

## **Determination of degradation potential for VLAD fibers**

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The VLAD (Vehicle Lightweight Arresting Device) can be rapidly deployed to stop a variety of different classes of wheeled vehicles. The device is equipped with a net made of tar impregnated, braided Dyneema fibers and barbed spikes. The spikes penetrate the vehicle tires and the netting wraps around the vehicle axle, forcing the vehicle to stop.

In this study mechanical property measurements were performed on Dyneema which is an ultra high molecular weight polyethylene (UHMWPE) fiber. The material is 10 times stronger than steel by weight, and similar to Kevlar. It is also used in bullet proof vests, trawling and fishing lines in various configurations. Test methods used to evaluate Dyneema range from evaluation of a single strand (20 microns in diameter) to evaluation of bulk properties of the braided strands.

Special precautions must be taken during mechanical property testing to avoid forces which cleave the UHMWPE molecules. The molecules of polyethylene are 100 times stronger in the longitudinal direction (axial) than in the radial direction (perpendicular to the axis). This makes the mechanical property testing difficult since grips tend to cleave the molecule in a radial direction unless they are designed properly.

The testing was done in order to provide data on the potential for mechanical property degradation of Dyneema due to exposure to common chemicals found in and around vehicles including motor oil, power steering fluid, brake fluid, antifreeze, diesel fuel, automatic transmission oil, and a combination of all the fluids.

Statistical results indicated affects due to diesel fuel, oil, and all the fluids combined. Additional test results for the tar impregnated braided Dyneema fibers (i.e., actual braid used in VLAD) are also discussed.

Key words: VLAD, ultra high molecular weight polyethylene, Young's Modulus, chemical resistance, degradation.