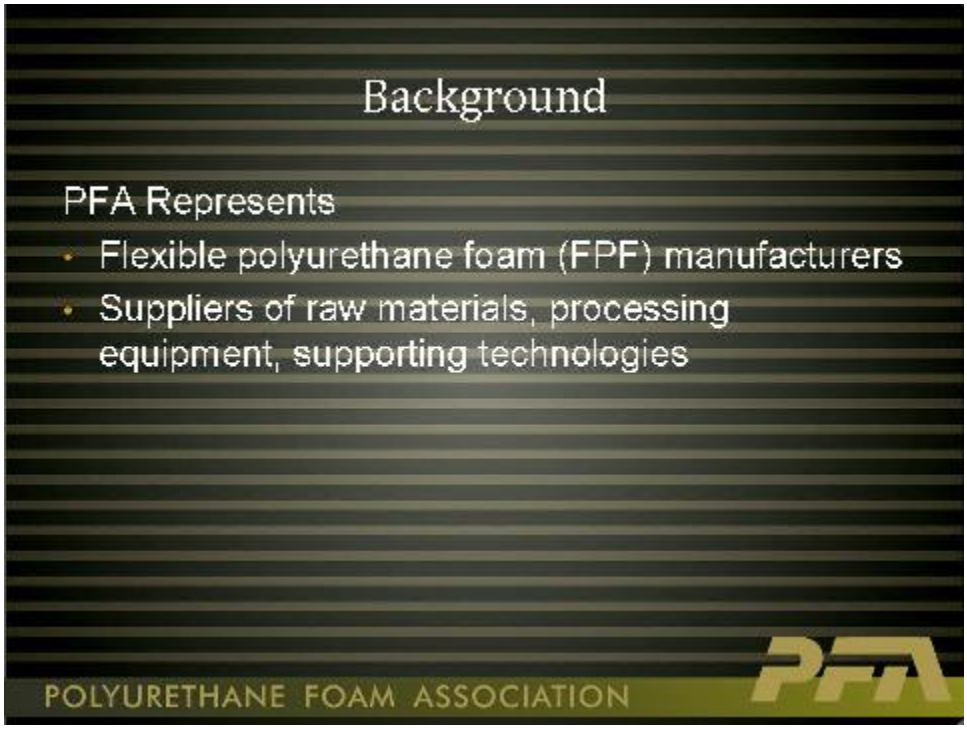
UL Conference Atlanta May 21 – 22, 2014
Polyurethane Foam Association presentation

Thank you to UL and the organizing staff for inviting me to speak today so that I can share the Polyurethane Foam Association's point of view on the subject of managing furniture flammability in a science-based manner. First a little bit of background about our organization.



The Polyurethane Foam Association was founded in 1980 and represents manufacturers of flexible polyurethane foam primarily in North America along with suppliers of chemical raw materials, processing equipment and supporting technologies. PFA is focused on providing accurate information regarding the general performance of foam products in common applications such as its use as filling material in upholstered furniture.

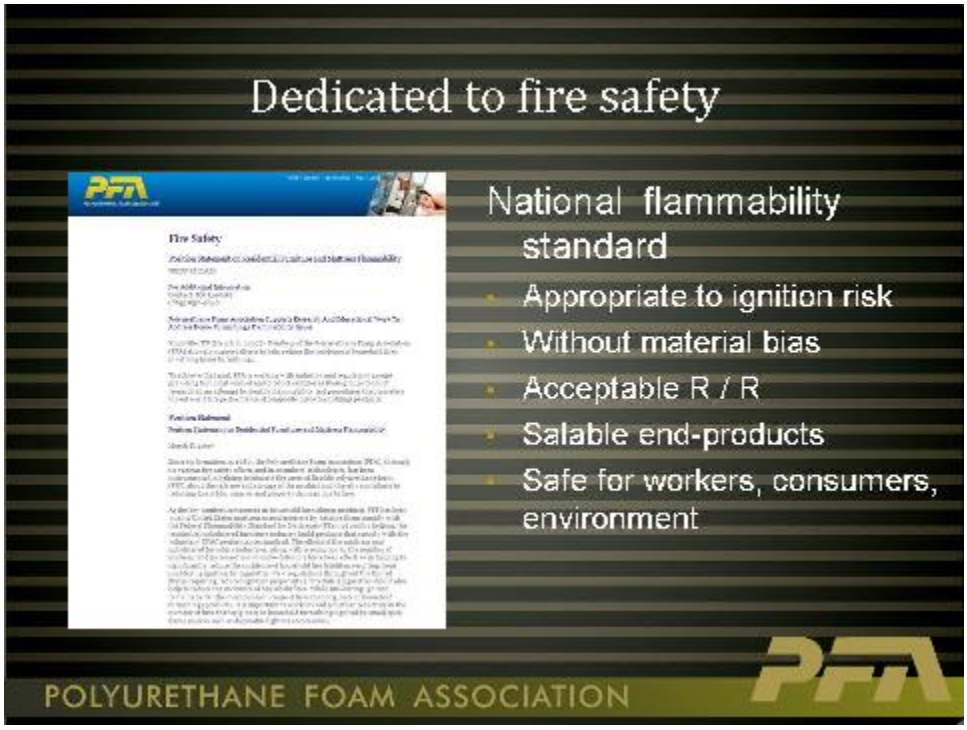
PFA was founded with the purpose of addressing questions about foam ignition and combustion characteristics. Like all carbon-based materials such as cotton, latex foam rubber, and natural and synthetic fiber materials used in cushion fill applications, flexible polyurethane foam, provides a porous relatively large surface area that can provide fuel and sufficient access to oxygen to support vigorous combustion once ignited.

