Construction and actual material test of prism LGP not using function characteristic optical sheet for production of high brightness Back Light Unit

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Abstract

We have designed High Performance Prism LGP in 17 inch TFT-LCD. In test result to embody high brightness BLU in case of LGP of base and upper surface with 17 inch, thickness 8mm adding prism construct, it is superior brightness improvement than previous that of printing form about some 20% and in this course to embody actual material it succeeded prism LGP production by 17 inch injection form process.

1. Introduction

When the use of the TFT-LCD increases recently rapidly, the portable Note PC, Tablet PC which saves the strong point of compactness and the use of the business monitor spreads rapidly. Price of the LCD monitor is higher than that of the CRT monitor of identical size and after several years a more positive price depreciation will be advanced by the production industry. In the center of the TFT-LCD production industry the tendency of this original cost curtailment is deepened as time is past, recently the generation competition of manufacturing equipment is advanced. About the BLU occupied some 10~15% in manufacturing cost of the TFT-LCD, progress of the technical development for a positive original cost curtailment was delayed. Because the demand of the market about the BLU of the high performance is strong for satisfaction of the product feature in the user center and the development of the high brightness product. Even though the original cost curtailment against a fundamental material arrives already to a limit in the present BLU market, the market demand of efficiency against focus parts surpasses the level of the technical development progress. [1-5] This research does not use the function characteristic optical sheet of high price like prism or the polarized prism and it uses only the diffusion sheet and as the focus parts manufactured the BLU of the high performance, it verifies probability through optical simulation for prism LGP and embody actual material and focused on certification for reappearance of construct.

So, we estimated prediction of efficiency and realization of the object realization to architect and make of prism LGP which is the core parts using optical simulation. The basic LGP prism figures are under figure 1 and figure 2.

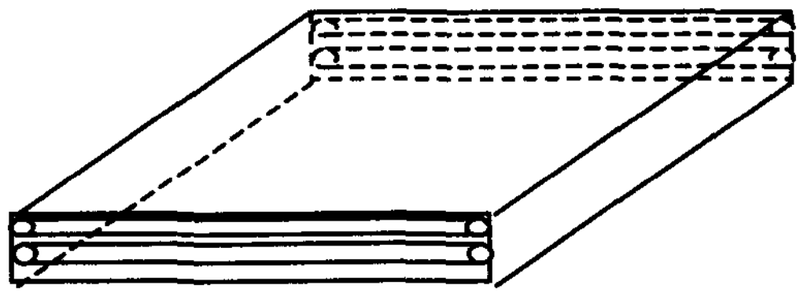


Figure 1 Structure of 17" Prism BLU

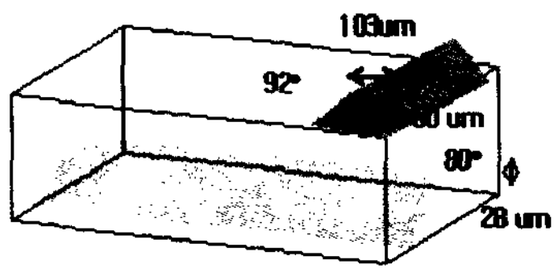
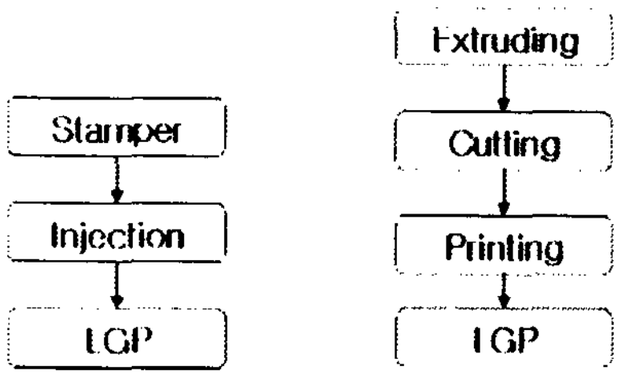


Figure 2 Structure of Upper Prism

Likewise upper figure 1 and figure 2, the prism LGP increased efficiency of concentrate light through the arrangement of the same pitch prism on upper surface and controlled overall light density in addition to intaglio direction of lamp and horizontal prism on lower surface. Also we used injection molding an engineering method in order to realize of the object and achieved the cost reduction through shortening the length of the process likewise lower figure 3 compared with existing application process of printing after cutting the

PMMA sheet.



