



Semiconductor case studies: Yield Management Software

Outsourcing yield management software

Find out how yieldHUB makes engineers
more efficient

Learn how YMS helps companies meet quality,
reliability and traceability requirements

Discover how to extend STDF capabilities

www.yieldhub.com



yieldHUB is a leading provider of yield management software to the semiconductor industry. Founded in 2005, we've solved many problems for companies across different semiconductor verticals. Here you can read about some of our most interesting and insightful customers and challenges.

"The main selling point for us was yieldHUB's huge database scalability. We can store huge volumes of data and generate sophisticated reports at the touch of a button. It offered the best value for money."

Byungwoo Han, Principal Engineer Test Development, ADTechnology Inc.

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Microchip interview: The benefits of outsourcing yield management software



Kasia Metlička-Sawicka, Eng.
Release Supervisor, Senior
Engineer II-Product, Microchip

Microchip is a longtime yieldHUB customer. We work with a number of divisions worldwide. We spoke to Kasia Sawicka who works in Microchip Ireland to find out why she likes using our system.

What do you do?

I'm an Engineering Release Supervisor/Senior Product Engineer. I oversee the engineering release group of technicians and graduate engineers. I support several production lines.

What did you use before yieldHUB?

Before using yieldHUB, we used internal software. This was primarily needed to perform a type of analysis for quality control called Lot Norm (both multi-lot Lot Norm and within-lot Lot Norm). This was possible using our existing software but was laborious. Hence we evaluated whether to invest in upgrading our system or outsourcing it. yieldHUB was by far the easiest and most cost-effective solution. It does what we need out of the box, there's no maintenance required. We can do a wide range of analysis that we wouldn't have developed ourselves.

Over the years, we've considered taking it in-house, but we always stay with yieldHUB. It's just easier, better and more cost-effective.

Why is it better than an internal option?

yieldHUB has all the functions we need and more. The amount of possibilities to analyze data is endless.

The most important feature is Lot Norm and yieldHUB does it easily.

If we were to create it in-house, we would need a team of people, and it would take a vast amount of time.

It's very complex work, so it was less problematic for us at the time to buy off the shelf!

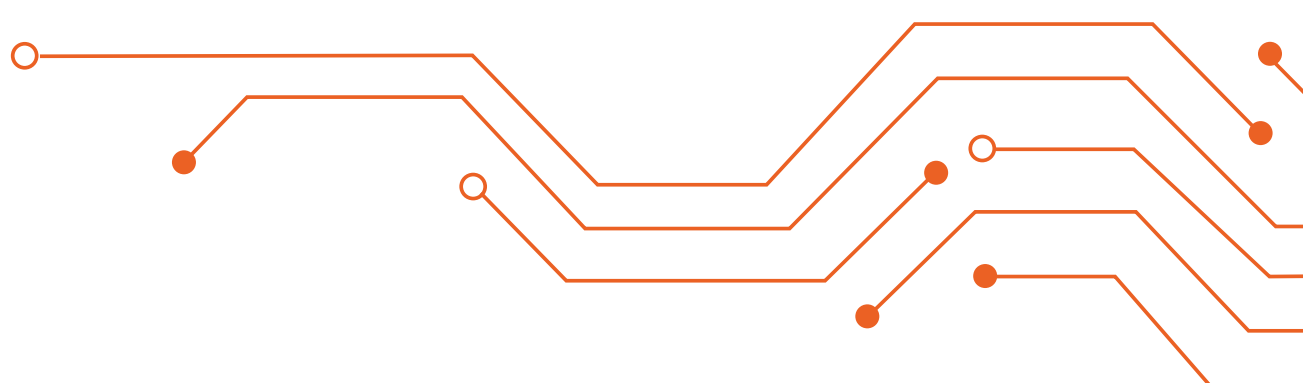
What's the best thing for engineering managers and supervisors?

I can access the data anywhere! If someone on my team finds a problem, I login and see what the issue is and help them solve it. The charts and graphs make it easy to identify problems and their causes. It makes my job easier. The team is happier and more productive.

What's the best feature for users?

Lot Norm. It's a life saver! It's a very useful function for gathering data from different products and test steps, and the possibility of linking them by parameter (in my case by elec. parameters).