But, unlike many other filling materials, flexible polyurethane foam (that I will refer to as FPF) is a polymer product having the ability to perform comparatively well with moderate radiant heat ignition sources such as exposure to a smoldering cigarette. FPF tends to shrink and retreat from a smoldering source, removing potential fuel that is required for ignition. This important performance property provided the basis for wide use of FPF in the early days as the top layer of cushioning in innerspring mattress construction. FPF quickly became and remains the preferred material used to achieve compliance with 16 CFR 1632, the federal mattress smolder ignition standard, in place since 1972 and still in effect today. And, it is noted that FPF can perform well in many smolder ignition situations without the need for flame retardant additives.

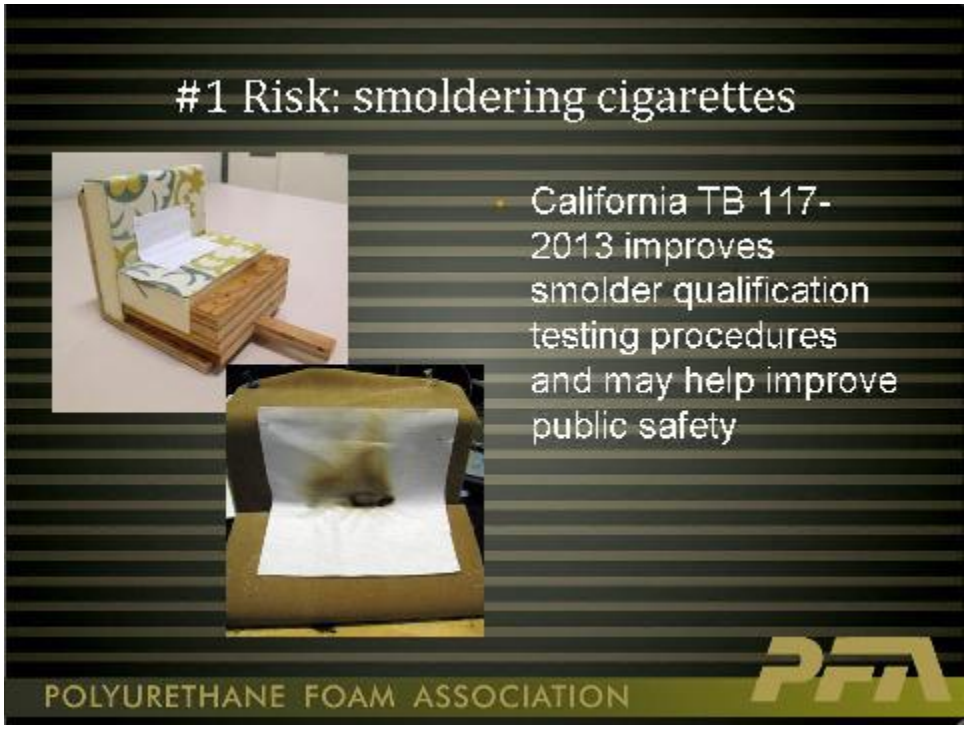
In addition to providing a level of smolder ignition resistance, FPF also provides durable resilience and compression recovery characteristics combined with favorable economics. As a result, FPF gained acceptance within the upholstered furniture industry as the filling material of choice, initially for use in seat cushions, back cushions and upholstered arm wrap. Today, with changes in market conditions, FPF is typically found as the primary component in seat cushion construction , but not used often in back cushions or arm wraps.

In addition to favorable comfort performance, FPF also offered the advantage of being relatively easy to combustion modify. Historic PFA materials proclaimed that FPF could be combustion modified to meet existing furniture flammability standards. This was dependent on the use of flame retardant additives of various types and concentrations depending on the flammability performance requirements. Acceptance for FPF products was broad and enthusiastic. There was little attention given to the characteristics of specific FR components, and manufacturing combustion modified foam products that complied with California TB 117 and other flammability performance specifications became routine.

