YieldManager

Customizable yield management for IC manufacturers

Overview

For semiconductor foundries and IDMs that must maintain high yield for their products and real-time identification of process excursions, Synopsys YieldManager® provides in-line fab defect-centric yield solutions through accurate collection and analysis of defect and equipment data. YieldManager combines high-level correlation of disparate data sources with the rapid drill-down of data scope to expedite root cause identification, saving engineering time and focusing resources. Data types include defect, review, binsort, bitmap, parametric, MES and final test.

Benefits

- Implements a complete wafer fab defect centric solution with a single unified database

- Expedites root cause identification. YieldManager facilitates the correlation of all types of fab data, making it easier to differentiate between symptoms and probable root causes of yield problems

- Improves productivity through automated analysis. Analytical processes can be captured by YieldManager using its VB Script recording, editing and execution features. Reports can be customized and output to a variety of formats, including HTML and Microsoft PowerPoint®

- Ensures data security. YieldManager has a three-tier system approach that gives administrators powerful and versatile tools to control data flow

Reduces the Time Required to Resolve Yield Problems

Effective defect centric yield analysis requires powerful management of data from disparate sources and the ability to quickly distinguish probable root causes from symptoms. Such a solution must enable rapid correlation of various data types with meaningful statistics and graphical presentation. YieldManager provides a common data framework that permits consistent analysis methods throughout the fab, empowering multiple teams to collaborate effectively.
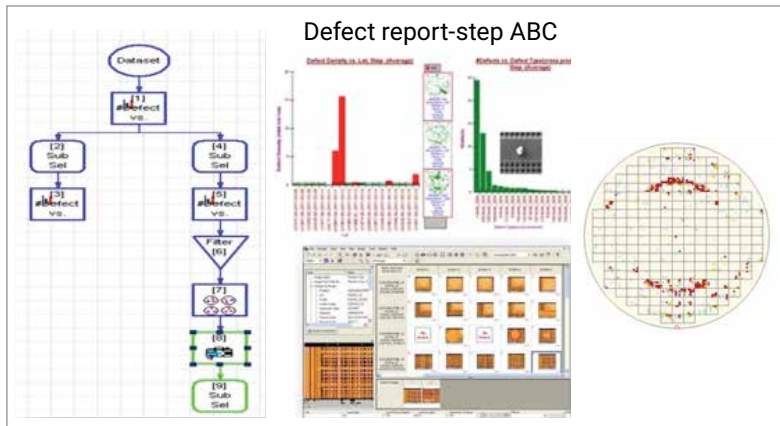
Figure 1: YieldManager's enhanced automation framework embeds decision making processes through data analysis

Data Storage Security and Stability

YieldManager's single unified database and infrastructure provides a robust, consolidated and secure data system that simplifies maintenance, yet is scalable to increasing demands.

The production-proven YieldManager data system is built on the Oracle platform and runs in a UNIX environment with field-proven stability. Included in YieldManager is a comprehensive and expanding assortment of loading tools to interpret most data formats. YieldManager has added a new level of security with a server-based utility that gives system administrators more control and flexibility using genuine domain authentication.

YieldManager Architecture Highlights

- Multi-tier client server architecture supports performance and hardware scalability
- Open database architecture with documented access
- Multi-tier component-based architecture built on Microsoft technology to allow plug-and-play of functional modules to achieve function and feature scalability
- Hardware platform independence provides flexibility and enables utilization of next-generation IT systems including SAN, gigabit and multiprocessor systems
- Database schemes and designs handle throughput requirements of the future
- Open architecture, standard communication protocols and data conversion tools enable easy connectivity with a variety of data equipment from multiple sources within a fab manufacturing infrastructure

Powerful Interface

With YieldManager, any data condition can be virtually included, excluded, or compared including split lots, process tool, die-based zone, high-low yield and groups, enabling quick and easy identification of the source of a problem. Throughout an analysis session, data selection can be further refined with simple point-and-click selections to isolate distinct yield loss sources.

