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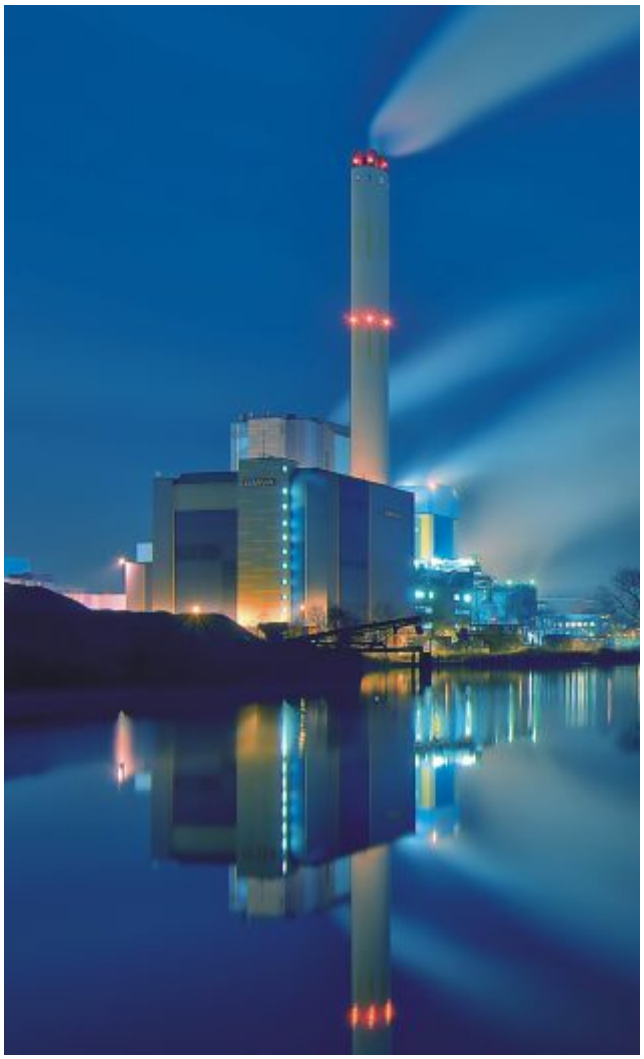

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Waste to Energy

The Worldwide Market for Waste Incineration Plants 2010 / 2011

Extract

Cologne / Oberhausen, April 2010

ecoprog / Fraunhofer UMSICHT

The world market for waste incineration plants

The market leaders present the world's largest survey and data collection of the growth market for thermal waste revocery – in the third edition already.

Waste incineration is still on the rise throughout the world, despite the economic crisis. Over the past ten years, the global capacities have almost doubled and increased from 180 to 350 million annual tons. One can expect a further growth up to 420 million annual tons in the coming five years. Worldwide, new plants are primarily constructed in metropolitan areas, due to the increasing shortage of land for landfill sites. The densely populated areas are not able to cope with the steadily growing amounts of waste anymore and focus on industrial waste incineration more and more.

ecoprog and Fraunhofer UMSICHT analysed the worldwide market for waste incineration plants in detail, on the basis of the previous study which was published in 2008. Once again, we involved sub-contractors and waste management industry insiders in the world's most important markets, such as Eastern Europe, North America, Japan, China and South Korea.

Based on in-depth surveys and our market knowledge, we offer an up-do-date analysis of numbers, facts, evaluations and trends of the international waste incineration operator and plant market. This study is of interest for disposal companies, suppliers, operators, associations, research institutes and consultants.

The study "The World Market for Waste Incineration Plants" 2010/2011 includes:

- A detailed presentation of pros and cons, technology and costs of waste incineration, including all the important political, economical, managerial and technical trends.
- A concrete description of the current and future market volumes by countries, up to and including 2014, based on a transparent and comprehensible methodology.
- A project list with new construction, extension and renewal projects, of which more than 160 are under construction, almost 40 have been approved and over 120 are being planned.
- A presentation of around 1,000 incineration plants worldwide, including essential technical data and contact addresses. This does also include the description of more than 2,400 incineration lines with information on capacities, manufacturers and commissionings.
- An analysis and description of the world's most important operators and plant manufacturers, including market shares.

