

# Semiconductor testing: Going back to the future

Dirk de Vries, co-founder of Qualtera



The integrated circuit semiconductor testing process produces oceans of data. This data is used to control product quality, performance and yield, and to resolve issues in those areas.

Paradoxically, while the semiconductor industry has been one of the key enablers in the development of the technology responsible for dramatically changing our daily lives, it is conservative in its ways of working.

Practices for test data analysis are still rooted in concepts that were adapted in the early 90s, when computers were less powerful, and the Internet was a relative novelty. At the time, semiconductor design, manufacturing and test operations were organizationally and also physically close together. Today, these same operations are often distributed over independent fabless, wafer foundry and OSAT companies and located in different countries and time zones.

### **So what's the problem?**

In a typical traditional analysis, engineers retrieve test data and other potentially relevant data; clean, align and pivot the data then apply a suite of statistical analysis methods.

This is a highly iterative analysis process, and the outcome depends on the expertise and talent of the engineer performing it. Moreover, it is not uncommon for an analysis to take hours or even days, especially if interaction is needed with colleagues in other time zones.

To focus engineering resources on topics that are expected to give the highest return, test data analysis is often triggered by alerts, such as when a lot exceeds a limit on certain fail bins. On unanalyzed baseline material, lingering issues, as well as excursions that have not been put under explicit control limits, can mean a lot of faulty products.

The communication of intermediate analysis results has its own problems. The different companies in the supply chain do not necessarily use the same analysis

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software, so exchanges tend to be based on documents or slides with screenshots. If different people are to re-analyze the same data with different analysis software, the results rarely are the same.

Exchanging raw data, which can easily run over 100 MB, is often prohibitive cross-company for reasons such as bandwidth or confidentiality. Even within a single company, communication and inconsistency problems can add precious days to the time to contain or solve a test, yield or quality issue.

### **But the future's bright ... and native to the cloud**

By taking advantage of new data processing technologies, of IT infrastructure developed to support treatment of huge volumes of data, as well as of the matured security protocols for safe data storage and exchange over the Internet, newly emerging cloud-hosted solutions allow fabless companies, IDMs, wafer foundries and OSATs to speed up the test data analysis process and increase efficiency.

These new solutions for semiconductor test data allow massive automated generation of high-quality, consistent reports. Horizontally scalable architectures allow quick scale-up or scale-down with the potential to treat millions of wafers, billions of measurements while maintaining excellent performance. Internet technology helps the user navigate efficiently between high-level syntheses of analysis results and the lowest level drilldown reports in just a few clicks.

A cloud-hosted decision support system can be made to handle all types of test data regardless of product type or data source. It is accessible from anywhere, and requires no local installs, no licences, and nowhere near as much training.

Sharing analysis with colleagues across the world, with suppliers or with customers is as simple as sending a link. Each chart and analysis is perfectly reproducible, and can be used as an accurate and reliable base to take the analysis quickly towards the best corrective action.

This helps avoid duplication of engineering analysis effort, improves consistency of results and conclusions, and facilitates seamless communication between the different teams involved.

Such a solution wouldn't have been possible 10 years ago but it seems strange that the analysis of data coming from the forefront of test technology is stuck in the past. Many other businesses are using cloud storage and services for critical applications and today there is no technical reason why semiconductor companies shouldn't follow suit.

### **We're helping build the future so why not embrace it?**

The dissociation of functions in the semiconductor manufacturing and test supply chain has made effective communication across supplies and customers, across teams and across cultures and time zones more important than ever. At the same time, society has undergone profound changes with pervasive connectivity and integration of social media. Newly emerging solutions, including Qualtera's own Silicondash, are built on the vision that semiconductor test data analysis can take

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great advantage of the technologies and solutions used in the information and connectivity world. Why not use today's technology to bring an exceptional improvement in engineering productivity?

*Dirk K. de Vries co-founded Qualtera in 2010, after 15 years of yield management and consulting functions in NXP Semiconductors and PDF Solutions. Qualtera provides tools and services for integration, storage, mining, and visualization of semiconductor test and manufacturing data. At Qualtera, Dirk is responsible for product definition and technology. Dirk holds M.S. and Ph.D. degrees in physics, 2 US patents, and has several patents pending.*

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