Hitachi Zosen
INOVA

Lucerne (Perlen) / Switzerland

Waste to Energy Plant

2 x 15.6 t/h, 2 x 47 MW

Renergia, the New Ecological Waste to Energy Plant in Central Switzerland

Maximum energy efficiency combined with low emissions – these are the declared aims of the new Renergia Waste to Energy plant in Lucerne (Perlen).

After 50 Years in Service, the Lucerne Waste to Energy Plant was Replaced

The municipal association for recycling, disposal and waste water in Lucerne (REAL) has been operating the Waste to Energy (WtE) plant at Lucerne-Ibach as a heat and power generating plant since 1971. Since then, the Lucerne WtE plant had been added to and extended several times, the last time in 1996. In 2015, almost 50 years after its commissioning, the old plant was replaced by a new WtE plant (which has been given the name Renergia) in the proximity of the paper factory Perlen Papier AG (PEPA).

Prime Location for Ecological Energy Generation

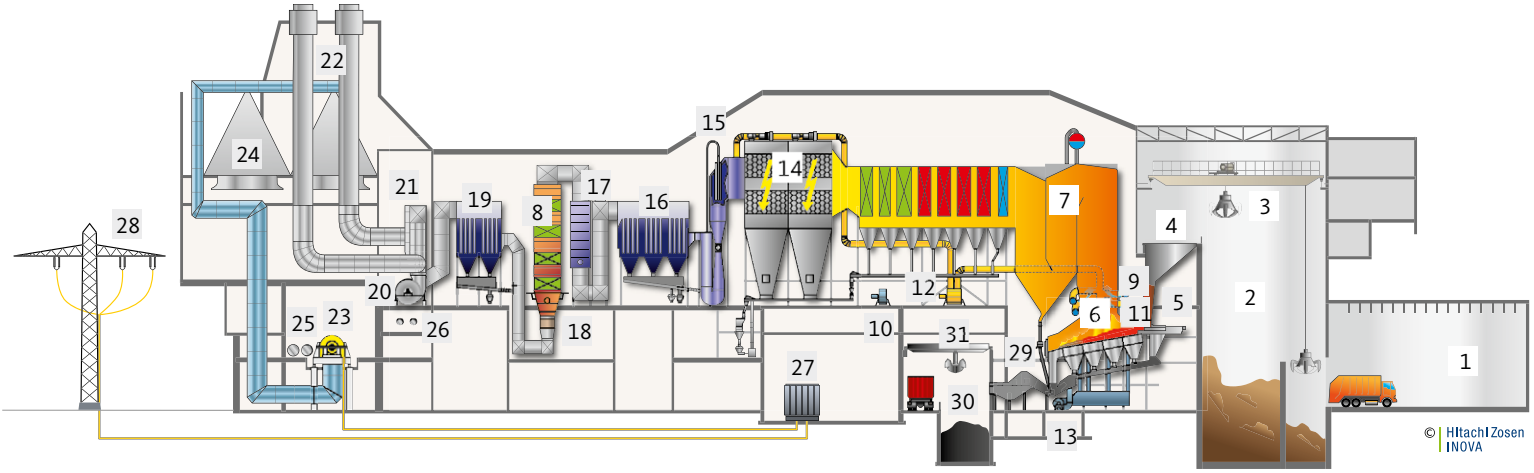
The aims of the Renergia plant are maximum energy efficiency and low emissions. The energy efficiency of a WtE plant is determined by a number of factors. The most important one is the location, which should allow a maximum export of steam or heat. A better location than that of the Renergia plant with its direct proximity to the paper factory and the district heating connection point is hardly conceivable. The second important aspect is energy recovery from the flue gases of the combustion, which should be as complete as possible. At the Renergia plant, this was achieved very effectively by keeping the flue gas flow and the chimney outlet temperature as low as possible and by omitting any water injection into the flue gas flow. Thanks to the Renergia plant, PEPA could reduce its heating oil consumption by 40 million litres annually and lower its CO_2 emissions by 90,000 tonnes.

