It is no art to generate waste - but to recover it, sustainably and with high efficiency, is.

MARTIN Reverse-Acting Grate System – The Challenge of High Heating Value Fuels
Contents

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• MARTIN reverse-acting grate
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Range of heating values of untreated waste in different countries

- P. Rep. of China
- Rep. of Korea
- Brazil
- Taiwan, R.O.C.
- Rep. of Singapore
- Japan
- Europe
- U.S.A.
- Switzerland
- Germany
- France
- Scandinavia

Possible total range of MARTIN reverse-acting grate up to 20,000 kJ/kg
MARTIN reverse-acting grate

- Movement against the direction of waste flow
- Uniform covering of grate
- Protection against intensive heat radiation
- Protection against thermal wear
- Long service life
Fuel-bed temperature – measurements / modeling

IR camera

Ball instrument

Insertable thermocouples

Temperature probes
Fuel-bed temperature – IR camera
Fuel-bed temperature – Insertable thermocouples

- Thermocouple zone 2
- Thermocouple zone 3

Insertion depth:
- 200 mm
- 300 mm
- 400 mm

Temperature [°C] over time from 7:00 to 19:00.

TFEMK06 (T Brennbett Zone 2)
TFEMK062 (T Brennbett Zone 3)
Insertion depth: 300 mm
Insertion depth: 200 mm
Insertion depth: 400 mm
Comparison of IR camera and grate bar temperature measurements

Conventional, 13 MJ/kg / SYNCOM, 10 MJ/kg
Water-cooled MARTIN reverse-acting grate

- Grate structure and reverse and forward movement are identical to standard grate
- Cooling segment is wider than an uncooled grate bar
- Cooling water flows in parallel through all cooling segments
- Sophisticated cooling system with significantly low losses
- Cooling system can be switched on and off in automatic mode during plant operation
Water-cooled MARTIN reverse-acting grate – heat extraction by cooling water

0.05% of thermal load
SYNCOM – process

- Grate-based system using the MARTIN reverse-acting grate
- Combustion control system using infrared thermography
- Overfire air system with 4 nozzle rows (”4-row stitching”)
- Flue gas recirculation
- Oxygen enrichment of underfire air
SYNCOM - temperature measurements

Average IR camera
1,130 °C

LHV 9,000 kJ/kg
RDF trials – high heating value fuels

13,000 kJ/kg
5,589 BTU/lb

17,000 kJ/kg
7,309 BTU/lb

19,000 kJ/kg
8,169 BTU/lb
RDF trials – grate bar temperature measurements

T_{UFA} 54°C

T_{UFA} 14°C

LHV

- 13,000 kJ/kg
- 17,000 kJ/kg
- 19,000 kJ/kg
RDF trials – grate bar temperature measurements

- Front grate bar
- Grate step 4
- Grate step 8

Temperature [°C]

- Normal operation
- LHV 13,000 kJ/kg
- LHV 17,000 kJ/kg
- LHV 19,000 kJ/kg

$T_{UFA}$

54°C → 14°C
Downtime analysis of COVANTA facilities with MARTIN reverse-acting grates

53 boilers
168 grate runs

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Hours</th>
<th>Total Downtime</th>
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<tr>
<td>2003</td>
<td>7.0</td>
<td>0.6</td>
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<tr>
<td>2004</td>
<td>5.3</td>
<td>0.4</td>
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<tr>
<td>2005</td>
<td>3.7</td>
<td>0.3</td>
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</table>

Grate bar failure
Stoker equipment – I&C
Stoker system
- Mechanical undefined
- Feeders
- Grates
Summary / Conclusion

- The SYNCOM process as well as the thermal treatment of high heating value fuels on a MARTIN reverse-acting grate are possible unconditionally without additional cooling.
- Modifications to the general plant design of existing MARTIN WTEs are not necessary; detail modification to the grate / boiler design may be necessary.
- The MARTIN reverse-acting grate is always covered with a fuel bed or ash, and is thereby protected from excessive thermal radiation and intensive overheating.
- The MARTIN reverse-acting grate has a long service life.

The MARTIN reverse-acting grate does not require water-cooling!
Contacts

If you have questions or want further information, please feel free to contact us at

MARTIN GmbH für Umwelt- und Energietechnik
Leopoldstr. 248
D – 80807 München
Tel: +49-89-356 17 0
Fax: +49-89-356 17 299
E-mail: mail@martingmbh.de
Internet: www.martingmbh.de