

The Screen of the Future E-Paper

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Abstract

E- paper is portable, re-useable and storage display device. it works by using E-ink technology. it is not backlit . E- paper is two types i.e., non-flexible and flexible. flexible displays uses plastic substrates and plastic electronics for the display backplane. Think of a technology that could provide you with a large display screen which uses less battery power then the backlight of your cell phone. Think of a revolution which will replace CRT, LCD AND TFT in few years and change the way we view our daily digital gizmos .

“This is e-paper –screen of the future..

Introduction

WHAT IS E-PAPER?

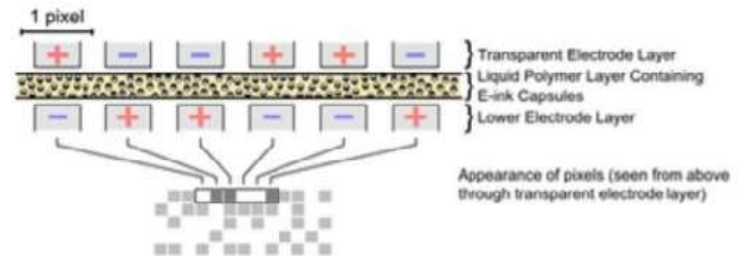
E-paper is also called electronic paper or electronic ink display. the first e-paper was developed in 1974's by “nicholas k sheridon” at Xerox palo alto research center. An electronic paper display is a display that possesses :

- A paper –like high appearance
- Ultra-low power consumption
- A thin and light form
- Gives the viewer and experience of reading from paper, while having the power of updatable information.
- E-paper have a wide viewing angle.
- Gyricon is used only black and white display.

Electronic paper was developed in the seventies by Xerox. made of flexible material, requiring ultra power consumption, cheap to manufacture, and most importantly , easy and convenient to read. the limitation of monitors which is backlight hard on the human eye, while electronic paper reflects light just like normal paper .electronic paper also has the potential to be flexible because it is made of plastic. Electronic paper display were light weight, efficient and clear resolution.



Overall Structure



Composition:

- Titania particles inside capsules.
- Hydrocarbon oil containing dye.
- Plates having gap (10-100)um.
- Migration of particles: electrophoresis.

Properties

- Ultra – thin and flexible energy cell.
- Eliminates the cost of the battery, weight and volume of the battery holder.
- Can be made into almost any shape.
- Can be integrated on almost any surface.

- The most promising implementation of e-paper is the ultra slim monitors for TV, PCs, Laptops etc.

- E-paper monitors would be paper thin and easily mountable on walls, thus saving desk – space.

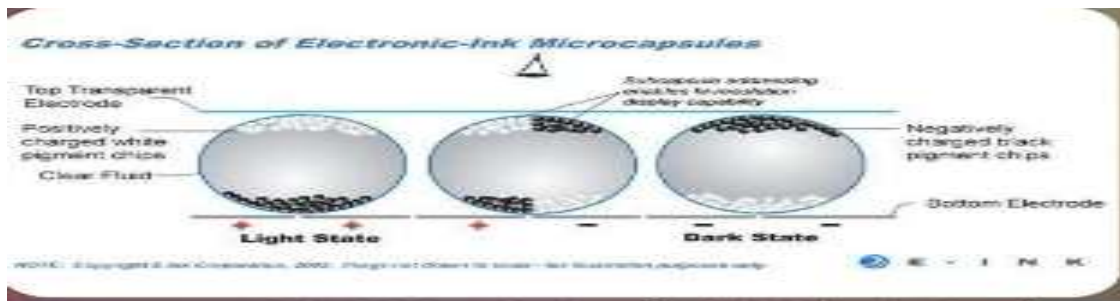


WORKING

- When a voltage is applied across two plates, the particles will migrate electrically to the plate bearing the

opposite charge from that on the particles.

- The electrodes are charged to repel the ink to the surface, effectively turning them on and off.



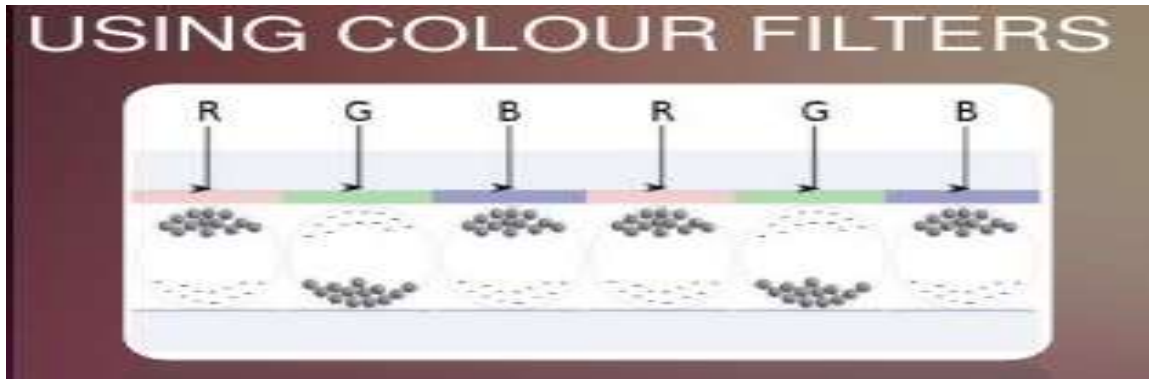
- When particles are located at the front side of display, it appears white.
- When particles are located at rear side of the display, it appears dark.

