

ARPRO[®]

Expanded Polypropylene (EPP) Foam

UV Exposure Testing

Sewer Ring Program
Black EPP; 120 g/l

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Summary

The following is a summary report of the evaluation of the Sewer Ring application utilizing Black ARPRO® Expanded Polypropylene (EPP) at a molded density of 120 g/l (7.5 pcf).

Properties evaluated are:

- UV Resistance. Tested in accordance to SAE J1885 with 720 hour accelerated exposure using a Xenon Weatherometer.
 - a. Pre and Post test compression strength
 - b. Pre and Post test tensile strength

Results

UV Resistance & Visual Examination

UV Resistance was tested in accordance with the industry standard SAE J1885, which consists of the accelerated weatherometer test. This test subjects the samples to simulated accelerated solar radiation as well as accelerated temperature and humidity conditions. The samples were exposed for a total time of 720 hours (30 days).

It is generally accepted that 30 days of accelerated aging is equivalent to 1 year of direct outdoor exposure at a location equivalent to Florida (Hot/Humid) for most plastics.

After the aging, a Color Eye was used to record differences in the level of color which reflects a change from Pre-test to Post-test. Measurements were taken at 180, 360 and 720 hours (3 months, 6 months and 12 months equivalent exposure, respectively). The numbers (Post-test) are recorded below. Densities at 30, 82 and 120 g/l were tested for comparison purposes. The results are show below in Figure 1:

Figure 1

| Density (g/l) | Delta E (ΔE) Color Eye Measurement; Post-Test | | |
|---------------|---|----------|-----------|
| | 3 Months | 6 Months | 12 Months |
| 30 | 0.35 | 2.91 | 4.93 |
| 82 | 0.23 | 2.16 | 4.37 |
| 120 | 0.24 | 1.92 | 3.82 |

As is evident from the results above, the 12 month equivalent aging result for 120 g/l Black EPP indicated a ΔE of 3.82. A picture the Pre-test and Post-test samples are shown below for comparison. It should be noted that industry standards indicate that a ΔE result >2.5 is the typical threshold of visible differences noted by the human eye. As can be see from the pictures below in Figure 2, some difference is noted, however, the surface of the material exhibits only minor 'chalking' and the material properties are not affected.

Figure 2

Pre-Test UV
Aged Samples

Post-Test UV
Aged Samples
(12 months)



Pre and Post Test Property Comparison

Compression strength and tensile strength measurements were made prior to UV resistance testing and upon completion of the UV resistance testing. The results are show below in Figure 3:

Figure 3

| Physical Property | Units | Pre-test | Post-Test | Change | |
|----------------------|-------|----------|-----------|--------|--------|
| Density | g/l | 7.61 | 7.66 | 0.66% | |
| Compression Strength | 10% | MPa | 0.807 | 0.803 | -0.50% |
| | 25% | MPa | 0.987 | 0.991 | 0.41% |
| | 50% | MPa | 1.422 | 1.417 | -0.35% |
| | 75% | MPa | 3.295 | 3.34 | 1.37% |
| Tensile Strength | MPa | 1.14 | 1.097 | -3.77% | |