

## Video surveillance

### *Detection, Recognition and Identification*

# Selecting the Optimal Resolution

Camera manufacturers make a lot of noise about the latest technologies and high resolutions. There is also discussion over crime detection, business intelligence and return on investment. With all this hype, selecting the right camera can be challenging.

### What then is the ideal surveillance solution?

The answer to this question is to first understand the requirements of the customer. **It is important to determine what the surveillance system is expected to achieve.** The operational requirements have to be understood.

***Is it mere detection or detection and observation or detection, observation and recognition or detection, observation, recognition and identification?***

- Identification: identification of an unknown individual or object
- Recognition: recognition of a known individual or object
- Observation: being able to interpret what is going on
- Detection: detection of activity within a scene

**It is these operational requirements that will determine the 'resolution' or the 'pixel requirement'.**

As yet there is no industry standard for pixel density requirements. However it is accepted that mere detection could be achieved at 0.5 pixels per inch while recognition would require closer to 3 pixels per inch. Identification is the most demanding and would require close to 13 pixels per inch.

**Proper combination of camera selection, lens pairing and installation location can achieve the requirements of a customer.** Standard resolution cameras can either provide details or situational awareness by setting a wide or narrow field of view. Higher resolution cameras can deliver both details and situational awareness.

### Specifying the level of quality.

Two common measures of specifying surveillance video quality are:

- Resolution
- Pixel Density

**Resolution** : Historically this has been the way of specifying surveillance cameras. This is easy to specify and verify as resolution is prominently stated by most manufacturers. However it is extremely inexact and may, at times, be over specified for some situations. While in some situations it may not provide adequate coverage. A better approach is to specify higher resolution cameras for situations covering large areas (e.g., only 4CIF for entrance cameras but 3MP for parking lots).

**Pixel Density** : This is the 'new' way of specifying surveillance cameras. Specific levels of pixel density are specified (e.g. 40 pixels per foot for entrance cameras but 15 pixels per foot for the auditorium camera). **This is more exact than simply specifying resolution.**

**It is therefore important to understand how pixel density is to be specified.** Merely specifying so many pixels per foot or pixels per meter misses out on crucial details that are vital to accurately achieving the desired video quality.

In order to accurately specify and obtain the desired video quality levels it is important to specify the pixel density along with the following attributes:

- Lighting Conditions in Scene
- Horizontal Width of field of view (FoV) required
- Distance from Camera
- Vertical Range of Coverage

### Verifying pixel requirement

A)

Let us take a case of the desired target pixels to be 45 pixels per foot.

Let us assume that the field of view (F.O.V.) is 35 feet.

Pixel density = Pixels/F.O.V.

Therefore Pixels = FOV x Pixel density;  $35 \times 45 = 1575$  pixels

A 3 mega pixel camera, which has a horizontal pixel count of 2048 pixels, will meet the desired quality.

B)

What would be the FOV if a 5 mega pixel camera were to be used?

FOV = Pixels / Pixel density.

For a 5 mega pixel camera the horizontal pixel count is 2592 pixels.

Therefore the FOV =  $2592/45 = 57.6$  feet.

### Examples of the quality of the video for different pixel densities

The images below (courtesy Axis) give examples of the quality of the video for different pixel densities.



100 Pixels Per Metre



200 Pixels Per Metre



500 Pixels Per Metre



## Conclusion

- Providing the right solution starts with understanding the security needs.
- It is these operational requirements that will determine the 'resolution' or the 'pixel requirement'.
- Camera output or video is only valuable if it can actually be used.
- Knowing and understanding the importance of resolution and pixels on target will help deliver an optimal video surveillance system.

