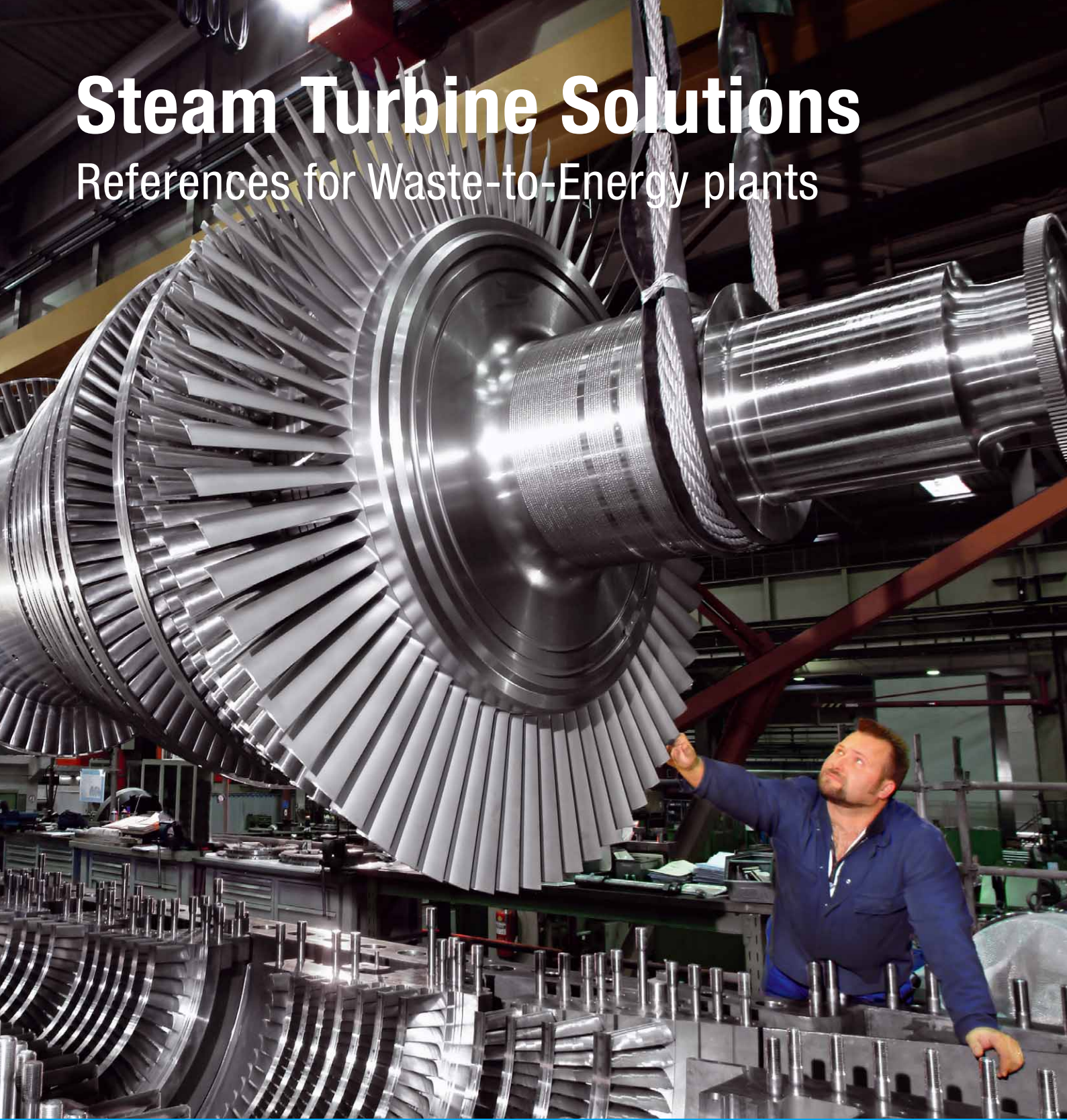


# Steam Turbine Solutions

References for Waste-to-Energy plants



Engineering the Future – since 1758.

**MAN Diesel & Turbo**



# Waste-to-Energy Plants

## Well proven steam turbine technology



*Side elevation of the waste incineration plant Belvedere*

Waste-to-Energy (WtE) refers to any waste treatment that creates energy in the form of electricity or heat from a waste source. For WtE plants MAN Diesel & Turbo offers a highly comprehensive range of steam turbines (5 - 160 MW) with proven performance for this application.

