

Domes: In a Spin?

*Dome cameras offer great flexibility and user-appeal during the day, but don't work quite as well at night. Right? Wrong, says **Shaun Cutler of Derwent Systems**.*

He argues that with the right lighting – which is too often overlooked – domes can offer improved performance at night.

Fully functional dome cameras are increasingly popular, bringing customers significant benefits – they're more aesthetic, are less intimidating, they move faster and through more angles than pan/tilt/zoom (PTZ) cameras, and they are good for discreet security surveillance. Colour and Monochrome dome units are now commonplace, giving the user full colour pictures during daylight hours, and a low light sensitive monochrome image at night. A potential disadvantage, however, is that domes don't come with an in-built and obvious lighting solution offering totally effective performance at night.

with the right lighting, domes can offer improved performance at night

Infra-Red (IR) lamps cannot be fitted into the dome because of their size, and problems with overheating and internal reflection from the dome bubble.

In contrast, the traditional PTZ camera set up can have powerful IR lamps mounted on the sides to sweep round and light up whichever area the camera is focused on.

There are other factors which further reduce night-time performance of some domes:

- tinted dome covers reduce light pick-up by blocking out some available light
- combined cameras/lens combinations may not be as sensitive or effective as models specifically designed for performance in low light
- many domes are based on smaller CCDs with integral lenses, which do not provide the most sensitive low light performance

The result is that users have a system with great visual appeal and flexibility during the day, but provides reduced performance during the vulnerable hours of darkness.

However, the performance of many dome cameras at night can be significantly improved through the correct use of IR lighting.

Dome cameras can be divided into two categories: fixed domes and fully functional domes.

Fixed Domes

External fixed domes are often vandal resistant and used for short-range surveillance purposes. Because the unit is fixed, the low light issues involved are similar to those of other standard cameras. In low light or zero lux conditions, fixed domes will require additional lighting. Typically, IR lighting provides the best, most practical and cost-effective solution.

Many dome systems are sold with smoked domes that can reduce the IR that reaches the camera by up to 70%. Bear this in mind when considering the camera's performance in low light. Increased IR illumination levels may be required to compensate for the dome's IR attenuation.

To maximise low light performance it is best to use clear domes.

To ensure full coverage of the scene, the IR illumination must be matched to the field of view of the camera. Narrow beam illumination should be used to match narrow field of camera view, and wide beam illumination for a wide field of view. Failure to match camera field of view and IR beam can dramatically reduce system performance.

Make sure that you match the camera's field of view with that of the Infra-Red.

Fully Functional Domes

The challenge with fully functional dome cameras lies in the inability to mount Infra-Red illuminators on the moving part of the dome.

360° wide area illumination

360° IR coverage would ensure that wherever the camera moves there is sufficient IR illumination to enable the camera to view the scene effectively. But full 360° coverage would require location of approximately eight 45° spread Uniflood IR lamps. Domes mounted on the corner of a building may only require 270° IR coverage, and domes mounted on walls may require only 180° IR coverage.



The Uniflood 500

Specific target illumination

An alternative solution can be achieved by using 'specific target' illumination. This is a method of providing illumination to specific areas of risk rather than the whole area being viewed by the dome camera. The technique IR illuminators are positioned strategically to illuminate targeted locations and vulnerable areas such as gates, doors or pathways.

During the full 360° rotation of the dome camera, there may be only two or three specific targets that need to be viewed. IR units may be mounted on and around the camera pole to illuminate these targets, increasing the effectiveness of the camera's monitoring.



Local Area illumination

The IR illumination may be located above or near a specific target. Good matching of the camera angle of view and that of the IR illumination is essential for maximum performance.

Angle of illumination and camera field of view are critical to success.

For both specific target illumination and local area illumination the IR lamp may be triggered on/off via a pre-set on the dome. A PIR detector may also be used to activate the IR lamp, which is especially useful for discreet applications or to save energy and Bulb life, especially for high voltage IR lamps.

Using dome pre-sets or PIRs to activate specific target or local area illumination will reduce running costs of the system.

Frame Integration

Some dome cameras include frame integration techniques to attempt to overcome the problems of obtaining clear images in poor light. A slow shutter speed is used to capture enough light in dark areas of the scene. This may be acceptable only in a limited number of applications because of the inability of these systems to work with moving objects. If an intruder moves through these areas during the dome's tour the person will only be recorded as a blur and vital information and detail will be missed. The net result will be a large and potentially serious gap in the surveillance system's total coverage.

Infra-Red and Video Motion Detection (VMD)

Speed domes are often integrated with computer-driven digital video recorders using a 'video follow' or Video Motion Detection (VMD) systems. The VMD works by actively analysing pixel changes occurring in the video picture. But a person walking through a dark scene is unlikely to cause any pixel changes if there is insufficient illumination to detect pixel changes, thereby defeating the system. Infra-Red illumination can dramatically increase the effectiveness of VMD systems & intelligent video analysis systems.

Summary

Designers of CCTV systems need to consider some fundamental issues involved in achieving effective 24/7 pictures using dome cameras, particularly in low light conditions. Illuminating the field of view of the camera with sufficient IR lighting is essential. Three successful ways of achieving this are 360° wide area illumination, Specific Target illumination and Local area illumination. IR is also a crucial element in ensuring the success of Video Motion Detection, Intelligent Video Analysis & other sophisticated software functions.

Derwent has produced a Night-time Handbook that provides a good starting point to help understand some of the key generic issues.