



NIPPON STEEL & SUMIKIN ENGINEERING Group's
Waste to Energy System
Your most reliable partner for Waste to Energy



NSENGI Group's State of the Art Combustion System

CONCEPT

Stable and Thorough Combustion Sequence

- From high to low calorific values, our system can treat a wide range of waste.
- Highly reliable because of its simple combustion control system, able to adapt to changes to waste properties.
- By creating efficient air cyclones in the secondary combustion zone, less air is required for full combustion.
- Currently holds the record for largest operating plant per line at 864t/d. Our maximum design capacity is at 1,200t/d, which is also the largest in the world.

High Energy Generation Efficiency

Various technologies (e.g. High steam condition boiler and regeneration / reheating cycle of steam) allow us to achieve higher power generation efficiency. Our reference plants are as follows:

- Napoli Plant
Steam Conditions : 500°C, 90 bar
Generation Efficiency : 30.2% (Highest in the world)
- Rüdersdorf Plant
Steam Conditions : 420°C, 90 bar
Generation Efficiency : 29.9% (Uses Reheating Cycle)

Advanced Flue Gas Cleaning

- We comply with even stricter emission regulations than standard Japanese and EU regulations.
- We provide various treatment methods that fit your flue gas cleaning needs.
- Dioxin is dealt with by destruction through complete combustion of flue gas and removal using activated carbon or further destruction with catalyst.

Easy Maintenance and Long Continuous Operation

- <Furnace> Minimize shutdown to prevent clinker blockage.
- <Grate> Minimize replacement needs by choosing optimum grate type (air or water cooled).
Simple (bolts and nuts not required) structure allows easy maintenance .
- <Boiler> Maximize lifespan by optimizing temperature settings and equipment design/material.

References



Napoli, Italy

Provided:SBENg

Start of operation	2009
Waste	MSW
Calorific value	15MJ/kg (3,580kcal/kg)
Capacity	658t/d × 3line
Steam condition	90bar 500°C
Amount generated	107MW

NSENGI Group's Standard Spec

Topic	Standard Spec	Comments
Grate Combustion rate	250-360kg/m ² h	Depends on waste. Able to conserve space.
Range of calorific value (LHV)	5.0 to 18.0 MJ/kg	Waste of lower and higher values (including RDF) is also acceptable
Acceptance size	Under 600mmX600mmX600mm	Lengths up to 1200mm also acceptable
Throughput Capability	50 to 1200t/d	Largest so far is 864t/d(largest in the world)
Flue gas cleaning method	Dry, Semi Dry, Wet	Depends on customer needs
Flue gas type (NO _x)	Catalytic, Non-catalytic, Activated Carbon	Depends on customer needs
Start up time	Appx 8 hrs	
Shut down time	Appx 4 hrs	Emergency shutdown available
Energy generation efficiency (max)	26% (30.2%)	EU standard achievable. Max is world's best.
Availability	8,000hrs (10,000hrs)	EU standard
Steam temperature	~400°C (500°C)	Designed based on LCC preference of customer
Fluctuation of Steam	Below 3%	Important factor for PPA
Utilities	Water, electricity, fuel	Fuel for start-up and shut down
Ignition Loss	Below 3%	Reference around 1~2%