### **Waste-to-Energy power station Belvedere, South East London**

#### **Project description**

The Riverside Waste-to-Energy plant is the biggest plant of its kind in England. With an average annual capacity of 585,000 tonnes, it will be an important strategic river-served waste management facility for London. It will help the capital to manage its own waste, keeping over 100,000 heavy goods vehicles off the capital's congested roads each year. Thus making a real contribution to London's ability to meet its landfill targets.

The plant consists of three incinerator lines for waste combustion, each processing 29.8 tons of waste per hour with a calorific value of 9.6 MJ/kg.

The heat generated from the waste is used to generate steam at 72 bar and 427°C. During normal operation the steam is routed to a condensing turbine. The

turbine drives the generator, thus producing electrical power up to 80 MWe.

#### **Turbine description**

The 80 MW steam turbine is a single casing turbine with axial exhaust. It is equipped with three uncontrolled extractions. The first two extractions are designed as sliding bleeds and supply low pressure (LP) steam for auxiliary systems such as deaerator/feed water tank, Selective Non-Catalytic Reduction (SNCR), LP primary air preheater and sealing air heater at approx. 4 bar. The third turbine bleed supplies steam to a LP heater. The exhaust steam is fed into an air cooled condenser.

The turbine is capable of operating continuously at optimum efficiency throughout the boiler operating envelope with one, two or three boilers in operation. During island mode the steam turbine generator set supplies the base load of the plant to maintain the incinerators at maximum continuous rating.

A noise enclosure for 80 dB(A) covers the complete turbine generator set.

## Kehrichtheizkraftwerk Hagenholz, Switzerland

### Project description

In 2001, the Zurich public utility company "Entsorgung + Recycling Zürich (ERZ)" began the gradual modernisation of the waste combustion plant at Hagenholz, which had been in operation for 30 years. Having acquired a new refuse bunker, a bulk goods shredder, and having optimized the plant logistics, the next step, in 2004, involved the procurement of a new power station.

The power part of the plant was awarded to Caliqua AG in Basel, which awarded the contract for the steam turbogenerator to B+V Industrietechnik, now MAN Diesel & Turbo. Replacement of the existing steam turbine coupled with the optimisation of the steam system as a whole led to a doubling of the electrical output. The heat extracted for the purpose of district heating increased from 59 MWth to 84 MWth. According to the operator ERZ, this structural measure brought a significant improvement in air quality within the North Zurich supply area. Augmented use of combined heat and power (CHP) means that less fossil fuels are needed to feed smaller local boiler systems.

### Turbine description

A MARC 4-B10 turbine is used in Hagenholz. The fact that there are almost 200 of these turbines in operation confirms that the MARC series has proven itself



*Fitting of rotor into the casing of the new MARC 4-B10 steam turbine for the Hagenholz Plant.*

in the European Market. The MARC series is characterised by its high efficiency as well as optimum operational reliability.

The turbine used in this project, which is manufactured in Hamburg, is a backpressure turbine with a controlled extraction. The steam from the extraction is directed to a heating condenser, that feeds the district heating of North Zurich. Dependent on the operational requirements, the extraction pressure may be set at 12 to 14 bar. The network of district heating requires up to 100 t/h of steam for the heat supply. The turbine is designed for a nominal live steam flow rate of 119 t/h. A peak output of 19.6 MWeI can be fed into the grid when operating the boilers at 125 t/h capacity.

Technical parameters	of the Belvedere plant	of the Hagenholz plant
Combustion capacity	90 tons/hour	24 tons/hour
Number of combustion lines	3	2
Thermal power	243 MWth	84 MWth
Steam flow at rated loading	317 t/h	125 t/h
Live steam temperature	425 °C	400 °C
Live steam pressure	70.5 bar	39.0 bar
Turbine output	80.0 MWeI	19.6 MWeI

**MAN Diesel & Turbo**

46145 Oberhausen, Germany

Phone +49 208 692-01

Fax +49 208 669-021

[www.mandieselturbo.com](http://www.mandieselturbo.com)

**MAN Diesel & Turbo**

Hermann-Blohm-Str. 5

20457 Hamburg, Germany

Phone +49 40 370 82-0