Hitachi Zosen INOVA

NEWENERGY

TRIBE

Aurora environmental
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APPENDIX

5

SELECTION OF REFERENCE PROJECTS

APPENDIX 5: Selection of Reference Projects

Hitachi Zosen
INOVA

Energy from Waste Reference Projects

EfW Plants larger than 25 t/h

in chronological order

Hitachi Zosen INOVA

GB, Buckinghamshire

Start of operation	2015	
Combustion	Concept	Air-cooled Grate
	Fuel	Municipal Solid Waste, Industrial Waste
	Number of Lines	1
	Throughput per line	39.40 t/h
	Thermal power per line	101.7 MW
Boiler	Concept	5-pass boiler
	Steam	127 t/h at 52 bar(a) and 402 °C
Flue gas treatment	Concept	SNCR, Fabric Filter, Semi-dry System
	Reactant	Activated Carbon, Calcium Hydroxide
	Throughput per line	180'714 m³/h (STP)
Energy recovery	Concept	Condensation Turbine
	Electric power output	26.50 MW (gross)
	Output	Electrical Power

GB, Ferrybridge

Start of operation	2015	
Combustion	Concept	Water-cooled Grate
	Fuel	Municipal Solid Waste, Biomass, Refuse Derived Fuel, Wood
	Number of Lines	2
	Throughput per line	42.25 t/h
	Thermal power per line	117.4 MW
Boiler	Concept	5-pass boiler
	Steam	104 t/h at 72 bar(a) and 427 °C
Flue gas treatment	Concept	SNCR, Fabric Filter, Heat Exchanger, Semi-dry System
	Reactant	Activated Carbon, Calcium Hydroxide
	Throughput per line	208'000 m³/h (STP)
Energy recovery	Concept	Condensation Turbine
	Electric power output	75.00 MW (gross)
	Output	Steam, Electrical Power

GB, Riverside, London

Start of operation	2011	
Combustion	Concept	Air-cooled Grate
	Fuel	Municipal Solid Waste, Industrial Waste
	Number of Lines	3
	Throughput per line	32.44 t/h
	Thermal power per line	81.10 MW
Boiler	Concept	4-pass boiler
	Steam	99 t/h at 72 bar(a) and 427 °C
Flue gas treatment	Concept	SNCR, Semi-dry System, Fabric Filter
	Throughput per line	169'800 m³/h (STP)
Energy recovery	Concept	Condensation Turbine
	Electric power output	73.00 MW (gross)
	Output	Electrical Power

Hitachi Zosen INOVA

ES, Mallorca

Start of operation	2009	
Combustion	Concept	Water-cooled Grate
	Fuel	Municipal Solid Waste, Sewage Sludge
	Number of Lines	2
	Throughput per line	27.00 t/h
	Thermal power per line	70.00 MW
Boiler	Concept	3-pass boiler
	Steam	82 t/h at 52 bar(a) and 400 °C
Flue gas treatment	Concept	Semi-dry System, Fabric Filter, Heat Exchanger, Heat exchanger 2, SCR, Heat exchanger
	Throughput per line	142'000 m³/h (STP)
Energy recovery	Output	Electrical Power

DE, Witzenhausen

Start of operation	2008	
Combustion	Concept	Fluidized Bed
	Fuel	Refuse Derived Fuel, Pulp Sludge
	Number of Lines	1
	Throughput per line	34.92 t/h
	Thermal power per line	125.3 MW
Flue gas treatment	Concept	SNCR, Semi-dry System, Fabric Filter
	Throughput per line	207'100 m³/h (STP)
Energy recovery	Output	Steam, Electrical Power