Injection type LGP Pringting type LGP

Figure 3 Type of LGP Production Process

The optical simulation carried by SPEOS (OPTIS CO. Ltd., French) and the optical simulation condition is same as lower Table 1. to accomplish the prism form of the optimum

Table 1 Simulation Condition

		Width	Height	n	Thickness
LGP		345	281.4	1.49	8
Lamp		340		1.5	2.4
Prism	Upper	Angle : 90 degree			
	Lower	Angle : 80~90 degree			
Simulation Condition		Ray : 2000000, Detector : 0.5m			

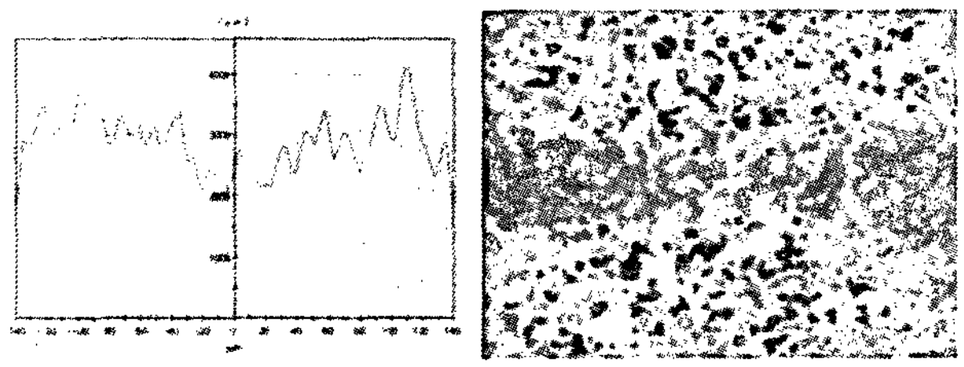
It predicts efficiency of LGP in construct stage through the optical simulation with condition of upper table 1 and it produced stamper using injection molding process to embody actual object. It produced metal material master reflected construct condition to produce stmaper and produced stamper using this master through Ni plating processing. Injection molding used injection forming machine (Meiki Co., Ltd., Japan) and injected after it attached stamper in both faces.

2. Simulation and Experimental

It was progressed by dividing the bottom of the optical disk into relief and intaglio, in result it was able to predict the performance.

2-1. Simulation-1

In simulation-1 it accomplished the plan which leads an optical science simulation assuming the bottom of the optical disk to be intaglio as shown in the fig. 2. It applied a condition of Table 1 against the prism form of upper or bottom part of the optical disk.



Vertical Line Scan Luminance properties of Actve area

Figure 4 The Result of Optical Simulation

With the optical simulation, there was a whole brightness distribution result as shown in the Right image of fig. 4. It shows high brightness in incident plate where the ramp in top and bottom part stands. It was predicted with brightness result in a line following to the center of horizontal axis in Left image of fig. 4.

2.2. Simulation-2.

In simulation-2, it accomplished the plan which leads an optical science simulation assuming the bottom of the optical disk to be relief as shown in the fig. 5. It shows the reverse direction of prism as Simulation-1.

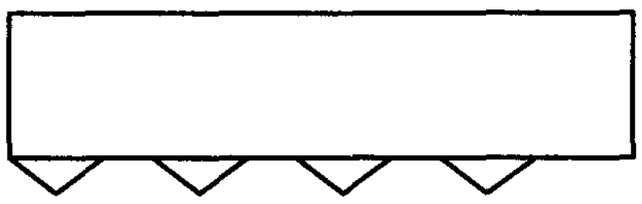
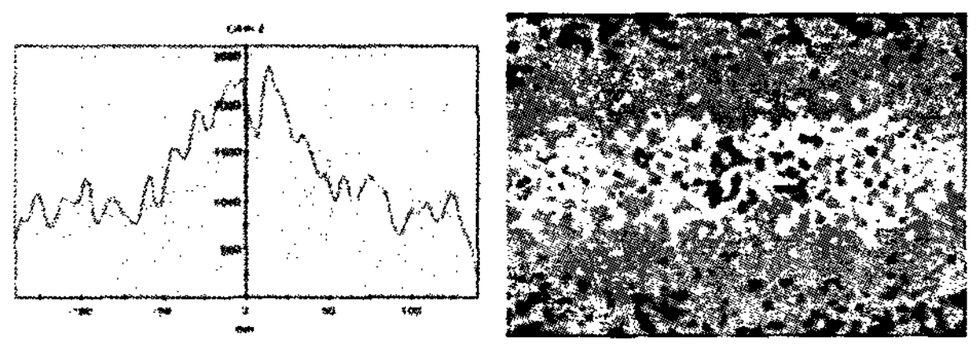


Figure 5 The Structure of Lower Prism



Vertical Line Scan Luminance properties of Actve area

Figure 6 The Result of Optical Simulation

In optical science simulation result, it shows high brightness from center department like figure. 6.

