

# MEMO

Job **TNG Energy from Waste Facility, Eastern Creek,  
References Facilities**  
Date **2016-10-26**  
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## Background

TNG has been requested to provide further information on the capacity of the technology to process/handle the proposed volume (approx. 50%) of C&D waste. Ramboll has been asked to identify such plants and supply information on the operational experience of such plants.

## Results

We acknowledge that it has not been possible to identify an EfW plant (neither with comparable nor with alternative technology) processing a documented input of 50% C&D waste. The main reason is the fact, that any EfW plant treating primarily pre-processed waste (as this is the case for TNG) receives these pre-processed waste streams from different sorting/pre-processing plants. Once waste has been pre-processed it "looses" its waste declaration/identification and cannot be tracked back to its origin. Therefore it is not possible neither to declare the initial origin of the waste nor the exact composition concerning C&D, C&I, etc.

Nevertheless when taking in to account the relevant aspects for the design of an EfW plant (mainly the physical and chemical waste composition) it is possible to demonstrate that TNG operates well within the range of comparable facilities, namely the listed reference plants.

## Reference facilities

The information on reference facilities provided in February 2016 (attached) provides details on the capacity, technology type and fuel mix including the chemical analysis of the design fuel of these plants.

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The reference plants are treating big variation in the feedstock, which shows that the technology can be used on a broader level. There variation in the feedstock profile of all of the reference facilities combined is evidence to demonstrate a technological capacity to withstand a wide range of variance. The provided technology with moving grate technology and semi dry flue gas treatment is able to run with the waste composition of TNG.

Following several key design parameters are listed and discussed in relation to the design parameters of TNG.

### **Plant capacity**

The mechanical throughput of TNG is comparable with the plant in Grossräschen (DE) and Ferrybridge (UK). While the plant capacity of TNG seems higher than these plants the thermal capacity (throughput x CV) – the most important design parameter – is identical. TNG therefore is in no way an exceptionally large plant

### **Calorific value**

The calorific value defines the combustion characteristics of the waste. Generally it can be said that - except for very low CV below 8 MJ/kg - the higher the CV, the more difficult to maintain an ideal combustion process. With a CV of 12.3 MJ/kg TNG falls in the medium range between i.e. Knapsack with 15 MJ/kg or Riverside with 9.6 MJ/kg.

### **Chemical waste composition**

Within the waste composition the most important parameters are:

- Moisture (limits the controlled ignition of the waste)
- Inert (ash) content (limits homogenous combustion and burnout)
- The larger of Chlorine or Sulphur content (is the limiting factor for the APC system)
- C/O ratio (high C/O ratio is an indicator for high plastic content which limits homogenous combustion and burnout)

For all these aspects TNG is well within the range of all the reference plants.

### **Summary**

None of the listed reference facilities is an exact replica of the TNG fuel profile, however all relevant design parameters of TNG are well within comparable plants which are successfully in operation. As a result it can be said that the technology option pursued, being moving grate technology with semi dry flue gas treatment, was selected based on its capacity to handle a wide range of fuel types and variation of feed stock.

## Appendix A Reference Facilities

### Key Plant Parameters

Facility/Location	Country	Commission year	Capacity t/a	Fuel mix	Furnace/Boiler	Supplier Furnace/Boiler	APC	Supplier APC
TNG	AU	-	4 x 276'250	C&I, C&D	Grate	HZI	Semi dry (lime)	-
Grossräschen	DE	2008	1 x 246'000	C&I, C&D	Grate	AEE *	Semi dry (lime)	LAB
Heringen	DE	2009	2 x 148'500	C&I, C&D, some MSW	Grate	AEE *	Semi dry (lime)	LAB
Premnitz	DE	2008	1 x 150'000	C&I, C&D	Grate	AEE *	Semi dry (lime)	Lühr
Hannover	DE	2005	2 x 140'000	C&I, C&D, some MSW	Grate	AEE *	Semi dry (lime)	LAB
Knapsack	DE	2009	2 x 150'000	C&I, C&D	Grate	AEE *	Semi dry (lime)	Lühr
Ferrybridge	UK	2015	2 x 256'500	C&I, C&D, some MSW, waste wood	Grate	HZI	Semi dry (lime)	HZI
Riverside	UK	2011	3 x 195'000	MSW, C&I	Grate	HZI	Semi dry (lime)	HZI

