Hitachi Zosen
INOVA

Olmsted / USA

Waste to Energy Plant

200 tpd, 23 MWth

Flexible Use of Energy through Sustainable Waste Management

Hitachi Zosen Inova's expansion of the Waste to Energy plant in the small American city of Olmsted, Minnesota, not only created additional thermal processing capacity, but also brought the city a reliable and safe step closer to its ultimate objective: to divert 90% of its waste from landfills. Moreover, now 37 public and private buildings can be supplied with heat and electricity from the plant's waste heat recovery.

Olmsted has been sharing its Waste to Energy (WtE) facility with Dodge County since 1987. The community pursues an all-encompassing waste management concept. Its short term objective is to reuse approximately 37% of the 150,000 tonnes of waste produced each year, to treat another 50% thermally, and to only landfill the remaining 13%. Long term, 90% of the waste produced would be recycled or thermally treated. The two original process trains implemented in 1987 would soon no longer accommodate the needs of a growing population. It was decided to expand the facility by one additional train. Hitachi Zosen Inova (HZI) won the bid to engineer, procure, and commission the complete combustion and flue gas cleaning train. The project began in 2007 and was completed three years later at the beginning of 2010 when the facility started its operation. It now has the capacity to process an additional 200 tons per day (180 Mg per day).

Proven Grate Technology

A crane thoroughly mixes the heterogeneous waste upon arrival at the plant. The waste is then pushed onto the HZI five zone grate and becomes completely burnt out. A wet expeller discharges the resulting bottom ash. The ash is dewatered and compacted before a vibrating conveyor transports it downstream for further processing.

A fully integrated combustion control system allows quick and simple adjustments so the combustion conditions can adapt to the continuously changing waste composition. This ensures the steady and efficient operation of the system.

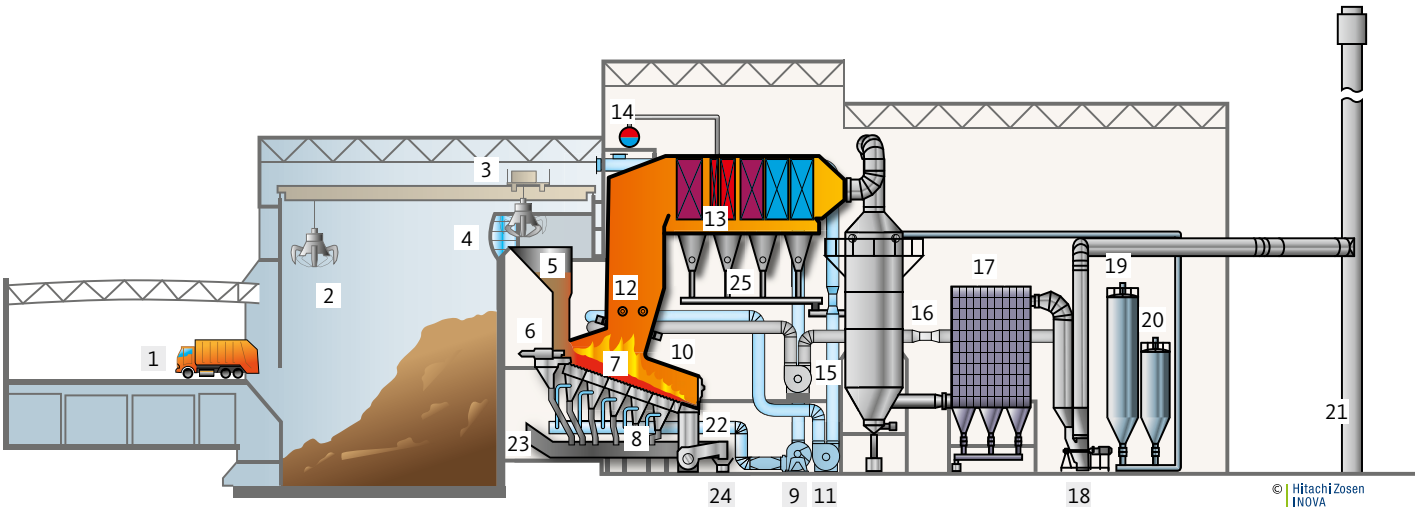
Optimum Combustion and Flexible Use of Energy