NL, Moerdijk L4

Start of operation	2008	
Combustion	Concept	Water-cooled Grate
	Fuel	Municipal Solid Waste
	Number of Lines	1
	Throughput per line	38.33 t/h
	Thermal power per line	95.80 MW
Boiler	Concept	2-pass boiler
	Steam	121 t/h at 107 bar(a) and 400 °C
Flue gas treatment	Concept	SNCR, Fabric Filter, Ext. Eco, Scrubber
	Scrubber Reactant	Lye
	Throughput per line	199'200 m³/h (STP)
Energy recovery	Concept	Back-pressure Turbine
	Electric power output	13.47 MW (gross)
	Output	Steam, Electrical Power

FR, Issy-les-Moulineaux

Start of operation	2007	
Combustion	Concept	Water-cooled Grate
	Fuel	Municipal Solid Waste
	Number of Lines	2
	Throughput per line	34.90 t/h
	Thermal power per line	85.23 MW
Boiler	Concept	4-pass boiler
	Steam	104 t/h at 50 bar(a) and 400 °C
Flue gas treatment	Concept	Entrainment reactor, Fabric Filter, SCR
	Reactant	Sodium Bicarbonate, Lignite Coke
	Throughput per line	151'000 m³/h (STP)
Energy recovery	Output	Electrical Power, Hot Water

Hitachi Zosen INOVA

SE, Uppsala (Block 5)

Start of operation	2005	
Combustion	Concept	Water-cooled Grate
	Fuel	Municipal Solid Waste
	Number of Lines	1
	Throughput per line	26.40 t/h
	Thermal power per line	73.33 MW
Boiler	Concept	4-pass boiler
	Steam	100 t/h at 20 bar(a) and 212 °C
Flue gas treatment	Concept	Electrostatic Precipitator (2 Fields), Scrubber, Fabric Filter, SCR
	Scrubber Reactant	Lye
	Throughput per line	148'900 m³/h (STP)
Energy recovery	Output	Steam, Hot Water

NL, Alkmaar L4

Start of operation	2004	
Combustion	Concept	Water-cooled Grate
	Fuel	Municipal Solid Waste
	Number of Lines	1
	Throughput per line	27.50 t/h
	Thermal power per line	75.00 MW
Boiler	Concept	4-pass boiler with external economizer
	Steam	89 t/h at 42 bar(a) and 405 °C
Flue gas treatment	Concept	Electrostatic Precipitator (2 Fields), Electrostatic Precipitator (3 Fields), SCR, Scrubber
	Scrubber Reactant	Caustic Soda
	Reactant	Activated Carbon
	Throughput per line	155'900 m³/h (STP)
Energy recovery	Output	Electrical Power

NL, Moerdijk L1 - L3

Start of operation	1996	
Combustion	Concept	Air-cooled Grate
	Fuel	Municipal Solid Waste
	Number of Lines	3
	Throughput per line	26.50 t/h
	Thermal power per line	81.00 MW
Boiler	Concept	2-pass boiler
	Steam	99 t/h at 100 bar(a) and 0 °C
Flue gas treatment	Concept	SNCR, Scrubber, NH4OH-Stripper
	Scrubber Reactant	Lye
	Throughput per line	134'000 m³/h (STP)
Energy recovery	Output	Steam, Electrical Power

US, Falls Township, PA

Start of operation	1994	
Combustion	Concept	Air-cooled Grate
	Fuel	Municipal Solid Waste
	Number of Lines	2
	Throughput per line	28.35 t/h
	Thermal power per line	84.50 MW
Boiler	Concept	3-pass boiler
	Steam	94 t/h at 90 bar(a) and 0 °C
Energy recovery	Output	Electrical Power

Hitachi Zosen INOVA

US, Broward South, FL

Start of operation	1991	
Combustion	Concept	Air-cooled Grate
	Fuel	Municipal Solid Waste
	Number of Lines	3
	Throughput per line	28.35 t/h
	Thermal power per line	84.50 MW
Boiler	Concept	3-pass boiler
	Steam	87 t/h at 59 bar(a) and 0 °C
Energy recovery	Output	Electrical Power

