

CLEARER VISION



Aspherical lenses are nothing new. They have been available to professional security installers for many years, but have never really received the level of interest that they deserve. When it comes to optics in general, there are two schools of thought. The first is that the lens affects the overall quality of the system, and therefore a quality item must be carefully selected for not only each application, but for each individual camera. Considerations must be paid to the field of view, ambient illumination, expected risk (both what the user wants to see and when they want to see it), camera type, etc.. The second way of thinking is that lenses are, by and by, pretty much the same, and therefore paying more for a brand name unnecessarily eats into the budget.

Sadly, those who subscribe to the latter way of thinking by far outnumber those who understand the true value of

optical devices and adhere to the first way of thinking. Cameras are devices which change chrominance and luminance into electrical signals, which are changed into images at a later stage in the surveillance process. A sketchy description it may be (a fuller explanation would use up all of this test) but it pretty much underlines the functions. The lens is the device which focuses the chrominance and luminance onto the CCD. It is the quality of the light falling on the CCD which affects the final image. Lenses which do not correctly focus the light, or which create aberrations, will ultimately affect the overall performance of the system.

Aspherical options

The quality of a lens determines many aspects of its performance. As well as the drives and the physical construction, the most important element of any lens is the quality of the ground optical surface. It is the surface of the lens which differentiates aspherical lenses from spherical lenses. Before looking in more detail at the CBC Europe items, it is worth considering why aspherical lenses are necessary.

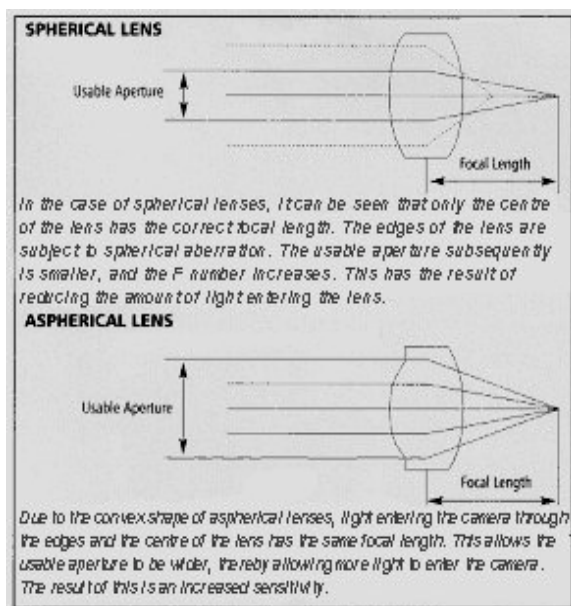
Whilst it is true that high quality grinding will ensure that aberrations are eliminated, this does not mean that the lens will be optically perfect. Spherical lenses (standard lenses) will have differing

Over the years, PSI has constantly promoted the use of quality optics when installing CCTV systems. It is frightening how often a quality camera's performance will be adversely affected by low quality optics. Whilst lenses which carry a trade price of around £10 might seem like a bargain, they actually cost you money, because the optical quality might reduce the performance from a £200 camera to the equivalent of that from a £60 camera! In our book, that means you are effectively paying £150 for a lens that belongs in the dustbin! However, it's not just optical quality that a good lens can provide. Select the right unit, and you will receive other benefits such as enhanced low light performance. That is the claim of CBC Europe about their aspherical lenses, so PSI took a long look at dusk to see what all the fuss was about.

interests of economy, the lens is ground in a uniform manner. The performance-based cost of this is that the edges of the lens are not optically correct, and so the usable aperture is smaller, equating to less light falling on the CCD.

An aspherical lens is able to enhance a camera's performance because of its shape, and the way that shape refracts light so that it has a common focal point, no matter whether it is from the centre or the edge of the lens. Rather than being ground on a single plane, like spherical lenses, an aspherical lens is ground in two ways to a very high tolerance, and the resultant convex shape enables the light rays that pass through both the optical axis and the outer edge of the lens to have the same focal point, so the entire surface of the lens can be used without blurring.

As a result, the aperture can be larger, allowing more light to fall on the CCD and therefore giving better sensitivity. Aspherical lenses do attract a





Quality might cost more, but the performance will be worth every penny.

tricks of the trade to push the quoted figures to the maximum. In other words, some installers might find that getting a real improvement in sensitivity might be expensive if relying on a higher specification camera. Scene illumination is all well and good, but again there are issues involved such as long-term cost of ownership, light pollution (where white light is used), etc.. However, improvements through the addition of an aspherical lens are just that - improvements!

