Subject 746A (94, 746B, 746C, 746D, 1692, 1694)

July 27, 2018

SUMMARY OF TOPICS

The following topics were discussed at the meeting of the Standards Technical Panel for Polymeric Materials:

1. Update on the Activities of the Long-Term Thermal Aging (LTTA) Forum

2. Proposal for Alternate Flame Bar Design for Thickness Below 0.4 mm for UL 94

3. Changing the Calibration of the Flame for UL 94

4. UL 746B: TI Based on IEC 60216 – An Alternative for RTI?

5. Discussion of Status of Proposal for UL 746B Titled Revision of Paragraph 19.14 to Update Default Correlation Time for RTI Determination from 100,000 Hours to 60,000 Hours

6. Revision of Lab Environment Conditions for Comparative Tracking Index (CTI) Tests in UL 746A (PROPOSAL)

7. Simplify the RTI Testing Requirement During Addition/Deletion of Colorants (UL 746A)

8. Accelerated Heat Aging Evaluation by Thermal Analytical Tools in Accordance with IEC TS 60216-7-1 (746B)

9. UL 746C: Consideration of Hygroscopic Materials in UV Light Exposure and Water Immersion Test (PROPOSAL)

10. Revision of Paragraph 10.2.6 of UL 746D With Respect to Relative Thermal Index (RTI) Assignment for Recycled Plastics with Consistent Identification (PROPOSAL)

11. Discussion of "All Color" Testing for the Comparative Tracking Index (CTI) and Proof Tracking Index (PTI) Tests

12. Historical Information on UL Standards Documents

A meeting of the Standards Technical Panel of UL for Polymeric Materials was held on June 5, 2018 at UL's office in Northbrook, Illinois. The purpose of the meeting was to discuss matters regarding the performance requirements of some of the standards covered by STP 746.

The purpose of the STP meeting report is to briefly summarize discussions held during the meeting, and to document any resulting outcomes, including planned future action.

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CALL TO ORDER, ANNOUNCEMENTS, INTRODUCTION OF MEMBERS, GUESTS, AND OBSERVERS

The STP Chair, Diana Pappas Jordan, called the meeting to order and welcomed participants. The Chair made announcements regarding the operation of the meeting and gave an overview of STP procedures and current STP activity. All meeting attendees introduced themselves. A call for corrections or additions to the meeting agenda was made. There were no corrections to the meeting agenda.

The Chair informed the meeting attendees of UL's Patent Policy. A copy of UL's Patent Policy was given to each of the meeting participants.

ANNOUNCEMENTS AND REPORTS FROM THE STP PROJECT MANAGER

The Project Manager informed the meeting attendees that the meeting report would be posted in CSDS. Proposals for revisions discussed at the meeting will appear in a separate document.

The current balance of the STP was discussed at the meeting and is shown in the following table:

Interest Category	Number of Members	Interest Category	Number of Members
Producers	16 (33%)	Government	1 (2%)
Testing & Standards Organizations	5 (10%)	Consumer	0 (0%)
Supply Chain	15 (31%)	General Interest	11 (22%)
AHJs	0 (0%)	Commercial/Industrial User	1 (2%)

UL's goal is to have no interest category comprise more than one-third of the STP membership.

FUTURE MEETING SCHEDULE

Some of the meeting attendees indicated that there would be enough topics for members of STP 746 to discuss to meet on an annual basis. UL noted that the next meeting of STP 746 would most likely be a two-day meeting. UL suggested that the next meeting of STP 746 could be held in June again next year at UL's Northbrook office. A meeting attendee indicated that UL should consider scheduling future meetings of STP 746 in Europe to enable the participation of European customers. After further discussion, UL indicated it would send a Doodle survey to members of STP 746 to seek their input on whether the next meeting of the panel should take place at UL's Northbrook office or in a location in Europe during the second or third quarter of 2019.

DISCUSSION OF PROPOSALS AND AGENDA TOPICS

For your convenience in review, proposed additions to existing requirements are shown underlined and proposed deletions are shown ~~lined-out~~.

1. Update on the Activities of the Long-Term Thermal Aging (LTTA) Forum

DISCUSSION

Discussion item submitted by: Helena Chiang, UL LLC

UL's Helena Chiang provided an update on the activities of the Long-Term Thermal Aging (LTTA) Forum during this meeting in the form of a presentation. A copy of the presentation, labeled **Topic 1 – LTTA Forum Activities Update (2018)**, is included in the Supporting Documentation section of the Quick View menu located in the STP 746 CSDS Meeting Area dated May 4, 2018.

