AUTOMATED VISUAL INSPECTION
SOLUTIONS FOR REDUCING COST & IMPROVING QUALITY
OF FLAT PANEL DISPLAYS THROUGHOUT THE SUPPLY CHAIN
“Display quality has quickly evolved into one of the most critical technological differentiators for the end product”

Source: DisplaySearch FPD Shipment and Forecast Report, Q3-2011 & Q4-2011
ABOUT RADIANT VISION SYSTEMS

• Leading provider of automated visual inspections hardware, software and systems

• Designs, manufactures, and sells camera-based inspection solutions that automate visual defect measurement in Flat Panel Display (FPD) production

• Headquartered in Redmond, WA, USA, with direct offices in China and Korea
RADIANT VISION SYSTEMS: PRODUCTS & SOLUTIONS

Systems and Solutions

Automated Visual Measurement Systems

- Imaging Colorimeter (FPD and Light Inspection)
- Imaging Goniometers (Light source / LED measurement and characterization)
- Imaging Spheres (Angular light and color performance & scatter measurement)
- Application Systems (For production testing)
- Vision Products (Large format LED screen calibration)
Growing Needs in FPD Automated Visual Inspection Market
GROWING NEEDS IN FPD AUTOMATED VISUAL INSPECTION MARKET

- Quality of the display has quickly evolved into one of the most critical technological differentiators for the end product
- Manufacturers, spending a greater portion of the total product cost on the display subsystem, are increasingly demanding best in class test and measurement solutions
- Quality issues exist throughout the supply chain
- Technological change such as OLED accelerate the need for quality displays and test and measurement equipment
- Manual visual inspection is the dominant testing method at present
- However manual inspection is limited in capability and there is demand for a better solution
- Current camera based solution do not provide as capable and flexible suite of tests

Source: DisplaySearch FPD Shipment and Forecast Report, Q3-2011 & Q4-2011
GROWING NEEDS IN FPD AUTOMATED VISUAL INSPECTION MARKET

Pixels Per Inch Development

OLED Display Market

Source: DisplaySearch FPD Shipment and Forecast Report, Q3-2011 & Q4-2011
INCREASING EMPHASIS ON DISPLAY QUALITY

- Displays are evolving into one of the most valued technology differentiators for consumer electronic products
- In particular the display is becoming the primary user interface. As displays become central to the consumer, they are becoming increasingly important to the OEM business-model
- As the FPD end-market grows and as display quality requirements increase, the quality and productivity constraints of manual testing processes will drive adoption of automated visual inspection systems
- End-user perceptions of OEM brands and quality can be negatively impacted by failures and inconsistencies in these products

Source: Company Management
HOW IMPORTANT IS DISPLAY QUALITY?

“The real story with this new [MacBook Pro with Retina Display] laptop has nothing to do with external dimensions and everything to do with internal density. Pixel density.”

-Engadget

“LG Infinia produces among the deepest shades of black of any TV; superb shadow detail; exceedingly accurate color . . .”

-CNET

“In typical Samsung style, [Galaxy S3’s screen] is Super AMOLED technology, which means colors are vibrant and it displays videos and photos in rich hues. It may in fact be too crystal clear.”

-CNET UK

Source: Company Management
WHAT WE SEE IN THE MARKET

Yield Loss Throughout FPD Supply Chain is a Major Problem for Manufacturers

Supply Chain

Glass Manufacturer
- Makes and sells glass

Finisher
- Makes glass cover part (buys glass, cuts part, ion exchange and silk screens)

Touch Panel
- Cover glass part assembled with touch panel module

ODM
- Original Design Manufacturer, assembles entire consumer device

OEM
- Original Equipment Manufacturer, brand name of consumer device, retail channel

Efficiency

Glass utilization
- 70%–95%

Finisher yields
- 70%–85%

ODM
- 80%–95%

OEM
- Over>95%

Cumulative Efficiency

Glass utilization
- 70%–95%

Finisher yields
- 49%–81%

ODM
- 39%–77%

OEM
- 37%–73%

DRIVING INNOVATIVE SOLUTIONS FOR THE FPD INDUSTRY

- Radiant Vision Systems pioneered camera-based light and color measurement seeing color like the human eye
- Comprehensive testing suite for R&D into production with a series of standard tests along with testing customization to meet customer specific requirements
- Leading provider of a comprehensive solution for automated FPD visual defect measurement
- Field proven solution with thousands of cameras testing millions of displays
Sophisticated cameras autonomously scan a screen under inspection for a variety of defects including pixel, blob, illumination, edge, and color defects.
WHAT SOLUTIONS DO WE PROVIDE?