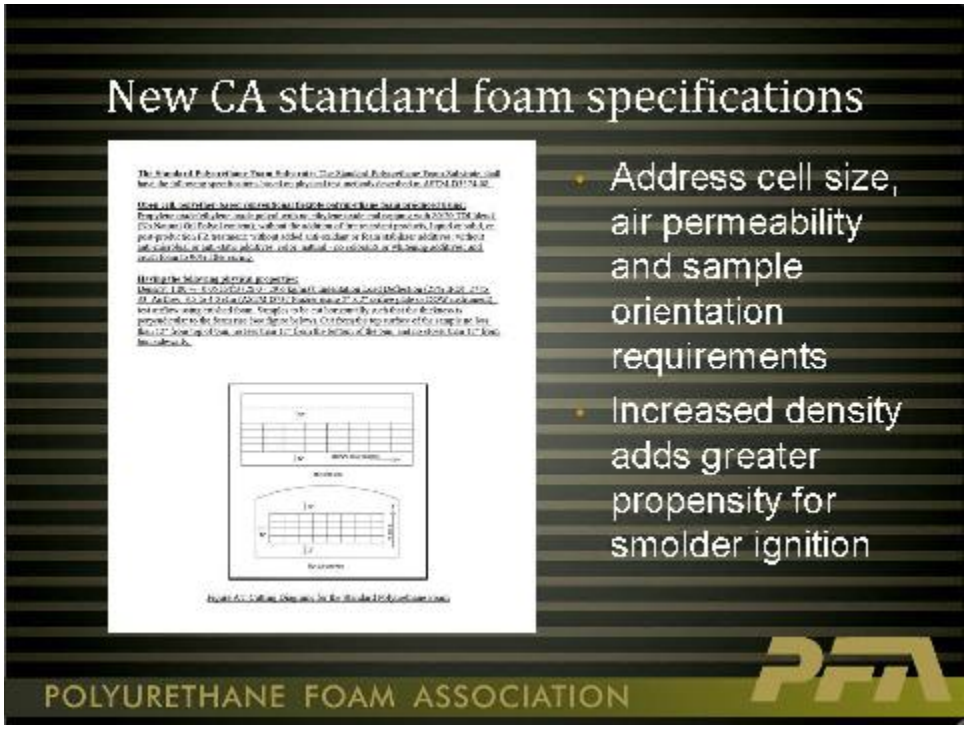
That was then, and now we are here -- discussing ways to make furniture that can provide adequate safeguard from the risk of ignition without the use of flame retardant additives. Whether decisions about the use of flame retardants are science-based, politically-based or emotionally influenced can be the subject of other presentations. My focus is on how to address furniture flammability questions based on the real-world that, for now, does not favor the use of FR additives.



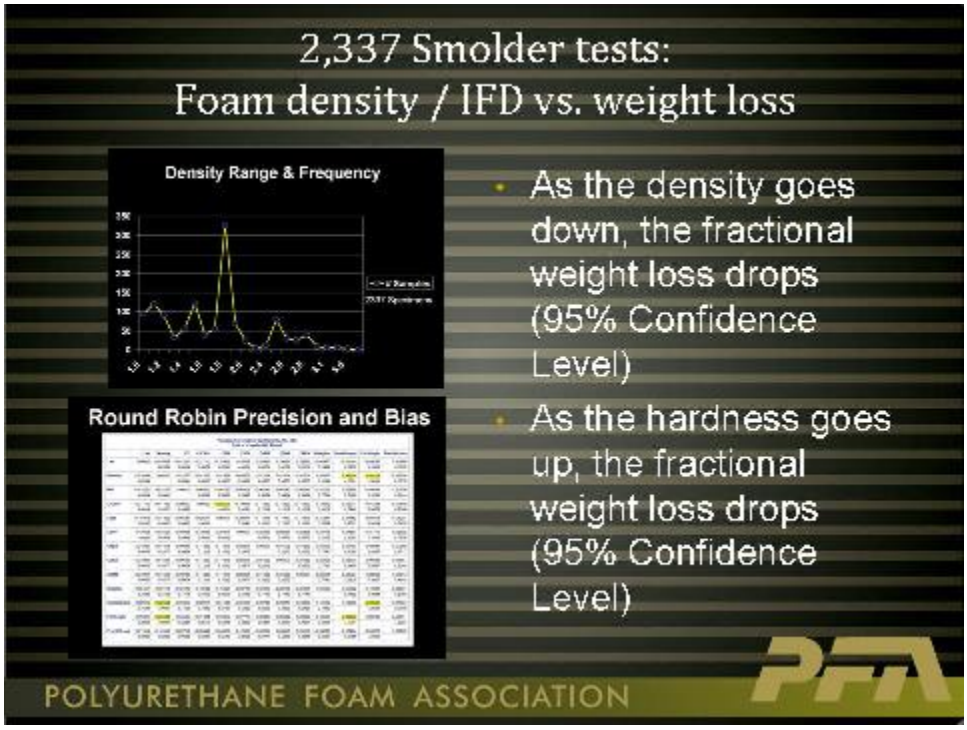
Here, in the real world, members of the PFA, and I suspect all home furnishings industry stakeholders are dedicated to provide products that are safe for intended use. PFA is on record in support of development of a national furniture flammability standard that will be appropriate to the real risk of ignition, based on a test method that is performance based without bias toward any component or material. The test method must be measurable with acceptable reproducibility and repeatability. With resulting compliant products that are salable and safe for workers, consumers and the environment.



