

Measuring the Moisture Content of PBT Pellets with the MS70

Polybutylene terephthalate, abbreviated PBT, is a straight-chain thermoplastic polyester that has an ester linkage in its main chain. PBT is a polymeric resin that belongs to the same family as PET.

1. Determining the Sample Quantity

As the moisture content of the PBT used for the present report was less than 0.1%, the sample mass was set to 20g in accordance with Section 5.3.1 of the instruction manual, "Necessary Mass for Measurements."

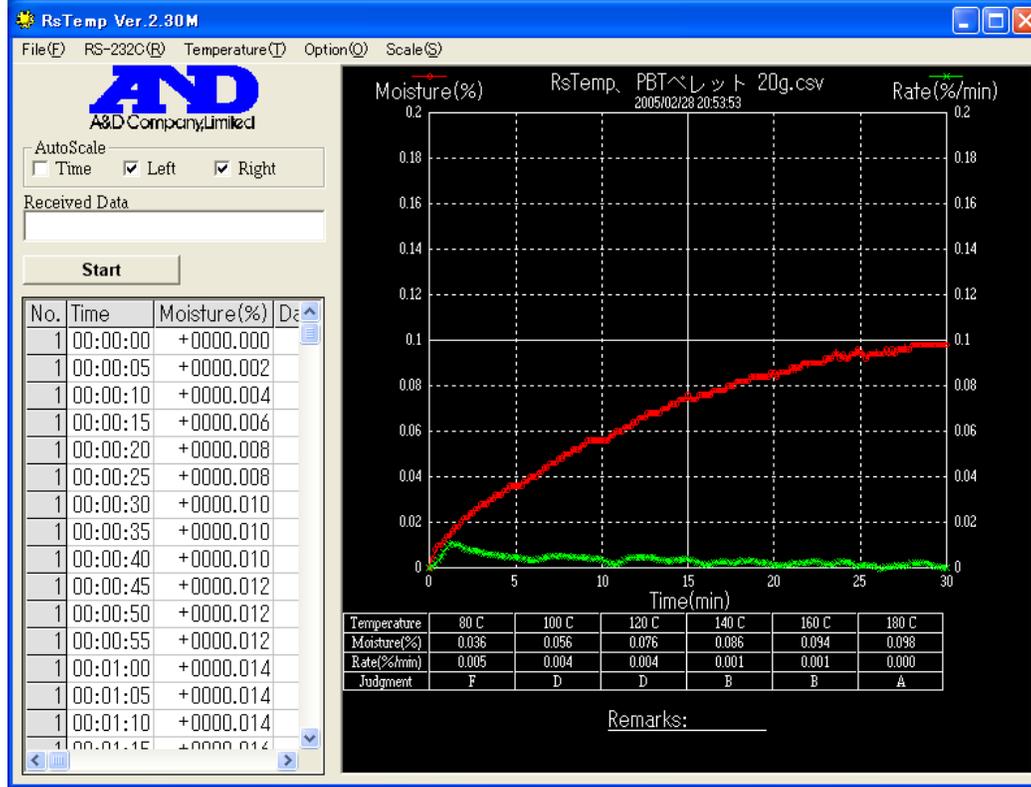
Estimated Moisture Content		Necessary Mass for Measurement
1%	->	At least 2g
0.5%	->	At least 5g
0.1%	->	At least 20g

(Note: The larger the error of measurement the smaller the sample quantity)

2. Determining the Drying Temperature

The optimal drying temperature was determined using the RsTemp function of the standard software WinCT-Moisture. In general, the moisture content of a resin material is small and difficult to volatilize. Therefore, the graph curve is slow to stabilize and it is hard to judge whether water or another constituent is vaporizing.

The graph below appears to stabilize at 180°C. However, a slight odor was generated and the sample started to melt at around 200°C. Consequently, based on overall considerations, 160°C was chosen as the drying temperature.



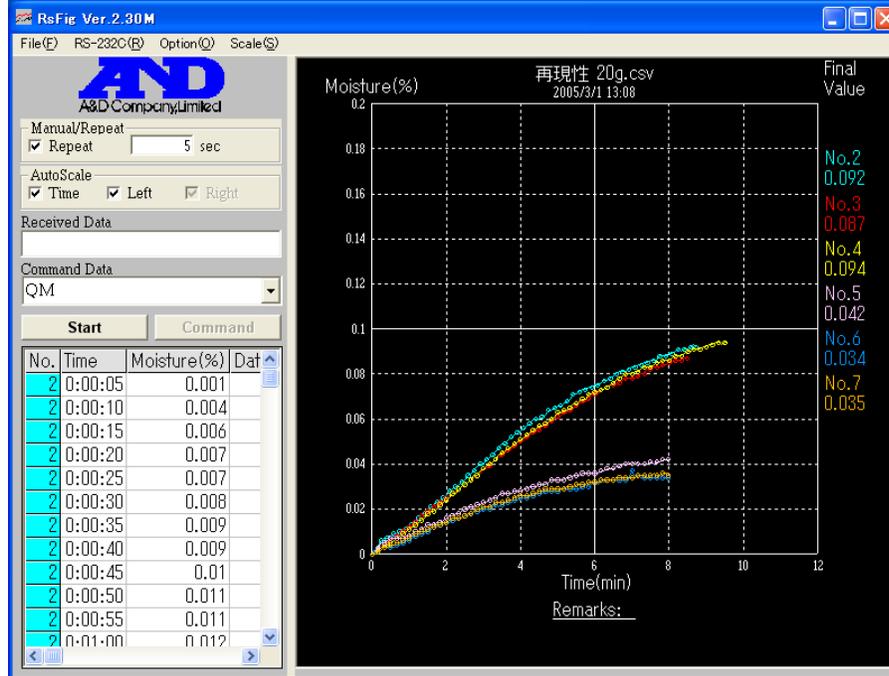
(Graph 1)

