



## Is Fully Automatic Bond Testing Possible? » Test debris management

### Test debris management

Examples of test debris are a loose die or shards of silicon after a die shear and solder balls after a ball shear. Debris can be projected at considerable velocity by the energy released when the bond fails, alternatively it may stick to the test tool or sample being tested. In some cases this is not an issue but in others it may be desirable or essential to control and capture such debris. This is a consideration for both manual and automatic testing but can be more significant in automation where more debris is likely to be produced and if not captured may contaminate the sample effecting bonds yet to be tested.

In most applications it is possible to capture debris with a combination of a timed delivery from a focused high pressure jet of gas (typically air) to the test, and propelling debris in the direction of a relatively larger low pressure but high flow vacuum pick up (Fig 22). Debris that is stuck to the sample or tool typically being dislodged by the pressure jet.



Fig 22. Debris collection system with combined pressure jet and vacuum pick up

In a few cases the debris may be too strongly adhered to be dislodged by the pressure jet. If it is

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#### **XYZTEC Netherlands**

J.F. Kennedylaan 14-B  
5981 XC Panningen  
Netherlands ([map / route](#))  
Tel: +31-77-3060920  
Fax: +31-77-3060919  
[sales@xyztec.com](mailto:sales@xyztec.com)  
[support@xyztec.com](mailto:support@xyztec.com)

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stuck to the sample it would typically not be a problem since if the jet cannot dislodge it, it is already captured, and as debris only occurs in destructive testing the sample will eventually be discarded. If it is stuck to the tool something has to be done. It is often possible to program a clean routine where a mechanical cleaning station is driven to the tool and mechanically wipes the debris off, often in combination with the gas jet and vacuum pick up. The mechanical clean can be a hard knife, soft knife or brush depending on the application and tool.

An extreme case occurs with Cold Ball Pull (CBP) where special tweezers grip and pull a solder balls. Over time the tweezers becoming contaminated with compacted solder. A solution is to use a heated gas jet that melts and then blows the solder clear (Fig 23). In extreme cases like this the cleaning process may be insufficiently robust to continue testing and so some operator involvement may need to be programmed in, but even this can be mitigated using an automated camera inspection of the tool.



Fig 23. Hot jet cleaning CBP solder ball pull gripping jaws

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Fax: +31-77-3060919  
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2. What is Required for Automation?
3. What is Possible with Modern Automation?
  - Multiple test heads
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  - Automatic load and unload
  - Machine Vision
    - Measurement of gross sample position (fiducial camera alignment)
    - Accurate automatic alignment for variations in bond position
    - Automatic failure mode analysis (auto grading)
  
  - Test debris management
4. Non-Destruct Testing
5. Conclusion

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J.F. Kennedylaan 14-B  
5981 XC Panningen  
Netherlands ([map](#) / [route](#))  
Tel: +31-77-3060920  
Fax: +31-77-3060919  
[sales@xyztec.com](mailto:sales@xyztec.com)  
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