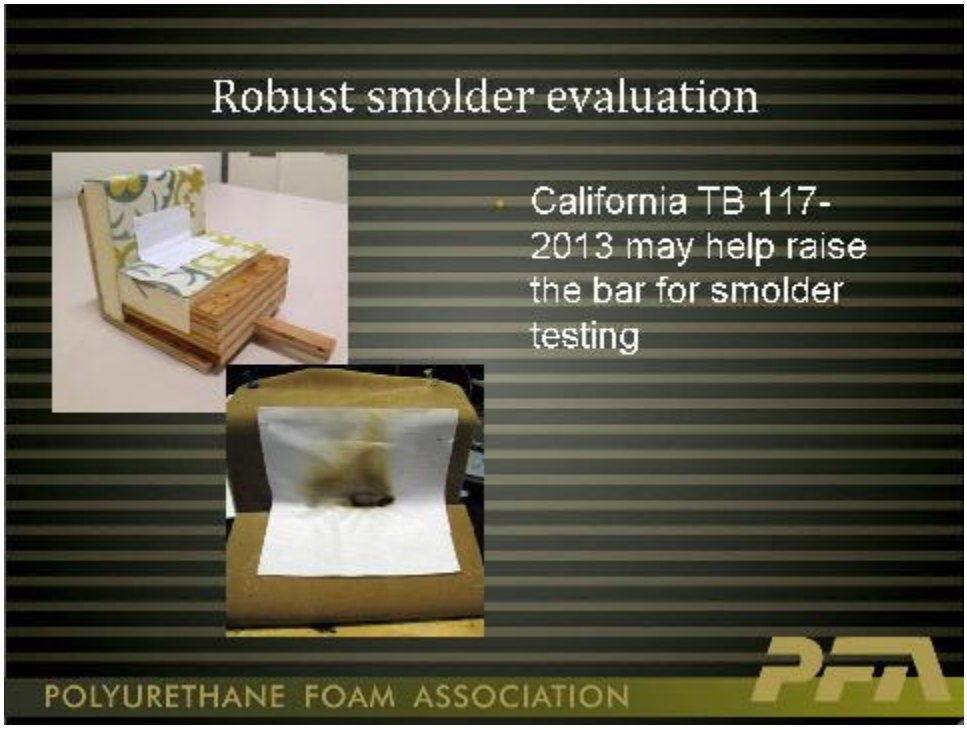
In this regard, PFA recognizes that, over the years, fire incidence statistics clearly and consistently identify smolder ignition sources – specifically smoldering cigarettes – as by far, the dominant cause of household fires involving upholstered furniture. And so, when the State of California began work to update its Technical Bulletin 117, PFA was glad to respond to Bureau requests to contribute science-based suggestions to help improve its existing smolder ignition test method. The main contribution was a set of specifications for standard testing foam that could serve the need for product consistency and for a test material that might help raise the bar for smolder ignition evaluations.



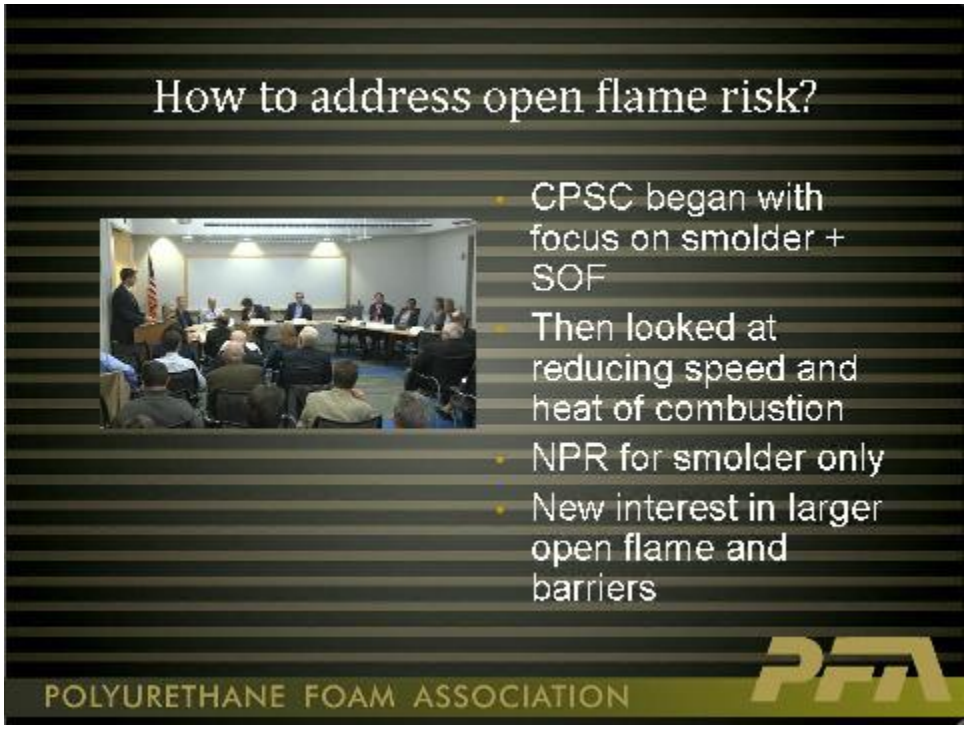
PFA recommendations reflect much of the work published recently by NIST regarding developing a standard foam for flammability testing. By noting requirements for air permeability, cell orientation through machine direction and consistency in selecting positions for sample cutting from the production bun, the PFA-developed specifications address interests in obtaining similar cell structure and configuration from lot to lot. This is important in obtaining consistent test performance.



