

DLCDs and FrenLCDs : the way to decrease in the cost price of LCDs manufacture

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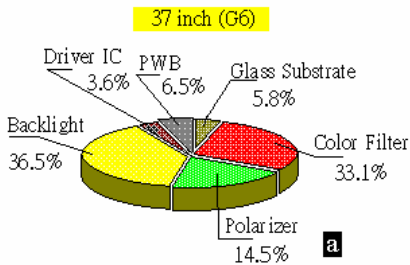
Abstract: Comparison of the cost price of manufacture known displays and offered by author DLCDs and FrenLCDs is resulted. According to the author the cost price of manufacture can be lowered on 20-50 %

Keywords: Diffractive LCDs; LCDs using Fresnel lenses; matrix of color filters; cost price of manufacturing

Introduction

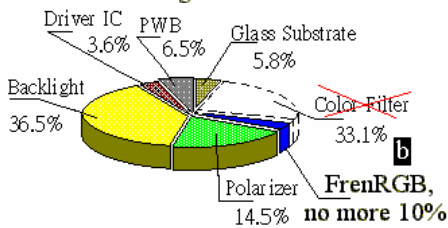
Liquid crystal displays have received the broadest distribution to all branches of modern technical equipment. Their consumer properties are rather perfect and continue to be improved. Many thousand manufacturers are engaged in release LCDs.

Well known LCDs



Note: These main materials cost about 90% for total materials cost
Source: PIDA 2005/03

LCD using FrenRGB



DLCDs or FrenLCDs

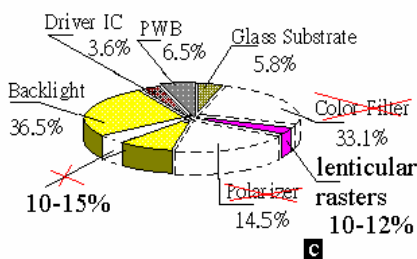


Figure 1. Structure of expenses for manufacture of LC Gen-6 module(a) and DLCDs/FrenLCDs

The prices on LCDs rather moderated are accessible to mass consumers and continuously fall (up to 1.5-2.0% p/m). That in these conditions manufacture profitable

was necessary to search for ways of decrease in the cost price of manufacture.

On Figure 1a the structure of expenses for manufacture of LC Gen-6 module is presented. It is visible, that the basic expenses fall to backlighting unit -BLU (36,5 %), a matrix of color filters- MCF (33,1 %) and polarizes (14,5 %).

Offered displays

We offered two new types of LCDs in which formation of primary colors is created due to decomposition of white light on color components active or passive diffraction gratings (DLCDs) or Fresnel lenses (FrenLCDs) without use of absorbing dyes and polarizes (FIGURE 2,3). Detailed enough description of principles of action of these displays and level of their development can be found in [2-4].

On a rough estimate such decision will allow to lower on 45-50 % the cost price of the module (FIGURE 1c). Whereas such large LCDs manufacturer as CPT (Taiwan) dreams to lower the cost price even on 10-12 % due to perfection of BLU only [1] -interview previous ID Editor Dr. K. Werner with VP, CPT Central Research Institute, Taiwan.

Besides on the basis of passive Fresnel lenses it is possible to lower on 20-25 % the cost price only one of expensive components - MCF (FIGURE 1b).

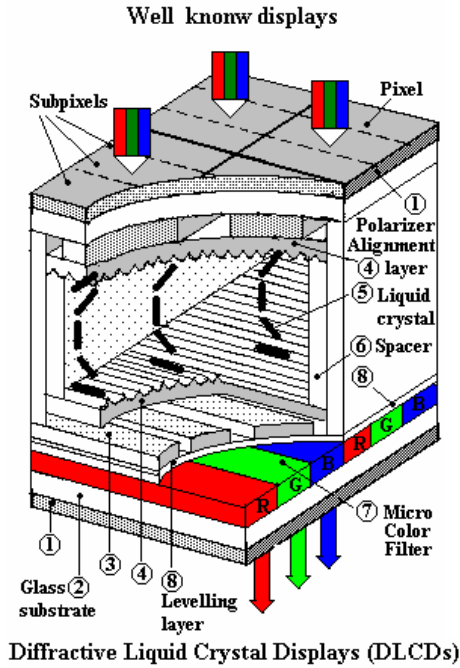
The basic results and the conclusion

The basic conclusions from the resulted sources the following:

1. On the main ergonomic parameters: brightness, viewing angles, contrast, purity of colors, times of switching and power consumption offered DLCDs and FrenLCDs, at least, are not worse than widely widespread LCDs, and on many parameters surpass them. So, the EFFICIENCY of use of light energy can make up to 60 % whereas in widely known displays it makes 1-5 %. It allows to reduce consumption of energy by BLU and/or to lower cost of its manufacturing. Thermal loading will simultaneously decrease at illumination through end faces of screens by CCFL or roughly developing technique of illumination by LEDs
2. At manufacturing DLCDs and FrenLCDs it is not required any essentially new processes or materials, including LC materials. Two of three expensive components: the matrix of optical filters and polarizes and operations on their installation are excluded from the display in general.
3. In DLCDs and FrenLCDs any known phase electro optical effects can be used. But use TN-90° that can

result to decrease in the cost price on 8-10 % is especially preferable.

4. The cheap industrial lines for manufacture of black-and-white displays can be adapted for manufacture of more expensive color displays. It will salutary affect



Diffractive Liquid Crystal Displays (DLCDs)

Figure 2. Comparison well known LCDs and DLCDs.

decrease in the cost price and will promote profitability. In the separate report at the same conference we inform on results of prototyping of one of versions of the color display. The breadboard model was produced on the out-of-date Russian equipment for manufacturing B/W displays.

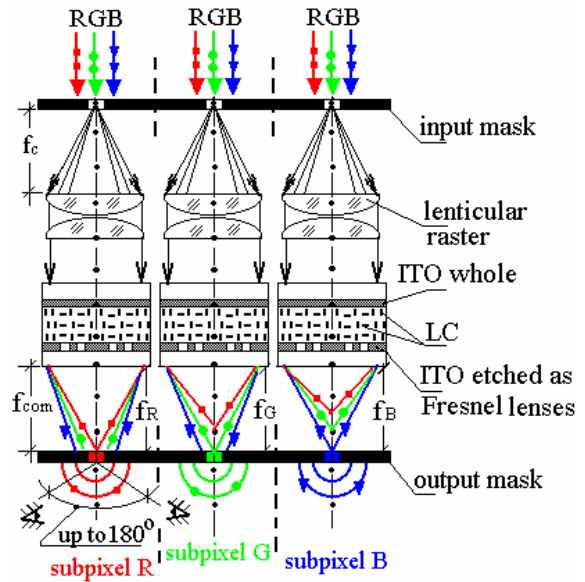


Figure 3. LCD on basis of Fresnel lenses

5. Especially significant economic benefit of manufacture DLCDs and FrenLCDs will be received for screens of the big size Gen6-Gen8. First, because by manufacture DLCDs and FrenLCDs the number of technological operations and moving of substrates with the subsequent exact overlapping with position of a substrate during performance of the previous operation, are much less. And for substrates with a diagonal up to 100 inches it is rather essential factor. Secondly, the increase in EFFICIENCY of use of energy for illumination will allow to lower consumption of energy and to use cheaper lamps or LEDs of smaller power at preservation or even increase in brightness of images. Thirdly, design of LC module becomes simpler and reduced the price because from space between substrates the polymeric micro color filters, the leveling layer, a contrasting mask are removed. Manufacturing of these elements in an essential degree makes the manufacture more expensive.

References

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