Hitachi Zosen
INOVA

Riverside / UK

Energy-from-Waste Plant

Turnkey Plant 3 x 31.8 t/h, 79.5 MW

Riverside resource recovery facility – a successful end to a long road to an integrated waste management solution for London.

The Riverside energy-from-waste plant at Belvedere in the London borough of Bexley is Hitachi Zosen Inova's most recent reference project in the UK. With an average annual capacity of 585,000 tonnes, it will be an important strategic river-served waste management facility for London, helping the capital to manage its own waste, keeping over 100,000 HGVs off the capital's congested roads each year and making a real contribution to London's ability to meet its landfill diversion targets while at the same time producing electricity for more than 66,000 homes.

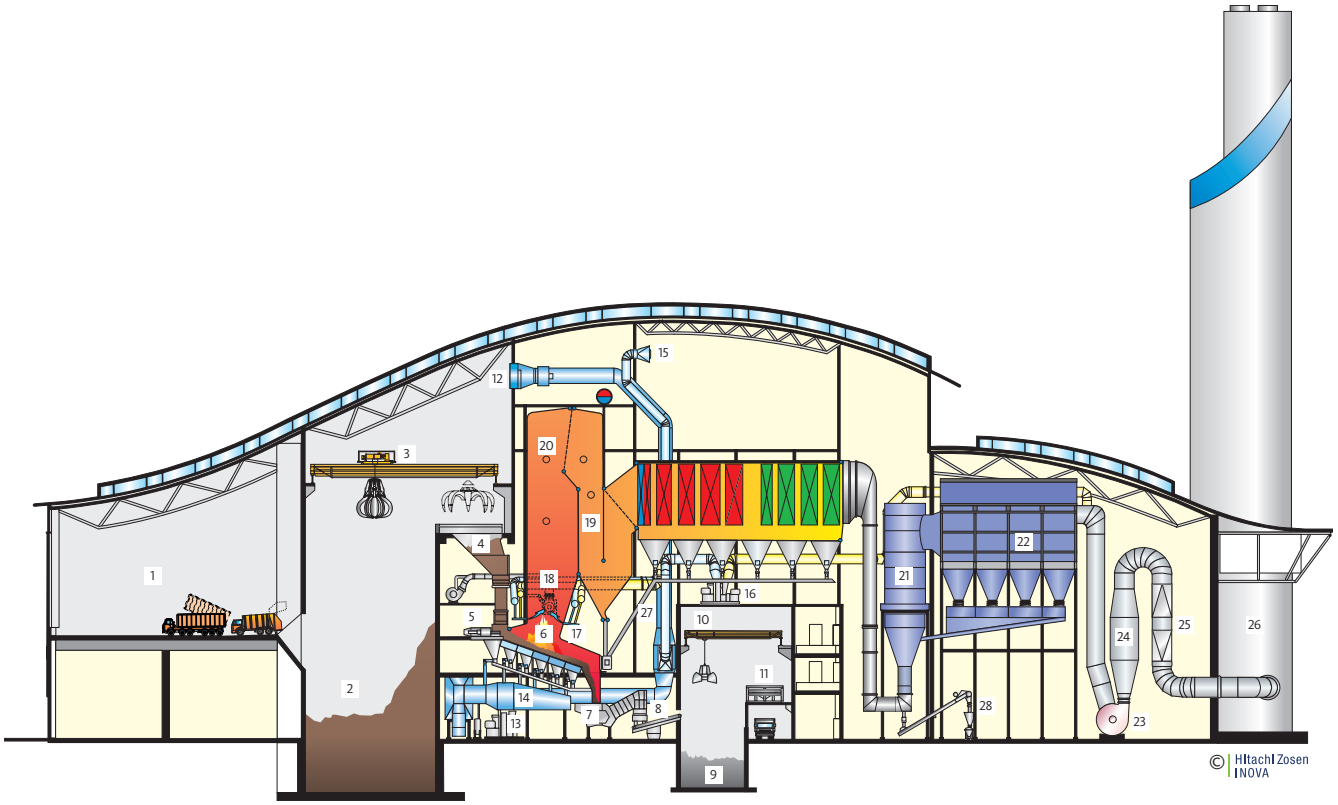
The project is successfully being developed by Cory Environmental after achieving planning in 2006 followed by a two-stage tender process, which Hitachi Zosen Inova AG could secure in early 2007. The second stage consisted of an open book tender process for the civil works in cooperation with the client. With the decision on the civil sub-contractor at the end of 2007, financial close was later achieved on 31st July 2008. The facility will be owned and operated by Riverside Resource Recovery Ltd, a subsidiary of Cory Environmental. Hitachi Zosen Inova AG has assumed in the role of an EPC contractor. Moreover O&M services are part of Hitachi Zosen Inova AG's delivery, which gave funders comfort with regard to a safe start-up of the plant and a smooth continuation into the operational phase. Construction start was in 2008 and the hot commissioning phase is about to be completed.

Renewable energy for UK's capital.

As with Hitachi Zosen Inova's reference in Paris, the Isséane energy recovery plant, the Riverside energy-from-waste facility is another example of an Energy Recovery concept in one of the major capitals in Europe. Both projects prove today's careful consideration with regard to integration and environmentally friendly concepts, not only through safe operation but also security in fulfilment of emissions legislation. Moreover, the focus is energy recovery and the Riverside facility is the only energy-from-waste plant in Europe which is obliged to reach a net electrical efficiency of 27%. The plant is expected to exceed this limit by implementing multiple recovery technologies as well as high steam conditions. Since the plant is also located in a developing area, the water-steam cycle of the plant was designed for future possible heat off-take for local district heating schemes. The Hitachi Zosen Inova AG expertise with such highly complex process designs was a key element for its selection as EPC contractor.