I like the scatter charts visual. yieldHUB gives everything on the plate. Comparing data across different lots is quick and easy. It has all the charts I need and many more. The system is very powerful! Even after years of using it, I discover new visualizations, charts and ways of analyzing data through yieldHUB.



"Over the years, we've considered taking it in-house, but we always stay with yieldHUB. It's just easier, better and more cost-effective."

What do you like about the yieldHUB system?



The team: I like working with the team as they are engineering experts which makes it easier. Otherwise, I would have to explain things in layman terms which could be frustrating. On the rare occasion that there is an issue, I send a short email with a screenshot. Within a few hours, the query is answered. It's very straightforward, there are never any issues.

They have great attention to detail. When I have a problem, they come back with a solution and often other advice to help me.



Ideas and updates: They are very open to new ideas and ways of doing things. Sometimes we have ideas and are surprised to find the functionality already exists. Other times they work on the software to develop what we want. Over the years, the interface of the system developed and changed. I'm glad that they update their software regularly. You can tell they know what they are doing.



Complexity: My team and I use yieldHUB all the time. The number one thing I like about it is its complexity. The number of possibilities of graphs, charts and comparisons is endless. There are a huge amount of functions, we're still scratching the surface.



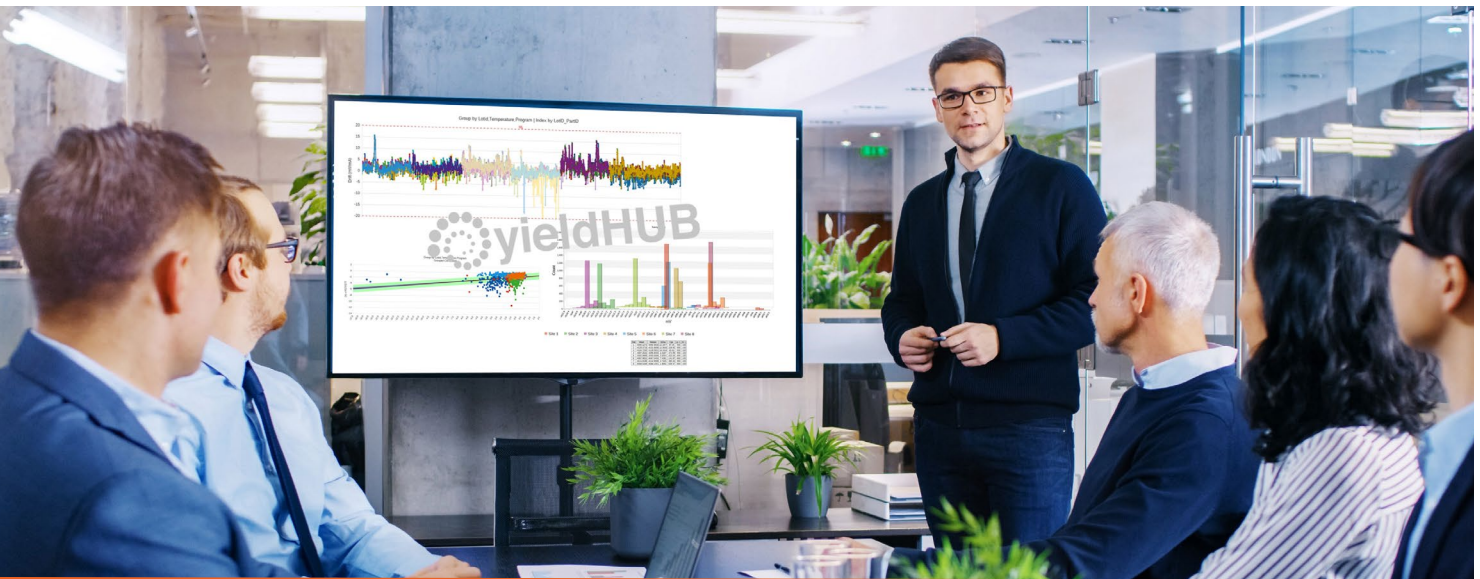
Speed: I get the data I need quickly. It analyses data and produces charts at the touch of a button.



Database: I like having all the data I need in one place.



Effectiveness: yieldHUB has all of the functions I need and is very accurate. This enables me to keep up with production and respond to anomalies and solve problems quickly.



Did it take you long to get used to the system?