The study is available in **German and English from 3,900,- euros plus VAT.**

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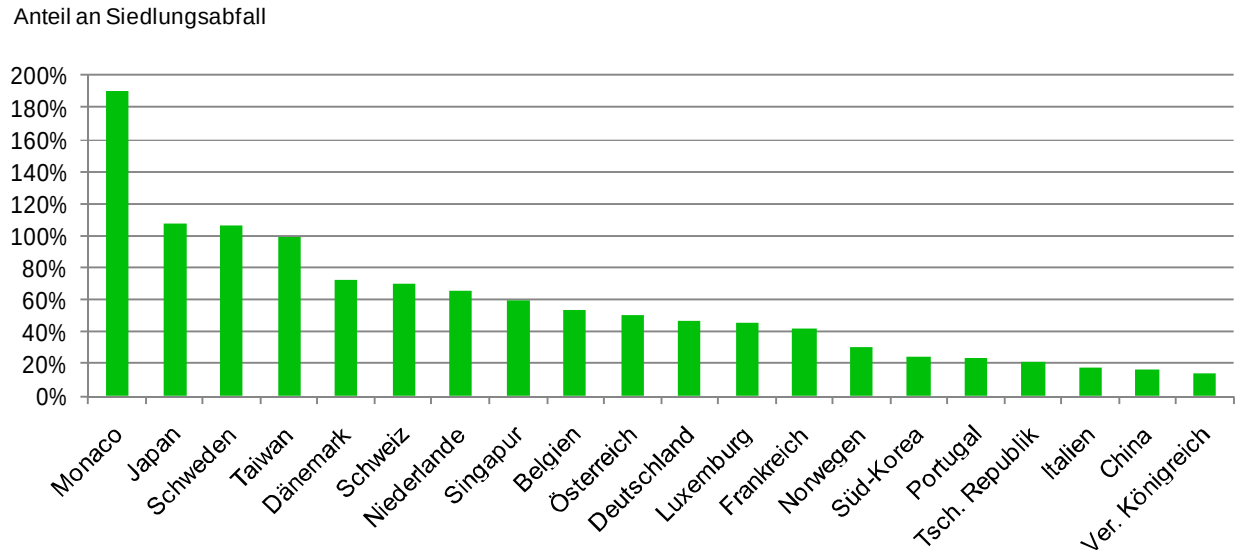
Due to their large populations, countries such as the USA or China have very large incineration capacities by international comparison – despite the fact that waste incineration has not played a major role so far in these countries. Once again, China's development is remarkable: in 2007, the total capacity amounted to about 16 million tons. In the meantime, the amount increased up to 24 million tons. With this increase, China did even overtake Germany, although the German capacities grew considerably as well – from 18 million tons in 2007 up to 21 million tons in 2010.

In terms of incineration capacities per head, the "typical" countries, where waste incineration has a strong tradition and where the technology was essentially developed, still prevail. These countries are Belgium, Denmark, Germany, France and the Netherlands in Central Europe as well as Japan which is an independent Asian market.

Figure 18: Incineration capacities as a proportion of municipal waste



Quelle: ecoprog

The incineration capacities are larger than the total amount of municipal waste in Monaco, Japan and Sweden. In Japan, this is determined by its historical development. Here, waste incineration had been widely used even before an environmentally motivated paradigm shift towards an enforced material recovery of waste took place. A further reason is the local disposal self-sufficiency which says that the waste should preferably be disposed at the location where it has emerged. This principal results in far too large capacities in many places – as a technical minimum size is the prerequisite for a more or less functioning and independent incineration process.

A part of the Japanese incineration capacity will be shut down in the future as the recovery quota will continue to increase.

A general reason for the case that the capacities are larger than the volume of municipal waste are the additional amounts of commercial waste that are also incinerated. Sweden and Monaco additionally incinerate waste from neighbouring countries.

Finland

Population (million people)	5.3	Number of waste incineration plants	3
Municipal waste (1,000 t)	2,675	Incineration capacity (1,000 t/a)	304
Incineration rate (%)	11.6	Average age of incineration units (a)	8

In terms of waste incineration, Finland still has a lot of catching up to do. In 2007, the year with the latest statistics, about 53 per cent of the municipal waste was sent to landfill without prior treatment. Today, one can assume a slight decrease in the share of landfilling, however, no official statistics are available. The commissioning of the waste incineration plant in Kotka in 2008 has increased the waste incineration capacities in Finland up to 300,000 annual tons, which is about eleven per cent of the total amount of municipal waste.

Figure 50: Prognosis investment volume Finland

Million euros	2010	2011	2012	2013	2014	Sum
New construction/extension	0	0	65	75	160	300
Renewal/replacement	0	0	0	0	0	0
Maintenance	4	4	4	5	7	24

Additionally, efforts to increase material recovery were enhanced. However, the aim to reduce the amount of biodegradable municipal waste by 50 per cent in 2009 in comparison to the amount of 1995 was not achieved. Consequently, there is still need for action. The national strategy for the achievement of the Landfill Directive for the period 2006-2016 states the necessity to install a further 600,000 annual tons of treatment capacity by 2009 and 900,000 tons per year by 2016.

Currently, a waste incineration plant is under construction in Mustasaari. The plant is supposed to go on line in 2013 and its capacity shall amount to 150,000 annual tons. Building licences have been granted for two further projects that are supposed to be commissioned in 2012 and 2014.