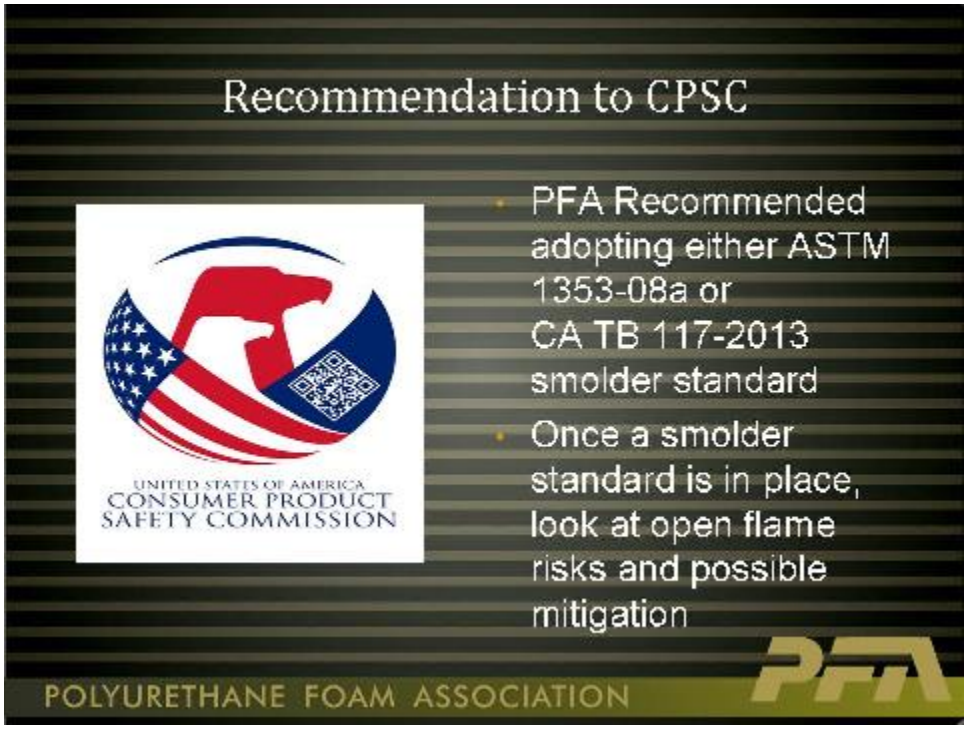
We also considered the effect of foam sample density on smolder ignition performance. While ASTM E1353-08a specifies use of foam with a density range of 1.3 to 1.6, PFA used data collected from more than 2,000 round robin smolder tests to determine that the propensity for percent weight loss from exposure to a smoldering cigarette grew as the foam specimen density increased. Our recommendation to the Bureau to increase the standard testing foam density to 1.8 reflected the results of this research. The new standard foam, as specified in TB 117-2013, is now being commercially produced and is beginning to enter the test material distribution channel.