A varied choice

PSI looked at three different aspherical varifocal lenses from CBC Europe. The catchy product designations are TG3Z3510FCS, TG3Z2710FCS and TG10Z0513FCS. The lenses are 3.5-10.5mm, 2.7-8mm and 5-50mm varifocals respectively, with apertures of F1.0 for the first two models, and F1.3 for the latter. All three lenses are 1/3 inch models and are fitted with a 4 pin connector for DC auto-iris. They also include an aberration filter, which is used in conjunction with a spacer, for black and white cameras.

price premium because the grinding process is more complex, and it is because of this price differential that aspherical optics have traditionally been utilised where low light performance is required. The real crux of the matter is whether the additional cost of an aspherical lens is less than a higher sensitivity camera or additional illumination at the scene.

When cameras are tested for sensitivity, the manufacturers will usually define specific parameters which might not be achievable at all sites, and others might use all the



However, this is not unusual, as few applications would require the additional capability of an aspherical unit during normal periods of illumination. However, during daylight the images were crisp and clear. There were not noticeable aberrations, colours were well defined and the auto-iris dealt well with general scene illumination changes. It was both fast and responsive, and performed as expected.

It was interesting that although the spherical and aspherical CBC Europe lenses had no visible differences during daylight, both stood out as giving better images, both in terms of colour fidelity and sharpness, than a low-cost (read cheap) unbranded lens. However, the real test came as light levels fell.

After sunset, when using the standard lens, the colour definition became slightly fuzzy, taking the

Build quality on all units is good, as would be expected from computer brand lenses, and settings are retained via simple to tighten grub screws. Even finger-tight is sufficient to stop all but the most concerted effort at altering the settings. If computer lenses do attract a price premium in general, then it is understandable, because when compared with lesser brands these do stand out as the finished article

However, the real issue with these models is whether the aspherical lens actually does give a higher performance for the cost. Judging against quoted sensitivity figures for cameras is always a fraught issue, because few state whether figures are given for 1V peak-to-peak signals or usable video (or if the latter, what criteria represents usable video), whether the lux figure is taken from scene illumination of light at the faceplate, what shutter speed is being used, etc.. For the purpose of our test we compared the lenses with a standard CBC Europe varifocal lens the TG2Z3514FCS-2. The unit does have a smaller aperture than the aspherical lenses (remember that the size of aperture is not linear) at F1.4, meaning it receives less light. The camera used was a Baxall CDX-9714 colour camera. The unit is specified for low light applications, and has a quoted sensitivity of 0.4 lux.

During normal daylight conditions, there is really little to push the aspherical lens to the fore.

Sensitivity can be enhanced and image clarity is exceptional.

edge of definition but getting nowhere near an unusable image. When the signal was measured from the camera, it fluctuated between 1V p-p and 0.8V p-p. Once the aspherical lens was used, colour definition returned and a steady 1 V p-p signal could be measured. Quality was markedly better with the aspherical lens, and as illumination fell further, the gulf between the two units became even more noticeable.

The standard lens and camera was providing a 0.6V p-p signal after twilight, and colours were becoming hard to clearly define. The image was, at best, muddy, and the failing light led to an increasingly failing image. Without additional illumination, the results could not even be described as usable. However, the aspherical lens was giving a signal which meandered between 1V p-p and 0.8V p-p. In essence, this was still usable in all but the most demanding applications.

The camera used was specifically aimed at low light applications, and using an aspherical lens with it certainly ramped up the performance. However, when the two lenses were tried on a medium resolution low-cost camera, the results were even more interesting. The evening was slightly brighter, and the standard spherical lens

based signal dropped away from 1V p-p shortly after sunset, at around 2-3 lux. However, it was deep twilight (around 1 lux) before the camera mounted with the aspherical lens showed signs of losing a full video signal.

In conclusion

The price differential between an aspherical lens and a spherical alternative is enough to raise a few eyebrows. It is not a case of a few pounds more. However, it is our opinion that the CBC Europe aspherical lenses are worth the extra, because of the additional performance they provide.

Much of low light performance depends upon camera set-up, the climate and the application, but in our case the aspherical units gave a performance from a standard camera which was on a par with a higher performance camera with a low cost lens! When looked at this way, the price differential is very easy to swallow.

Aspherical lenses won't see in the dark; let's not think that they do away with the need for other considerations if a 24 hour system /S required. However, every application has differing factors to consider, and where there is some form of incidental lighting, or where surveillance is required in difficult conditions but not in darkness, these lenses are definitely worth a look.