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The LTTA Forum is a group that includes representatives of UL, plastics producers, government officials, end-product manufacturers, and experts from the plastics industry. The Forum meets by teleconference on a monthly basis. The overall objective of the LTTA Forum is to:

1. Develop the LTTA Roadmap and to review projects associated with the Roadmap;

2. Refine proposals for UL 746B, the Standard for Polymeric Materials – Long Term Property Evaluations;

3. Share knowledge obtained by the LTTA Forum; and

4. Publish studies associated with the topics that are addressed by the LTTA Forum.

Ms. Chiang's presentation included an update of the work performed by the LTTA Forum during the past year. The tasks for the Forum are designated as the LTTA Roadmap. The following is an outline of the LTTA Roadmap Objective and Scope:

1. Strengthen Data Integrity

    a) Reduce data variations and enhance analysis quality

    b) Establish methods to address data quality

2. Advance Process

    a) Refine the UL 746B evaluation process

    b) Investigate new approach to accelerate process to determine RTI

3. Predictive Models

    a) Explore life expectancy modeling approach to predict RTI

    b) Deal with challenges in non-Arrhenius degradation behavior

4. Incorporate Alternate Temperature Rating

    a) Publish IEC 60216 Temperature Index (TI) on UL iQ

The LTTA Forum has prioritized their completion of the tasks and objectives as described in the LTTA Roadmap Objective and Scope noted in Slides 3 and 4 of the presentation labeled **Topic 1 – LTTA Forum Activities Update (2018)**. Additional information regarding the Roadmap is provided in the presentation.

2. Proposal for Alternate Flame Bar Design for Thickness Below 0.4 mm for UL 94

DISCUSSION

Discussion item submitted by: Greg Lau, DuPont China Ltd.

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Greg Lau presented information regarding a proposal for an alternate flame bar design for thickness below 0.4 mm during this meeting. A copy of the presentation, labeled **Topic 2 – UL 94 Flame Bar Design Study Result (2018)** is included in the Supporting Documentation section of the Quick View menu located in the STP 746 CSDS Meeting Area dated May 4, 2018.

An ad-hoc group consisting of the following individuals was formed to ″evaluate the minimal bar width which can use the same UL 94 50W test method and result interpretation protocol.″

- Ine Cox;
- Daniel Francke;
- Jun Haruhara;
- Anil KS;
- Gregory Lau;
- Prasad Shankarappa; and
- Ken Vessey

The methods used to conduct the study of this topic are provided in detail in the presentation labeled **Topic 2 – UL 94 Flame Bar Design Study Result (2018)**.

The proposed project schedule for this study is provided in Slide 6 of the presentation.

The following is a list of the findings of the work performed to date by the ad-hoc group:

- The flame bar length is more critical to maintain in order to allow the initiation of FR mechanism. Reducing the length hence will affect the results when the specimens are subjected to vertical burning test as per UL 94.
- Width is less sensitive than the length.
- Reduction of width does not change the flammability rating.

There was a discussion during the meeting regarding various elements of the tests conducted to support the proposal, such as the effects of the narrower width of test samples on the test results. There was also discussion of the basis for the proposed tests.

At the conclusion of the discussion, none of the meeting attendees expressed disagreement with the proposal. As such, the ad-hoc group will begin preparing the proposal. The proposal will then be sent to the STP for review and comments. It was also suggested by some members to generate additional flame test data on samples of different generics that are injection molded at thinner thickness rather than mechanically cut.

3. Changing the Calibration of the Flame for UL 94

DISCUSSION

Discussion item submitted by: Mike Masciantonio, Covestro LLC

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Mike Masciantonio was scheduled to present information regarding the possibility of changing the calibration of the flame for UL 94 during this meeting. For the UL 94V testing, the flame is applied to the bar 10 seconds on the first ignition, 10 seconds on the second ignition. for a total of 20 seconds. For UL 945V, the flame is applied, 5 seconds on, 5 seconds off 5 times, for a total of 25 seconds. When doing calibrations, the thermocouples often burn out when heating to 700 degrees C - 44 seconds for the V0 calibration and 54 seconds for the 5VA calibration. Each of these is over double the amount of time actually used in the tests.

This topic was discussed at the STP meeting even though Mr. Masciantonio was unfortunately unable to attend the meeting. There was a discussion of the flame test and UL indicated that there might be a misunderstanding of the test and noted indicated that the second flame application is done to confirm the results of the initial flame application. UL indicated that the test procedure for the second flame application is partially covered by IEC 60695-11-4, Fire hazard testing - Part 11-4: Test flames - 50 W flame - Apparatus and Confirmational Test Method. No further action will be taken at this time. If changes to the standard is needed, a proposal should be submitted in CSDS for future consideration by the STP.