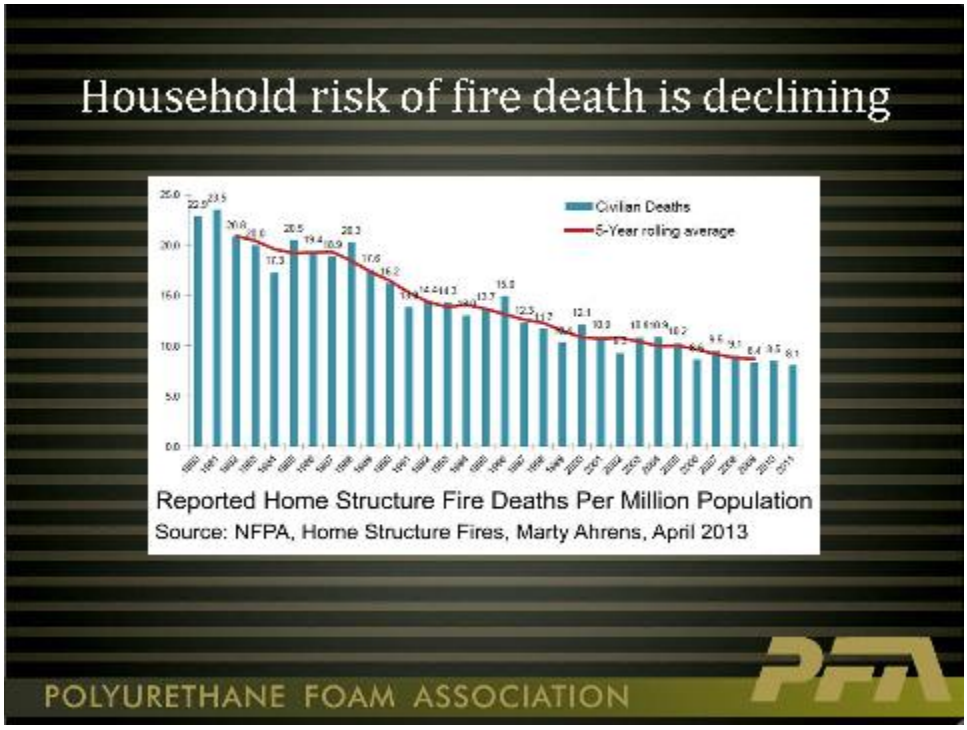
Based on PFA's original research that supports the 1.8 density specification and the Bureau's new 45-minute testing requirement, we believe that the new California TB117-2013 smolder test method provides a more robust evaluation of smolder ignition potential than the previous test method. A number of borderline upholstering fabrics that may have passed the previous test may now require the addition of a qualified smolder barrier to be in compliance with the new California standard. While there are still "bugs" to be addressed within the TB 117-2013 test procedures, this new smolder standard is a positive step in the right direction and PFA believes that the new standard addresses the vast majority of risk of furniture ignition – caused by smoldering cigarettes.



That said, the question of open flame remains. And this is a big question that the CPSC has been working on for many years. The CPSC began efforts with a focus on both ignitions by smolder and small open flame. Then, the emphasis shifted toward interest in reducing the speed and heat of combustion. An NPR was issued addressing smolder only. And, now, there is new interest in larger open flame ignition sources and possible mitigation through use of barriers.

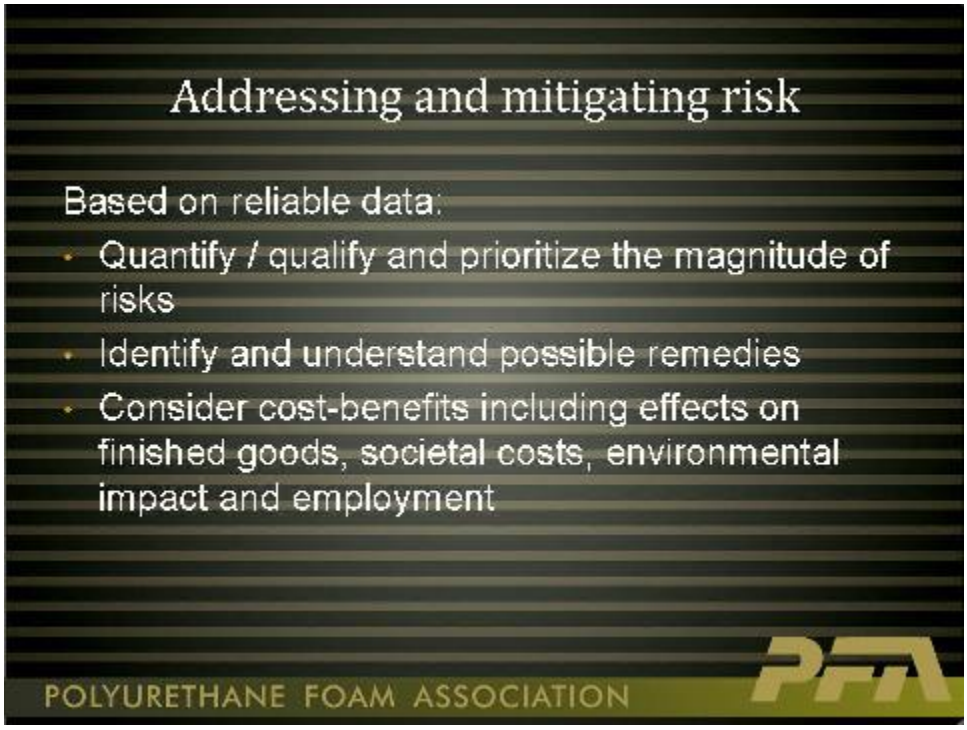


PFA recently met with CPSC commissioners and recommended that since two smolder performance test methods are available and have wide use, either the new California test method or ASTM-1353-08a could be adopted as a national standard. This would address the need for smolder ignition resistance that is by far the most prevalent cause of household fires that begin with upholstered furniture. We suggested that development of an additional open flame performance standard requires a better understanding of the addressable risks and methods for possible mitigation.