The thermal energy released during the combustion process is used in a two-pass horizontal boiler which produces approximate 61,000 lb/hr (27.7 Mg/hr) of superheated steam. The chosen parameters of 635 psia (44 bara) / 655°F (350 °C) ensure high energy efficiency. The superheated steam is expanded in a condensing turbine. The new and the two existing trains were combined to form an efficient heat and power coupling. The thermal energy can either be converted to up to 5.5 MW of electrical power in a turbine generator or a slip stream can deliver heat into the district heating grid. This concept allows the plant the required flexibility to supply electricity or heat to 37 public and private buildings depending on the season.

Efficient Flue Gas Cleaning

The flue gas cleaning system uses a Selective Non-Catalytic Reduction (SNCR) process to lower the nitrogen oxides (NO_x) formed during combustion. This process takes place at flue gas temperatures of 1,560 °F to 1,830 °F (850–1,000 °C) and uses aqueous ammonia as reduction medium. Lime slurry and activated carbon injected into a spray dryer serve to remove acid gases, such as hydrogen chloride and sulfur dioxide, and heavy metals that are entrained in the flue gas. Heavy metals adsorb to the activated carbon and are removed in a downstream baghouse (existing). The cleansed flue gas is then released into the atmosphere via a stack.

Continuous gas measurements and monitoring ensure that all values fall below the mandatory emission limits at all times.



Waste Receiving and Storage

1 Delivery hall
2 Waste pit
3 Waste crane
4 Crane control room

Combustion and Boiler

5 Feed hopper
6 Ram feeder
7 HZI Grate
8 Primary air distribution
9 Primary air fan
10 Secondary air injection
11 Secondary air fan
12 Start up burners
13 Two-pass boiler
14 Steam drum

Flue Gas Treatment

15 Flue gas recirculation fan
16 Spray dryer absorber
17 Baghouse
18 Induced draft fan
19 Lime silo
20 Activated carbon silo
21 Stack

Residue Handling and Treatment

22 Bottom ash expeller
23 Siftings conveyor
24 Vibrating conveyor
25 Boiler Fly Ash conveyor

General Project Data

Owner and operator	Olmsted County
Start of operation	2010
Total investment	~ 100 Million US Dollars
Scope HZI	Design and Supply of Chute to Stack Equipment (21 Million US Dollars)

Technical Data

Capacity of new 3rd train	200 tpd (7.5 Mg/h)
Number of trains	1 (3rd unit addition)
Calorific value of waste	4,000 BTU/lb (HHV)–6,400 BTU/lb (HHV) 8.1 MJ/kg (LHV)–13.1 MJ/kg (LHV)
Thermal capacity	90 MMBTU/hr (HHV)–23 MWth (LHV)
Waste oil	0.5 GPM

Combustion System

Grate type	HZI Grate
Grate size	Length: 33.5 ft (10.2 m), width: 9.8 ft (3.0 m)
Grate cooling	Air cooled

Boiler

Type	Two-pass boiler, horizontal
Steam quantity	61,000 lb/hr (27.7 Mg/h)
Steam pressure	635 psia (44 bar)
Steam temperature	655 °F (346 °C)

Flue Gas Treatment

Concept	SNCR DeNO$_x$, spray dryer absorber, existing baghouse (reused for new unit)
Flue gas volume	29,400 scfm (46,300 m^3/h)
Flue gas temperature	284 °F (stack inlet) (140 °C)

Energy Recovery (by others)

Type	Extraction-condensation turbine
Electric power	5.5 MW (max. generator output)
District heating output	8.5 MMBTU/hr (2.5 MWth) (max.)

Residues

Bottom ash (wet)	12,350 tons/year (11,200 Mg/a)

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