- The display forms visible images by rearranging charged particles using an applied electric field.



- It uses microcapsules technology to produce color display.

- Every color has some particular voltage levels.



Flexible display

Flexible display is a display which is flexible in nature; differentiable form the more prevalent traditional flat screen displays used in most electronics devices.

What makes flexible electronic display attractive?

- Rugged
- Light weight
- Unconventional form factors
- Very thin
- Non brittle
- The ability to curve, flex , conform, roll, and fold
- Portability
- Low paper



Constuction of E-PAPER

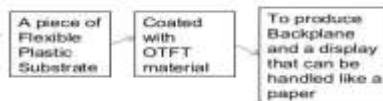
- It has two different parts.
 - Front plane.
 - Back plane.
- The front plane consist of E-ink. where visible images will be displayed.



- The back plane consist of electronic circuits. it is made up of thin film transistor arrays which provide voltage needed by the, e paper or the FOLED(flexible organic light emitting diode)based front plane.

- To form an e-ink electronic display the ink is printed onto a plastic film that laminated to a layer of circuitry.

Back Plane construction



Application

- Education: digital schoolbooks or e-books.
- Wristwatches: refreshing display, overlapping.
- Newspaper: flexible , I Rex iLiad .



- Cell phones: Motorola’s low-cost mobile phone, Motorola f3 uses an alphanumeric black/white Electrophoretic display; Samsung alias 2.
- Time table at stations.
- Electronic billboards



- status displays
- Digital photo frames.
- Digital ID tags.
- Digital price boards.



Wristwatches



A Fujitsu employee displays the prototype model of an electronic paper display that is flexible and does not blur even if it is bent or pressed by a finger



Advantages

- Potential flexibility
- Less power consumption
- Battery powered
- Paper consumption can be reduced

- Paper –link readability.
- Reduced eyestrain.
- Include graphics
- Inexpensive.
- Space saving
- Foldable and bendable
- Smaller dimensions required.



Limitation

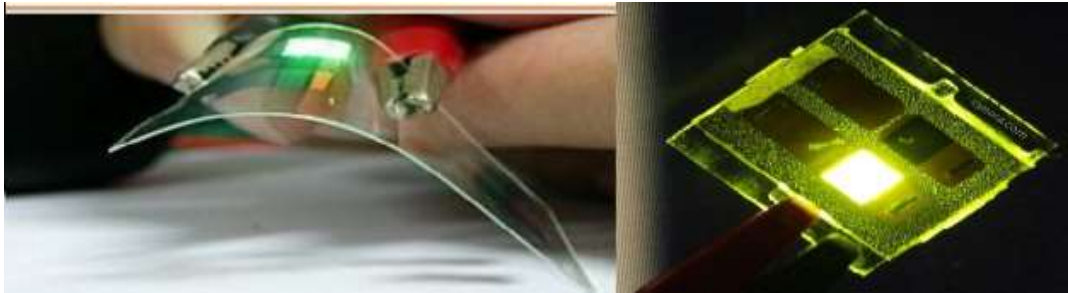
- Less attractive to LCD and LED.
- Difficult to read in low lighting conditions.
- Initial investment may be expensive.

- Integration of components would be challenge for engineers.
- Precision machines required.
- Full color implementation –not yet.
- Implementation of video on it – not yet.



A flexible organic light emitting diode





Comparison of e- paper & LCD

Electronic Ink Display	Liquid Crystal Display
Wide viewing angle	Best image only from one position
Readable in sunlight	Can be difficult to see in sunlight
Holds image without power drain	Required power to hold images
Plastic or glass	Glass only
Light Weight	Power supply and glass make LCDs relatively heavy
Thin (~1 mm)	Thick (~7 mm)

Conclusion

Researches found that in this technology can around mobility and easy of information flow, e- paper seems to fit right into the mould for the future. E- paper display reduce battery consumption and to read easily under sunlight. flexible electronic displays have the opportunity to revolutionize an industry. Effort to understand the failure limits and

mechanisms have been gaining momentum. A flexible electronics in future will play a part in field of security, entertainment and may lead to innovative applications.

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