US, Bridgeport, CT

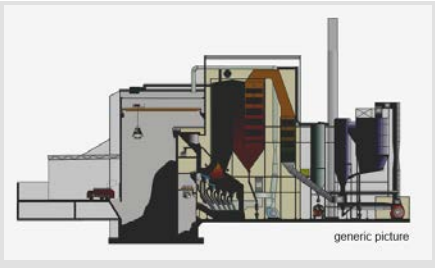
Start of operation	1988	
Combustion	Concept	Air-cooled Grate
	Fuel	Municipal Solid Waste
	Number of Lines	3
	Throughput per line	28.35 t/h
	Thermal power per line	85.00 MW
Boiler	Concept	3-pass boiler
	Steam	87 t/h at 59 bar(a) and 0 °C
Energy recovery	Output	Electrical Power

US, Millbury, MA

Start of operation	1987	
Combustion	Concept	Air-cooled Grate
	Fuel	Municipal Solid Waste
	Number of Lines	2
	Throughput per line	28.30 t/h
	Thermal power per line	85.00 MW
Boiler	Concept	3-pass boiler
	Steam	87 t/h at 59 bar(a) and 0 °C
Energy recovery	Output	Electrical Power

US, Baltimore, MD

Start of operation	1985	
Combustion	Concept	Air-cooled Grate
	Fuel	Municipal Solid Waste
	Number of Lines	3
	Throughput per line	28.30 t/h
	Thermal power per line	85.00 MW
Boiler	Concept	2-pass boiler
	Steam	77 t/h at 59 bar(a) and 0 °C
Energy recovery	Output	Electrical Power



SE, Linköping HKW

Start of operation	1985	
Combustion	Concept	Air-cooled Grate
	Fuel	Wood
	Number of Lines	1
	Throughput per line	29.58 t/h
Energy recovery	Output	Hot Water, Electrical Power

Hitachi Zosen INOVA

US, Westchester Country, NY

Start of operation	1984	
Combustion	Concept	Air-cooled Grate
	Fuel	Municipal Solid Waste
	Number of Lines	3
	Throughput per line	28.30 t/h
	Thermal power per line	71.60 MW
Boiler	Concept	3-pass boiler
	Steam	77 t/h at 59 bar(a) and 0 °C
Energy recovery	Output	Electrical Power

US, Saugus Boston, MA

Start of operation	1975	
Combustion	Concept	Air-cooled Grate
	Fuel	Municipal Solid Waste
	Number of Lines	2
	Throughput per line	28.30 t/h
	Thermal power per line	85.00 MW
Boiler	Concept	3-pass boiler
	Steam	84 t/h at 45 bar(a) and 0 °C
Energy recovery	Output	Electrical Power

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Hitachi Zosen Corporation

運転・維持管理実績証明書
Certificate for the reference of long-term operation and maintenance

1.	施設名： Project Name:	藤ヶ谷清掃センター Fujigatani Waste Incineration Plant
2.	施設所在地： Location:	大分県別府市大字平道字藤ヶ谷次の 333-3 333-3, Aza Fujigatani, Oaza Hiramichi, Beppu City, Oita, Japan
3.	運営事業者： Client:	別杵速見環境テクノロジー株式会社 Bekki-Hayami Environmental Technology Corp.
4.	最終需要者： Ultimate Client:	別杵速見地域広域市町村圏事務組合 Bekki-Hayami Joint Waste Management Association
5.	処理能力： Waste Throughput:	235t/日（2 炉構成、117.5t/日・炉） 235 tons per day (2 lines, 117.5 tons per day)
6.	発電能力： Power Output:	4 MW 4 MW electricity generation
7.	炉 形 式： Furnace Type:	全連続燃焼式火格子焼却炉 Full-time continuous combustion grate furnace
8.	契約・運営期間： Contract Form & Operation period:	1) 2014 年 6 月 15 日～2029 年 6 月 14 日（15 年間）の運営・維持管理業務 2) 新施設の整備 3) 既存施設の解体・撤去・場内整備工事 1) Operation and maintenance from June 15th, 2014 to June 14th, 2029 (15 years) 2) Construction of the new facility 3) Dismantling, removal, and improvement of the existing facility
9.	請負事業者： Contractor:	日立造船株式会社 Hitachi Zosen Corporation
10.	運転状況： Operating Status:	運営開始日より稼働中 Normal operation since the commercial operation starting date

We certify the details described above.

