GREEN FR COTTON BARRIER NONWOVENS: A PROGRESS REPORT

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Abstract

This green barrier fabric is unique in sense that it is from a renewable resource, biodegradable, economical, employing greige (unbleached) cotton, thus, increasing its marketability.

The recent open-flame standard (effective since July, 2007) for residential mattresses 16 CFR 1633 from CPSC has lead to new approaches for protecting polyurethane foam from fire. One approach is to employ fire barrier material in the manufacture of mattresses. The barrier material may be either inherently non-flammable (such as Kevlar) or flame retardant (FR) treated flammable material (such as FR treated greige cotton fiber).

The fire barrier material is designed to protect and prevent ignition of the major cushioning component of the mattresses and thereby prevent a self-propagating fire from occurring. Limiting fire involvement of the major cushioning component will significantly restrict fire growth. This is a practical and economical approach to prevent fires as compared to producing mattresses with FR fibers or with FR treated polyurethane foam. Lightweight (approximately 200 g/m^2) and heavy weight (approximately 350 g/m^2) FR nonwovens can be used as fire barrier fabrics for mattresses.

Cotton is readily flammable and requires chemical modification to be flame resistant for the development of safe and high volume uses. Regulatory guidelines in the interest of worker and environmental safety suggest that new reagents that provide flame resistance to cotton must be effective, non-toxic, and should become innocuous upon reaction with cotton. While the threshold temperatures for the breakdown of cotton, its chemical treatments, and treated fibers and fabrics are important for processing, volatile byproducts generated during the degradation of treated cotton products should be innocuous.

At SRRC, we have created non-durable phosphate based formulations. In this presentation, preliminary test results of the FR cotton barrier nonwoven fabrics will be discussed.

A commercially available FR chemical that has been widely used and accepted for producing FR barrier fabrics to meet the new CFR 1633 was acquired. This chemical is phosphate-based free of halogens and is a proven FR chemical on materials other than greige cotton. The chemical produces a non-durable FR that creates a highly insulating char barrier for a range of fibers and constructions. At SRRC we used it on greige cotton. The performance of SRRC formulation is comparable to the compliant chemical.

Deaths and Injuries Reduced from Mattress Fires

The recent national fire loss estimates that mattresses and bedding were the first items to ignite in 15,300 residential fires attended by fire service annually during 1999-2002. These fires resulted in 350 deaths, 1,750 injuries and $295.0 million in property loss annually (http://edocket.access.gpo.gov/2006/pdf/06-2206.pdf). CPSC fire statistics showed that from 1994 to 1998, over three-quarters of the deaths relating to bedding fires ignited from open flame

sources such as matches, lighters and candles (Damant, G., Flammability . . . The issue Heats Up, Part 1, BEDtimes, p. 53-60, September 2000). Effective July 1, 2007, the new 16 CFR Part 1633 open flame (using a pair of T-shaped gas burners) standard is designed to minimize/delay flash. The compliant mattress would burn slowly and the flashover would not occur in 30 minutes permitting occupants to escape safely. Limiting the intensity of a mattress fire is estimated to save 270 lives each year and prevent as many as 1,330 injuries each year (www.CPSC.gov).