Challenges

Today’s advanced process control (APC) and equipment engineering systems (EES) are typically decentralized without a unified platform, shared repository or common algorithms. And because many of these stand-alone systems are highly customized or supplied by different vendors, heavy IT involvement is required when factories add manufacturing lines and additional tools. This involvement leads to a high cost of ownership.

Many standalone fault detection systems rely on a reactive methodology to identify issues. Without a proactive fault detection monitoring system, huge yield loses can result before process drifts are noticed. Therefore, needs exist for both a proactive FDC system that can detect equipment issues before they affect process output, and a unified platform to facilitate integration of process tool, metrology tool and manufacturing data between APC components.

Solution Description

The Applied E3 FDC module is the only fault detection and analysis solution in the market today built on a common platform with integration to statistical process control (SPC), equipment performance tracking (EPT), run to run (R2R) control and advanced data mining (ADM). The FDC module continuously monitors equipment sensors and events against performance metrics using statistical analysis techniques, and provides proactive and rapid feedback on equipment health. Using the E3 FDC module, engineers can analyze sensor data from manufacturing equipment, detect out-of-norm conditions and relate them to problems with tools.

PREDICT AND PREVENT. The E3 FDC solution gives process engineers the flexibility to not only perform corrective maintenance, but to also predict and proactively schedule a system for repair before a failure can occur. For example, when data exists for both a known good substrate (e.g., wafer or glass) and a known bad substrate, sensor traces can be superimposed to help identify a potential root cause. Using this type of data-driven troubleshooting approach, predictability of operations increases and tool downtime and unnecessary parts replacements can be significantly reduced.

DETECT AND DIAGNOSE. Engineers can construct classification models to define root cause based on fault detection alarms with the E3 FDC strategy engine. This strategy engine provides a dashboard with extensive tools for analyzing various data sources. With the dashboard, engineers can drag and drop data collections into data views, reuse previous analysis templates, access all types of data in the repository and add comments to run data. The FDC solution also provides a vast library of univariate and multivariate analysis tools for developing detailed diagnostic models. These models can detect problems with equipment and provide predictive maintenance capabilities that reduce unscheduled downtime and product scrap. The strategy engine also includes support for limits management and offers extensive data filtering capabilities to eliminate false positives.

E3 FDC includes a dashboard that offers extensive tools for analyzing various data sources. This dashboard shows a UVA box plot, a UVA trend report and additional trace data.
How much scrap can be reduced in your facility by using an effective fault detection system?

95% Reduction

Percent scrap reduction reported by one display CMP customer using E3 FDC.

Customer Results
Historical data from E3 FDC implementations at customer sites have shown:
> Up to 90% reduction in equipment and process false alarms
> Over 95% reduction in scrapped material
> Demonstrated 26 hour reduction in unscheduled equipment downtime

Package Contents
Designed around best known methods for detecting faults and process deviations, the E3 FDC module offers proven technology in one package that includes:

LICENSE AND PLATFORM
> Applied E3 FDC module license
> Applied E3 FDC Web interface with UvA and trace reports, data status and data export functions
> Applied E3 platform with strategy engine, logic strategies, and designer and dashboard interfaces

TRAINING AND SUPPORT
> User training and application consulting (optional)
> One year of maintenance and support

Server hardware and installation services sold separately.

APPLIED MATERIALS EXPERTISE. Applied Materials has the expertise and solution portfolio to help manufacturers maximize factory value with data capture and analysis, best known method integration and comprehensive reporting. With a deep knowledge base and a rich history of providing products and solutions specifically addressed to the semiconductor, display and solar industries, Applied Materials experts provide services to deliver turnkey solutions that offer quick value and short ROI.

From the E3 FD UVA Collections window, engineers can select process types and tool historical data to define statistical models and limits for recipes, steps and sensors.

UVA statistical reports are available on the Web for displaying UVA trend and process trace data.

Engineers can easily customize and modify fault detection strategies without coding or scripting. This sample logic strategy checks for faults, shuts down a tool (PM overdue), and sets the PM to pending.

E3 FDC is more than just “detecting faults.” It translates equipment data into actionable information.