FAILURE ANALYSIS

Industrial forensic inquiry into failed components, products, and systems



RJ Lee Group's experts perform root cause failure analysis to identify issues throughout all stages of the product's life cycle, helping the client find a remedial plan of action. Focusing on materials characterization, our multi-discplinary scientific staff works with clients across all industrial sectors, supported by a full-service characterization laboratory.

From production to development to operation in the field, we conduct industrial forensic inquiries into failed components, products, and systems, relaying results so the client has a thorough understanding of how and why a component or product failed. Our experts then recommend corrective and preventative actions to reduce future risk of failure and to optimize performance.

Our failure analysis skill sets include metallurgy, concrete, glass, electronics, corrosion, welding, and specialty chemicals and coatings. We also serve as a third-party laboratory to provide objective evaluations of warranty claims.

RJ Lee Group's clients value the integrity of the data our laboratory generates and the insight into those results that our scientists provide, all delivered in the required time frame.

Benefits of RJ Lee Group

- Provides single-source information you need to make an informed decision
- Access to a wide network of experts
- A vast array of specialized test equipment for both field and laboratory testing

Case Studies

INDUSTRY: CONCRETE

A civil engineering firm hired RJ Lee Group to conduct analysis on a concrete viaduct that handled about 75,000 vehicles per day. Our experts provided information on the current state of the concrete, performed failure analysis, and provided an estimation of service life. We provided critical data for the engineering firm to generate and oversee repairs.

INDUSTRY: METALLURGY

A failed municipal water pipe caused a landslide, releasing fly ash materials into a drainage stream. Our investigation revealed the tons of cover material around the pipe caused stress to cause the crack, and the sudden release of this stress by the landslide caused the pipe to fail. The pipe was a victim of the landslide, not the cause.

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These case studies highlight the PC² modular approach. Each case uses only the modules needed to resolve the contamination problem. Our analysis will provide a cost-effective formula to determine root cause as well as to propose measures to prevent future contamination.

CASE STUDY 1: Analysis Automation and Customized Reporting Provide the PC² Solution

Issue: Finished product experiencing catastrophic failure

Investigation: Root cause was already determined to be particulate contamination within a specific raw material

Need: Screening process for particulate size and composition to prevent use of contaminated powder

We identified an automated SEM/EDS particulate characterization technique as the optimal solution because it could efficiently generate the number of data points that were statistically significant and met the need criteria. We developed innovative sample preparation procedures so this automated technique could be enabled.

The large number of data points produced by this analysis necessitated a software solution that would quickly reduce the information. We created a package to:

- Define customized rule sets to immediately flag contaminant data
- Create a mechanism that enabled Pass/Fail summary reporting

This customized information management system also enabled evaluation of Pass/Fail history overall, per specific vendor or time of year.

CASE STUDY 2: Full Use of PC² Program Mitigates Risk and Creates a Proactive Program

Issue: Visible particle contamination in liquid product

Investigation: Hypothesized that process material was shedding into the product

Need: A program for monitoring and characterization of contaminates found in the product

We developed a three tier strategy to 1) determine root cause, 2) develop a monitoring program and 3) develop a library of reference materials for more proactive investigation resolution

Because the contamination could be organic or inorganic, we utilized a suite of analytical techniques. Once we uncovered the root cause, full characterization of each particle was not cost effective (or necessary). We phased the subsequent approach by evaluating physical characteristics first using simple, efficient analyses. When designated criteria were met, full characterization followed. Risk assessment determined likely contaminates which were then characterized to facilitate any future root cause determinations.

The monitoring program included full characterization of particle types on an annual basis to ensure contaminates remained the same.

We generated a completely customized solution to house sample information and raw data providing availability using only one platform. This solution allowed:

- Monitoring contamination by physical property or material composition
- Trending contamination during certain times of production
- Determining from what subsystem the contamination originated

Training ensured consistent particle categorization between inspections contributing to the success of the phased approach. This allowed supervisors to maintain the proactive program in house.

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