Furthermore, there are various other projects that have not obtained approvals yet. Some of them have been discussed for years already. Recently, the project in Hämeenkyrö was questioned,

Figure 51: Project outlook Finland

Plant	Type of investment	Capacity (t/a)	Start	Status
Mustasaari	New construction	150,000	2013	under construction
Oulu	New construction	130,000	2012	approved
Vantaa	New construction	320,000	2014	approved
Hämeenkyrö	New construction	200,000	n/a	planned
Jyväskylä RDF	New construction	55,000	n/a	planned
Lapinlahti RDF	New construction	17,000	n/a	planned
Lohja	New construction	445,000	n/a	planned
Pori RDF	New construction	150,000	n/a	planned
Riihimäki II	New construction	160,000	n/a	planned

Canada

Population (million people)	33.6	Number of waste incineration plants	8
Municipal waste (1,000 t)	13,375	Incineration capacity (1,000 t/a)	817
Incineration rate (%)	n/a	Average age of incineration units (a)	24.8

Over the past years, waste incineration has been discussed more intensely in Canada. The last waste incineration plant went on line more than 20 years ago – now, there are concrete projects for constructing new plants. However, these advance only slowly. Only one project has been officially approved yet.

Plasco Energy is supposed to build a plant in the province of Alberta where municipal waste shall be treated with plasma gasification technology. Originally, the construction should have started in summer 2009 already, however, it has not started yet due to remaining financing issues.

Figure 1: Prognosis investment volume Canada

Million euros	2010	2011	2012	2013	2014	Sum
New construction/extension	0	32	0	100	100	232
Renewal/replacement	3	3	3	23	20	52
Maintenance	10	10	11	11	14	56

Plans for the construction of a waste incineration plant in Clarington are well advanced. The plant with a capacity of 200,000 annual tons is supposed to incinerate the waste from York and Durham counties. However, a building licence has not been granted yet. An environmental impact assessment is currently under progress. In the case of approval, US-american company Covanta Energy Corp. shall construct and operate the plant.

A further plant is being discussed in Metro Vancouver. The pressing reason for the construction plans is the fact that the Cache Creek landfill will reach its maximum capacity in 2010. In order to solve the problem of disposal, a plant with a capacity of 700,000 annual tons shall be built. However, there was a setback lately, as a 42 hectare extension of the landfill was approved in January 2010. As a result, it will be possible to operate the landfill for another 20 years. Consequently, no urgent disposal problems can be expected and it is questionable whether the plant will be built under these circumstances.

Figure 2: Project outlook Canada

Plant	Type of investment	Capacity (t/a)	Start	Status
Alberta	New construction	64,000	2010	approved
Clarington	New construction	200,000	2013	planned
Dufferin County	New construction	24,000	2012	planned
Edmonton	New construction	n/a	n/a	discussed
Gold River RDF	New construction	n/a	n/a	discussed
Norfolk County	New construction	n/a	n/a	discussed

Changshu

DYNAGREEN Holding Group Co Ltd.(Changzhou)
Wujin District Niutang Town Qingyun Villiage
- Changzhou

Status: active
Capacity (t/a): 219,000
Real throughput (t/a): 163,800
Electric power production (MWh/a): 28,120

Remarks: Operation Mode: BOO (30years), Investment sum 265 million Yuan, electricity price 0.5 Yuan per kWh

Line 1
Start of operation: 2006
Capacity (t/h): 13.75
Incineration mode: Feeder grate
Flue gas cleaning: Dry Scrubbing / Fabric Filter / Active Carbon
Manufacturer furnance: Keppel Seghers

Line 2
Start of operation: 2006
Capacity (t/h): 13.75
Incineration mode: Feeder grate
Flue gas cleaning: Dry Scrubbing / Fabric Filter / Active Carbon
Manufacturer furnance: Keppel Seghers

Changzhou 1

China EVERBRIGHT INTERNATIONAL Ltd.
Changzhou

Status: active
Capacity (t/a): 365,000

Remarks: Investor is Golen State Group. BOT. The plant receives a government subsidy of 97 Yuan per tonne and receives 0.5 Yuan per kWh.

Line 1
Capacity (t/h): 16.70
Manufacturer furnance: Keppel Seghers

Line 2
Capacity (t/h): 16.70
Manufacturer furnance: Keppel Seghers

Changzhou 2

Changzhou 2
Changzhou Xinbei

Status: planned

Remarks: Swedish EcoEnergy Scandinavia AB has signed a memorandum of understanding with Chinese Changzhou Xinbei Government and Jiangsu Guoyu Electric Co to build a waste-to-energy plant in the Changzhou Xinbei district. As a next step, EcoEnergy will conduct an on-site feasibility study for the project.