Defect Analysis

Interactive stacked or a gallery of wafer maps provide a single view of front scan, back scan, edge inspection and SEM review data. Defect density and intensity maps enable hot spot analysis (Figure 2). Standard communication protocols and data conversion tools enable easy connectivity with over 100 inspection tools and a variety of data equipment from multiple sources. Intuitive customizable data summaries include features such as zoom-in, bird view, reclassification and signature patterns based on inspection layer, zones, killer classification and more.
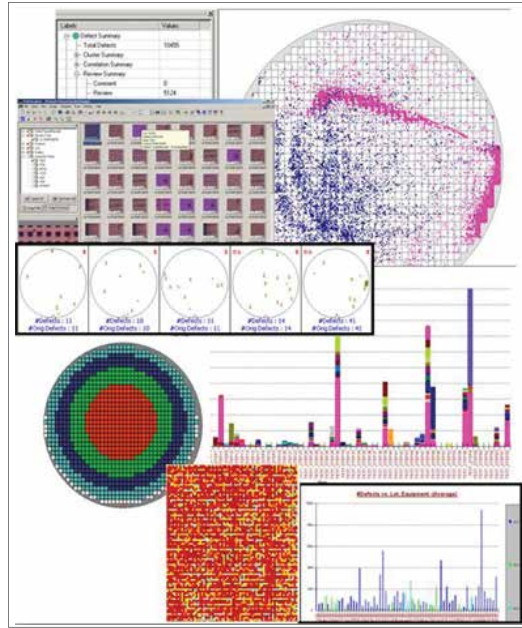

Figure 2: Interactive gallery of wafer maps, images and histograms

Enhanced Charting and Reporting Engine

A powerful charting engine presents data in an interactive and highly customizable format. Chart types can be easily designed using intuitive, drag-and-drop features that make multiple methods of analysis easy. Frequently used charts and preferences can be saved to further streamline analysis. Intuitive chart formulas, chart thumbnails and data explore features are also available.
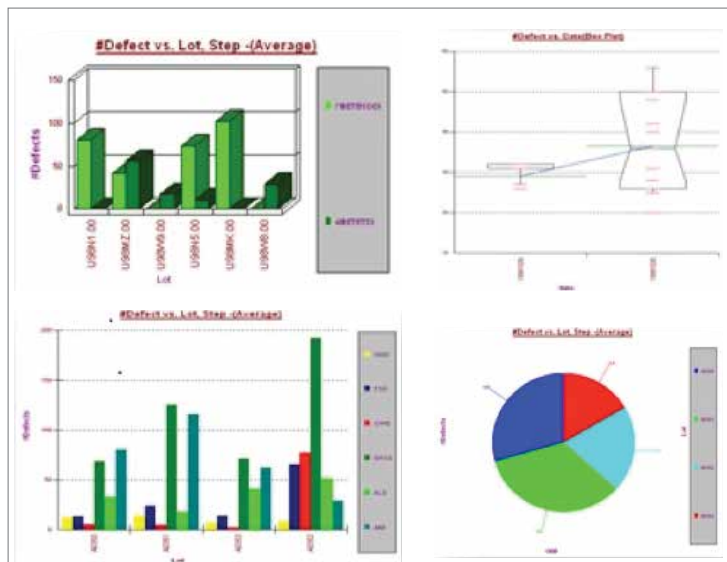

Figure 3: Powerful charting engine presents data in an interactive and highly customizable format

Interactive Lot, Wafer and Defect Extraction Reports

Users can easily create reports using an intuitive drag-and-drop interface with user-defined templates. YieldManager supports multiple export formats including Excel, HTML, and PowerPoint.
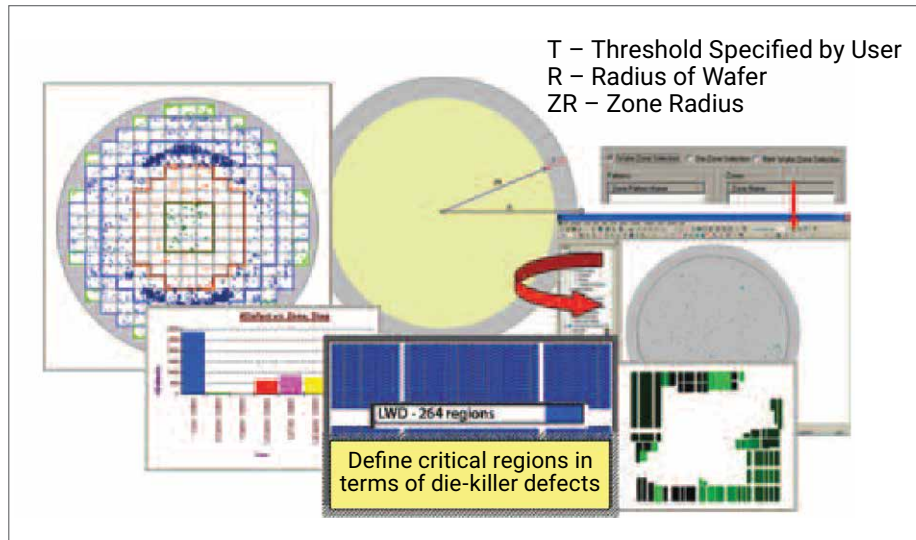

Figure 4: Wafer and die based regional analysis

Automation Module

Capturing and sharing routine analysis saves time and promotes consistency. Workflows integrating charts, wafer maps, reports and image galleries can be created quickly and easily using the powerful, intuitive graphical interface.

