

Macro Defects Inspection of TFT-LCD Color Filter Glass: System and Algorithm

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Summary

In this paper, we will propose the architecture of the inspection system including optics and the industry applicable inspection algorithm, especially focused on macro defects of TFT-LCD color filter glass. And the proposed system and the algorithm are evaluated by experiment of various types of macro defects. The experimental equipment is developed to install in real industrial LCD plant.

Introduction

Recently, defect inspection system based on machine vision techniques has been widely used in the intelligent manufacturing system, including FPD (Flat Panel Display) manufacturing plant. In order to monitor the manufacturing process stability by reviewing, classifying, and analyzing trend of defects and guarantee the display quality of various FPD, for example TFT-LCD (Thin Film Transistor Liquid Crystal Display), PDP (Plasma Display Panel), OLED (Organic Electro Luminescence Display), the inspection of defects becomes a critical task in manufacturing process. In particular, more accurate and faster defect inspection of TFT-LCD is very important issue for demanding manufacturing process with a high production yield and low production cost to be winner in the competitive FPD market[1].

In TFT-LCD production, defects are roughly classified into two categories: micro and macro defects. Micro defects include pinhole, particles and scratches. Typically, the size of micro defects is regarded as under a few tens micrometers. A macro defect is a relatively large defect that covers over multiple display pixels. Even its size can be a few hundreds millimeters. Macro defects are caused by various physical factors such as difference between width of TFT patterns, misalignment of TFT patterns, unevenness of TFT panels, and stains on glass. Human eyes-based inspection has not a consistency because criterions of inspection judge can be expressed numerical data. And inspection result can be varied with the human operator due to limitation of inspection time, sensitivity, difference of inspection skill and experience of each inspector. Especially, the growing size of glasses makes increasing the probability for macro defects and mistake of inspector. Therefore automatic inspection system for macro defects is strongly needed for high productivity, high quality and low production cost.

In this paper, we are focused on macro defects of TFT-LCD color filter glass. Especially, the objective of research is to inspect some macro defects that is can not be observed in manual inspection equipment. Macro defects sample of TFT-LCD color filter glass are experimented in this paper are passed in the manufacturing process of color filter glass, and then rejected in the final inspection of TFT-LCD cell.