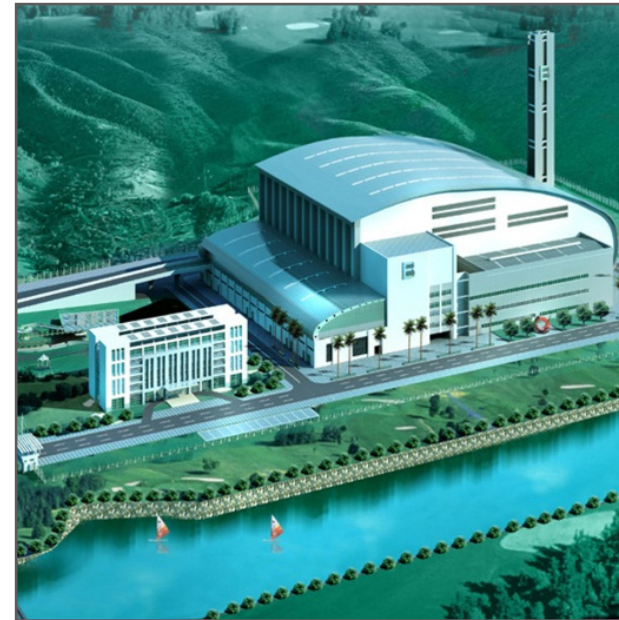


China – JIANGYIN/CHANGZHOU/SUZHOU

Client: China Everbright International

Capacity: several plants of 2 x 400 tonnes/day, 2 x 350 TPD

Start-up: Operational since 2008



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China Everbright International China – JINAN



Client: China Everbright International
Capacity: 4 x 500 tonnes/day
Start-up: Operational since 2011



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Cost Analysis



- Investment amount
 - 30.000 - 45.000 €/ton per day
- O&M cost
 - 6-23 €/ton



Gate fees



- Gate fees :
 - Typical cities : 6 – 15 €/ton
 - Some rich cities : 25 – 30 €/ton



Gate fees



- Tipping fees Jiangnan/Jiangbei tenders :

| | | Average | EBI | SEEE | CECIC | ENFI | SEC | Jiangsu Saite |
|-------------|---------|---------|------|------|-------|------|-----|---------------|
| Jiangnan | RMB/ton | 77,4 | 69 | 80 | 62 | 89 | 87 | |
| Jiangbei | RMB/ton | 80,2 | 85,8 | 93 | 66 | | 76 | 80,2 |
| Electricity | RMB/kWh | | | | 0,646 | | | |



Electricity Revenue



- Gross electricity generation ranges from 280 to 330 kWh/ton waste.
- Electricity tariffs are high (8,3 € cent/kWh) but limited to 280 kWh/ton waste
- Lower IPP tariff applies > 280 kWh/ton waste



Revenue Analysis



- Electricity income is 70-85% of the revenue.
- Tipping fee is 15-30% of the revenue
- Income is 1/3 of a similar European plant



Tendencies in the Chinese market



- Short delivery times
 - Construction period : 18-24 months
 - Grate delivery time : 4-8 months
- More public protest (NIMBY)



CECIC



China – BAI GE HU (Shenzhen)

Client: CECIC

Capacity: 3 x 400 tonnes/day

Start-up: On hold for several years



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Tendencies in the Chinese market



- More localisation & local competition
- Chinese technology suppliers becoming active overseas
- Chinese project developers show interest to go abroad



Tendencies in Chinese market



- IP protection has become a concern



IP protection in CHINA



- The tiles even show the KEPPEL SEGHERS TILE MODEL NUMBER !



The Hong Kong market



- HK generates 18,000t MSW daily, 13,300t (74%) are landfilled, the rest recycled.
- 3 operational landfills scheduled to close in the years to come.
- HK Govt plans 2 WTEs
- First WTE project in Hong Kong
 - Capacity first WTE plant : 2800 TPD
 - Offshore land reclamation +coastal protection works
 - Construction of marine berths





Keppel Seghers
Solutions for a Cleaner Future



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