Cork Tech TalkNews

Manufacturers of Waterbase, UV+EB Curable Coatings, Varnishes and Adhesives

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GLOSS, ARE WE ALL TALKING ABOUT THE SAME THING?

Gloss, according to Webster is: “the brightness or luster of a smooth, polished surface; sheen”. But it’s more than that, isn’t it? After all, when gloss strikes us, doesn’t it immediately attract our attention? It’s been said, that the visual impression that gloss gives is not unlike that which we get from color. Like color, gloss is the result of light interacting with the physical characteristics of an object. Gloss, it would seem is more, much more than just reflected light, so much more that our initial impression of a product is influenced by this surface quality.

Gloss and color are visually observed sensations that result when the human eye evaluates an object. While the human eye is recognized as the most sensitive of optical tools, it is well known that individual humans have differing visual acuity (keenness), and the judgments that are made are dependent too, upon the mood of the individual.

When we evaluate gloss we evaluate the capability of a surface to reflect light or objects, just as a mirror does. A mirror reflects light striking its surface directly in an outward direction. Light travels in straight lines that are called rays. Rays travel straight from their source until something bends (refracts) them or reflects them. When a ray of light strikes a mirror it is reflected. When a light ray strikes a mirror at an angle, the angle is called the angle of incidence or illumination. The angle at which the light ray is reflected is called the angle of reflection. A basic law of reflection says that these two angles are the same or equal. Mirrored or reflective surfaces that are not flat will reflect rays that hit in directions that converge, or concentrate in the case of concave surfaces, or diverge and disperse in the case of convex surfaces.

The impression we receive of gloss is directly influenced by the properties of a surface, the type of light involved, the visual acuity and the mood of the viewer.

Surface properties that affect our impression of gloss are affected by the substrate material, if it be metal, plastic, glass, wood, coatings, laminations, etc., the surface structure, smoothness, roughness, texture, and its degree of transparency.

The observation and evaluation of gloss requires direct light of illumination. Indirect or diffused light produces a diffused reflection and a lowered impression of gloss.

There are two ways that we can focus to obtain an impression of gloss. We can focus our eyes on the reflection of a light source or on the surface itself, either of which will influence the impression of gloss that we gain. When we focus on the reflection of the light source we are evaluating how distinct the image is. Depending on the properties of the reflecting surface, the image may appear to be brilliant and sharp, or dull and diffused. The outline of the reflected image can appear to be very distinct and sharp, or it may be blurry, or sometimes the outline may be surrounded by a halo indicating haze. When we focus on the reflecting surface itself, we will get an impression of the structure of the surface. We may see light and dark areas indicative of a less than perfect reflecting surface.

Gloss is a subjective (affected by or produced by the mind) impression of a surface and it is not a physical property of the reflecting surface. The reflection itself influenced by the reflective properties of the surface can be physically and objectively measured.Smoothness or flatness is a key element of a high fidelity reflection. This is what we observe when looking at ourselves in a high quality mirror.

The intensity of reflected light or the image depends upon the angle of illumination, and the properties (refractive index) of the material being illuminated. Metals reflect light that is high in intensity while non-metals reflect light at a lower intensity. Reflected light from a non-metal surface is dependent on the angle of illumination while metals are not. Nonmetallic surfaces absorb or scatter part of the light of illumination in all directions depending upon the color of the material giving us an impression of color.

When a surface is rough it reflects illuminated light not only in the direction of specular reflection but also diffusely in all other directions. The more the illuminated light is diffused in all directions the lower the specular reflection will be in intensity and the less gloss the surface will appear to have.

When a glossy surface has a wavy structure to it, due to flow/leveling defects or substrate imperfections, illuminated light will reflect in a diffuse manner from the angles of the imperfections. A poor image that is distorted and broken will be reflected and resemble the surface of an orange. These orange peel defects lower the intensity of a reflection giving the appearance of lower gloss.

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A high gloss surface that has very small micro-scopic defects will diffuse some amount of low intensity light next to the specular reflection. This haze will give the impression of lower gloss.

Specular reflection may be measured with an instrument called a glossmeter which can differentiate between high, semi-, and low gloss surfaces.

A glossmeter is based on the idea of measuring the specular portion of reflected light. A glossmeter when activated beams a light source through an aperture to illuminate a surface to be measured. The intensity of reflected light is measured at a specific angle range which is limited by another aperture. A photoelectronic detector measures the reflected light passing through its aperture.

Gloss as measured by these devices is relative to a standard, which is a highly polished, black glass standard with a defined refractive index of 1.567. When calibrated the black glass standard has a specular gloss value of 100.

The angle of illumination as discussed earlier can greatly affect gloss measurement results of coatings, plastics and other non-metallic products. This occurs because part of the illuminated light penetrates into the material. Therefore, the greater the angle of illumination, the greater the amount of reflected light.

Different angles of illumination, (measurement ranges) have been defined in order to obtain good differentiation when examining gloss.

Recommended angles of illumination are:

20 degrees for high gloss surfaces >70
60 degrees for gloss surfaces 10 to 70
85 degrees for low gloss surfaces <10

These and all other aspects of glossmeter design and operation are defined in a number of globally recognized technical standards such as: ASTM D523, DIN 67 530 and ISO 2813.

Gloss readings of coatings over printing will be affected by the underlying color. Additionally, absorbent substrates will affect gloss readings to the extent that inks and coatings are absorbed by the substrate and are not heldout on the surface to build a smooth reflective layer.

The effect of smoothness cannot be over emphasized. Any surface roughness, hills and valleys, will diffuse and scatter illuminated light with the result being lowered gloss.

When you're after high gloss, go for smooth, go for a smooth, flat reflecting surface free of all defects!

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