



The Hybrid Bonding Yield Business Case

A single particle at the bond interface can compromise an entire stacked structure. Once bonded, the defect is locked in and cost compounds immediately.

That risk makes hybrid bonding a compelling case for in-tool classification: a high-value commit point where earlier qualification strengthens tool positioning.

STEP 1

Reduced Particle-Induced Bonding Failures

Example assumptions (HBM stacking / hybrid bonding line)

- ±8,000 modules are processed/month
- ±€3,000 bonding step value/module
- ±0,7% particle-related bonding failures

Segmentation reduces particle-induced bonding failures

- Particle contamination:** clean
- Scratches:** reject

Conservative assumption: 35% bonding defects reduction

Financial Impact

±€700k

recoverable value/year per bonding line (€2.0M × 35%)

STEP 2

False Scrap Recovery

Example assumptions

- 3% of surfaces flagged pre-bond
- 60% particle-related
- 50% conservatively scrapped

Recovery

- Modules:** ±72/month (8,000 × 0.03 × 0.60 × 0.50)
- Value:** ±€2.6M/year (72 × €3k = €216k/month)

Financial Impact

±€3M

per bonding line, per year

The financial impact comes from reducing uncertainty at the point where bonding decisions are made.

How This Value Is Created

In-situ classification enables every surface to be assessed before bonding. Sampling-based assumptions are replaced by deterministic qualification at the bond interface which reduces:



Particle-induced bonding failures



Classification ambiguity



False scrap



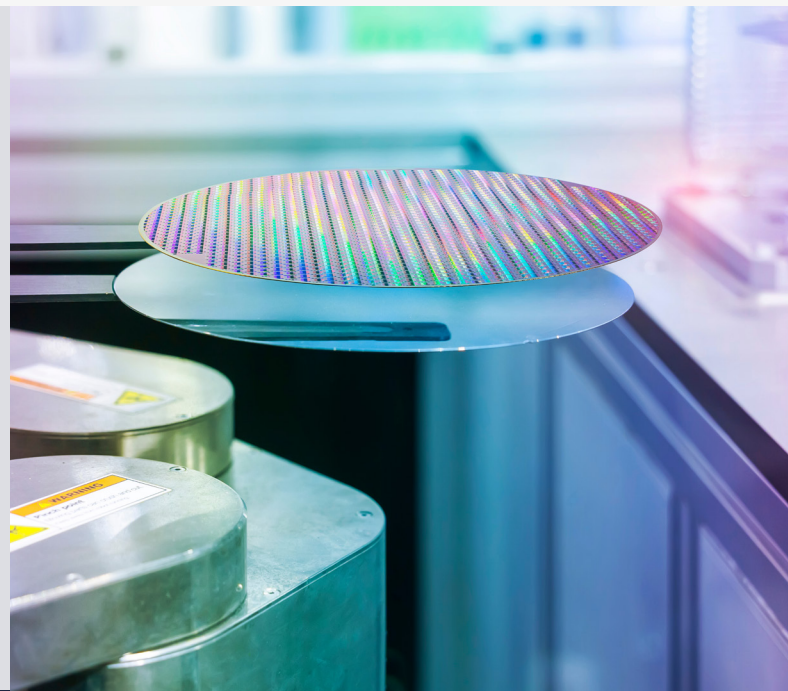
Process uncertainty before irreversible bonding

Why This Matters for Semiconductor Equipment OEMs

As hybrid bonding tolerances tighten, upstream tools increasingly influence bond integrity and downstream yield performance.

For OEMs, embedded classification drives:

- **Specification-level and commercial differentiation**
- **Measurable customer value**
- **Tool positioning and assessment**



The New Standard for Pre-Bond Tools

Surface preparation alone is no longer sufficient. The commercial shift is toward tools that qualify bond readiness with confidence before bonding occurs.

To learn more about how in-situ classification impacts how the pre-bond tool is positioned, valued, and selected, head to our blog.

[READ BLOG](#)



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