

## Procedure of Proficiency Testing of Plastic Packaging Material Barrier Property Testing

**Abstract:** This paper introduced the implementing procedure of the proficiency testing of barrier property testing of plastic packaging material, the procedure is divided into several parts, including previous preparation of proficiency testing, specimen preparation and test, specimen distribution, testing data receiving from laboratories engaged in the project, result statistics, supplement testing and presentation of the finally result.

**Key Words:** barrier property, oxygen transmission rate, water vapor transmission rate, proficiency testing, statistics

Development of material barrier property testing in China is unbalanced, with the existence of different testing levels, so it urgently demands the enhancing of laboratory construction, validating and promoting the laboratory testing ability. Certification and Accreditation Administration of the People's Republic of China (CNCA) organized the laboratory proficiency testing of "Barrier property test of plastic packaging material—Determination of oxygen and water vapor transmission rate". This proficiency testing is organized by CNCA, National Package Product Quality Supervision & Testing Center (Jinan) act as the organizational institute, and Labthink act as the one and only cooperating institute. The scale of this project of proficiency testing is unprecedented, amount of laboratories engaged in the project, and aroused extensively attention from society. For strengthening the confidence of this test result, many specialists and experts also want to know the detailed process of proficiency testing. This paper will introduce the whole process of proficiency testing comprehensively and systematically.

### 1. Brief introduction to the procedure of proficiency testing

According to temporal sequence, the concrete procedure of proficiency testing of "Barrier property test of plastic packaging material—Determination of oxygen and water vapor transmission rate" including preparation of proficiency testing, specimen preparation, homogeneity and stability tests of samples, specimen distribution, testing data receiving from laboratories engaged, result statistics, supplement testing and publication of the finally result. The work of each part can be further divided into smaller parts, this will be introduced in details in next part.

### 2. Concrete test procedure

#### 2.1 Design of proficiency testing project

The scheme design of proficiency testing was accomplished by National Package Product Quality Supervision & Testing Center (Jinan) in may 2007, this project definitely appointed the scheme and organizational institute, cooperating institute, members of expert team, technical team and statistical team. Labthink was appointed as the one and only cooperating institute, and was ensured of its main work (the preparation and analyses of specimen with organizational institute, make sure of the reliability of testing specimen).

#### 2.2 Sending off first-turn announcements and sign up lists

First-turn announcements and sign up lists was sent off first in June 2007, trying to send it to all laboratories which should engage in this project, including production quality test centers nationwide, inspection institutes at

provincial levels (including deputy provincial level city and city directly under state planning), government-controlled technical centers (labs) of Administrations for Entry-Exit Inspection and Quarantine, various relevant departments and ministries or industrial product quality inspection centers. Besides this, all relevant laboratories can participate the project.

### 2.3 Specimen preparation and testing

Specimen preparation was finished by Labthink in July 2007. This proficiency testing adopted “split level” specimen pairs existing slight differences, to inspect this differences interlaboratory and within-laboratory. That is to inspect the systematic errors and random errors in laboratories and inspect consistency and stability of specimen according to CNAS-GL03 《Guidance on Evaluating the Homogeneity and Stability of Samples Used for Proficiency Testing》 (and the revised edition of CNAL/AG04:2003 《Evaluation Guiding for Homogeneity and Stability of Samples in Proficiency Testing》 ), and accomplish the specimen index testing.

### 2.4 Specimen distribution and handing out of other information

To ensure the reliability of specimen transportation, we packed each kind of specimen separately to avoid damages to specimen, and transported specimen to each laboratories by express delivery. At the same time, we pasted tags of specimen on the packages, marked the numbers of specimen, plus the task instructions and second-turn announcement of proficiency testing. Task instruction contains notices of specimen receiving, methods of test, notices of specimen keeping, instruction of quality control before tests, data disposing, and regulations of results feed back, instruction of suspicious approaches, technology instruction of results and working schedule arrangements. The second-turn announcement including numbers of laboratories (secret codes), testing specimen and testing goals, and the way to afford fares.

### 2.5 Experimental test

Experimental procedure begins as soon as sample distribution finished. This proficiency testing project suggest GB/T1037-1988 《Test method for water vapor transmission of plastic film and sheet - Cup method》 and GB/T1038-2000 《Plastics - Film and sheeting – Determination of gas transmission - Differential-pressure method 》 as experimental method, other methods choosing in experiment must be indicated in the experimental report.

### 2.6 Lab returns test data

The first round test data should be return back to National Package Product Quality Supervision & Testing Center (Jinan) before August 2007. Data feed back after the time limit can be list in 《Finally Report of Proficiency Testing》 , but should be marked late tag to show differences.

### 2.7 Result statistic

Proficiency testing data statistic was based on CNAS-GL02 《Guidance on Statistic Treatment of Proficiency Testing Results and Performance Evaluation》 , using robust statistic method to evaluate the testing proficiency of laboratories, the main parameters of laboratories proficiency evaluation include ZB interlaboratory and ZW within-laboratory, evaluation result also contains seven general statistical measurements: fruit number, median, IQR, CV, minimum value, maximum value and range. Figure out laboratories which are outlier and suspiciousness, according to statistic results. Late arrival results are not put in the general statistic but are given result evaluation according to the first-turn general statistic. Labthink also took part in the evaluation compute of

proficiency testing.

Suspicious and outlying laboratories were called to a supply testing according to proficiency testing announcement of CNCA 2007.

## 2.8 Supplement experiment

All supply testing results feed back to National Package Product Quality Supervision & Testing Center (Jinan) in October 2007, listed in 《Finally Report of Proficiency Testing》and marked for the difference. Result evaluation was given according to the first-turn total statistic.

## 2.9 Technology summary

Finally report was drafted out by National Package Product Quality Supervision & Testing Center (Jinan), submitted to Laboratory of CNCA and Test Supervision Department for discussion. Laboratories were appeared in codes instead of names to keep the secret of laboratories in the proficiency testing report. National Package Product Quality Supervision & Testing Center (Jinan) sent middle-stage result report to laboratories after audited and passed by CNCA.

## 2.10 Project evaluation and result publishing

Experts from CNCA accepted the project in January 2008. Name list of satisfactory laboratories will be published in the first quarter of 2008, and proficiency testing satisfactory certificates will be awarded by National Package Product Quality Supervision & Testing Center (Jinan).

Laboratories received satisfactory certificates are excused of examinations of this item when taking qualification cognizance and laboratory certification evaluation in 2008, and laboratories apply qualification cognizance and laboratory certification for the first time will be recorded into its proficiency testing records. Relevant institutes must consider laboratories received certificates firstly when distributing tasks in relevant testing fields.

## 3. Conclusion

The procedure of the proficiency testing item “Barrier property test of plastic packaging material—Determination of oxygen and water vapor transmission rate” is scientific and precise. Ways of specimen evaluation and data processing are reliable and reasonable. Therefore, this proficiency testing reflected the general domestic level of barrier property testing, found and recognized differences existing internal laboratories, and could work good in unification and regulation of barrier property test in most domestic laboratories at the same time.