CHOOSING A COMPUTER SCREEN; LCD OR CRT?

Over the last few years, flat panel displays (also called LCD screens, Thin Film Transistor displays [TFT] or flat screens) have started replacing traditional cathode ray tube or CRT monitors. As the price of LCD screens decreases, their popularity continues to increase. However, from an ergonomic viewpoint, which is the best choice for your work? Here are some facts to consider when choosing one over the other:

Technology:

- CRT monitors use the same technology as your television set to produce the image on the screen. It consists of a large vacuum tube with an electron bean inside of it. The beam constantly scans across the front of the tube containing phosphorus, exiting the particles and producing the light.
- LCD screens produce their image by having a film that turns to a color when current runs through a pixel. Brightness is achieved through backlighting behind the actual LCD films.

Advantages of LCDs:

- *Flicker:* LCDs don't flicker like CRTs. LCDs are free from flicker because they do not rely on a scanning electron beam to produce the image. CRTs are prone to flicker unless the refresh rate is 75 Hz or higher for 15-17" screens and 85 Hz for 19" screens.
- *Distortion:* LCDs are free from geometric image distortions at the screen edges because they have a flat matrix display where every pixel is active. CRTs can have peripheral distortion as the electron beam becomes progressively more tangential to the screen phosphors at the edges. This distortion is thought to affect visual performance.
- *Glare:* LCDs have uniform screen brightness. The screen is covered with a flexible surface that is less prone to specular glare than glass covered CRTs. However, this flexible surface is soft and prone to damage when touched.

Productivity and Comfort:

- *Speed:* Users read 20% faster when using an LCD screen compared to a CRT.
    - *Visual search times for text targets embedded in a screen are 22% faster for LCDs than CRTs (Ziefle, 2001; Naesaenen et al, 2001)*
    - *Eye fixation times are shorter and less frequent when reading information on an LCD than a CRT (Ziefle, 2001; Naesaenen et al, 2001)*
- *Accuracy* improves by 22% when reading from an LCD than a CRT (Menozzi et al, 2001)
- *Posture:* LCDs allow for greater postural variety when working (Nylen, 2002)
- *Eye fatigue:* Flicker-free LCDs theoretically reduce visual efforts (number of fixations). Glare reductions can also reduce eyestrain.
- *Headaches:* Flicker free LCDs theoretically reduce the risk of headaches. Additional research is needed on this subject.

Display Quality:

- *Color range*: CRTs have more color choices and are preferred by graphic designers for this reason.
- *Image response*: CRTs respond faster than LCDs to fast-moving images in games or movies and are preferred by gamers.
- *Viewing angle:* CRTs have a wider viewing angle than LCDs. If you are not directly in front of an LCD, the screen fades as you move to the side.
- *Viewing position:* LCDs can be easily placed on monitor arms to save desk space, adjust position for different users and postures, and orient the screen vertically for portrait views.
- *Aspect ratio:* LCD displays are marketed by their actual screen dimensions. This is the viewable area of the screen from the lower corner to the opposite upper corner of the display. The aspect ratio of the screen is the ratio of horizontal to vertical measurement. Be sure to look for the aspect ratio when selecting a screen. It will affect the image viewed on the screen.

- *Resolution:* CRTs usually have adjustable pixel resolutions for displaying more material. LCDs are designed to work best at a pre-set resolution. Changing it reduces image quality. This is very important to consider when purchasing a screen. Here are the common resolutions found in LCD monitors:
  - *14*-15": 1024 x 768 (XGA)
  - *17*-19": 1280 x 1024 (SXGA)
  - *20"+:* 1600 x 1200 (UXGA)

  One disadvantage of LCD screens is possible presence of "dead" pixels. Each pixel is made of up 3 layers of transistors which can go bad. Be sure to check the warranty for pixel life when buying a monitor. Some warranties are much better than others.

Cost:

- *CRTs cost less than LCDs*. You can get more size for your money with a CRT. This is very important if you need a large screen for spreadsheets or Cad-cam drawings.
- *Power Consumption*: An LCD consumes about 1/3 the power of an equivalent CRT.
- *Service:* The service interval for an LCD is about 5 years, compared to a 3-year service interval for a CRT.

Size and Space:

- *Screen size:* The viewable area of an LCD is larger than a CRT. A 15" LCD is equivalent to a 17" CRT screen.
- *Weight:* LCDs are less than ¼ the weight of an equivalent size CRT. This is beneficial for users adjusting their workstation and the IT staff who lug them around and set them up.
- *Size:* LCDs are thinner than CRTs. Functional workstations can be reduced by 10-20% when LCD screens are used.

Criteria	**LCD**	**CRT**
Image flicker	None	Prone to flicker
Image sharpness	High	Moderate to high
Image response	Slow	Fast
Image brightness	Bright, uniform	Variable, uneven
Color range	Good	Excellent
Resolution	Fixed for best quality	Adjustable
Aspect ratio	Variable	Standard
Viewing angle	Poor to fair	Good
Flexible positioning	Very good	Poor
Space efficiency	High	Low
Weight	Light	Heavy
Energy consumption	Low	High
Visual comfort	Very good	Average
Visual search time/error rate	Improved over CRT	Worse than LCD
Electromagnetic emissions	No	Yes
Heat emissions	Minimal	Yes
Cost	Moderate	Low

Summary:

LCD monitors save space and have clear, crisp pictures without flicker or glare problems. They are often more comfortable to view in brighter settings or near windows due to a higher luminance factor. However, they must be used at a set resolution for maximum clarity.

CRT monitors are less expensive offering more screen size for the money and are better for graphics displays. So, consider your budget, space issues and the software programs you use when making a decision.