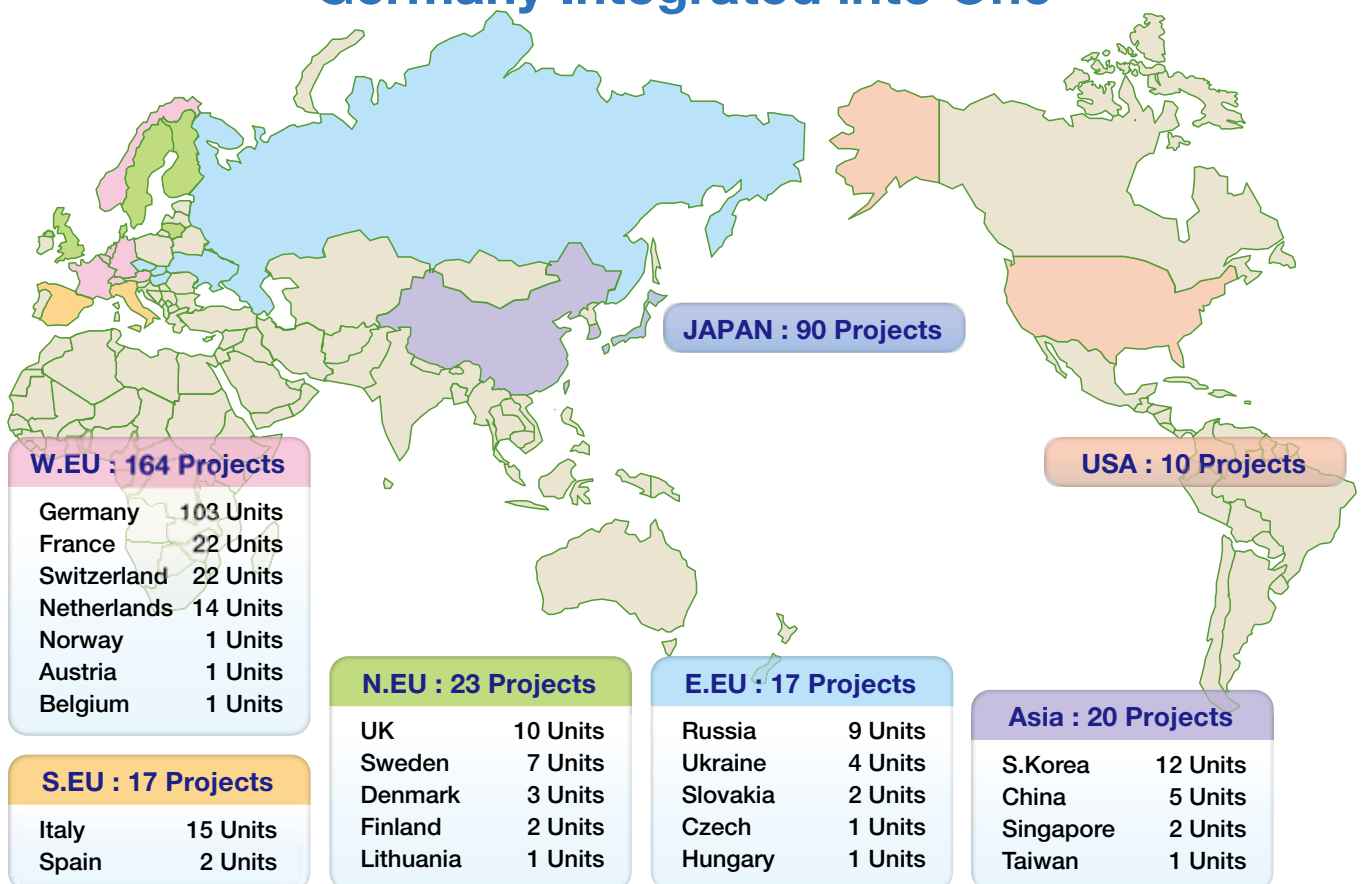
Global Presence in WtE Business

REFERENCES

Combustion: 50years, appx 500 Units= 150 thousand tpd
Gasification: 30years, appx 80 Units= 10 thousand tpd

※Updated in January 2016
 ※Includes Licened Projects.

