



Need for discussion

Discovering the benefits of preselection

The selection of components, subassemblies and individual materials is a key element in the design of electrical equipment. To reduce the risk of products being delayed to market, product designers need to select materials that mitigate the risks of fire, electric shock, personal injury and environmental hazards, as well as comply with established North American and international safety standards.

Preselection is a valuable tool for helping product designers find materials that comply with safety standards. It can also greatly reduce the time and cost associated with final end product testing, thereby speeding time to market. Preselection may also permit the use of alternate materials without end product testing on assembled plastic parts, providing manufacturers the ability to easily substitute alternate materials without incurring additional costs.

Recent amendments to the International Electrotechnical Commission's (IEC) standards for household appliances and information technology equipment—IEC 60335-1 and IEC 60950-1, respectively—now permit the use of materials preselection testing as the equivalent or preferred method to end product testing on assembled plastic parts. The revised IEC 60335-1 standard covers preselection for plastic materials located within 3 millimeters of electrical connections within the appliance.

Although most manufacturers of products sold in North America are familiar with the preselection process as far as safety certification is concerned, many manufacturers that sell their products in other geographic regions are not familiar with the process. In regions outside North America, the preselection process is not well publicized and, as such, is underutilized in many product categories. Furthermore, much of the preselection data that is made available to manufacturers is self-declared by the plastics suppliers as opposed to information provided by a third-party source.

This paper will provide an overview of materials preselection and its benefits to product designers—particularly designing safety into products and components, and reducing time to market. It will also examine the options product designers have at their disposal for making the most of this process.

Preselection vs. end product testing

Preselection allows product designers to determine the function of a component in the end product application. Several material characteristics are of major concern during the design process.

For example, a material's resistance to ignition or flammability, as well as its electrical, tracking resistance, physical/mechanical and thermal characteristics, may be critical parameters for an appliance enclosure that is relied upon as electrical insulation.

Preselection also provides several advantages to product designers looking to determine such characteristics, including:

- An increased level of safety in the design of the end product
- Consistency of test data
- Reduced design costs
- Availability of material data
- Reduced time to market

The preselection process involves applying specific small-scale material test methods and minimum performance criteria for each critical material characteristic. Because the process is often more comprehensive than end product testing alone, preselection can result in an increased level of safety.

The Glow Wire End Product Test (GWEPT), for example, only evaluates a material's ability to react favorably to ignition from a heated or glow wire source. Preselection testing is more comprehensive, testing a material's ability to react favorably to ignition from arcing and flames, in addition to heated or glow wire sources.

Furthermore, the GWEPT is in conflict with its own intention. Except for the enclosures of electrical products, it is virtually impossible to determine and access interior locations for the application of the glow wire. And the GWEPT, as described in several IEC end product standards, allows for the end product to be modified in several ways in order to conduct the test. The resulting modification creates a test situation that no longer represents the end product application.



Because the use of multiple samples is often specified in the materials preselection test procedures, preselection provides greater consistency in test results. The preselection Glow Wire Ignition Test (GWIT), for example, requires the test to be conducted on three material plaques in an identical manner and location. The GWEPT, conversely, specifies the testing of only one sample.

Cutting costs

Preselection can also result in more predictable design and testing costs. There are no additional costs associated with end product testing of assembled plastic parts, no contending with inconsistent test results, and no retooling costs due to unanticipated end product test failures.

Take the example of a plastic switch on a coffeemaker. Under IEC 60335-1, the plastic components within 3 millimeters of the switch's electrical connections must score a Glow Wire Flammability Index (GWFI) of 850 or higher. If the manufacturer of the switch opts for end product testing, it will have to send samples to the testing agency. This involves the manufacturer procuring all material samples from suppliers, including alternate vendors, preparing and shipping the sample, then waiting for test results.

With preselection, however, a product design can identify which plastic materials are used in the switch, compare different materials based on their GWFI values, and quickly determine whether the switch meets IEC requirements.

In this example, by selecting plastics that scored at least 850 on the GWFI, the manufacturer can avoid the time and expense associated with end product testing on molded parts. The manufacturer can simply present the preselection data to the certification organization.