3 Measurement Results

Below is an explanation of Graph 2:

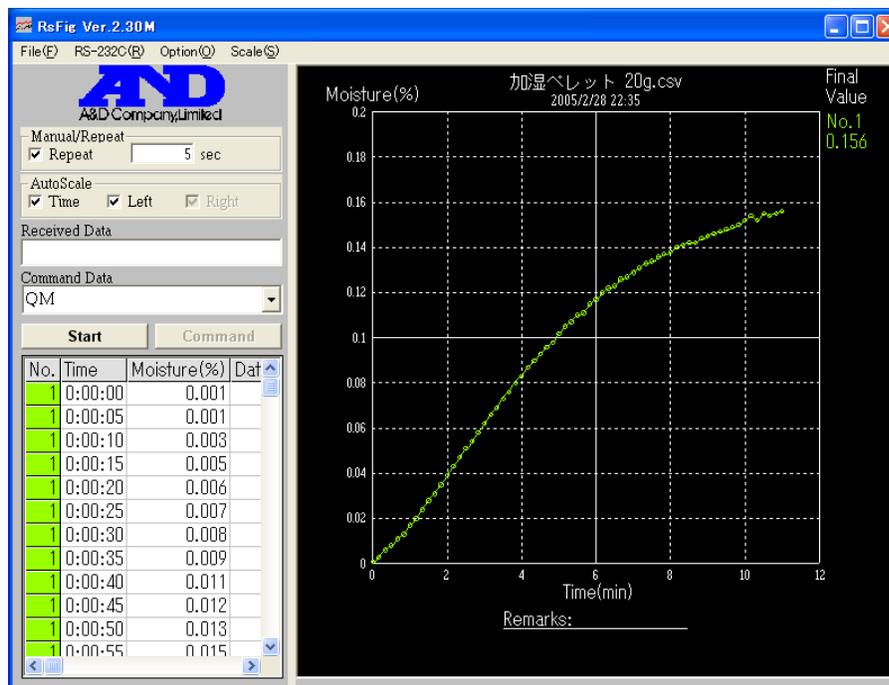
- (1) The three measurement results above 0.08% were obtained from samples that were not subjected to pre-heating. They were stored in a room with humidity around 30%RH.
 (Automatic mode: Drying temperature 160°C, Termination value 0.005%, Sample mass 20g, Measurement interval 10 minutes).

- (2) The three measurement results below 0.04% were obtained from samples that had been subjected to preliminary heating once before the measurements. The samples were considered to have been dried.
 (Timer mode: Drying temperature 160°C, 8 minutes, Sample mass 20g, Measurement interval 10 minutes)



(Graph 2)

- (3) For your reference in the event that the pellets are left in a room of 23°C/45%RH for 3 days (see Graph 3).



(Graph 3)

4 Discussion and Recommendations for Accurately Measuring PBT Pellets

- (1) If the analysis mode of the MS70 is set to the “Standard Mode,” even when the accuracy setting is **III** (0.02%), it is hard to remove the moisture content, and

the measurement will be terminated in one minute, around 0.01%. Therefore, more accurate results will be obtained if the measurement time is preset in the "Timing Mode." The measurement conditions should be the same each time.

- (2) In the event that the absolute value of the measurement results is different from those of a Karl Fischer moisture analyzer, it is possible that a constituent other than water is vaporizing. It is recommended that the drying temperature and measurement time are set so that there is a correlation between the results of the two methods.

To correlate the results of the MS70 with those of a Karl Fischer moisture analyzer, conduct both measurements in the same location simultaneously. Depending on the storing environment, the samples may absorb moisture (See the measurement results in Graph 3).

- (3) When the moisture content reaches below 0.1%, the influence of errors by the moisture analyzer become more significant, not to mention that of environmental factors (humidity). For instance, a moisture content of 0.02% means that a mass change of 0.004g has to be detected when the sample mass is 20g (and only a 0.001g mass change for a 5g sample mass). Therefore, the larger the sample mass the more accurate the measurement.
- (4) When measurements are done in succession, the temperature around the sample pan increases, which volatilizes some of the sample's moisture before starting a subsequent measurement, thereby causing more errors. It is highly recommended that a cooled pan be used each time and that measurement intervals of approximately 10 minutes be taken to lower the temperature around the pan and maintain an equal temperature distribution for each measurement.