Consistent Quality for Profile and Pipe Extrusion

You are looking out of your window directly onto your beautiful terrace. Both, window profiles as well as decking material, have been selected from most modern materials and with great attention to the detail. Now, what does this have to do with color & appearance control? A whole lot!

Plastic is the most versatile and important material in today's world. In the past plastic products were often considered as cheap and having inferior quality. This image has completely changed over the years and depending on the application it might be preferable compared to a natural product. For example more than 50 % of all installed windows worldwide are made of plastic – a trend consistently growing. Development of new, innovative plastic materials is especially demanded for outdoor applications. Thermoplastic WPC (wood-plastic composites) products have only been in existence for a few years and are gaining rapidly market share. Manufacturers use the feature "consistent color and gloss over 10/15/20 years" as an essential quality criteria to differentiate themselves from competition. Thus, weathering resistance needs to be carefully and objectively tested.

Weathering Ageing Test

Weathering is a routine performance test to determine durability of plastics under extreme weather conditions. The most popular areas for weathering studies are located in Arizona and South Florida. Samples can also be placed into weathering chambers performing accelerated tests to simulate changes in temperature, humidity and UV levels.

Weathering:
A photochemical process in which a combination of water, time, temperature variations and UV radiation can alter material properties.

When plastics are used outdoors, weathering can damage general polymer properties. Most of the damage in plastics results from UV radiation. The extend of degradation varies depending upon the resin system, additives, colorants, stabilizers and processing conditions.

Typical effects may include:
- Surface Chalking
- Color & Gloss changes
- Embrittlement

Some colorants such as Carbon Black are UV absorbers which act as UV stabilizers. Other colorants which are not UV stable will undergo degradation and pigments and dyes will change color. Inorganic pigments tend to turn dark and dull, while organic pigments and dyes tend to fade in color. Thermoplastic and thermoset resins degrade and typically yellow upon exposure. The color would usually appear lighter in the L* value and yellower in the b* value.

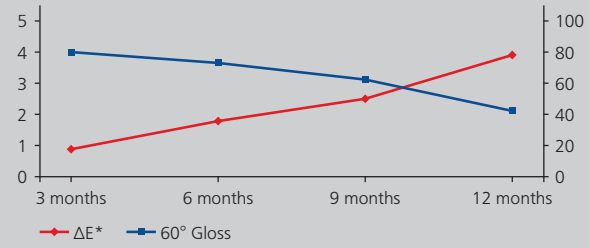
BYK-Gardner Solution

Solid Color & Gloss
spectro-guide

Gloss
micro-gloss

Objective Visual Evaluation
byko-spectra

Weathering of PP decorative trim



Yellowness Index

For near-white or near-colorless products – like window profiles – an one-dimensional number is calculated from the spectral data, the so called Yellowness Index. This index quantifies the degree to which a sample's color shifts away from an ideal white. The larger the value, the more yellowish the sample appears.

$$YI = 100 \times \left[1 - \frac{0.847Z}{Y}\right]$$

Typically the Yellowness Index of the reference is measured, which represents the ideal white. Samples (or changes) are compared to the reference and differences are calculated. Positive values will indicate that the sample is more yellow. Negative values will indicate that the sample is more blueish.

Very often such samples do not strictly appear just yellow, but show a significant difference in hue and lightness. Therefore, a three dimensional description of color using ΔL*, Δa*, Δb* differences is getting more and more popular.

Measurement of Curved Parts

Curved plastic samples like pipes reflect color differently than flat samples. As light is projected onto the surface of a curved sample, the curvature changes the direction of the specularly reflected light. To accurately access the color of the curved sample, the total reflected light must be measured.

In order to achieve good measurement results, the curvature radius of the sample to be measured shall surpass ten times the diameter of the measurement aperture. If this ratio can not be maintained, it is recommanded to use a fixture which allows your sample to sit flat against the aperture of the instrument. Additionally, the fixture should serve as a baffle to block out excess light.

Averaging the measurement from several different areas will give good overall representation of the surface characteristics.

Sample Holder
Curved Parts

Curved Parts Accessory
Cylinder Kit