Preselection also allows for the evaluation of an alternate plastic material in an end product. Rather than conducting costly and time-consuming end product tests, the properties of the new material can be compared to the properties of the existing material to determine whether the new material's performance is equivalent to or better than the existing material.

Preselection doesn't just aid in product design. It's also an important part of supply chain management, as it allows manufacturers to find suppliers that can provide materials that meet your requirements.

Overall, preselection helps manufacturers maintain a competitive advantage by reducing development and certification costs, and turnaround time.

A source you can trust

Despite all of these advantages, preselection doesn't appear on the radar of most manufacturers. Typically, a manufacturer sends a certain number of product samples to a testing agency, a process that is time-consuming on two fronts. First, manufacturers have to gather and assemble materials for test samples to send to the testing agency. Then they have to wait for the test results.

As described earlier, end product testing for assembled plastic parts is both costly and inefficient. Nonetheless, this is the option most manufacturers select.

Even if a manufacturer is familiar with preselection, the tools they have at their disposal may not best serve their interests. Most plastics preselection databases, such as CAMPUS, include test data that's self-declared by the plastics suppliers.

Without independently verified information, product designers still leave themselves exposed to the risk that the components included in their designs are not certified to comply with North American, IEC or customer requirements. End product manufacturers need to be confident that the components they acquire from their suppliers are compliant.

Ideally, a manufacturer would consult a source that provides independently verified preselection data from an easily accessible database. Underwriters Laboratories Inc.'s free iQ for Plastics database (<http://iq.ul.com>), which contains information on more than 60,000 grades of plastic materials, can assist manufacturers in the safety compliance analysis and merchandising of their plastics for use in both component and end product parts.

UL iQ for Plastics contains information regarding the following materials preselection characteristics:

- Flammability
- Glow wire flammability and ignition
- Hot-wire ignition
- High-ampere ignition
- Dielectric breakdown strength
- Impact resistance
- Ball pressure
- Vicat softening and heat deflection
- Comparative tracking index
- Relative thermal indices

Materials included in UL iQ for Plastics are covered under UL's Component Recognition Program. Under this program, all materials are initially subjected to a series of quantitative and qualitative analytical tests to identify the samples that are subjected to the small-scale material performance tests.

To confirm ongoing compliance, UL's Follow-Up Services program monitors the consistency of the plastic over time on a global basis. Analytical tests are repeated on samples that are periodically selected by the local UL field representative for each manufacturing location authorized to produce the plastic material. These periodic audits verify that the plastic materials included in the iQ database continue to maintain their indicated ratings, providing the end product manufacturer with confidence that the materials they use continue to meet the preselection criteria.

UL also helps manufacturers obtain global acceptance of their products. UL has harmonized its preselection flammability tests with ASTM International, the International Organization for Standardization (ISO) and the IEC to facilitate the sale of materials in all markets.

Furthermore, UL has the expertise to guide manufacturers through the preselection process. UL 746C is the de facto industry standard to provide application guidance of the use of preselection data.

Taking advantage of a valuable tool

Preselection is a valuable tool for both product designers and component suppliers. Plastic materials that demonstrate an acceptable performance when subjected to the small-scale preselection tests should behave favorably when subjected to end product testing in the product application.

The use of preselection test data can reduce the time and costs associated with final end product testing and, consequently, the time to market for end product and component manufacturers.

Summary

This paper provides manufacturers with the background to help them make informed decisions concerning their safety compliance efforts. For more information on this subject, visit www.ul.com/plastics or contact UL at **1-877-854-3577**.

No matter what stage your company is in on its journey to safety compliance, UL will help you identify and implement the smartest, most efficient and effective solution based specifically on your company's needs. With a proven track record in product compliance developed over more than 110 years, UL is a respected third-party source to help manufacturers achieve total market access.

This is an introductory paper on materials preselection. This paper is intended for background information and discussion only.

This paper should not be relied upon for any purpose other than to gain an overview of this subject area. It is not legal advice and should not be treated as such. If you require specific advice on the subject, you should consult your legal advisors and relevant authorities in your operating jurisdictions.