I'm an engineer so no! We were in touch with the team at the start when we got set-up. After that it was seamless. We use the system daily but rarely have to contact them, which is what I like when it comes to software.

There was training and on-boarding when we first started working with them. But I preferred using the software myself, figuring out how it works and what kinds of reports were possible.


There are endless amounts of reports available, so every now and then I find a new chart that I didn't know was possible. Using the system by itself didn't take too long. I'm still discovering some new features.

What's the best thing about yieldHUB for Product Engineers?

The system helps you find equipment issues (quick results on the chart) and respond to them swiftly.

Who should use yieldHUB?

Anyone working in the semiconductor industry, who needs to analyse any type of data. There are limitless options for any manufacturer, especially for those who collect large amounts of data.



"yieldHUB is for anyone working in the semiconductor industry, who needs to analyse any type of data. There are limitless options for any manufacturer, especially for those who collect large amounts of data."



ADTechnology INC: How yieldHUB makes engineers more efficient

Many of our customers are Fabless companies who used to spend far too much time gathering and analyzing data. They struggled with sub-par solutions and put extra pressure on existing teams. Companies who work with yieldHUB are often surprised with the transformation in their yield improvement. The system quickly pays for itself. One such company is ADTechnology Inc. who switched to yieldHUB back in 2017 and haven't looked back.

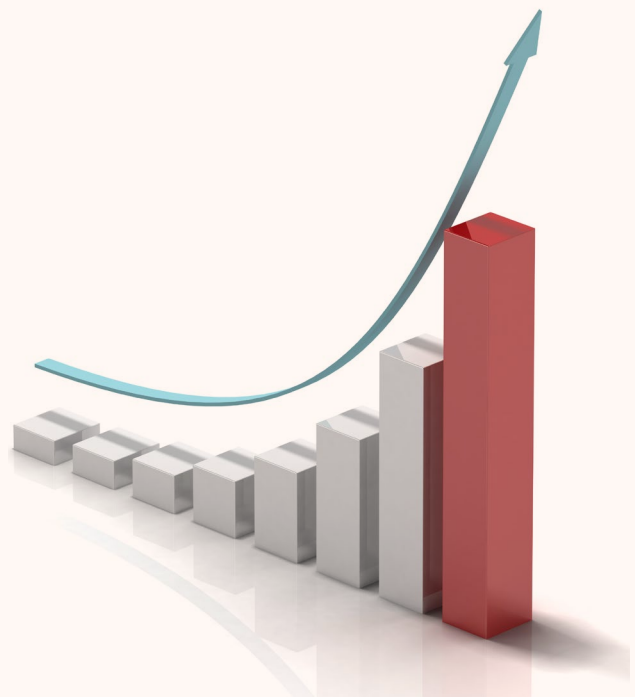
Who are ADTechnology Inc.?

