PAPER

water content determination

Paper is a felted fibrous mass of the cellulose and wood fibers and other additives, such as organic fillers (potato starch) and non-organic fillers (talk, chalk) with a basis weight of 28-200 g/m^3. The production consists of grinding, mixing, dyeing and dehydrating the paper mass in order to obtain the desired shape, color and size of the paper. Paper is a hygroscopic material, which means that external conditions, mainly air humidity, may cause it to absorb a specific amount of water or may lead to a drying phenomena, that is desorption. Both phenomena are unfavorable to the paper industry because they may result in electrostatic charges, paper deformation during storage, low-quality print, dusting in offset machines, etc. The information on the water content is therefore crucial for the manufacturer and paper user, e.g. printing house. The quick and precise information on the water content in paper can be obtained with the use of Radwag MA R, MA X2, MA X7 or MA 5Y moisture analyzers.

The application note includes basic information for validation of the paper drying method with the use of MA R, MA X2, MA X7 and MA 5Y moisture analyzers series by Radwag Wagi Elektroniczne. The application note may be the basis for elaborating own drying method with special regard to distinctive features of the product in question.

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TERMS

ACCURACY of determining water / dry matter content is the difference between the result of the water / dry matter content received in the moisture analyzer method and the result of the water / dry matter content received while drying the same sample through a reference method.

PRECISION is a degree of compliance between independent results of the test, received in specific conditions. The measure of precision is a standard deviation from a series of several measurements.

REFERENCE METHOD

ISO 287:2018-02. Paper and board — Determination of moisture content of a lot — Oven-drying method.

SAMPLE PREPARATION

Before testing, the sample must be stored in a tightly sealed container. Before testing, cut the sample into small pieces.

ACCESSORIES

Laboratory dryer, glass weighing vessels with a lid, AS 220.X2 analytical balance, laboratory spoon.

METHOD DESCRIPTION

Place the sample with a mass of ca. 25 g in pre-dried glass weighing vessels. Specify the real mass of the sample in question with the use of the balance whose weighing accuracy is 0.1 mg (AS 220.X2). Put weighing vessels with the sample and lids into the temperature-controlled laboratory dryer. Dry samples at the temperature of 105°C for 1 hour. After this period, remove vessels and put into the desiccator to let them cool down and weigh afterwards. Place samples in the laboratory dryer again and keep on drying them for 30 minutes. Cool them down and weigh again. Repeat the procedure until you obtain a stable sample mass or record the sample mass growth after drying.

RESULTS

Sample name	PAPER 160 g/m^2	PAPER 75 g/m^2
Water content (%)	7.50	6.76
Standard deviation (%)	0.12	0.10

PAPER – WATER CONTENT ANALYSIS WITH THE MOISTURE ANALYZER

The water content testing with the use of the moisture analyzer (IR radiation) entails two phenomena: convection and radiation. The sample temperature rises from outer layers to the bottom of the sample. The temperature gradient in the sample structure minimizes through optimization of the thickness of the dried sample and drying temperature. Too high drying temperature may lead to surface burning of the sample, which may be hard to diagnose if the sample color is dark.

SAMPLE PREPARATION

Before testing, the sample must be stored in a tightly sealed container. Before testing, cut the sample into smaller pieces (20 x 20 mm).

ACCESSORIES

MA R, MA X2, MA X7 or MA 5Y moisture analyzer, laboratory spoon, disposable aluminum weighing pans.

METHOD DESCRIPTION

Set drying parameters presented below. Collect the sample with a mass of ca. 2.5 ÷ 3 g and distribute pieces throughout the weighing pan. Lock the drying chamber manually or automatically.

DRYING PARAMETERS / RESULTS

Sample name	**PAPER 160 g/m^2**	**PAPER 75 g/m^2**
Drying profile	Standard	
Drying temperature	80°C	75°C
Sample mass (g)	~2.5 ÷ 3	
End of analysis	Auto 3	
Water content (%)	7.62	6.67
Standard deviation (%)	0.11	0.23
Analysis time $\acute{x}$ (min)	10	8

ACCURACY OF THE MA R, MA X2, MA X7, MA 5Y METHOD

Sample name	**PAPER 160 g/m^2**	**PAPER 75 g/m^2**
Water content (%) – Ref.	7.50 ± 0.12	6.76 ± 0.10
Water content (%) – MA	7.62 ± 0.11	6.67 ± 0.23
Analysis accuracy (%)	|0.12|	|0.09|

RESERVATION

The method in question has been verified by the Research Laboratory, yet the results do not include factors arising from diversity of tested samples, operators' personal skills as well as measuring capability used by moisture analyzer users. For this reason Radwag shall not be held responsible for drying parameters but they can be used to elaborate own drying method.