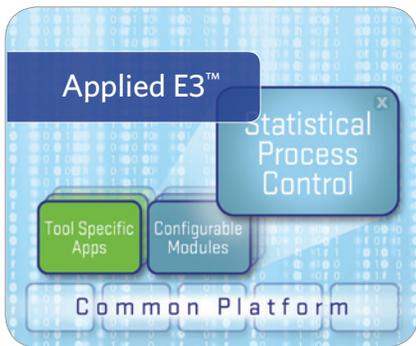# APPLIED E3™

STATISTICAL PROCESS CONTROL (SPC) MODULE

An E3 module that integrates measurement and process analysis data with other advanced process control (APC) and equipment engineering systems (EES), providing more in-depth analysis findings, faster process results and out-of-control action plans (OCAPs), all from a unified platform.

Industries

> Semiconductor wafer manufacturing
> Display manufacturing
> Crystalline silicon (c-Si) solar manufacturing
> Light-emitting diode (LED) manufacturing

Features

> Statistical data analysis with control charts (mean, std. dev., median and range)
> Immediate detection of product quality variation
> Automatic operator and engineer notification, and correction of SPC violations
> OCAP tracking and execution
> SPC data and results used by E3 strategy engine and other E3 modules
> Drill down and across raw data based on SPC results or violations
> Factory floor interface to view charts
> Single database for all collected data

Benefits

> Provides rapid analysis
> Improves process control
> Improves product quality
> Reduces need for inspection
> Simplifies administration
> Lowers cost of ownership

Challenges

An SPC system is essential for achieving quality goals. However, many semiconductor, LED, TFT-LCD and solar manufacturers use standalone SPC systems that do not actively interact with other fault detection and APC systems. Such SPC systems may be homegrown or highly customized and do not drill down and across data collected by various APC systems to identify additional process variations. Because many systems are not integrated from the outset, IT involvement and integration can be complex and expensive. A need exists for better integrating process tool, metrology and manufacturing data on a single platform that seamlessly shares performance data and results, triggering immediate corrective action when necessary.

Solution Description

The Applied E3 SPC module is an advanced solution that addresses process variability to maintain high quality and improve product yield in complex manufacturing environments. As the industry-leading statistical process control solution, E3 SPC offers seamless integration with other E3 modules to more quickly identify the root cause of a process failure—all from one unified system.

What sets E3 SPC apart from competing systems is its ability to trace statistical analysis and violation data back to the raw data from the process equipment. It can drill down and across the data collected by the other E3 modules, such as run-to-run (R2R) and fault detection and classification (FDC), identifying specific parameters and sensors to recognize process variation issues.

The E3 SPC module leverages the E3 strategy engine to enable more effective fault detection and APC models by linking to SPC results. The strategy engine allows engineers to automatically execute OCAPs based on specific manufacturing operations and is a key element for implementing Six Sigma programs. For example, when a lot is processed on a metrology tool, E3 SPC collects the tool data and performs the statistical analysis. E3 then correlates the SPC data with the equipment data for the same lot, identifies problems with specific parameters and sensors for that tool and immediately takes appropriate corrective action.
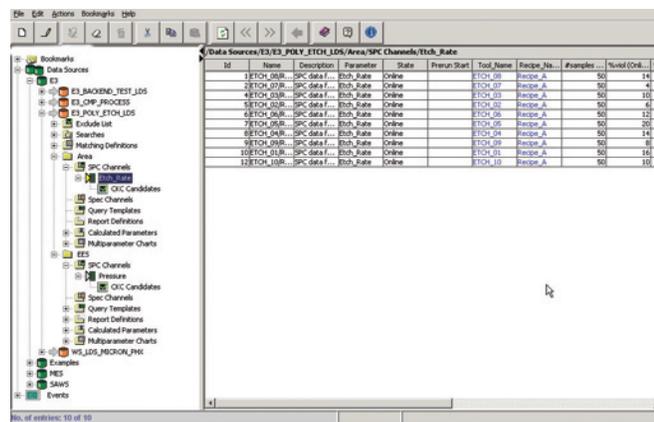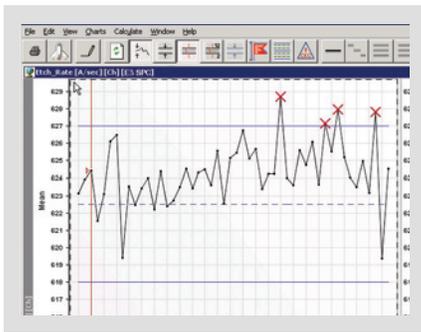

The Navigator Configuration Client allows users to configure SPC charting and view offline SPC charts.

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APPLIED E3™
STATISTICAL PROCESS CONTROL (SPC) MODULE

The Integration window allows users to define what data is sent to E3 SPC.

The Monitor displays online SPC charts and provides corrective action execution.

SPC Capabilities for Achieving Manufacturing Efficiency and Process Control		
✓	**Statistical data analysis**	Provides statistical analysis of data with chart types such as mean, standard deviation, median and range.
✓	**Diagnostics**	Handles violations and other analysis results with the E3 strategy engine to support automated corrective actions (engineers can quickly view corrective actions associated with violations).
✓	**Notification**	Provides automatic notification based on detection of SPC violations.
✓	**Drag-and-drop, workflow-based strategy engine**	Leverages the E3 strategy engine, which provides logic strategies that listen for events from equipment, performs logic analysis based on collected information and sends commands down to equipment. The graphical "drag-and-drop" E3 Designer window included with the strategy engine allows process engineers to easily customize and modify models, with no coding or scripting.
✓	**Multi-level data visualization and analysis**	Includes extensive tools for plotting real-time data, analyzing various data sources and monitoring process health.
✓	**Configurable with other E3 modules***	Combines with FDC, EPT, R2R and ADM on a common platform, eliminating issues with tool connectivity, model and system integration, and lowering overall cost of ownership (CoO).

*See the appropriate data sheet for each module.

Package Contents

SOFTWARE LICENSES
> Applied E3 SPC module license, which includes the E3 SPC monitor interface, SPC engine, and SPC configuration, analysis and visualization capabilities
> Applied E3 platform license with strategy engine, designer and dashboard interfaces

INITIAL DEPLOYMENT SERVICES
> Product installation and setup
> User training

MAINTENANCE AND SUPPORT
> One year of maintenance and support

APPLIED GLOBAL SERVICES

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