

Silgan Plastics HDPE PCR Update

- Silgan produces bottles with up to 100% HDPE PCR in a monolayer application and can create virtually any HDPE PCR concentration through our mono, bi-, and tri-layer options
- Silgan currently sources HDPE PCR from three qualified sources
- No food grade HDPE PCR currently exists in the market
 - Envision Plastics hopes to have a food grade HDPE PCR commercially available by mid-2008
- Samples are available from the Port Clinton sample room with HDPE PCR resin in the percentages tested below



HDPE PCR Test Results

- Tested five different loadings of HDPE PCR in varying layer configurations against control bottles of white and natural virgin HDPE

| <u>% of HDPE PCR</u> | <u>Layer Configuration</u> | <u>Color</u> |
|----------------------|----------------------------|--------------|
| 0% PCR – Control | Tri-Layer (20/70/10) | White |
| 0% PCR – Control | Monolayer | Natural |
| 50% PCR | Monolayer - Blended | Natural |
| 59% PCR | Tri-Layer (20/70/10) | White |
| 73% PCR | Bi-Layer (20/80) | White |
| 97% PCR | Monolayer – Blended | White |
| 100% PCR | Monolayer – Blended | Natural |

- Test Bottle— 16 oz Lexington Round (Bottle Code 79175)
- Top Load—As the amount of PCR increased, the top load also increased due to the higher density of PCR, which mainly comes from homopolymer HDPE found in milk and water jugs.
- Drop Impact— PCR loading did not significantly affect drop impact performance with all bottles passing a 9 foot drop test. The lowest mean failure rate was 10.70 feet.
- ESCR (Environmental Stress Crack Resistance)— As the percentage of PCR increased, more bottles began to fail ESCR testing. The highest rate of failure was noted among the bottles with 73% PCR and above. Testing shows that bottles with more than 59% PCR result in a 90% ESCR failure rate. However, no ESCR failures were noted with bottles at or below 59% PCR.
- Color/Appearance
 - As the percentage of PCR increased in both the white and natural samples, the bottles became darker, greener and more yellow compared to virgin HDPE bottles in both white and natural. Obvious imperfections were noticeable on the 100% PCR bottles and may be visible on any monolayer blended PCR bottle.
- Dimensions— PCR did not significantly affect bottle dimensions.

Test results will vary depending on bottle design. Customer specific testing is highly recommended