Core Technology

- Radiant Vision Systems provides optical testing systems that match human perception and judgment.
- We have 20 years of experience providing state-of-the-art light and color measurement, testing, analysis and optical system design.
- Thousands of our CCD-based display testing systems are deployed in production today, measuring millions of displays annually.

Testing Systems

- Dedicated testing systems:
  - Evaluating display optical performance, e.g., uniformity
  - Display defect detection
  - Mura (unevenness, irregularity or inconsistency in appearance) detection with JND (Just Noticeable Difference) evaluation
- Fully configurable test suites.
- Fully automated, or partially automated test processes.
- System integration to Production Control Systems, video pattern generators, bar code readers, etc.
TrueTest™

FPD Testing Applications

- Brand Owners, Manufacturers and Embedded Display Integrators
- Replacement of human visual inspectors
- Automated optical inspection

Key Features

- Flexible test sequencer
- Built in test library
  - Standard FPD Quality Tests
  - Advance Mura Detection Tests
- Fully integrates with Production Control Systems
- Powerful test set-up engine; Simple to add new / custom tests
- Easy-to-use operator mode

Customer Benefits

- Production line ready / proven
- Dramatic improvement over human visual inspectors
- Reduces / controls production cost
- Improves the end-customer experience
WHAT RESULTS ARE ACHIEVED?

Comprehensive Testing

• Pin-points and quantifies quality issues and defects

• Allows pass/fail determinations to be automated against a consistent standard, from DUT-to-DUT, line-to-line, and supplier-to-supplier

Uniformity testing
Defect detection
Mura detection and JND evaluation
SAVE COST AND INCREASE QUALITY IN THE SUPPLY CHAIN

LED Assembly
Light guide

Film

Back Light Unit

Glass

LCD

Assembled Unit - No Cover

Assembled Unit w/Cover

Pre-assembly test

Test in production now
Test in R&D now
Future test application
Incoming quality control
Outgoing quality control

Choices:
- Proactive and/or reactive testing
- At end of line and/or in-line

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WHAT BENEFIT DOES TrueTest™ PROVIDE?

The visual interface is the most important and persistent interface between the user and the product

Getting its right is critically important to the customer experience

• TrueTest delivers lower cost
  • Failures are caught earlier in the supply chain, where the cost of failure is lower
  • There are fewer returns / replacements

• TrueTest delivers improved customer experience
  • Fewer bad products reach the end customer
  • Product-to-product consistency is improved

• TrueTest results in a better managed, better performing supply chain
  • Detailed, comprehensive quality data is available from every supplier, by location and by line
  • Bad, and good, trends can be seen earlier
  • Performance evaluation is based on objective, numerical data
  • Manufacturing partners can be assessed on a program by program basis for new projects
TESTING AND EVALUATION CASE STUDIES

Lit Keyboard Appearance Testing

Challenges:
Inconsistent brightness and color of each key

Radiant Vision Systems Solution:
ProMetric imaging colorimeter, PM-KB software

Results:
Keyboard with objectionable brightness variations are not shipped to customers

Display Quality Control

Challenges:
Yellow/blue color blotches at edge due to backlight

Radiant Vision Systems Solution:
ProMetric imaging colorimeter, TrueTest software

Results:
Eliminated customer complaints about poor appearance

"... after the Radiant systems were implemented, customer complaints stopped "

SEE THE DIFFERENCE

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EXCELLENT RETURN ON INVESTMENT

- Reduced Labor Costs

- Improved reliability and repeatability in quality and performance testing

- Reduced cost by preventing failed products continuing through production or shipping to the customer

- Improved tracking of supply chain partner performance

Significant Cost Saving Opportunity from Quality Improvement and Cost Reduction

- Cost advantages of Radiant Vision Systems systems vs. human inspection:
  - Automation reduces labor costs
  - Fewer false failures reduce material costs
  - Improved defect detection reduces product returns
WHAT IS THE DEPLOYMENT MODEL?

- Develop solutions and quality test requirements with OEMs
- OEM cascades specification to CMs and, often, further through the supply chain
- Radiant Vision Systems coordinates deployment and on-going training and maintenance
- Radiant Vision Systems manages consistency of test application between suppliers

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Radiant Vision Systems.....

- ensures your customers get quality products that meet your specifications
- has proven reliability with thousands of deployed systems testing millions of displays
- has fast, capable, and flexible testing systems for your current and future models
- has local support to make sure deployments are smooth and effect and your factory stays up and running
THANK YOU

For more information, please email: Info@RadiantVS.com