ANALYTICAL SERVICES

PARTICLE CHARACTERIZATION • SEM + AUTOMATED ANALYSIS

You Found the Particle. Now What?

When contamination, inclusions, or foreign debris threaten your product or your process, JH Analytical Labs identifies what it is, how many there are, and where it came from—automatically, at scale, with full documentation.

In contamination investigations, the first question is easy. ***Is there a particle?*** The hard question is everything that follows.

What is the particle made of? Where in the process did it originate? Is this an isolated event or a systemic contamination problem? How many particles are present across the sample population, and what does the size distribution tell you about the source? These are the questions that manual inspection—optical or SEM—rarely answers fast enough, consistently enough, or with enough data to act on.

JH Analytical Labs uses Oxford Instruments' automated particle analysis software, integrated with high-resolution SEM and EDS, to automatically characterize thousands of particles per session, delivering the statistical depth and chemical identification that contamination investigations require.

The Problem With How Most Labs Approach Particle Analysis

Optical microscopy measures size and shape but can't identify composition. Manual SEM/EDS provides particle-by-particle chemistry, but doing so at any meaningful scale is slow and expensive, and it introduces operator-to-operator variability that undermines confidence in the results. Most labs end up with either too little chemistry or too little data—rarely both.

The result is investigations that stop at 'we found contamination' without reaching 'we know what it is and where it came from.' That gap is where product decisions stall, corrective actions get delayed, and root causes stay unresolved.

How Automated Particle Analysis Closes the Gap

Oxford Instruments Particle Analysis software runs the entire characterization workflow without operator intervention at each step. The system scans the sample surface, detects particles using image thresholding and analysis algorithms, measures each one dimensionally, acquires an EDS spectrum for elemental identification, classifies particles by composition and morphology using user-defined rules, and compiles the results into a comprehensive report—all automatically.

AUTOMATED DETECTION

EDS ON EVERY PARTICLE
Elemental composition identified automatically for each particle, not sampled or estimated.

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Every particle on the sample surface is found and measured—no operator selection bias, no missed features.

STATISTICAL SCALE
Thousands of particles per session versus hundreds by manual methods—enough data to characterize populations, not just events.

LARGE AREA COVERAGE
Automated stage mapping covers filter media, full wafer surfaces, and large sample areas without manual repositioning.

CONSISTENT CLASSIFICATION
User-defined rules categorize particles by chemistry, size, and morphology the same way every time.

AUDIT-READY REPORTING
Particle counts, size distributions, composition statistics, and image galleries generated automatically for regulatory and quality documentation.

Where This Changes the Investigation

Contamination & Cleanliness Analysis

Semiconductor fabrication, medical device manufacturing, aerospace components, and precision machining all require documented evidence that particulate contamination is understood and controlled. Automated particle analysis identifies contamination sources, characterizes particle populations across the entire sample, and generates the documentation that quality systems require.

Failure Analysis

Wear debris and foreign material contamination leave a chemical signature. Characterizing a particle population across a filter or fluid sample reveals the source material of debris, which points directly to the component or process that produced it—faster than manual investigation, with more statistical confidence.

Powder Characterization

Metal additive manufacturing powders, battery materials, pharmaceutical powders, and catalyst particles all require data on size distribution, shape consistency, and compositional uniformity. Automated SEM-EDS characterization delivers a level of detail and throughput that other methods can't match.

Inclusion Analysis

Non-metallic inclusions—oxides, sulfides, carbides—influence mechanical performance in ways that correlate directly with inclusion characteristics. Automated identification and quantification of inclusion populations gives materials engineers the data to make those correlations reliably.

Filter & Environmental Analysis

Particles captured on air filters, liquid filtration media, and environmental monitoring substrates can be characterized across the full filter surface—not just a representative spot—giving a complete picture of the particle population and its composition.

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Proven in Practice

Three investigations where automated particle analysis moved our customers from uncertainty to root cause:

CASE 01 Semiconductor Fabrication Yield Loss

Challenge: A fab was experiencing unexplained yield loss traced to particulate contamination on wafer surfaces.

Analysis revealed: Automated analysis of 4,200 particles across the wafer surface identified two distinct particle populations by composition—one matching process chemicals, one matching a tooling material.

Root cause: Two simultaneous contamination sources confirmed. Corrective actions targeted separately, yield loss resolved.

CASE 02 Foreign Debris in Medical Device Assembly

Challenge: Metallic particles were discovered during final inspection on a Class II medical device assembly.

Analysis revealed: Particle composition matched a stainless steel alloy inconsistent with the assembly's specified materials.

Root cause: Contamination traced to a shared tooling fixture used across multiple product lines. Segregation protocol implemented.

CASE 03 Additive Manufacturing Powder Qualification

Challenge: An aerospace supplier needed to qualify a new metal powder lot against print performance specifications.

Analysis revealed: Automated characterization of particle size distribution, morphology, and elemental consistency revealed a satellite particle population exceeding specification limits.

Root cause: Powder lot rejected before use. Supplier qualification process updated to include automated SEM-EDS powder analysis.

A Complete Investigation, Not Just a Particle Count

Automated particle analysis is most powerful as part of a complete analytical workflow. JH Analytical Labs combines automated particle characterization with SEM imaging, EDS, cross-sectioning, and EBSD when the investigation demands it:

- Visual inspection and optical microscopy for initial assessment
- Automated SEM particle detection and dimensional measurement
- EDS elemental identification on every particle
- Statistical reporting and population analysis

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- Cross-sectioning and complementary techniques for complex cases
- Clear root-cause determination you can act on and document

Why Teams Send Samples to JH Analytical Labs

Automated particle analysis requires Oxford Instruments software, a calibrated SEM with EDS, and the analytical expertise to configure classification rules for your specific materials and contamination types. JH Analytical Labs provides all of that—along with the interpretation that turns data into conclusions. Our applications scientists correlate chemistry with physical observations, know the technique's limits, and tell you when a complementary method will yield a better answer.

SCALE
Thousands of particles characterized per session—statistically significant results, not educated samples.

CHEMISTRY + MORPHOLOGY
Size, shape, and elemental composition combined in a single automated workflow.

EXPERTISE
Applications scientists who configure the analysis for your materials and interpret the results, not just collect them.

FULL WORKFLOW
SEM, EDS, EBSD, ion milling, and cross-sectioning under one roof when your investigation needs more.

Have a particle problem that needs an answer?

Send us your sample—filter media, a component surface, a powder lot, or a failure site—and JH Analytical Labs will run automated particle analysis and deliver a full characterization report. We also work with labs evaluating Oxford Instruments equipment for in-house implementation.

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