

Improving Yields and Tool Uptime with In-Line Particle Sensor in Semiconductor Environments

Fine particles can have disastrous effects on semiconductor manufacturing, where devices are extremely sensitive and prone to damage by particulate contamination. Despite manufacturers' best efforts to prevent contamination through air filtering and recirculation methods, particles are still able to form inside process tools where they can create defects and harm yields.

CyberOptics' In-Line Particle Sensor™ (IPS™) provides a streamlined solution for particle detection and maintenance. The IPS relieves pains of traditional monitoring methods while simultaneously increasing tool uptime and improving yields.



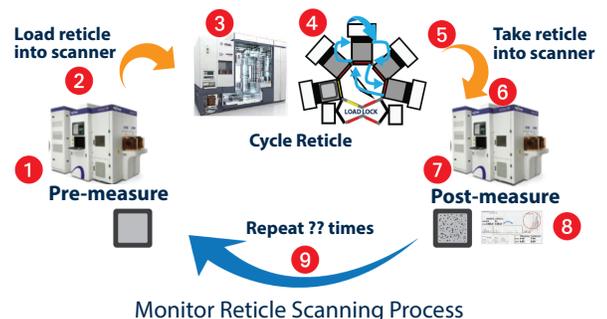
Challenge

The three widely used methods for particle detection in photolithography environments—benchtop and handheld particle counter, monitor reticles, and in-situ monitor particle scanners—all have significant drawbacks. It is often impossible to reach all locations of interest using the benchtop and handheld methods, while benchtop counters are also frequently incapable of following the reticle path and monitor reticle scanning creates long delays before delivering test results. The conventional approach is slow and takes tool time which could instead be used to process product wafers—a missed opportunity to improve yields.



Handheld / Benchtop Counters

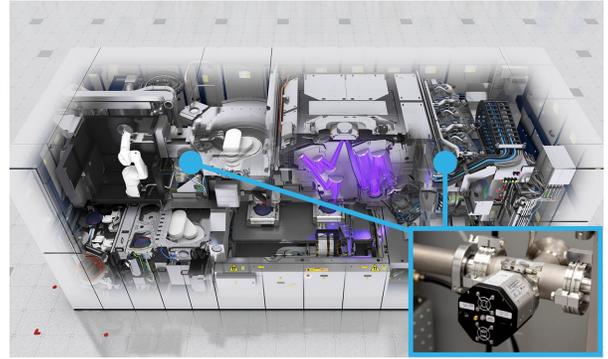
Quickly identifying when and where airborne particles originate is challenging with traditional methods, but it is critical to success. Most monitoring relies on inspection with monitor wafers, which are run through the process routinely or in response to a contamination problem detected by downstream inspection of product wafers. However, due to their intermittent nature, conventional monitoring methods often miss contamination until damage has already been done and is later detected downstream.



Manufacturers faced constant frustration attempting to locate precisely when and where airborne particles originated while using imprecise traditional methodology. Managing contamination while maintaining production speed was an uphill battle before the adoption of CyberOptics' In-Line Particle Sensor (IPS) technology.

Solution

CyberOptics' In-Line Particle Sensor addresses these issues, offering a solution informed by a thorough understanding of the contamination and detection problems that process engineers or operators face. IPS is an extension of CyberOptics' Airborne Particle Sensor™ (APS/APSRQ™) technology, which has been recognized as the Best-Known Method (BKM) in fabs worldwide. The IPS can be installed anywhere in the process chamber exhaust line, where it utilizes a high-power blue laser to quickly monitor, identify, and troubleshoot particles down to 0.1 μm.



IPS Locations: Supply and Exhaust Lines - Photo Illustration: ASML

CyberOptics particle sensors can detect particle sources precisely when and where they occur, thus dramatically improving tool-up-time and first-pass wafer yields by selectively servicing the portions of a tool causing particle generation. Unlike competitors' products, the IPS works continuously and in real time to deliver significant productivity and cost benefits.

By recording particle counts versus time, the IPS enables particle generating events to be correlated with process events occurring inside the tool. CyberSpectrum™ software displays real-time numerical and graphical particle event data over time, including instantaneous and average particle measurement results and accumulated particle counts. The data is recorded to enable past and present comparison, as well as comparison between tools. EUV customers, for instance, have shown a clear correlation between IPS measurements and particle adder events.



CyberSpectrum Software

Operators are spared the need to open tools in order to make particle measurements.

In addition to CyberSpectrum software, the Software Development Kit (SDK) allows recorded data to be stored in a network, thus eliminating the need for a designated data-storing PC. From this central location in the cloud, any software can be utilized to analyze particle data. CyberOptics' IPS is suitable for use in a wide range of process sensitive applications including, but not limited to, Extreme Ultraviolet Lithography (EUV) processes, semiconductor process equipment, vacuum chambers, 3D metal printing equipment, and equipment in controlled environments.

Benefit Summary

CyberOptics' IPS helps producers maximize process yield and tool availability for contamination-free process environments. IPS and wireless wafer and reticle format sensors detect particle sources precisely when and where they form, with results available in real-time and conveniently stored for future analysis. Rapid results speed detection of source contamination, shortening maintenance cycles as a result. Continuous monitoring eliminates downtime and damage to in-progress work, ultimately improving yields while providing tremendous time and cost saving benefits.

About CyberOptics

CyberOptics Corporation is a leading global developer and manufacturer of high-precision 3D sensing technology solutions. CyberOptics' sensors are used for inspection and metrology in the SMT and semiconductor capital equipment markets to significantly improve yields and productivity. By leveraging its leading edge technologies, the Company has strategically established itself as a global leader in high precision 3D sensors, allowing CyberOptics to further increase its penetration of key vertical markets. Headquartered in Minneapolis, Minnesota, CyberOptics conducts worldwide operations through its facilities in North America, Asia, and Europe.

For more information on CyberOptics products, services, or solutions, visit our website at www.cyberoptics.com.

CYBEROPTICS®

Contact CyberOptics today for more information

+1 800.366.9131 or +1 763.542.5000 | CSsales@cyberoptics.com | www.cyberoptics.com

Copyright © 2021. CyberOptics Corporation. All rights reserved. Specifications subject to change without notice. 8030170 Rev B