Chengdu 1

Chengdu Luodai
Chengdu Luodai

Status: active
Capacity (t/a): 440,000
Electric power production (MWh/a): 130,000

Remarks: Investor is Shanghai Environment Investions. Plant will be equipped by Martin / Mitsubishi. BOT. Investment sum 525 million RMB. The plant receives a government subsidy of 71 Yuan per tonne.

Chengdu 2

Status: planned
Capacity (t/a): 576,000

Remarks: in the process of environmental appraisal,planned to build at the end of 2009

Line 1 (planned)
Start of operation: 2011
Capacity (t/h): 25.00
Manufacturer furnance: Chongqing Lueng Environment Industry Co. Ltd.

Line 2 (planned)
Start of operation: 2011
Capacity (t/h): 25.00
Manufacturer furnance: Chongqing Lueng Environment Industry Co. Ltd

Line 3 (planned)
Start of operation: 2011
Capacity (t/h): 25.00
Manufacturer furnance: Chongqing Lueng Environment Industry Co. Ltd

Chengdu 3

Chongqing Sanfeng Kawanta Environmental industry Ltd.
Chengdu Shuangliu

Status: under construction
Capacity (t/a): 657,000
Electric power production (MWh/a): 110,000

Remarks: Covanta Energy Group Inc and Chongqing Iron&Steel Group have formed a joint venture which

Allerton Quarry

Allerton Quarry

Status: discussed

Remarks: Allerton Quarry is one of three possible sites for a waste treatment facility for municipal waste (the others are in Dalton Airfield, near Thirsk and Burn Wood, near Selby).The site chosen will be announced by North Yorkshire County Council in summer 2009 after tenders have been received. Planning applications will then be submitted, and approval could be gained by as early as December of 2009.

Barry Docks

Barry Docks

Status: planned
Capacity (t/a): 80,000

Remarks: BioGen Power has applied for permission to build a new gasification waste-to-energy plant for non-hazardous waste in Barry Docks

Billingham

SITA UK
Mr. John Thistlewood
Energy from Waste Plant, Haverton Hill Road
TS23 1PY Billingham
Tel.: +44 1642 202300
Fax: +44 1642 202301

Status: active
Capacity (t/a): 390,000
Electric power production (MWh/a): 30

Remarks: Sita UK announced that a major extension at the Haverton Hill energy from waste facility in Tees Valley has been handed over by contractors A&E, to the company and has officially been opened by Sita UK. The GBP 70 million plant was completed to budget and on time, according to the company. The extension was built on behalf of Northumberland County Council to provide an additional 136,000 tons capacity bringing the total plant capacity to nearly 390,000 tons per year. The plant extension is expected to yield around 10 MW of electricity giving in total over 30 MW of power from the whole facility.

Line 1
Start of operation: 2009
Capacity (t/h): 19.00
Manufacturer furnance: Von Roll

Line 2
Start of operation: 1997
Capacity (t/h): 14.00
Incineration mode: VS-Grate, air-cooled
Flue gas cleaning: Semi Dry Scrubbing / Fabric Filter
Manufacturer furnance: Ansaldo Vølund
Manufacturer flue gas cleaning: FLS Milijo
Remarks: Planned to shut down in 2020.

Line 3
Start of operation: 1997
Capacity (t/h): 14.00
Incineration mode: VS-Grate, air-cooled
Flue gas cleaning: Semi Dry Scrubbing / Fabric Filter
Manufacturer furnance: Ansaldo Vølund
Manufacturer flue gas cleaning: FLS Milijo
Remarks: Planned to shut down in 2020.

Billingham 2

Billingham 2

Status: approved
Capacity (t/a): 256,000
Electric power production (MWh/a): 161,280

Remarks: SITA UK is moving forward with its plans to build a second energy from waste facility adjacent to its Tees Valley EfW at a cost in the region of GBP 120 million by winning planning approval for the plant.

Line 1 (approved)
Start of operation: 2012
Capacity (t/h): 16.70
Incineration mode: Moving grate

Line 2 (approved)
Start of operation: 2012
Capacity (t/h): 16.70
Incineration mode: Moving grate

Binn Farm

Binn Farm

Status: approved
Capacity (t/a): 60,000

Remarks: Sita UK has applied to the Scottish Environment Protection Agency to operate the plant. Planning permission has already been granted by Perth and Kinross Council in 2007. The firm is now applying for a pollution prevention and control permit before it can begin processing solid waste into electricity. A decision about the GBP 100 million incinerator in Perth is due to be made in November 2010. Currently, the company also considers methods such as gasification and anaerobic digestion to convert the waste into energy.

Birmingham

Veolia E. S. Birmingham Ltd.

Register of plants

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