The technical set-up for safe and economical energy recovery.

After various materials have been separated for recycling (in a new 85ktpa MRF currently under construction) via kerbside recycling schemes and the network of Household Waste Recycling Sites, the residual waste can be delivered to the plant. Only 15% of the waste will be delivered to the site directly by lorries. The remaining 85% of the waste is delivered to the site by barges. At the jetty, the containers are unloaded onto lorries, which will then tip-off the residual waste into a bunker within the waste reception hall. The waste is thoroughly mixed in the bunker by a crane and then fed into one of the feed hoppers of the three process trains. Each train has a four-pass boiler with a thermal capacity of 79.5 MW. The waste passes down a feed chute onto the four-row Hitachi Zosen Inova grate. The moving grate mixes and agitates the waste to allow an optimal burnout of the diverse waste fractions. In addition to this, a fully integrated control system allows for continuous adjustments of combustion conditions for the safest and most efficient operation possible. The process reduces the waste volume received by up to 90%. The burnt out ash passes through the ash discharger onto an ash handling system.



Waste receiving and storage

1 Tipping hall
2 Waste pit
3 Waste crane

Combustion and boiler

4 Feed hopper
5 Ram feeder
6 Hitachi Zosen Inova grate
7 Bottom ash discharger
8 Bottom ash conveyor
9 Bottom ash pit
10 Bottom ash crane
11 Bottom ash loading station
12 Primary air intake
13 Primary air fan
14 Primary air distribution
15 Secondary air intake
16 Secondary air / flue gas gas recirculation fan
17 Secondary air / flue gas recirculation injection
18 Start-up burner
19 Four-pass boiler

Flue gas treatment

20 SNCR injection levels
21 Semi-dry reactor
22 Fabric filter
23 Induced draft fan
24 Silencer
25 Condensate preheater
26 Stack

Residue handling and treatment

27 Ash conveying system
28 Residue conveying system

The bottom ash is loaded into special containers, which will be further transported by barges, using the same system of water transport as the waste when being delivered to the facility. All these processes take place within enclosed areas. The bottom ash is sent for processing and reuse within the construction industry, for cover material or for disposal. By means of a metal separation process, ferrous and nonferrous material is also gained for recycling purposes.
Pyrolytic gas produced in the combustion process pass is mixed with secondary air and recirculated flue gas, which are injected tangentially at high velocity into the secondary combustion chamber above the grate, resulting in intensive mixing and the complete burnout of the pyrolytic gas. This is a first step in reducing emission levels. In parallel, the NOx-levels are maintained by means of Selective Non-Catalytic Reduction. The raw gas then passes through a water tube boiler where it is cooled while the water of the closed water-steam cycle is superheated. The superheated steam is then expanded by means of a turbo-generator. As a result, electricity is produced to supply the facility thereby allowing island operation as well as the export for over 90% of the produced energy to the national grid.

The energy recovery concept of the facility is also designed for potential off-take of steam or hot water for district heating purposes for future developments.
After leaving the horizontal last pass of the boiler and having extracted as much energy as possible by still maintaining sufficient temperature levels for efficient and reliable removal of pollutents, the cleaning takes place in the semi-dry system consisting of a reactor in combination with a fabric filter. The well proven semi-dry system technology keeps the plant in safe compliance with the Emission limits of the European Union by operating below them.
As reagents, lime and activated carbon are used for the removal of gaseous pollutants, including heavy metals and dioxins. Small particles are separated in the fabric filter. The facility is also prepared to be operated with bicarbonate as the reagent in the event that this would prove to be suitable in the future.
The residues resulting from the flue gas treatment are then either recycled (in the case of bicarbonate) or sent for safe disposal by an appropriate facility. The cleaned flue gas is finally released into the atmosphere through the stack.

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Hitachi Zosen INOVA

Riverside / UK Energy-from-Waste Plant

General project data

Owner and operator	Riverside Resource Recovery Ltd., subsidiary of Cory Environmental
Start of operation	2011
Total investment	EUR 400 million
Scope of Hitachi Zosen Inova AG	General contractor for entire plant, including civil works and jetty
Plant design	Hitachi Zosen Inova AG

Technical data

Annual capacity	585,000 t/a
Number of trains	3
Throughput per train	31.8 t/h
Calorific value of waste	7.0 MJ/kg (min), 13 MJ/kg (max)
Thermal capacity per train	79.5 MW
Waste type	Domestic solid waste

Combustion system

Grate type	Hitachi Zosen Inova grate R-100104
Grate design	4 rows with 5 zones per row
Grate size	Length: 10.25 m, width: 10.40 m
Grate cooling	Air-cooled

Boiler

Type	Four-pass boiler, horizontal
Steam quantity per train	96.5 t/h
Steam pressure	72 bar
Steam temperature	427°C
Flue gas outlet temperature	190°C

Flue gas treatment

Concept	SNCR, semi-dry system
Flue gas volume per train	170,000 m^3/h

Energy recovery

Type	Extraction-condensation turbine
Electric power	65 MW at 100%

Residues

Bottom ash	146,250 t/a
Flue gas treatment	10,015 t/a

Special features

Waste deliveries	By barges via the river Thames
Bottom ash transport	By barges