



Can you imagine shipping a 70 lb. windshield to a customer protected by a cardboard box and cornstarch? *Cornstarch??* Not only did the Packaging and Logistics Department at Volvo Parts North America (VPNA) imagine it, they successfully switched all of their glass packaging from fossil fuel-based packaging materials to cornstarch-based Green Cell Foam. As you will see as you read this story, it's a real win for Volvo, our customers and the environment.

The search for a better way started in March 2004 when Volvo's current President and CEO, Leif Johansson, announced his vision for The Volvo Group as the industry leader in environmental practices. Responding to this call, the packaging engineers at VPNA launched its initiative to contribute to this mission.

The first target was to find environmentally friendly materials to replace fossil fuel-based materials without losing performance and increasing costs. This search led them to KTM Industries in Lansing, Michigan, a company started by Michigan State University professors that developed new materials made from corn.

VPNA's engineers met with KTM personnel to learn more of Green Cell Foam and to determine whether it would be acceptable as a replacement for the combination of expanded polyethylene and polystyrene foams used in the current glass packaging. Glass pieces are susceptible to breakage during shipment, thereby requiring shock and vibration protection. Green Cell Foam's abilities to absorb multiple shocks made it a strong candidate as a replacement material.

Substituting Green Cell Foam for traditional foams such as expanded polyethylene, polyurethane and polystyrene demands a departure from traditional thinking. The challenge for VPNA: redesign the packaging for over 300 pieces of glass that have large variances in size, weight and curvature. After experimenting with Green Cell Foam, Volvo engineers believed they could effectively redesign the original packaging and even eliminate some of the foam. In considering the redesign for each pack, the approach was to meet three important criteria:

1. Performance – the pack must protect the contents
2. Operations – the pack must be easily integrated into the packout operation
3. Cost – the overall cost of the pack must be similar or less than the current packs

By working with KTM, VPNA engineers developed a number of key pieces that would protect most of the glass. This would reduce inventory and create efficiencies in the packout operation. The larger and more difficult glass would require custom packs to provide the necessary protection. By comparing Green Cell's technical information with the current materials, KTM and

VPNA engineers believed that an effective package design could be developed in conjunction with this guide.

The main drive for change in packaging materials was to reduce the environmental footprint, as per Volvo's corporate policy. We used life cycle assessment tools to quantify the ecologic effects of Volvo's change from the original EPE/EPS packs (equal to 300,000 bdft of material) to the new Green Cell Foam packs (equal to 270,000 bdft of material). The results, shown on the following table, were quite dramatic:



<u>Materials</u>	<u>GHG Emissions (Mt)</u>	<u>Energy Reqs (Mj)</u>
EPE/EPS Foams	45.02	1,662,500
Green Cell Foams	8.85	248,777

In a single calendar year, the direct effects of the change in materials was a reduction in greenhouse gas emissions by 36.17 metric tons and a reduction in energy consumption by over 1.4 million megajoules, which equates to the energy produced by burning 60.3 metric tons of coal. (US Department of Energy, Energy Information Agency)



In January 2007, VPNA started affixing a sticker announcing the contents as "biodegradable and recyclable" to each glass pack prior to shipment. The reaction from customers has been, as you would expect, favorable, with most customers expressing satisfaction with the packaging and the improved environmental impacts.

An important metric to determine the effectiveness of the change is to review the number of damage claims submitted from VPNA's customers. And while we won't know the complete effect until 2009, as there were EPS/EPE packs in inventory at the end of 2008, the reports showed a damage ratio of 1.43% - significantly better than the industry standard. VPNA and KTM are targeting a further reduction in claims in 2009 to 1.25%.

In March 2008, VPNA and KTM engineers decided to raise the level of sophistication for glass packs by submitting them to rigorous ISTA 3A testing protocols. Elevating the packs to ISTA 3A approved status would demonstrate a higher level of service to VPNA's customers by holding the freight companies accountable for the costs associated with damage from poor handling during transit. The real question was whether the new packs could meet this lofty goal.



The ISTA 3A testing was conducted over a 14 month timeframe and confirmed that most of the original designs were safe and effective, passing the test procedures. Some packs, though, showed susceptibility to damage, particularly the larger, heavier packs. Several packs required redesigns –



and, sometimes, multiple redesigns. It was with great celebration that after several months of testing, all VPNA glass packs are now ISTA 3A certified. With this certification, VPNA is transitioning the glass packaging of two other Volvo Construction Divisions to Green Cell Foam which began in March 2009.

The Packaging and Logistics team at VPNA are very proud of this accomplishment and the contribution to Mr. Johansson's goal of a better, cleaner Volvo. We encourage our global counterparts to look at these novel materials and designs for their operations and will continue to look for other ways to improve the environment for the world.