Users can create data-independent workflows of customized, complex analyses that can automatically follow conditional pathways when triggered or run according to a schedule.

Zonal Analysis

YieldManager supports user-configurable zones on wafer or die level for pattern and bare wafer scans. Zonal analysis shows defect, bitfail and binsort distribution across zones. Zones can be created quickly using the intuitive drag-and-drop interface or can be imported using .csv files with critical-area design attributes.

Enhanced DSA

Flexible load time for defect source analysis (DSA) enables fast, accurate identification of the source and physical attributes of defects. It also provides the flexibility to setup a correlation radius to classify defects such as adders, commons and missing defects and subselects to view signatures on the maps and Pareto charts.

Binsort E-Test-Defect Correlation

Wafer sort or chip probe data can be collected from both electrical probe and automatic test equipment (ATE). The inline or end-of-line (EOL) data can be correlated to perform yield correlation using defectivity analysis equipment. It enables high-yield/low-yield analysis to identify yield problems. Using a variety of methods including basic, KR, IEEE KR, enhanced "Killer Ratio" charts can be generated that help determine which steps are contributing a larger number of killer defects and what size or type of defects are reducing yield.
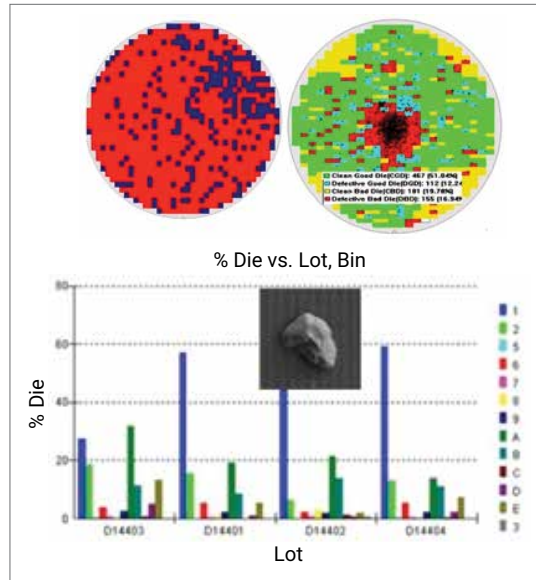

Figure 5: Defect to binsort correlation improves yield monitoring

Enhanced Bitmapping

YieldManager's enhanced bitmapping collects and stores large volumes of bitmap data measured at different parameters from different testers, providing the flexibility to classify failure patterns. Advanced bit-to-die analysis is also included.

The easy-to-use GUI with automated capabilities such as defect, sort floor and bitmap correlation eliminates repetitive manual tasks, enabling designers to focus on improving the yield of memory arrays (Figure 6). The enhanced bitmapping also delivers feedback on yield killers and their die locations. Intensity maps provide a view of all bits failing at the same location, which intuitively draws the yield engineer to specific regions of high fall out for further root cause analysis. Flexible classification of failed bit patterns is enabled through customized bitmap translators.
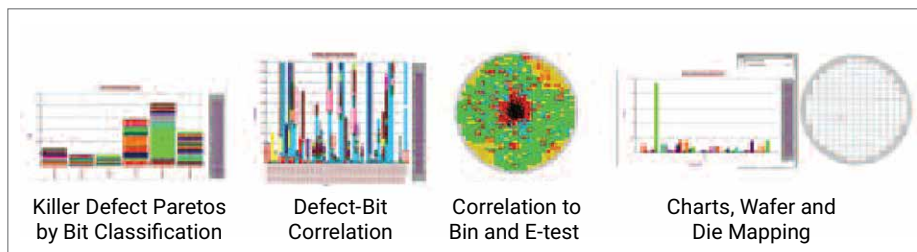

Figure 6: Comprehensive defect bitmap and sort correlation analysis to improve yield monitoring

MES/WIP Analysis

YieldManager provides views of MES data for process operation line monitoring and tool commonality analysis. This module identifies yield limiting excursions from specific process equipment or chambers.
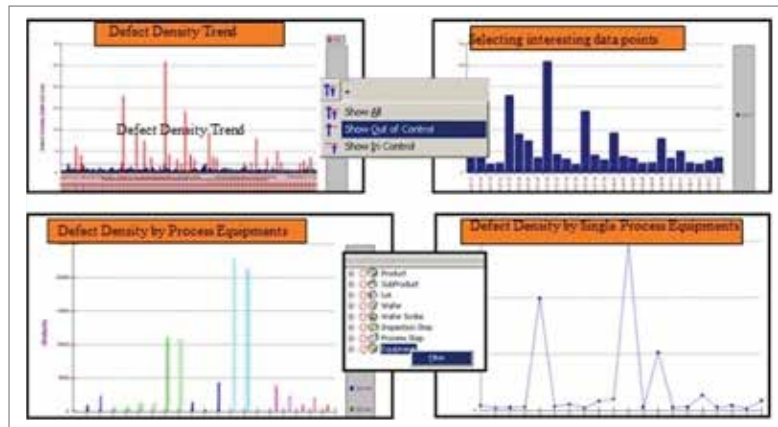

