



Case Study

yieldWerx helps Texas Instruments improve yield

The Challenge at Texas Instruments

Texas Instruments Incorporated is the world leader in digital signal processing and analog technologies, the semiconductor engines of the Internet age, and develops real-time technologies that help people communicate. The company is driving the Internet age forward with semiconductor solutions for large markets such as wireless and broadband access, and for new emerging markets such as digital cameras and digital audio.

TI generates a lot of test and characterization data from both wafers as well as packaged units that under go testing. Even though there were already analysis tools in place in TI for analyzing production data, there was a strong need by engineers to efficiently fill in a Specification Compliance Matrix (SCM) for a product that was undergoing development, and was not running in mass production.

As the product was being developed, it was characterized over different operating conditions such as voltage, temperature and different wafer fabrication processes and settings. Due complex design, high gate count as well as high pin counts on the products being developed, TI expected it to be particularly challenging to manually characterize its products.

The customer had collected a great deal of data including AC & DC parameters and split/corner information. What was missing was a tool that would allow engineers to generate characterization reports, and publish these to the web, and make them readily available to product development and process engineers to expedite the design and development processes.

The different product development and engineering groups had previously applied a fairly manual process to conduct product characterization. This practice involved development of custom scripts, and even databases, and then importing subsets of data into a spreadsheet where the data would have to be further refined and formatted before any analysis could be performed. The customer concluded that this was an extremely time-consuming, resource intensive, less-than-thorough process that proved error prone.

To perform the type of characterization analysis using their previous model meant it would take an engineer on average 1 week to thoroughly locate and extract data, then clean and filter it before analyzing the data, and generating the reports. Multiply this by the number of new products being developed in TI, across all the different design groups, and it surmounted to several man-months of effort.

Risks

Unless an alternative solution could be identified, the customer risked:

- Costly design/PG re-spins
- Delay in time to market
- Failing to secure a design win by not providing the characterization report as requested
- Going into volume production without fully understanding the effects of manufacturing chain on the performance of the product
- Unpredictable behavior at the end customer's system environment



The Solution: yieldWerx Semiconductor

In assessing a software tool to support the characterization process, a key criterion for the customer was to limit the upfront infrastructure investment required. Already stretched in-house resources would be unable to support and maintain the IT infrastructure demanded by yet another software application, in addition there were already a lot of expensive data and yield analysis solutions in place.

The customer was not willing to invest a great deal of capital into purchasing yet another tool or paying a lot of money to existing tool vendors to make enhancements and offer the types of reports and data analysis the product development engineers were looking for.

yieldWerx was selected by the customer as product engineers, test engineers and other customer staff involved in the characterization process could use it to load multiple lot and wafer data, from multiple sources, and define report templates based on the test program and process flow. These reporting templates could be created beforehand in yieldWerx, by working closely with test engineering, product development, and design engineers.

Results

Database enabled multiple wafer yield & trend analysis

In addition to the above reports and analysis the engineers are also able to run a who suite of other reports that come standard as part of the yieldWerx data analysis package since the data is stored in a database and is always available.

yieldWerx also allows TI Engineers to run the same analysis on large sets of data, instead of just a couple of lots or wafers, and is being used to identify trends in both engineering data as well as production data once the device is ramped up to production.

Reduced Processing and Analysis Time

The above process which used to take days on end, now only takes a matter on minutes. Reports are merely a key click away. Within the first minutes of working with yieldWerx and defining the templates, engineers were able to generate a series of interactive reports that helped determine:

- Whether or not the part can perform as designed, and
- Can it ramp and yield

yieldWerx answered these questions automatically based on data loaded, and the reports and filters defined. yieldWerx Reports showed parameters that failed to meet specs, helped to prioritize potential issues, and highlighted areas where additional test data was required. This allowed the engineers to both focus efforts on getting to the root cause of each potential issue, rather than spending weeks churning through data, and cycle quickly to a complete characterization report that showed the performance of the product.

Reusable Reporting Templates

These templates are designed around for example temperature and lot/wafer process split analysis. As data becomes available from test, it is loaded into yieldWerx, data falling into outlier control parameters is identified, and marked, but not deleted from the data set. Users can choose to further manipulate/filter and perform analysis either excluding certain die or ranges of data.

Interactive reports can be created quickly, and the data can be further modified via the reporting interface itself. Histograms and Cpk reports are generated to identify marginalities. Finally, the report is published to the web with the relevant graphs and statistical data.



"...Using yieldWerx, we were able to load data from our diverse test data sources, and instantly perform both yield & parametric analysis. yieldWerx has enabled us to accelerate decisions about critical operational and engineering issues...."

**Product Engineer
RF Division, Texas Instruments**

What yieldWerx bought for the Customer

- TI engineers were able to dramatically cut down on the characterization phase of the product introduction by almost 5-6 weeks, allowing them to get the right product to volume production more quickly
- Getting to market more quickly put the customer in a position to pull forward upwards of millions of dollars in potential revenue into the current year over a range of product lines.
- A clear understanding of the potential design and manufacturing issues allowed the customer to proactively address issues rather than being forced to react to them in volume production when they become exponentially more expensive to fix
- yieldWerx easily zoned in on data anomalies which helped focus, and limit subsequent tester time, and helped structure the production test program so that critical parameters were tested first
- The dramatic reduction in the time it took to characterize products enabled the customer to reallocate engineering resources to another product initiative, thereby accelerating its timelines and chances of success, and being able to focus on other problems instead of spending valuable time in collecting, cleaning, storing and manipulating data.

About yieldWerx Semiconductor:

yieldWerx is a semiconductor test improvement company that provides a cutting edge software solution that reduces test cost, and accelerates time to market for high volume production. yieldWerx customers include fables companies, IDMs, test and assembly houses, and ATE vendors.

Headquartered in Dallas, Texas, yieldWerx Semiconductor has been helping fabless semiconductor companies, IDMs, ATE vendors, and test houses since 2003. The company is managed by semiconductor industry experts, who are committed to developing leading edge technologies that solve semiconductor industry's management and data analysis issues.

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yieldWerx has reduced that time to merely a few minutes, giving our team the ability to reallocate engineering resources to another product initiative, thereby accelerating its timelines and chances of success..."

**Product Engineer
RF Division, Texas Instruments**