

Introduction

Vacuum pumps are one of the most widely used equipment in semiconductor process plants. They are critical to various Chemical Vapor Deposition processes which operate under vacuum to ensure uniform and conformal deposition coatings at lower processing temperatures. Dry pumps are generally reliable, but when pumping in harsh semiconductor manufacturing processes, they can occasionally suffer from unexpected failures.

The Problem

Dielectric deposition condensates and harsh process gases (e.g., NF_3) can result in failure modes and degraded performance, including sudden ingestion of deposits, exhaust blockages, deposition causing pump seizure and the corrosive degradation of pump components. Pump failure typically causes irreparable damage to 10's or even 100's of in-process wafers. Additionally, tool downtime and cleanup can result in significant expenses and lost revenue.

The Solution

Data-Driven Pump Failure Prediction

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Summary

By pre-emptively replacing the dry pump prior to failure, catastrophic vacuum loss can be mitigated, resulting in improvements in line yield.

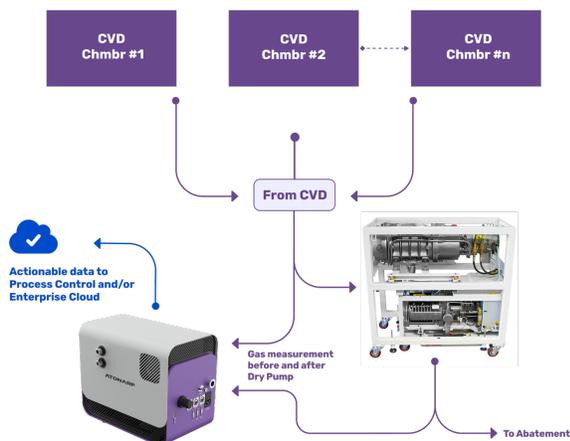


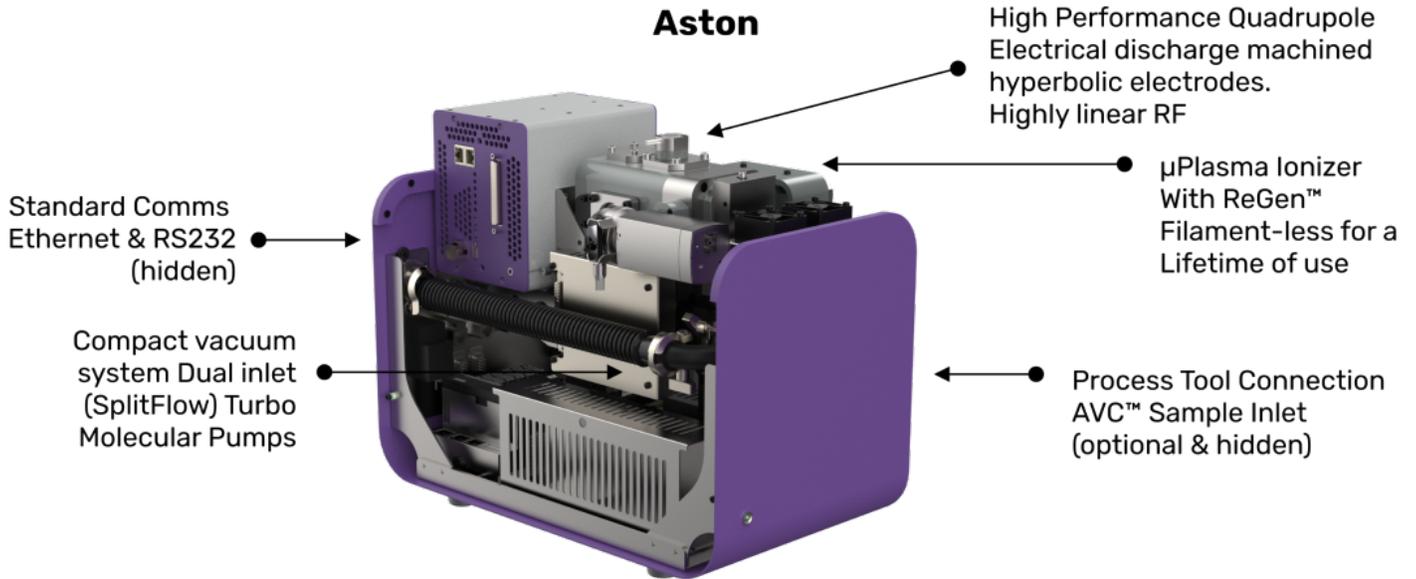
Aston Benefits

- Corrosive Gas Resistant
- Deposition Gas Resistant
- Real Time, Actionable Data
- Cloud Connectivity Ready
- No Plasma Required
- Best-in-Class Features
 - Stability
 - Repeatability
 - Sensor Lifetime
 - Mass Range
 - Resolution
 - Min Detectible (PP)
 - Sensitivity (PPB)
 - Sample Rate

Applications Supported

- Dielectric Etch
- Metal Etch EPD
- CVD Monitoring
- Chamber Clean EPD
- Chamber Fingerprinting
- Chamber Matching
- High Aspect Ratio Etch
- Small Open Area <0.3% Etch
- ALD
- ALE





Equipment and Process Co-Optimization (EPCO): A \$38B Long-Term Manufacturing Optimization Opportunity

Advanced processes now require Equipment and Process Co-Optimization (EPCO). A 2021 paper by McKinsey & Co. demonstrated that semiconductor manufacturing optimization, using artificial intelligence (AI) & machine learning (ML), represents a \$38B cost saving opportunity through improved yields and increased throughput. McKinsey highlighted the single biggest intervention point to help companies realize these benefits as adjustment of tool parameters, using live tool sensor data from current and previous steps to enable AI/ML algorithms to optimize the nonlinear relationship between process operations. Key to successful AI/ML deployment is actionable real-time data. Aston in-situ real-time molecular diagnostics and its cloud connected data are key technologies enabling this capability to unlock the potential for semiconductor EPCO.

Atonarp is leading the digital transformation of molecular diagnostics industrial and healthcare markets. Powered by a unifying software platform and breakthrough innovations in optical and mass spectrometer technology, Atonarp products deliver real-time, actionable, comprehensive molecular profiling data.