Description

Filler measurement / ash measurement and coating weight measurement MRP ASH Fe55 2005

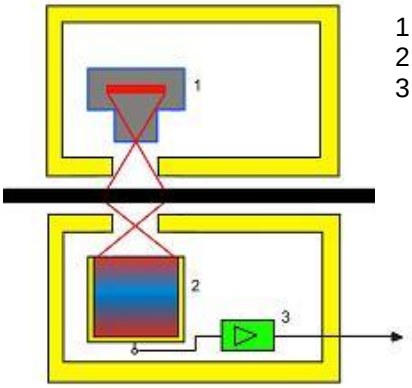
Ash measurement using the gamma-absorption principle with a Fe55 source

The ash content of a paper is defined as the proportion of contamination, fillers and pigments that are contained in the paper as inorganic substances in addition to the organic components (fibres). These do not burn. Hence the term "ash content". Fillers are additives for paper production. They fill the gaps between the paper fibres, improve the opacity (make the paper less transparent), the printability and also the smoothness of a paper. They also improve the uniformity of the formation. The fillers are usually washed in water and added to the pulp in the mixing vat. Fillers are usually minerals such as kaolin, titanium dioxide and/or calcium carbonate.
Besides the advantages, disadvantages are also to be expected. Filler particles get stuck between the paper fibres and thus reduce the number of fibre-fibre bonds. This results in lower paper stiffness and paper strength.

The filler is determined with a continuous, non-contact selective (filler elements only) radiometric measurement. A low-energy gamma emitter (Fe55; with an emitted gamma radiation of 5.6keV as opposed to approx. 300keV for a basis weight measurement) is used as the radiation source. The absorption of this gamma radiation by the paper web is mainly due to the photoelectric effect. The absorption is dependent on the mass absorption coefficient, and thus a material-dependent quantity. For example, titanium dioxide absorbs gamma radiation about 15 times stronger than cellulose or water.

Taking into account the individual filler components (kaolin, clay, titanium dioxide, etc.), the filler measurement now determines the total filler in the paper.

Coating weight measurement is carried out before and after the coating, which generally consists of the same fillers. Here the influence of the raw material is completely compensated. If the components of the coating colour are now known, the coating basis weight can be measured very accurately.



1 FE55 Source
2 Ionization chamber
3 Evaluation electronics with Profibus DP Connection

Electrical principle

The encapsulated FE55 isotope, which serves as a radiation source, is contained in a shielded container. The radiation is only emitted towards the material to be measured. On the opposite side there is a radiation detector (usually an ionization chamber, but today also semiconductor detectors) which generates a current depending on the received radiation. The currents resulting from this ion flow are in the range of pico amperes (pA, 10^{-12} amperes) for ionization chambers. Such small currents can be detected with special amplifiers and are a measure for the absorption by the material. The measurement is continuous, non-destructive and has no damaging effect on the product.

MRP Automatisierungstechnik GmbH
Otto-Lilienthal-Str. 2
D-56751 Polch

Telefon: +49(0)2654 88091-0
Telefax: +49(0)2651 88091-299
e-mail: info@mrp-at.de
Internet:: www.mrp-at.de

Measurement accuracy

Typ	MRP ASH Fe55 filler	MRP ASH Fe55 coatweight
Basis weight range	0-400 g/m²	1-40 g/m²
Resolution	0,01 %	0,01 g/m²
Accuracy - 2-sigma at 1 sec	±0,1 %	±0,1 g/m²
Measuring gap	20 mm	20 mm
Measuring spot diameter	20 mm	20 mm
Operating temperature	10°C-70°C / 110°C	10°C-70°C / 110°C

As an alternative, X-ray-based filler measuring devices can also be used. We would be pleased to explain the differences and the advantages and disadvantages of the different techniques.

MRP Automatisierungstechnik GmbH
Otto-Lilienthal-Str. 2
D-56751 Polch

Telefon: +49(0)2654 88091-0
Telefax: +49(0)2651 88091-299
e-mail: info@mrp-at.de
Internet:: www.mrp-at.de