New Approaches to Furnace and Boiler Design

The Renergia plant benefits from a number of innovative developments by Hitachi Zosen Inova (HZI) that are aimed at simplifying the maintenance of the plant and, furthermore, at being able to control the operation of the plant well, enabling combustion of waste with little excess air. The water-cooled HZI Grate combines the advantages of the grate designs of three experienced grate manufacturers. Its robust, straightforward and welldesigned construction ensures reliable and cost-efficient operation. It impresses with its very good serviceability, occupational safety and its stable, well controlled combustion. The plant is prepared for operation with reduced air supply. Its main characteristics are a boiler, the first pass of which is fully protected by Inconel 625 alloy cladding rather than by refractory lining, a two-stage secondary air and recirculated flue gas injection system, and an extended combustion control system.

Efficient and Thorough Flue Gas Treatment

It is very important for an Waste to Energy plant to keep its emissions reliably low. The multiple stage flue gas treatment at the Renergia plant ensures that the strict requirements of the Swiss Clean Air Directive (LRV) are not only met but improved on.



Waste Receiving and Storage

1 Delivery hall
2 Waste bunker
3 Waste crane
4 Feed hopper

Combustion and Boiler

5 Ram feeder
6 HZI grate
7 Four-pass steam boiler
8 External Economiser
9 Secondary air injection
10 Secondary air fan
11 Recirculated flue gas injection
12 Recirculated flue gas fan
13 Primary air fan

Flue Gas Treatment

14 Electrostatic precipitator
15 Sodium bicarbonate injection
16 Fabric filter 1
17 SCR DeNO$_x$
18 Heat exchanger 1
19 Fabric filter 2
20 Induced draught fan
21 Heat exchanger 2
22 Stack

Energy Recovery

23 Extraction condensing turbine
24 Air cooled condenser
25 District heating heat exchanger
26 Process steam extraction
27 Transformer
28 Electricity export

Residue Handling and Treatment

29 Bottom ash extractor
30 Bottom ash bunker
31 Bottom ash crane

This is achieved with the following sections:

- electrostatic precipitators that allow separate disposal of the fly ash,
- sodium bicarbonate injection with a downstream fabric filter for separating the acid pollutants,
- selective catalytic reduction (SCR) for the reduction of nitrogen oxide,
- residual heat recovery with an external economiser and heat exchanger,
- lime and lignite coke injection in order to absorb the last traces of acid pollutants as well as mercury and dioxins.
- Downstream of the induced draft fan, there is also an additional heat exchanger which cools the flue gas down to 80 °C and hence optimises the efficiency of the system.

Before the flue gas leaves the plant via the chimney, a continuous measuring system checks that the strict emission requirements are complied with.

General Project Data

Owner and operator	Renergia Zentralschweiz AG
Start of operation	2015
Total investment	CHF 320 million
Scope of HZI	Complete combustion system, boiler and flue gas treatment

Technical Data

Annual capacity	200,000 t
Number of lines	2
Throughput per line	12.5 t/h (nom.)–15.6 t/h (max.)
Calorific value of waste	9.5 MJ/kg–16 MJ/kg
Thermal capacity per line	47 MW
Waste type	Municipal solid waste

Combustion System

Grate type	HZI grate
Grate design	2 grate lanes with 4 zones per grate lane
Grate size	Length: 10.8 m, width: 5.2 m
Grate cooling	First two zones water-cooled (Aquaroll®)

Boiler

Type	Four-pass boiler, horizontal, external economiser
Steam flow per line	58 t/h
Steam pressure	41 bar
Steam temperature	410 °C

Flue Gas Treatment

Concept	Electrostatic precipitator, sodium bicarbonate injection, fabric filter 1, SCR DeNO$_x$, external economiser, heat exchanger 1, lime and lignite coke injection, fabric filter 2, heat exchanger 2
Flue gas volume per line	78,000 m^3/h

Energy Recovery

Type	Extraction condensing turbine
Electric power output	max: 28.1 MW gross; at max. steam export: 18.1 MW gross
Process steam export	75 t/h (3.5 bar/155 °C)
District heat export	max: 22 MW

Hitachi Zosen Inova AG | Hardturmstrasse 127 | 8005 Zurich | Switzerland
Phone +41 44 277 11 11 | Fax +41 44 277 13 13 | info@hz-inova.com | www.hz-inova.com

202311