Quality Control in Waste Recycling

CHLORINE CONTENT DETERMINATION

Analysis of chlorine contents, moisture and calorific value in RDF material streams
For the production of refuse derived fuels (RDF) high calori-
fific fractions of household waste, of bulky waste and recy-
cling remains from the recycling material sorting as well
as commercial and industrial waste are used. The compo-
sition of the RDF material with respect to particle size and
other material characteristics can be very heterogeneous.
That heterogeneity is reflected in parameters character-
ising RDF products such as the overall chlorine content,
the water content, the ash value and calorific value. These
parameters can vary, but should stay within permitted
limits. In particular the chlorine contents in RDF material
needs to be monitored carefully and must not exceed a
total mass percentage of at most 1%. LLA Instruments
provides an inline analytical method which allows quickly
and securely evaluation of RDF specific parameters by a
monitoring process. The data are logged and transferred
to the plant control via different communication interfaces.

Characteristics of RDF materials depending on their origin

- Remains of the household waste light fraction:
  - high organic contents
  - high water contents,
  - low calorific value
  - low chlorine contents (0.4 - 0.9 mass percentage)

- Commercial waste:
  - low organic contents
  - low water contents,
  - high calorific value
  - high chlorine contents (1 - 3 mass percentage)
## Material composition

By sample monitoring, RDF material (fluff) is identified with process controlled NIR measurement devices. Determination of the mass composition distribution with respect to different material types is achieved by means of statistical methods. The mass composition is (knowing the total mass) calculated by the specific weights for each material type. Output of the statistical composition of the RDF material stream is in mass percentage. The identification of the different material types in the material stream is the basis of all subsequent evaluation steps.

## Chlorine content determination

For the statistical determination of the chlorine content in the RDF material stream, a sufficient sample number is required. By determining the material particles distribution and calculating the mass percentage as part of the different material types, can be concluded on the mass percentage part of PVC/PVDC relative to the total quantity. For these two material types an average chlorine content is used.

## Moisture analysis

In the RDF material stream, the moisture of paper and wood is analysed. Plastics contain low levels of moisture and their moisture content is therefore negligible. However, water molecules on the plastics surface are detected and included in the moisture analysis. The final result is issued in mass percentage.

## Statistical calorific value

For all material types to be identified, the corresponding calorific values are stored in the NIR device. The calorific values are multiplied by the determined mass percentages of the individual material types. The overall calorific value is calculated in MJ/kg and transmitted to the control unit.
Multiplexed NIR Spectrometer
uniSPEC1.9MPL-24V

The multiplexed NIR spectrometer uniSPEC1.9MPL-24V permits easy integration in the industrial process. One measuring instrument allows the connection of up to 64 probes. These probes can be positioned in the process as single probes at different places or combined as a single probe line. The connection between probes and spectrometer is realised by optical fibres. Multiplexed NIR spectrometer uniSPEC1.9MPL-24V permits easy integration in conveyor belt systems of waste-to-energy plants (e.g. incineration plants, power plants, cement plants, firing plants etc.).

General Technical Specification uniSPEC1.9MPL-24V

<table>
<thead>
<tr>
<th>Measurement method</th>
<th>Contactless and non destructive measurement on the basis of NIR spectroscopy; measurement of absolute remission depending on wavelength</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wavelength range</td>
<td>~1365 nm - 1930 nm</td>
</tr>
<tr>
<td>Chassis configuration</td>
<td>Dust-proof housing for industrial use or OEM components for mounting in control cabinet</td>
</tr>
<tr>
<td>PC configuration</td>
<td>Operating system Windows® 7 Embedded, 1,7 GHz, 8 GByte RAM, Solid State Disk 80 GByte, connectivity: DVI, COM, USB, Ethernet</td>
</tr>
<tr>
<td>Software</td>
<td>Control software, analysis software, remote software</td>
</tr>
<tr>
<td>Power supply</td>
<td>230 V ~ 50 Hz</td>
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</tbody>
</table>

Identification of material composition

<table>
<thead>
<tr>
<th>Cellulose containing material</th>
<th>Paper, cardboard, wood, leaves (Hydrophilic)</th>
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</thead>
<tbody>
<tr>
<td>Plastics</td>
<td>ABS, PA, PC, PE, PET, PVC, PMMA, PP, POM, PS, PUR, silicone (Water retention in plastics negligible)</td>
</tr>
<tr>
<td>Plastic composites</td>
<td>Attachments of paper or wood on plastic</td>
</tr>
<tr>
<td>Textile materials</td>
<td>Cotton, linen, wool, leather (Hydrophilic)</td>
</tr>
</tbody>
</table>

Illumination unit PMAmpl

<table>
<thead>
<tr>
<th></th>
<th>PMAmpl1000</th>
<th>PMAmpl1600</th>
<th>PMAmpl2000</th>
<th>PMAmpl2800</th>
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<tbody>
<tr>
<td>No. of NIR lamps</td>
<td>2 x 8</td>
<td>2 x 12</td>
<td>2 x 15</td>
<td>2 x 21</td>
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<tr>
<td>Type of NIR lamps</td>
<td>230 V / 120 W</td>
<td></td>
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<tr>
<td>Power total</td>
<td>2 x 960 W</td>
<td>2 x 1440 W</td>
<td>2 x 1800 W</td>
<td>2 x 2520 W</td>
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<tr>
<td>Power supply</td>
<td>400 V AC (3~)</td>
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