平成 28 年 10 月 12 日(October 12th, 2016)
(証明者/Certifier)
〒879-0919　大分県別府市石垣東 1 丁目 7 番 38-307 号
別杵速見環境テクノロジー株式会社
社長　増水　豊

1-7-38-307, Ishigakihigashi, Beppu, Oita 879-0919, Japan
Bekkihayami Environment Technology Co.Ltd.
Yutaka Masumizu, President

日立造船株式会社　御中

To: Hitachi Zosen Corporation

運転実績証明書

Operation Certificate

1.	施設名称： Plant name:	磐田市クリーンセンター Iwata City Disposal Center
2.	発注者： Ordering Party:	磐田市 Iwata City
3.	施設所在地： Location:	磐田市刑部島 301 番地 301, Gyobujima, Iwata-shi, Shizuoka, Japan
4.	処理能力： Waste Throughput:	１１２ｔ／日×２基（２２４ｔ／日） 112 tons per day x 2 lines (224 tons per day)
5.	炉形式： Furnace Type:	全連続燃焼式火格子焼却炉 Full-time continuous combustion grate furnace
6.	竣工： Start of Operation:	２０１１年 2011
7.	受注者： Contractor:	日立造船株式会社 Hitachi Zosen Corporation
8.	運転状況： Operating Condition:	日立造船株式会社によって２０１１年より正常運転中 Normal Operation since 2011 by Hitachi Zosen Corporation

上記のとおり相違ないことを、証明します。

We certify the details described above are true and correct.

２０１６年/Year １０月/Month １７日/Day

(証明者/Certifier)

磐田市　環境水道部　ごみ対策課

課長 伊藤　元彦

日立造船株式会社
Hitachi Zosen Corporation

運転維持管理実績証明書

Certificate for the reference of long-term operation and maintenance

1. 施　設　名：　松山市西クリーンセンター
   Project Name：　Matsuyama City West Clean Center

2. 施設所在地：　松山市大可賀三丁目５２５番地６
   Location：　3-525-6, Okaga, Matsuyama-shi, Ehime, Japan

3. 運営事業者：　松山環境テクノロジー株式会社
   Client：　Matsuyama Environment Technology Co. Ltd.

4. 最終需要者：　松山市
   Ultimate Client：　Matsuyama City

5. 処理能力：　420t/日（3炉構成、140t/日・炉）
   Waste Throughput：　420 tons per day (3 lines, 140 tons per day)

6. 発電能力：　6.6 MW
   Power Output：　6.6 MW electricity generation

7. 炉　形　式：　全連続燃焼式火格子焼却炉
   Furnace Type：　Full-time continuous combustion grate furnace

8. 運営期間：　2013年4月～2033年3月
   Operation & maintenance period：　April, 2013 - March, 2033

9. 請負事業者：　日立造船株式会社
   Contractor：　Hitachi Zosen Corporation

10. 契約発行日：　2009年7月
    Notice to Proceed：　July, 2009

11. 運転状況：　運営開始日より稼働中
    Operating Status：　Normal operation since the commercial operation starting date

We certify the details described above.

