Antiglare vs Antireflection

Two terms used to talk about the impact of ambient lighting on displays are reflection and glare. The reduction of these is done using surface treatments for the display which are termed antireflection and antiglare. Because these are often confused, communications between display users and display engineers are often less than optimum. In this monograph, we will attempt to provide some guidance in usage.

Glare Definition

Glare is technically a phenomenon related to the surrounding environment of a display, and, as such, is beyond the ability of the display engineer to directly control. As used commonly by display users, however, glare refers to a reflection from the display which is highly distracting.

Typically a user will call an obvious reflection of a white shirt in a display as a glare which reduces user's ability to perform their tasks. This is more correctly referred to as a specular reflection (see the *Reflections on Reflections* white paper for more information).

Treatments of the surface to minimize this are referred to as antiglare or antireflection treatments. Antireflection treatments reduce the difference in refractive index between air and the display in a way which is the optical equivalent to impedance matching in electronics.

Antiglare treatments, on the other hand, leave the impedance mismatch present, but cause the reflections to be scattered into all directions.

Antiglare Surface Treatments

Antiglare properties are produced by roughening the surface of the display. This roughening can be done by any one of several processes; mechanical, chemical or depositions.

Chemical or deposition processes are most commonly used for displays. In the chemical process, the glass or plastic overlay to be applied to the display is etched with an appropriate solvent; buffered hydrofluoric acid for glass or an organic solvent for plastic. This removes material in such a manner as to leave a microscopically roughened surface.

Deposition processes involve spray or dip coating the overlay with a solution which, on drying, will leave a roughened layer behind. A common method involves using a nano-particle suspension of SiO_2 which leaves behind a random distribution of particles when dried. This surface treatment changes the ratio of specular to diffuse (Lambertian) reflections (see Figure 1).

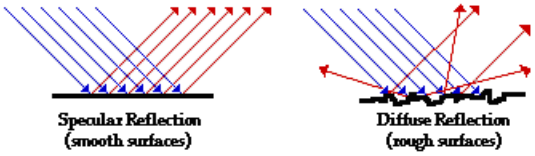

Figure 1
Lambertian distribution is a sum of reflections in all directions.

The degree to which this occurs is measured by a glossmeter. This instrument rates a surface in terms of percent of specular reflection; 92 gloss is a highly polished surface and 30 gloss is a very diffusely reflecting surface (approaching paper in appearance). See the white paper on *Gloss Standards and Measurements* for further information.

Antireflection Surface Treatments

In contrast to antiglare treatments, **antireflection** films are all deposited onto a substrate. Careful design of the film involves specification of the refractive index of the glass or plastic and of the surrounding medium (typically air). With this information, the designer of the film can make a determination of which materials to use and the thickness to be deposited. Process control in production is obviously a key element, as well.

These films can range from a simple, low cost single layer, typically made from magnesium fluoride, to higher performing, higher cost multiple layer deposition. These films are able to reduce the specular reflectance of a surface from the Fresnel value (about 4% for glass) to less than 0.5% over the visible range. More exotic coatings can be even lower.

Which Do I Need?

Because of the difference in antiglare and antireflection surface treatments, it is possible to apply them independently or jointly to the display.

The choice of treatments must take careful account of the environment in which the display will be viewed. For locations that have a few highly localized sources of light, a gloss of 60 with AR coating is recommended. In other applications where the light source is more diffuse (such as an outdoor kiosk), a more highly polished surface will generally be more desirable.

The final choice can only be made by an on-site evaluation of displays with alternative finishes and under a variety of lighting conditions from full light to full nighttime brightness.

For More Information

Determining the best solution for your particular application can be a daunting task. We invite you to visit our web site, **http://www.GDOptiLabs.com**, for the latest information available on LCD, OLED and Plasma display optical enhancements. Or call 800.952.2535 to speak with a Sales Engineer.

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