



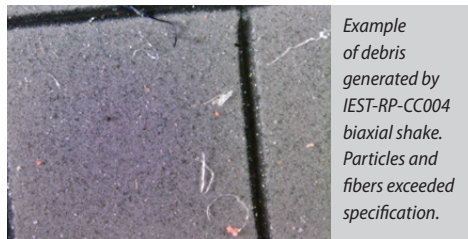
# Contamination Control Testing

## Capabilities

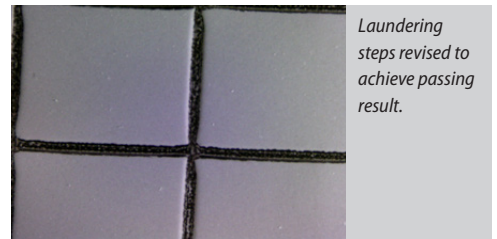
- Cleanroom facilities
- Liquid particle counting
- Air particle counting
- Helmke drum IEST-RP-CC003
- Microscopy: optical microscopy and scanning electron microscopy ASTM F51
- Metals analysis using high-resolution inductively coupled plasma mass spectrometry
- Testing according to IEST standards
- ASTM testing
- IEST-RP-CC004, IEST-RP-CC005, IEST-RP-CC0032
- Industrial forensics (nuclear magnetic resonance [NMR], Fourier-transform infrared spectroscopy [FTIR], liquid chromatography–mass spectrometry, gas chromatography–mass spectrometry)
- Thickness ASTM D3767
- Pinhole test ASTM D5151

RTI International has provided contamination control testing for critical controlled clean spaces—including cleanrooms, paint booths, and pharmaceutical manufacturing—for almost 3 decades. From particle counting and physiochemical characterization of unknown contaminants to trace metals testing, RTI is equipped to serve the needs of automotive, pharmaceutical, aerospace, and semiconductor manufacturers and suppliers. Our staff members are trained on Institute of Environmental Sciences and Technology (IEST) and ASTM International methods; with our large group of chemists, there is a subject matter expert available to assist with almost any request. RTI performs independent qualification testing for multiple *Fortune* 500 companies.

Determining the root cause of a test failure is a critical step for process improvement, and RTI has a full array of microscopy options available. Digital microscopes allow imaging sharing via online meetings in real time to discuss findings and mitigation strategies.



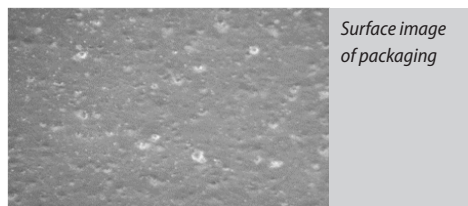
Example of debris generated by IEST-RP-CC004 biaxial shake. Particles and fibers exceeded specification.



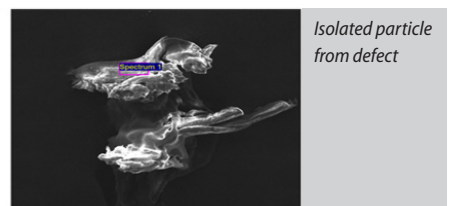
Laundering steps revised to achieve passing result.

## Automotive Contamination Case Study

An automotive assembly line experienced a 40% increase in rework. There was no change in the process or the staff members working on the assembly line; however, a grainy paint surface was ruining the paint finish. Within 48 hours of receiving the samples, RTI used optical microscopy and differential scanning calorimetry (DSC) to examine the paint defect; we traced the contamination back to the packaging.



Surface image of packaging

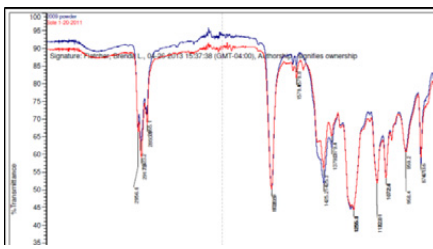


Isolated particle from defect



Mr. Frank Weber has over 27 years of laboratory experience and specializes in the analysis of trace metals and particle testing. He is an active member of the IEST and has served as chair of the IEST Working Group for Gloves and Finger Cots. He is a member of multiple working groups and has played an instrumental role in the development of recommended practices in IEST's Contamination Control Division. In 2014, IEST honored him with the Robert L. Mielke Award for his dedication and technical leadership.

Mr. Weber is currently focusing on the development and application of analytical methods for the determination of trace-level and ultra trace-level contaminants in a variety of sample matrices. He manages the inorganic and contamination control laboratories at RTI, along with qualification programs for multiple *Fortune* 500 companies.



FTIR spectra



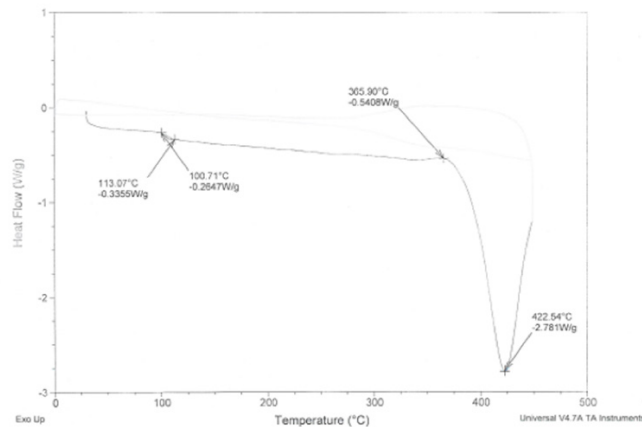
Medical device

### Garment Manufacturer Case Study

A semiconductor garment manufacturer suddenly experienced the presence of a bright orange stain on almost every cleanroom boot. Within 1 week, RTI solubilized the stain in organics and determined the unknown contaminant using multiple analytical tools—including FTIR, liquid chromatography with tandem mass spectrometry, and NMR. We traced the orange stain to a different chemical used for lubricating the needles during sewing/assembly.

### Medical Device Failure Case Study

Intravenous drip regulators were unexpectedly failing at a high rate. The manufacturer quickly traced the failure to the newest production lot. Although no visual or dimensional changes were found, RTI used DSC to resolve the difference between the new and existing lots within 24 hours. The lot variation was traced to a new formulation of the drip regulator's polymer body. The new polymer reacted when bonding to the tubing and cut off flow.



DSC scan showing polymer transition temperatures

#### More Information

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