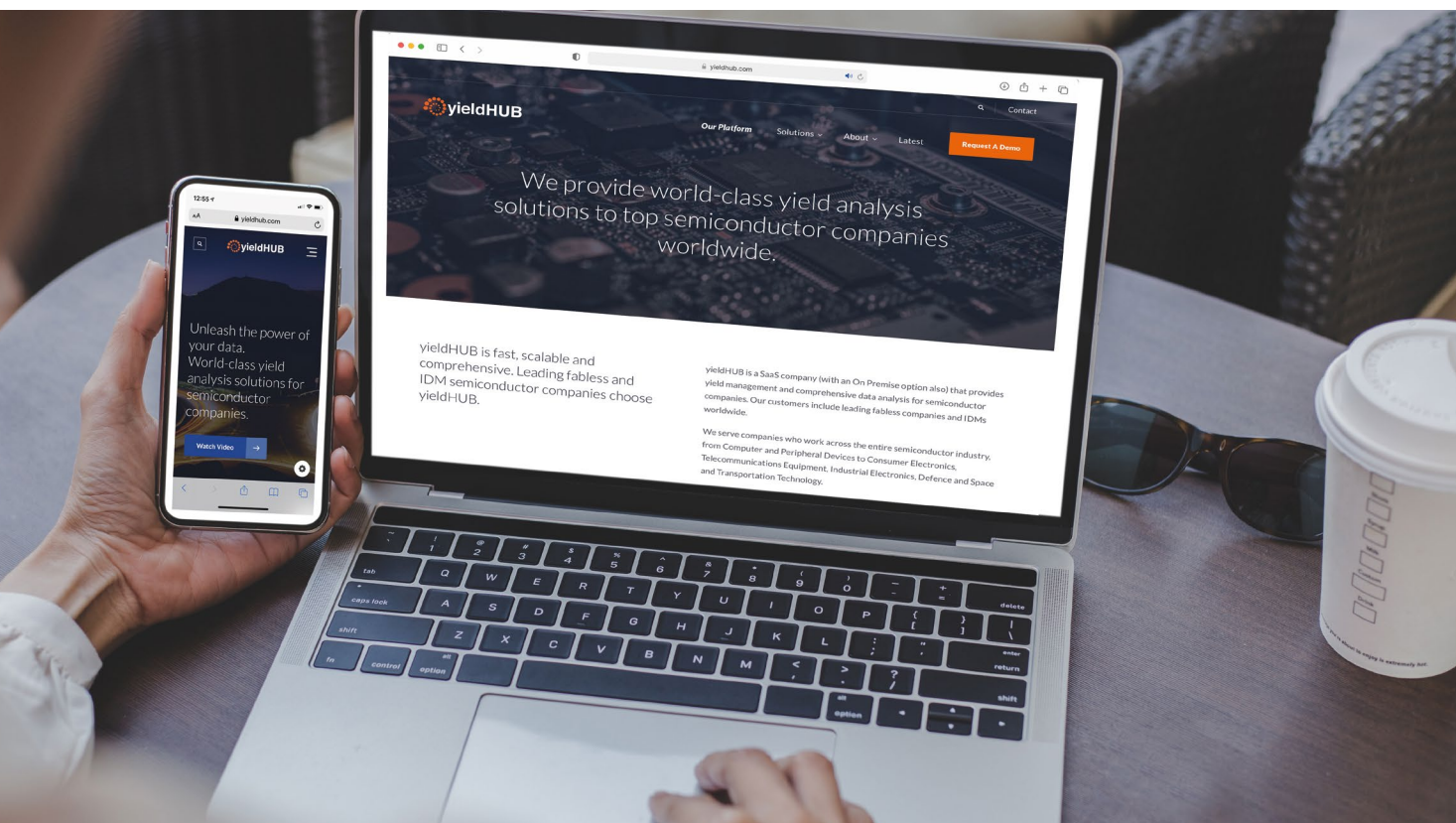
ADTechnology Inc. is a fabless semiconductor company based in South Korea. Founded in 2002, they provide custom designs and semiconductor development. We work with their Test Development and Quality teams.

What was their challenge?

ADTechnology Inc. is a fast-growing company. They generate huge amounts of data, and this increases year on year. Before working with yieldHUB, they used a combination of spreadsheets, free software, stand alone tools and hours of internally developed custom scripts. This process they used was very slow, for example, it took thirty minutes to load one STDF file. The product and test engineering teams spent most of their time uploading files to get results which had to be analyzed in Excel.

Byungwoo Han, Principal Engineer – Test Development, ADTechnology Inc. said: *"STDF file conversion, management, and capacity problems caused a lot of hassle and took time. It was solved by yieldHUB! It used to take us three hours to convert multiple STDF files. We now have our data in five minutes! This saves us hundreds of hours each week, which corresponds to many thousands of dollars. The Test Engineer can get the desired results without wasting time processing raw data."*





Speaking about this, Kevin Robinson, Director of Customer Success in yieldHUB said, *"Over the years, I've seen hundreds of examples of companies who use a combination of spreadsheets, free software, stand alone tools and hours of internally developed custom scripts to analyze data. The problem is that semiconductor data is very large and complex. When using a free option or tool, engineers waste most of their time gathering data. By investing in a specialist and scalable system, it makes life easier. The data is automatically transferred quickly and easily into the database. Engineers spend most of their time-solving problems. Not problems with the data but problems with their own test programs and their own products, which is what they're paid to do."*

ADTechnology Inc. was able to get by for a while until they experienced huge growth in the company. It increased explosively and they needed teams to oversee production.