Globally Proven Technologies of Japan and Germany Integrated into One



References

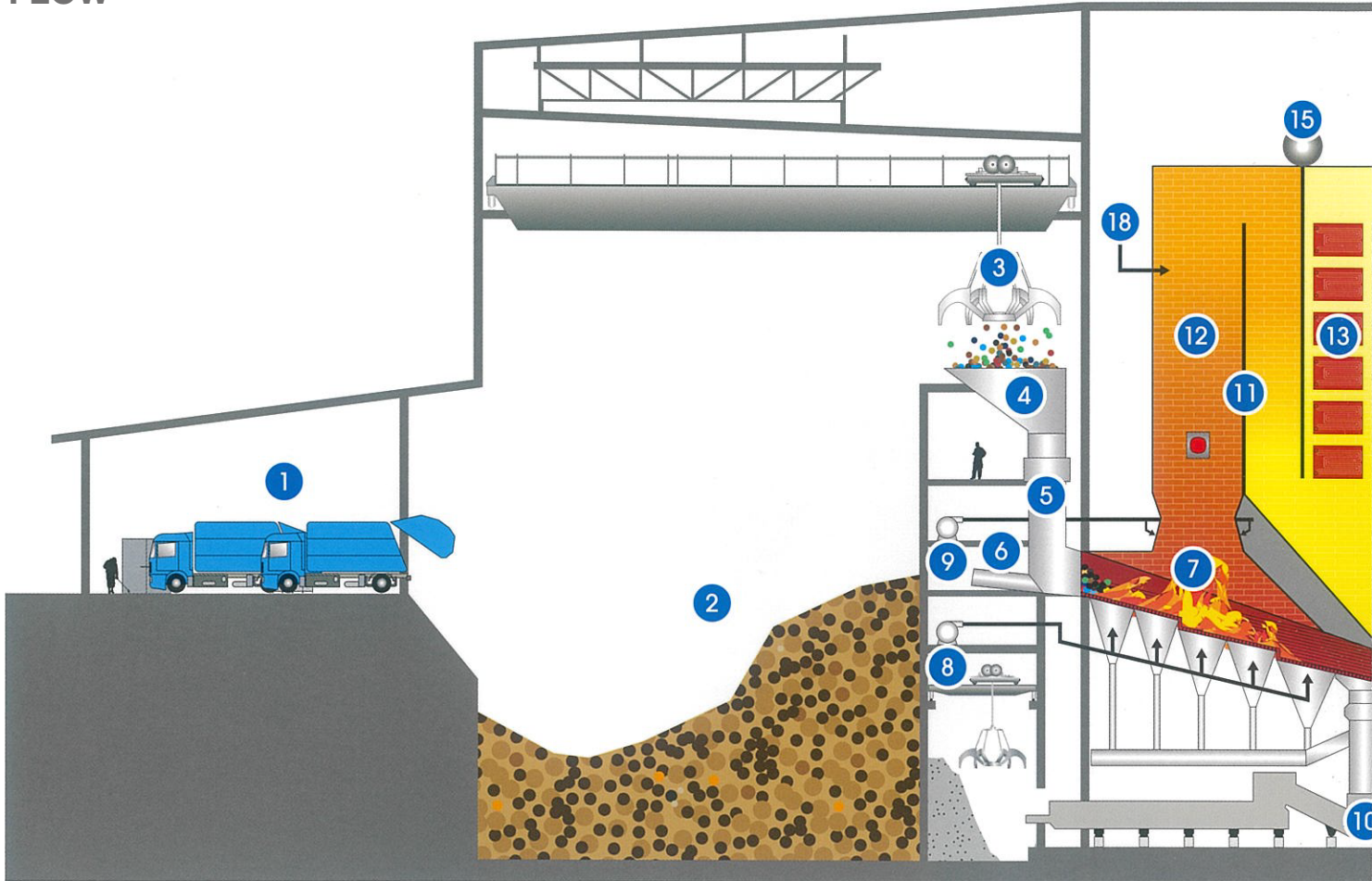


Rüdersdorf, Germany



Ruhleben, Germany

FLOW



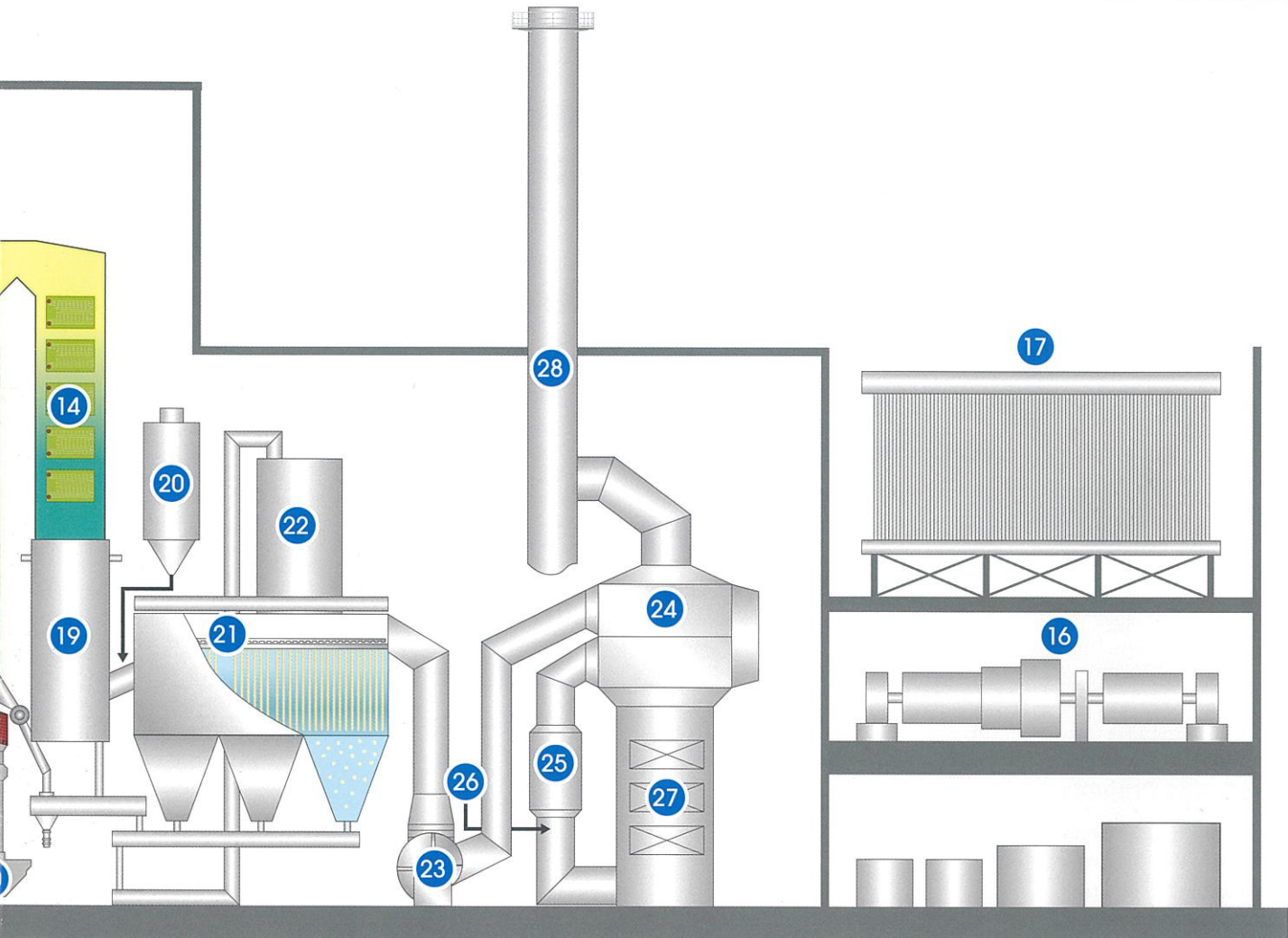
- 1 Platform
- 2 Waste Pit
- 3 Waste Crane
- 4 Waste Hopper
- 5 Waste Chute
- 6 Waste Feeder
- 7 Stoker Furnace

The well designed [2 'Steps'] and [Declination Angle] of the furnace allows stable and thorough treatment of a wide range of waste.



- 8 Primary Air Fan
Waste is combusted with air fed into the furnace. The air is designed to also dry incoming waste and cool the grate .
- 9 Secondary Air Fan
A cyclone to effectively and thoroughly combust flue gas within the furnace is created with a low 'excess air ratio'

- 10 Slag extractor
- 11 Boiler
Steam generated with the heat from the combustion of waste. Corrosion of boiler tubes and build-up of clinkers and fouling are prevented through our technology and experience.
- 12 Secondary Combustion Zone
The secondary air helps combustion and maintain the temperature above 900°C for more than 2 seconds. This prevents Dioxin generation.
- 13 Super heater
- 14 Economizer
- 15 Boiler Drum
- 16 Steam Turbine / Generator
- 17 Low Pressure Steam Condenser
The turbine exhaust steam is condensated and recirculated to the boiler.
- 18 Ammonia/Urea
If selective non catalytic reduction (SNCR) system is applied, Ammonia water or urea water is injected into the Secondary Combustion zone to remove NOx.
- 19 Gas Cooler
For additional needs