This NFPA summary chart and CPSCs Residential Fire Loss reports indicate that the numbers for deaths and injuries attributed to smolder ignition of upholstered furniture from ignition by smoking materials have been trending down along with fewer smokers in the population, greater use of smoke detectors and the advent of reduced ignition propensity cigarettes. Yet, smolder still represents the great majority of household fire risk involving furniture. Small open flame caused ignitions have been more consistent over the years and on the surface have not shown to be declining at the same rate. Joe Ziolkowski of UFAC shared an interesting perspective comparing the incidence of small open flame ignitions to an increase in the number households and quantity of home furnishings that may indicate a steady decline in small open flame ignitions that is similar to the reported decline in smoldering ignition fires.

There are now new suggestions that the open flame risk is much more than can be attributed to small flame sources such as lighters, candles and matches. But, there are not data to support identification of the characteristics of such potentially hotter ignition sources. If we reach beyond small open flame to an ignition source that could range from a burning crumpled newspaper, to a large pile of household trash, to ignited window or wall coverings, or even fire spread from another room, there is no way to estimate the ignition hazard from so many possible heat sources. This wide range of possible hazards is hard to consistently identify in fire investigations and a confidence interval for resulting fire incidence data has not been established.



As a result, PFA recommended to CPSC that before beginning work to develop a robust open flame test method a series of procedures should be completed.

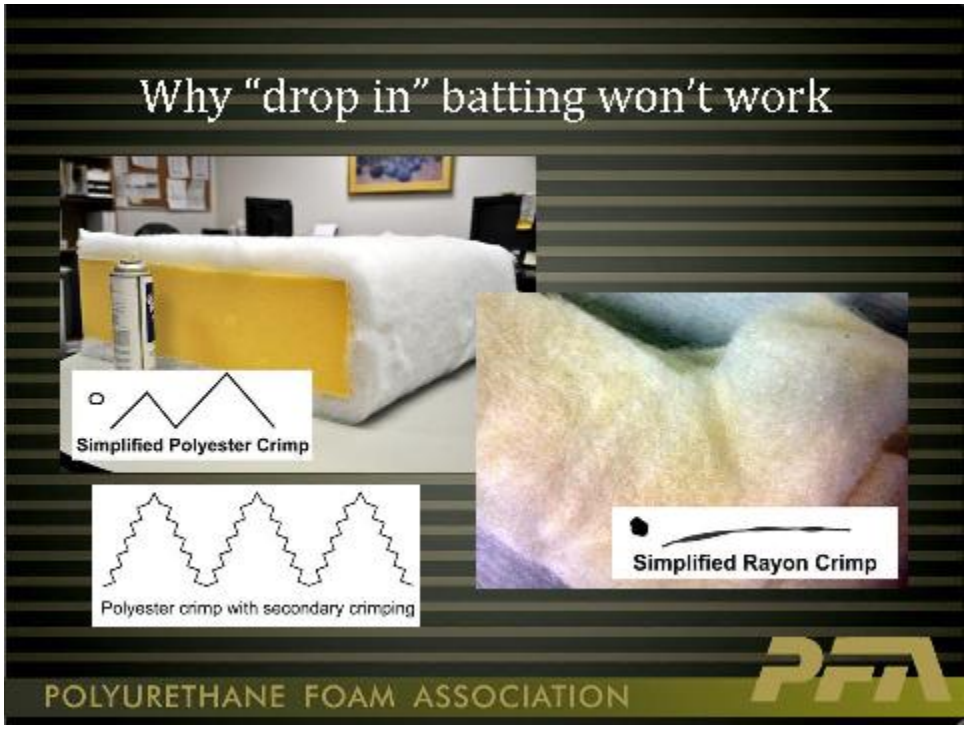
1) Qualify and prioritize the magnitude of the possible risks – based on reliable data with an acceptable confidence interval.
2) Identify and understand the effectiveness of possible ways to remedy high-priority addressable risks – I am not aware of any one-step, catch all method to handle all possible open flame insults short of concrete furniture
3) Consider the costs of mediating high-priority open flame risks. This necessitates a thorough cost-benefit analysis that takes into account all manufacturing costs and estimates the effects on finished goods pricing, as well as societal costs including environmental considerations and impacts on domestic employment, balanced with estimates of the mitigation value – and it must address whether possible solutions provide total protection or partial protection for whom, how, when and where.

Considering the fact that just addressing the risk of small open flame ignition without the use of flame retardants has become much a more challenging project than where it began,

the idea of going far beyond small open flame and finding an effective solution to protect against many types of large open flame ignitions is less probable.

If reliable data become available and show a need for a large open flame standard, then this should be pursued. It is the right thing to do. How to do it remains a dilemma. Based on current technology, it is not likely to come from a barrier solution.

There has been much discussion about applying barrier wrap products as used in the mattress industry as a drop-in solution in furniture. Mattress batting barriers are often blends of rayon and inherently combustion resistant modacrylic fibers. This type of fiber wrap has been suggested as a swap out for polyester fiber that is currently used to encase foam cores in seat cushion construction. This won't work in furniture and here's why.

