New Perspectives:
Electronic Ink Technology

Highly readable information systems for transportation applications with low-cost operation

Connecting IT and Transport
Signposting the Future: Electronic Ink Displays

Passengers travelling by rail, local public transport or air will catch a peek of the future as of 2004: display technology using electronic ink – E Ink. Perfectly clear characters and graphics from almost any viewing angle or in any light conditions. Furthermore, information systems utilizing this paper-like technology are attractively economical to run. This major breakthrough is the result of a development agreement between Vossloh Information Technologies of Kiel/Karlsfeld, Germany, and E Ink Corporation.

Electronic Ink Display Benefits*  

- High contrast for good readability
- Total viewing angle 180°
- Readable even in direct sunlight
- Black and white characters and graphics
- Freely programmable character and graphics modules
- Ultra-low power consumption due to bi-stable operation mode
- Low weight
- Flexible display design
- CE tested and approved
- Highly reliable interface software protocols

*belongs to the MEPD family (Microencapsulated Electrophoretic Displays)

Optimum readability
Electronic ink combines two essential features: the optical quality of printed media with the dynamic versatility of an electronic display. In addition, the new technology ensures greater contrast than, say, a newspaper and even surpasses the performance of reflective LCD displays. Information displays using electronic ink offer three to six times the contrast of reflective LCDs and remain perfectly readable within a 180° radius, even in dim light or direct sunlight.

Ultra-low power consumption
Display modules with electronic ink require 500 to 1000 times less power than transmissive LCDs in common use today. The two primary reasons for the low power consumption of electronic ink displays are: (1) they are completely reflective requiring no backlight (using ambient light to illuminate) and (2) they possess inherent image stability for extended periods of time; that means the displayed information remains visible even when the power supply has been shut off. The result: lower operating costs from potentially not having to use additional backlighting as well as lower maintenance costs because replacement of the backlight is not necessary.

Flexible material, flexible applications
Display modules using electronic ink technology are thinner, lighter and more robust than conventional display modules – and even flexible forms are possible. Electronic ink display technology enables modules that are only about 1 mm thick or less (without drive electronics) – this can be about half the weight and thickness of a comparable LCD module. This is partly due to the thin, lightweight, electronic ink film that replaces a layer of glass and eliminates certain optical components like polarizers. Thanks to their slim-line dimensions, the casings of electronic ink modules are considerably lighter in weight, which in turn reduces the demands on display panel mountings. Finally, being considerably more robust than LCD displays, electronic ink modules provide clear benefits in terms of storage, maintenance and service requirements. All that adds up to a further substantial savings potential.
A Closer Look: Revolutionary Paper-Like Display Technology

How does E Ink’s technology actually work? How can it be used to produce information systems? The answers to these questions are not only of interest to the technically minded, but equally to visionaries who can see the as yet unimaginable possibilities heralded by this new technology. In this respect, Vossloh Information Technologies quickly recognised the possible applications and benefits of the technology which are now being translated into specific products.

Microscopic Structures, Great Effect
Electronic ink is a revolutionary material that changes the image it displays when exposed to an electronic field. Millions of tiny microcapsules, each no thicker than a human hair, form the principal components of electronic ink. Every microcapsule contains both positively charged white and negatively charged black particles that are suspended in a transparent fluid.

For instance: when a negative electric field is applied at the front electrode, the positively charged white particles move to the top and makes the spot appear white on the surface of the module for the onlooker. At the same time, the positive electric field pulls the black particles to the bottom of the microcapsules where they are hidden. Changing the polarity of the charge applied to the electrodes will thus result in a colour change of the respective segments.

From the Basic Technology to its Application
To manufacture a segmented display module using electronic ink technology, the ink is coated onto the back of a transparent conductive front film provided by E Ink Corporation. Vossloh Information Technologies then laminats the film to a layer of circuitry equipped with segment electrodes as well as link circuits; this unit is subsequently sealed. Patterns of pixels or characters are created on the segments with the help of electrodes printed directly onto the circuitry layer. These segments can be controlled individually using the driver electronics, which are – where possible – fitted on the reverse of the circuitry layer and are thus hidden from view. Depending on the desired module properties, like the bending radius or number of segments to be controlled, both flexible and rigid materials can be used as substrates for electronic modules.
Two Partners – One Vision
Vossloh Information Technologies GmbH is a leading supplier of highly automated information and communication technologies for rail transport in Europe. The company belongs to the international Vossloh Group and develops rail planning systems, operations control systems, signalling technology, stationary and mobile passenger information systems as well as simulation and training systems.

E·INK
E Ink Corporation is the world-wide leading developer and marketer of electronic ink technology. In conjunction with strategic partners, E Ink supplies its electronic ink technology to display makers for applications in the areas of transport technology, advertising, and portable consumer products.

E Ink Corporation both develops and holds the patents for the basic technology. The company supplies electronic ink coated films to Vossloh Information Technologies where it is then used to develop and produce modules for its stationary and mobile passenger information systems.

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