平成28年10月19日（19, October, 2016）
(証明者/Certifier)
松山市大可賀三丁目５２５番地６
松山環境テクノロジー株式会社
取締役社長　　奥田　修

3-525-6, Okaga, Matsuyama-shi, Ehime, Japan
Matsuyama Environment Technology Co. Ltd.
Osamu Okuda, Managing Director

日立造船株式会社御中
Hitachi Zosen Corporation

運転・維持管理業務実績証明書

Certificate for the reference of operation and maintenance work

1．施設名称：	福岡市環境局施設部 臨海工場
Plant Name:	Fukuoka Rinkai Incineration Plant
2．発 注 者：	福岡市
Plant Owner:	Fukuoka City
3．施設所在地：	福岡市東区箱崎ふ頭四丁目１３番４２号
Location:	4-13-42 Hakozaki-Futoh, Higashi-ku, Fukuoka-shi, Japan
4．処理能力：	９００ｔ／日（３００ｔ／日×３基）
Capacity:	900 tons per day (3 lines)
5．炉 形 式：	全連続燃焼式火格子焼却炉
Furnace Type:	Full-time continuous combustion grate furnace
6．竣 工 日：	平成１３年（２００１年）３月
Completion:	March 2001
7．運転・維持管理状況：	日立造船㈱並びにニチゾウ九州サービス㈱（日立造船グループ会社）によって平成１３年度より正常運転・維持管理中
Operating and Maintenance Condition :	Normal Operation and Maintenance since 1 April 2001 by Hitachi Zosen Corporation and Nichizo Kyushu Service Corporation (Hitachi Zosen Group Company)

上記のとおり相違がないことを証明します。

We certify the details described above are true and correct.

平成 28 年(2016 年/Year)　月/Month　日/Day

平成28年(2016年)10月25日　(証明者/Certifier) 北島 保彦

London, 4th April 2016

Riverside Resource Recovery Ltd.
2 Coldbath Square
London
EC1R 5HL

Certificate

We hereby certify that the company Hitachi Zosen Inova, with its registered office at Hardturmstrasse 127, 8005 Zurich, Switzerland, has designed and built in our favor a thermal waste treatment plant using the grate technology, under the name of Riverside Resource Recovery Facility, located in London, UK, at Norman Road. The waste treatment plant converts municipal solid waste to electric energy (470'000 MWh/year) for export to the national electric grid with a design capacity of 670'000 Mg of waste per year. The contract included the design and turn-key execution of works covering the construction of, among other elements, a grate, a boiler, a flue gas cleaning system and a steam turbine. Also included in the scope of this contract was Hitachi Zosen Inova's active participation in the Operation & Maintenance of the plant during mobilisation and subsequent operating period for a total of 4 years.

The construction of this installation was completed by October 2011.
The O&M Mobilisation Services were provided from January 2010 until October 2011.
The O&M Services were provided from October 2011 until October 2014.

This municipal waste incineration plant meets the requirements of the Directive 2000/76/EC of the European Parliament and of the Council of 4 December 2000 on the incineration of waste with respect to the permissible emissions of flue gases from waste incineration.

The above mentioned municipal thermal waste treatment plant has been designed and built in a proper manner, in accordance with the rules of the trade, and properly completed.

For and on behalf of Riverside Resource Recovery

Andrew Pike
Director

日立造船株式会社

To: Hitachi Zosen Corporation

実 績 証 明 書
Certificate

1.	施設名称： Plant Name:	墨田清掃工場 Sumida Incineration Plant
2.	発 注 者： Plant Owner:	東京二十三区清掃一部事務組合 Clean Authority of Tokyo
3.	施設所在地： Location:	東京都墨田区東墨田１-１０-２３ Higashi-Sumida 1-10-23, Sumida-ku Tokyo
4.	処理能力： Capacity:	６００ｔ／日×１基 600 tons per day (1 line)
5.	処理形式： Furnace Type:	全連続燃焼式火格子焼却炉 Full-time continuous combustion grate furnace
8.	竣　　工： Completion:	１９９８年 1998
9.	運転・維持管理状況： Operation and Maintenance Condition	日立造船によって 2008 年より正常運転・維持管理中 : Normal Operation and Maintenance since 2008 by Hitachi Zosen Corporation

上記のとおり相違がないことを証明します。

We hereby certify that details described above are true and correct.

２０１６年/year 10 月/Month 25 日/Day

(証明者/Certifier)

施設管理部長

Manager, Facilities Management Department

井上 隆

Takashi Inoue