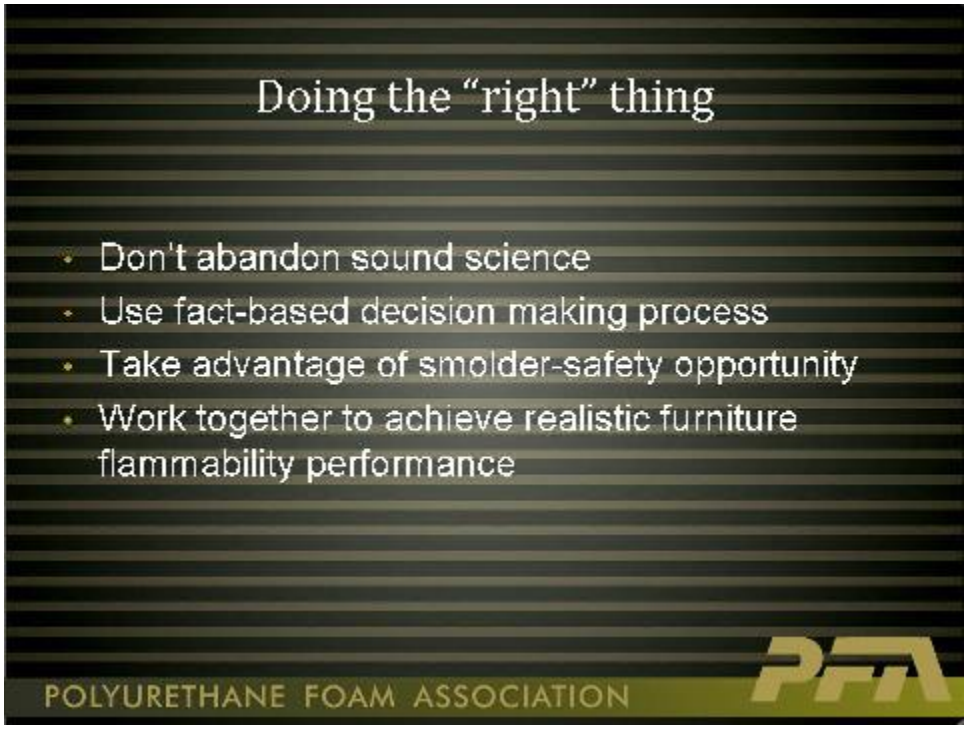


Because of the thickness of polyester fiber wraps used in seat cushions – typically ¾ inch to more than 2 inches – it is critical that the fiber wrap maintain resiliency, loft and resist compacting that would cause unacceptable thickness loss and result in a loose cushion cover and a real "ugly" situation. Polyester fibers respond well to heat set and accept a crimp that looks something like this sketch. Crimp allows individual polyester fibers to become entangled and this configuration helps the batting to retain resiliency, loft and height even after numerous compressions. Rayon, on the other hand, does not accept crimp as well. Without a lot of crimp, fibers do not remain entangled in the same manner.

This is not such a big problem in mattress applications because, by comparison with a furniture cushion wrap, a typical mattress barrier is very thin. If a thin mattress barrier compresses and flattens out, not much overall mattress thickness is lost. Not so with a 2-inch thick wrap on the top and bottom of a seat cushion.

Regarding use of woven, needle-punch or knit barrier fabrics, the issues are related to materials costs and cut-and-sew and labor for assembly. There are a multitude of furniture frame designs, shapes and sizes. Each unique stock keeping unit requires a cover fabric pattern and also would need a barrier pattern cut to specific product requirements. Then there is sewing, the possible addition of a zipper, and fitting and upholstering requirements for cushions, backs, arms and possibly an apron. This takes labor that costs money, effectively doubling the cost of labor without even considering the added cost of materials.

This slide demonstrates that the US upholstered furniture industry is rapidly losing presence in this country. Based on Department of Commerce U.S. Customs value declarations, more than 25% of upholstered furniture sold in the US is now being imported from Chinese manufacturing locations. It is all about the cost of labor. Any change in furniture construction must be sensitive to this threat to American jobs. The potential to offshore the remaining U.S. upholstered furniture industry must be taken into account in cost-benefit analysis Let's not displace any more American jobs.



In summary, PFA supports doing the right thing, based on sound science, and a rational fact-based decision-making process. There is much to be done to identify and address the possible need for an open flame performance standard. However, there are test methods and solutions available right now to address smoldering ignition. They may not be the perfect solutions, but they are clear steps in the right direction and fire safety progress can be achieved without much additional work, if we can agree to do so. I urge you to please consider the benefits and potential for saving lives and reducing losses that are available right now. Please support the effort to mitigate the risk of smolder ignition, now. Then we can work together to learn more about the more complex open flame ignition issue.

Thank you very much for your time and attention.