4. UL 746B: TI Based on IEC 60216 – An Alternative for RTI ?

DISCUSSION

Discussion item submitted by: Daniel Francke, BASF SE

There has been a number of discussions about the limitations of the RTI determination according to UL 746B in a full four point program, see e.g. item 10 of the STP 746 meeting minutes dated July 20, 2017. Moreover, the issue is one major topic in the roadmap worked out by the Long-Term Thermal Aging (LTTA) forum group.

One proposed resolution is the (mid- to long-term) retirement of RTI and replacement by TI based on the methodology as described in IEC 60216, the Standard for Electrical insulating materials - Thermal endurance properties - Part 1: Ageing procedures and evaluation of test results. Parts 3, 5 and 6 of that standard are currently under revision by IEC technical committee TC 112 (Evaluation and qualification of electrical insulating materials and systems) to foster it's easier practical usage by providing a new supplemented software tool. That project will not be finished before 2019, however the discussion item was aimed to present the concept and ongoing activities to the STP as "work in progress" and to get wide feedback for the best ways to enhance UL 746B accordingly.

A report associated with this topic, labeled **Topic 4 – IEC 60216-3, -5, and -6 Supplement** is included in the Supporting Documentation section of the Quick View menu located in the STP 746 CSDS Meeting Area dated May 4, 2018. The following is a summary of some of the information from the report that was presented by Mr. Francke:

- Provided an overview of how the TI (Temperature Index) is currently determined per IEC 60695-3,5,6) and a comparison with the Software supplement for IEC 60216-3/ -5 and -6

- Provided a description and intended usage of new software supplement for IEC 60216-3/-5/-6. Refer to Slide 3.

- Presented results for validation of TI. Refer to Slide 7.

- Provided a comparison of attributes for TI and RTI (Relative temperature index). Refer to Slide 11.

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- Presented the plan of action and next steps for this topic. Refer to Slide 12.

Several meeting attendees expressed their appreciation of the work done by Mr. Francke in developing the report. In addition, several meeting attendees indicated that the method for obtaining RTI data was sometimes inconsistent. A meeting attendee noted that the program for obtaining TI data would be an ideal alternative to UL's current method for obtaining RTI data. One meeting attendee noted that the method for obtaining TI values by using the software program described by Mr. Francke would be preferable to using RTI. In response to a question from a meeting attendee, Mr. Francke indicated in some, but not all cases, RTI data could be correlated to TI using the software program.

At the conclusion of extensive discussion of various aspects of the TI software program, it was determined that Mr. Francke would work with UL on developing a proposal for UL 746B and UL 746C for the determination and usage of TI values. It was recommend that the proposal also contain some comparison of TI versus RTI values. After the proposal is completed, it will be posted in CSDS for preliminary review and comment by the STP.

5. Discussion of Status of Proposal for UL 746B Titled Revision of Paragraph 19.14 to Update Default Correlation Time for RTI Determination from 100,000 Hours to 60,000 Hours

DISCUSSION

Discussion item submitted by: Girish Grover, Solvay Specialty Polymers, LLC

On May 11, 2018, a proposal for UL 746B titled ″Revision of Paragraph 19.14 to Update Default Correlation Time for RTI Determination from 100,000 Hours to 60,000 Hours″ was posted in CSDS for ballot. The vote and comment deadline for the proposal was June 11, 2018. Subsequent to the meeting, the proposal obtained consensus, but recirculation was necessary due to the comments received. The recirculation work area opened in CSDS with a due date of July 30, 2018. If consensus is maintained, the proposal will move forward to publication.

The following information associated with this proposal is included in the Supporting Documentation section of the Quick View menu located in the STP 746 CSDS Meeting Area dated May 4, 2018:

- Topic 5 – Figure 19.1 (UL 746B) and

- Topic 5 – Data from a UL Compilation of Correlation Times.

In response to a question from a meeting attendee who asked if any RTI values that were considered outliers were discovered when using correlation times of 60,000 and 100,000 hours for materials, Mr. Grover indicated that calculations had not been done using those variables. The meeting attendee remarked that it would be helpful to see data to show how much error would be caused by the proposal when using those variables. Subsequent to the meeting, Mr. Grover provide the additional data and it has been posted in CSDS under the Supporting Documentation tab in the July 16, 2018 Recirculation Work Area.

6. Revision of Lab Environment Conditions for Comparative Tracking Index (CTI) Tests in UL 746A (PROPOSAL)

RATIONALE

Proposal item submitted by: Anil KS, SABIC Innovative Plastics LLC

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