\* up to 2010 HZI was part of the AEE Group

## Appendix B Reference Facilities

### Chemical Analysis Design Fuel

		TNG	Grossräschen	Heringen	Premnitz	Hannover	Knapsack	Ferrybridge	Riverside
Carbon (C)	%	31.44	35.20	n.a.	28.50	n.a.	n.a.	35.60	26.63
Hydrogen (H)	%	4.07	1.88	n.a.	3.96	n.a.	n.a.	5.20	3.78
Nitrogen (N)	%	0.26	3.80	n.a.	0.32	n.a.	n.a.	0.60	0.54
Sulphur(S)	%	0.43	0.37	n.a.	0.18	n.a.	<0.8	0.20	0.10
Chloride (Cl)	%	0.88	0.70	n.a.	0.54	n.a.	1.20	0.50	0.70
Oxygen (O)	%	18.06	14.25	n.a.	19.50	n.a.	n.a.	25.10	17.79
Water (H2O)	%	23.38	25.00	n.a.	22.00	n.a.	18.00	20.00	30.76
Ash	%	21.49	18.80	n.a.	25.00	n.a.	19.00	12.80	19.70
Total	%	100.00	100.00	-	100.00	-	-	100.00	100.00
NCV	MJ/kg	12.30	12.50	12.6	13.00	13.5	15.00	13.50	9.60

### Percentage of wood (estimation based on chemical analysis of waste)

		TNG	Grossräschen	Heringen	Premnitz	Hannover	Knapsack	Ferrybridge	Riverside
Wood	%	30.24	23.86	n.a.	32.65	n.a.	n.a.	42.03	29.79

### Chloride range of fuel (average)

		TNG	Grossräschen	Heringen	Premnitz	Hannover	Knapsack	Ferrybridge	Riverside
Cl	%	< 1	<1	n.a.	0.2-1.5	n.a.	0.5-1.7	<1	n.a.

information source for reference plants: HZI

## Appendix C Reference Facilities

### Fuel Mix

	Mixed C&D								Mixed C&I					SRF from MSW	MSW	
		paper/card	plastic	textile	glass	vegetation	wood	hazardous (hospital waste)		paper/card	plastic	textile	flock waste			
<b>TNG</b>	<b>28.7%</b>	x	x	x	x	x	x	-	<b>71.3%</b>	x	x	x	x	<b>0.0%</b>	-	-
<b>Grossräschen *</b>	<b>9.8%</b>	x	x	-	x	x	x	x	<b>83.2%</b>	x	x	x	x	<b>7.0%</b>	x	x
<b>Heringen *</b>	<b>13.6%</b>	x	x	x	-	x	x	x	<b>62.4%</b>	x	x	x	-	<b>24.0%</b>	x	-
<b>Premnitz *</b>	<b>14.3%</b>	x	x	x	-	x	x	x	<b>57.0%</b>	x	x	x	x	<b>28.7%</b>	x	-
<b>Hannover *</b>	<b>9.0%</b>	x	x	x	-	x	x	x	<b>75.3%</b>	x	x	x	x	<b>15.7%</b>	x	x
<b>Knapsack</b>	<b>10.0%</b>	x	x	x	-	x	x	x	<b>90.0%</b>	x	x	x	-	<b>0.0%</b>	x	-
<b>Ferrybridge <sup>1)</sup></b>	<b>10.0% <sup>2)</sup></b>	n.a.	n.a.	n.a.	n.a.	n.a.	x	n.a.	<b>30.0%</b>	n.a.	n.a.	n.a.	n.a.	<b>60.0%</b>	x	x
<b>Riverside</b>	<b>n.a.</b>	x	x	x	x	x	x	-	<b>n.a.</b>	x	x	x	-	<b>n.a.</b>	x	-

<sup>1)</sup> Design Waste

<sup>2)</sup> Waste Wood

\* values from the year 2014, see <https://www.itad.de/information/abfallverwertungsanlagen>

all other values given from the operators verbally

SRF Solid Recovered Fuel

MSW Municipal Solid Waste

n.a. not available