Halftone process

The halftone process begins in Photoshop with a continuous tone (CT) scan. Scans should have a resolution of twice the line screen frequency. This means that the ppi (pixels per inch) of a scan is twice that of the halftone cell. Essentially, four continuous tone pixels in a scan are used to generate one halftone cell. The four pixel values are averaged to come up with the area of the cell that needs to be covered. If the average of the CT pixels is 20 percent black, then the center 20 percent of the cell will be solid black and the 80 percent towards the outside of the cell will be white. Because offset printing can not print grays, a halftone dot pattern is used which alternates black and white to create the illusion of gray. The imagesetter reduces the round cell to a series of very high-resolution black and white dots. In the example below, a 2400 ortho dpi imagesetter is able to render a 150 line screen with 256 levels of tonality. Although the imagesetter dot is not perfectly shaped, it does approximate a circle's round shape.

There are three different resolutions in the halftone process: the scan has a continuous tone (gray) resolution equal to twice the halftone screen, 300 ppi in this example; the halftone cell has a resolution equal to the halftone frequency, 150 lpi (lines per inch); and the imagesetter has a black and white resolution which it uses to render the halftone dot, 2400 ortho dpi mimics 256 levels of tonality.

There is a relationship between tonality, cell size and resolution. As the cell frequency increases, the tonality decreases as a square factor. As the imagesetter resolution decreases, so does the tonality. A low line screen frequency results in a dot so large it is visible to the naked eye. However, high frequencies result in the image losing detail in its tonality. Choosing lines screen frequency greater than 200 will generate unpredictable results.
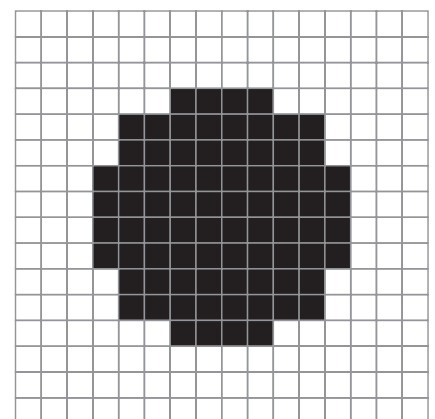
Continuous Tone Scan

15%	15%
25%	30%

├────── 1/150th inch ──────┤

Halftone Cell (theoretical)

30%

├────── 1/150th inch ──────┤

Imagesetter b/w output

├────── 1/150th inch ──────┤