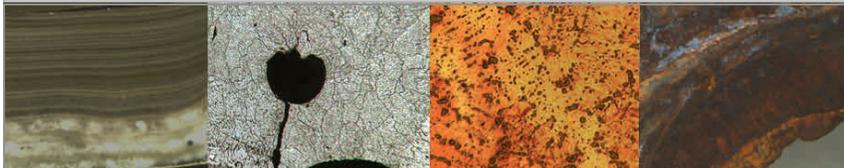


# NU S & B L S



New Hampshire  
**MATERIALS**  
LABORATORY, INC.  
*Your Problem Solving Partner*

PVC vs. RECYCLABLE PLASTICS

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## Welcome to New Hampshire Materials Laboratory

Polyvinyl Chloride, or more commonly known as PVC, is amongst the least recycled plastics within the United States. The EPA calculates that of the approximately 910,000 tons of PVC waste generated annually, less than one quarter of 1% is recoverable for recycling. As a result, researchers have been seeking to engineer into “next generation” products, the characteristics of 100% recyclability.

In this month’s issue of the Nuts & Bolts "PVC vs. Recyclable Plastics", the characteristics of PVC plastic and how it is currently not recyclable, along with the current advancements engineers have found to develop a 100% recyclable material is discussed.

Tim Kenney  
Laboratory Director

## PVC vs. Recyclable Plastics

by Jeff Masse

PVC’s list of uses is endless as it is one of the most widely used plastics in this day and age. It is found in numerous consumer, construction, and manufacturing products such as: bottles, credit cards, cling wrap film, various types of packaging, flooring, pipes, wallpaper and the list goes on. PVC products are difficult to recycle primarily due to the chemical manipulation during production which PVC experiences in order to make it usable in applications as diverse as household fabrics to outdoor banners or construction piping. The type of additives used and PVC’s inherent chlorine content,



Example PVC cling wrap

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Example of PVC mats

greatly complicates the recycling processes for the many different forms of this plastic resulting in much of the product ending up in landfills. However, with the production of PVC, toxic chemicals such as dioxin are created and released into the environment during the use and disposal of the material when burned or buried. Burning the material can create and release even more dioxins and compounds containing chlorine. Thus, PVC is currently very difficult to recycle and the need for an alternative grows greatly.

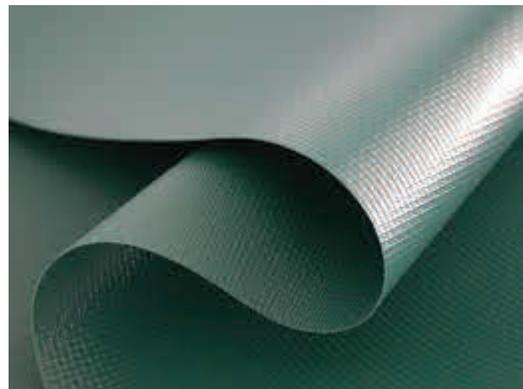
There are companies specializing in the manufacturing of PVC products that have found a way to engineer a 100% recyclable material, therefore making it superior to the standard PVC material. In the following case study, a manufacturer's 100% recyclable material is almost ready for production, however, there are still a few kinks to work out.

## Case Study

### The Problem:

Company claims that their PVC alternative product, in this example we will use banners and signage, is composed of 100% recyclable materials. The product that is manufactured is also composed of a durable Polyethylene weave which is overlaid with a special printable "skin" composed of thin polymer layers engineered to provide a high quality printable surface. During the extrusion process, the company found defects appearing on the final product in which a "bare spot" appeared to have no surface skin laid down and the underlying polyethylene weave was visible. Additionally, there were round, hard defect lumps in various parts of the finished product.

Example of PVC Banner Material



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### **How NHML found the problem:**

The company provided NHML with the defective product and the polymer pellets used within their extrusion process. NHML first took a spectrum from one of the largest hard polymer lump defects, as well as individual spectra of each of the polymer pellet samples. This determined the approximate polymer composition of the mysterious lumps when compared to the spectra of the individual polymer pellet samples. With the careful comparison of these spectra, we found that the hard lump was composed mainly of one of the polymer pellet samples.

Somehow, within the extrusion process, the other polymers were not being co-extruded thus causing the “bare spot” defects.



Example Polymer Pellets

### **Conclusion:**

Since these polymers were clear, differentiating them through microscopy was impossible. Therefore, a polymer “fingerprinting” technique was needed in order to differentiate between the polymers used within the product. By using FTIR Spectroscopy, we were able to find out that the single polymer, that the lumps consisted of, did not have the extrusion properties and characteristic of all the polymers put together. This is exactly the strength of FTIR Spectroscopy. We were then able to conclude that the approximate makeup of the non-extrudable lump consisted of mostly one polymer thus steering them towards a solution to the root of their problem.