20 Slaked Lime / Activated Carbon

Removes HCl, SOx, Heavy metals, and any remaining Dioxins

21 Bag Filter

22 Ash Treatment

23 Induced Draft Fan

24 Gas to Gas Heat Exchanger

25 Flue Gas Reheater

26 Ammonia Injection (de-NOx agent)

27 Catalytic Reactor (de-NOx and de-Dioxins)

28 Stack

References



Hefei, China

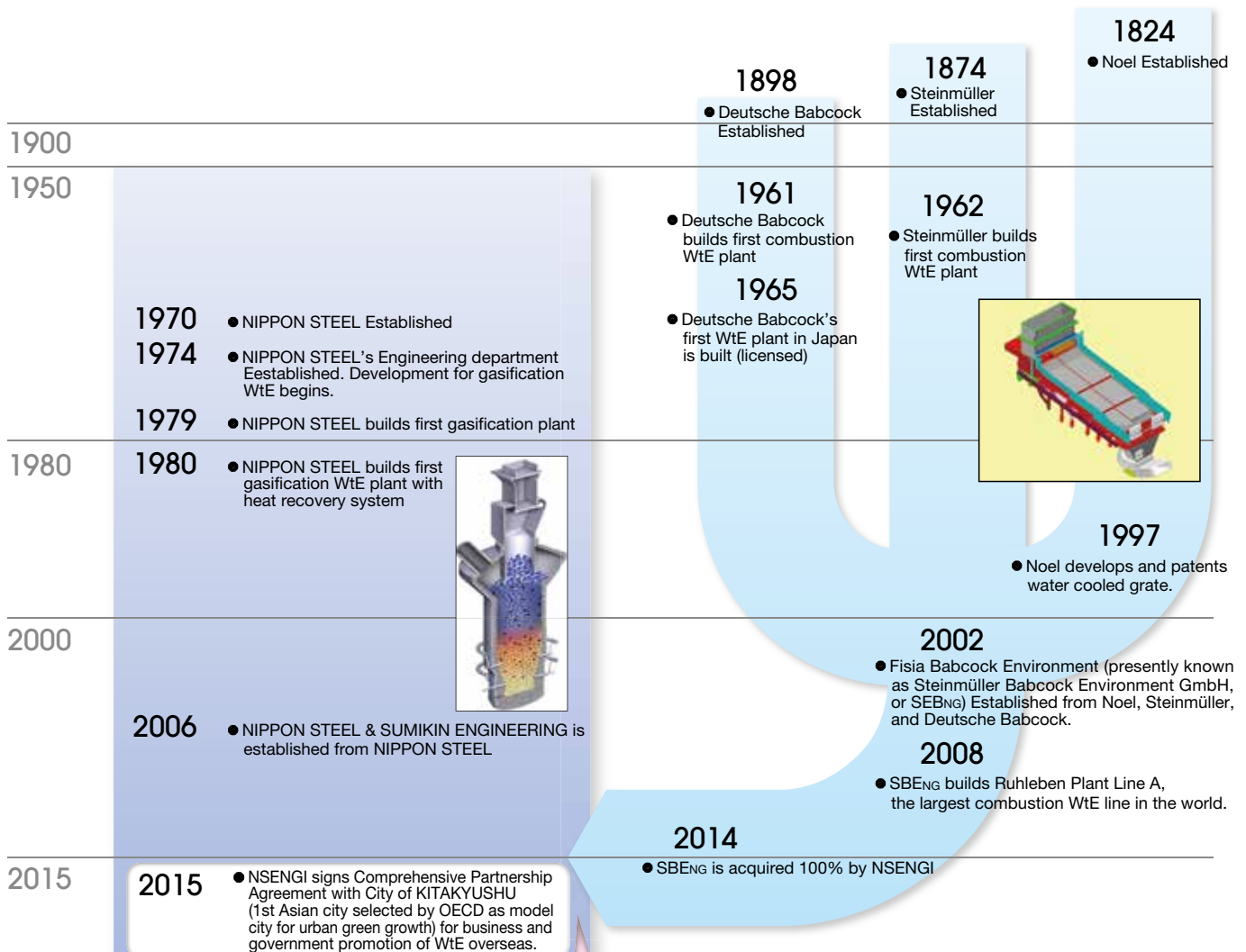


Klaipeda, Lithuania

History

Milestones for our Gasification and Combustion WtE technologies.

HISTORY



NSENGI, the holder of world's largest and longest running gasification WtE plants adds world class combustion technology to WtE menu

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