Figure 7: Typical MES systems include PROMIS™, FACTORYworks™, WorkStream™ and Siview™

Parametric Module

YieldManager's Parametric Module imports inline and EOL device performance structures for correlation to die fallout across a wafer or group of wafers (Figure 8). The Parametric Module allows the user to analyze the results for any test parameter and view the mean, standard deviation, Cp, Cpk, yield and other statistical results for selected test parameters collected from inline (WET) and EOL (WAT) at the lot, wafer or site level. Parametric specification limits and sigma levels can be set within YieldManager to show a parameter's normal versus OOC regions. Regular or scheduled trend charts and X/Y scatter plots for each designated parameter can be auto-generated for quick reference for OOC events and daily operations.
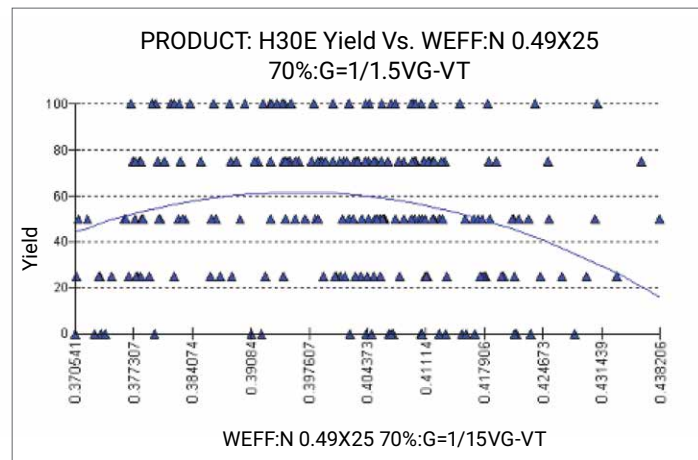

Figure 8: Parametric module imports inline and EOL device performance structures for correlation to die fallout across a wafer or group of wafers

Online Help

Online help provides a comprehensive guide for performing root cause analysis using YieldManager. Underlying mathematical assumptions are described in detail, enabling predictable and accurate yield analysis. Video tutorials demonstrate the advanced feature set, accelerating he learning curve.
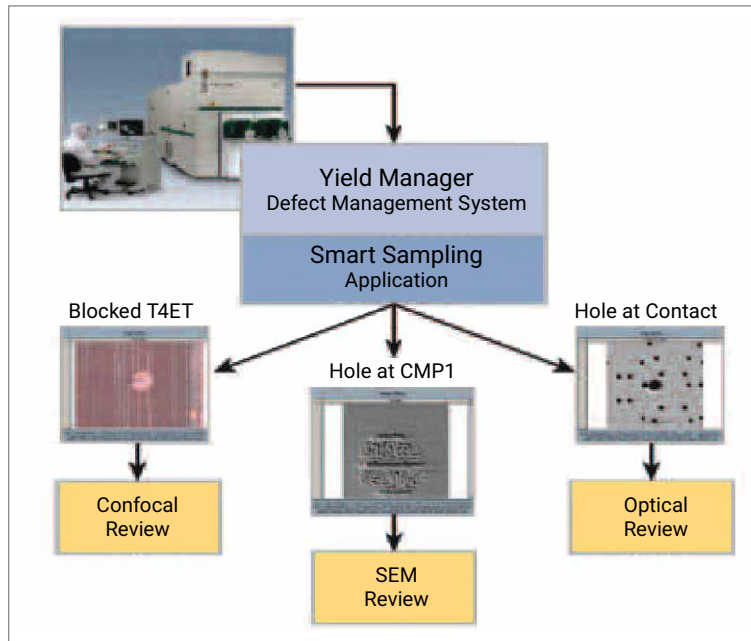

Figure 9: Smart Sampling automatically performs inline defect sampling of wafer inspection data

Smart Sampling™

Smart Sampling per forms highly efficient automatic inline defect sampling of wafer inspection data in conjunction with inline review tools within the semiconductor manufacturing environment (Figure 8). Smart Sampling utilizes the fab manufacturing data to determine which tool type is best suited to review and classify particular defects. The Smart Sampling solution runs independently and complements all defect analysis systems.