On based the plan of simulation-1, -2, produced stamper processing Master of Stainless quality, and it embodied actual object through Injection molding using this stamper.

3. Results and discussion

For complete reappearance of plan, molding product is applied to molding condition that can be

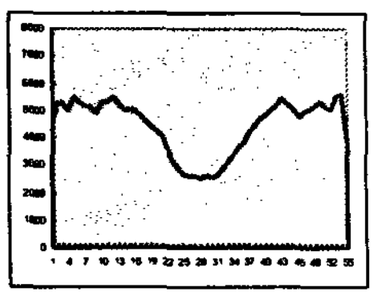
formed a shape above 90 percentages in comparison of plan. In result, we obtain the complete molding product on based plan like figure.7.

The Vertical Shape of Master

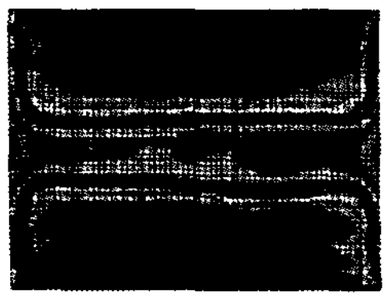
The Vertical Shape of LGP

Figure 7 The Vertical Shape of Master & LGP

The actual object which is made by an injection molding process observed by brightness meter BM7 (Topcon co., Ltd., Japan), this measurement result compared with initial simulation result .The brightness is measured from the hand weaving normal direction 500mm falls from the optical disk, it shared a former territory with 70 point * 55 point it measured the brightness of the face. The result which it shows from figure 8 is minute description picture 4 and shows high brightness quality underneath at the lamp mouth. Also from result of minute description simulation-2, the result of figure 9 is given. This result is identical with picture 6, in the center department where the rise of brightness is remarkable. Consequently like that it reappears the prediction of simulation-2.

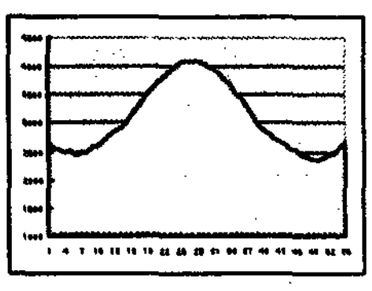


Vertical Line Scan

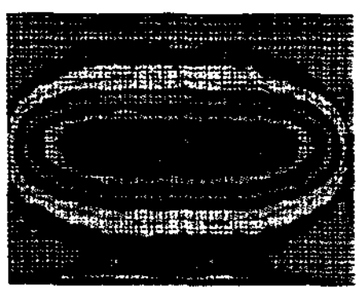


Luminance properties of Actve area

Figure 8 The Result of Luminance Measurement



Vertical Line Scan



Luminance properties of Actve area

Figure 9 The Result of Luminance Measurement

With reference, in case when compared in priority top of brightness, there is a possibility of knowing the fact that the brightness of the case which it sets in intaglio comes out being high, in both intaglio and relief it shows the tendency which is identical with the result of optical simulation of initial design.

4. Conclusion

In this research, after achieving prism LGP of 17 inch, 8mm thickness from optical simulation to actual object embodiment, then investigated about high efficiency LGP which can be used with high brightness BLU. As a test result, we could know that the prediction with using an optical simulation had a high accuracy and it was identical with the result of actual object embodiment and without using high price functional optical sheet it was possible to manufacture low price, high efficiency BLU. From this cause, when accomplishing an optical simulation to reduces an expense and the hour as it follows in actual object embodiment, it was possible to predict accurate result prediction, and confirmed that it was useful to apply substantially in planing of the optical disk. Also in this research, by using injection molding it was successful to manufacture the LGP of ratio above 90%, it was confirmed that it could be manufactured high reliability plan with high transfering process. By the actual object and optical simulation, in underneath form intaglio had advantage than relief in making effecttive brightness because of high output angle. When considering above result, without high price functional optical sheet, it was possible to confirm by using the actual object and optical simulation that it can be achieved brightness above 4700 nit, so hereafter we could know it possible to realize prime cost curtailment and high performance of TFT-LCD for 17 inch monitor.

5. References

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