John O'Donnell, CEO, yieldHUB said *"This happens frequently. Companies get by with free software and spreadsheets while they are small. Then they achieve traction in the market, their data increases substantially, and they need to invest in a system."*

ADTechnology Inc. explored several options before deciding on yieldHUB. Byungwoo said *"We knew we had to invest in a system so we had a look at what was out there. The main selling point for us was what yieldHUB's huge database scalability. We can store huge volumes of data and generate sophisticated reports at the touch of a button. It offered the best value for money."*

How long did it take to set-up?

The set-up was seamless. The users in ADTechnology Inc. mastered it within one month. The on-going support and service meant that they were able to get the reports they needed. It tracks so much data that they can play around with it and discover reports they didn't know existed that prove to be very useful.

Ongoing support

Though yieldHUB's core staff are English speakers, some team members and agents only speak Korean.

Like all other customers, requests are handled quickly by tech support. One of yieldHUB's core values is customer support. With support locally in Korea, customer queries are typically answered within one hour! If specialist input is required from yieldHUB team members in other countries, this is all handled efficiently using the online ticket system integrated into the software.



Results

yieldHUB's system is very fast and processes vast amounts of data within minutes. Mr Han "Using yieldHUB's Search function, we experienced a very large increase in our work efficiency that we had not felt before. I can identify problems that I had not detected even after collecting and checking data all day, using yieldHUB, in just one minute. We can search data across multiple parameters, various variables and environments (PGM, Site, Test Equipment, Probe Card, LoadBoard, etc.). Problems related to such environments can be instantly identified."

Byungwoo "yieldHUB makes my team 10 times more efficient. They spend little time transferring data. We are very happy with yieldHUB and recommend them to Fabless companies about to start production. The way to check STDF data using yieldHUB's database is very useful for companies that manage a lot of mass-production data, and it is a necessary software."



DisplayLink: How yieldHUB helps us meet quality, reliability and traceability requirements



Shane Zhang, Head of Product Engineering, DisplayLink, from Cambridge UK

DisplayLink is a UK based company, recently acquired by Synaptics. We began working with them a few years ago. We caught up with Shane Zhang, Head of Product Engineering to find out why he works with us, the problems we solve and the features he likes most.

Tell us about DisplayLink

Our operations team is based in Cambridge, UK. We work with teams, suppliers and customers worldwide. Working in the product engineering group, we technically manage chip manufacturer supply chains worldwide, from post chip tape-out mask-set making, Si processing, chip assembly, package, and ATE test. yieldHUB helps us manage our global supply chains.

Why do you need a yield management system?

We need a yield management system to monitor chip manufacture status, including foundry wafer electrical parameters, wafer sort yielding/binning and final package chip results to make sure our products meet the quality and performance requirements. yieldHUB enables us to meet these requirements.

What did you use before yieldHUB?

Before yieldHUB we were using a few different systems. We decided to pick one system and consolidate it. It was a great decision as now the teams see the same data, charts and reports which makes communication and problem-solving faster. It's easier for me to manage the teams and see what's going on at each stage.

Why did you decide to go with yieldHUB?

yieldHUB is great value for money based on both the power of the tools it provides as well as the service from the support team at yieldHUB. It has all of the data analysis features needed for small to medium-sized fabless companies. yieldHUB is a very handy software tool for general production engineering or test engineering teams to do semiconductor data analysis.

What do you like about the yieldHUB system?



Cost: For how much it costs yieldHUB gives a great return on investment.



Different types of reports: You can generate multiple charts and reports to help you solve problems quickly.



Cleanliness of the data: Although our test flows are not straightforward, yieldHUB cleanses the data automatically. Their algorithms take into account the steps on the test floor for retesting and rescreening rejects. It follows that we can trust reports and analyses in yieldHUB to help us make correct decisions on yield improvement. It also means that we can use the clean yieldHUB data to make sure invoices from our subcons are accurate in terms of yield, quantities and test times.



Layout: The layout of the data analysis features is great. It shows you what you'd intuitively want to see.



Shareability: It's on a secure cloud platform which allows us to share data and reports instantly with our customers and suppliers worldwide. The fact that we're all using the same system makes it easier for us all.



Scalability: In previous tools we could only analyse a few datalogs at a time. Important production capabilities such as ANOVA and parametric and bin trend analysis across hundreds of wafers were not available or even possible. In yieldHUB you can analyse simultaneously as many datalogs and wafers as you need.

Did it take you long to get used to it?

We had training in the system during onboarding. It was seamless and we were up and running very quickly. yieldHUB gives us excellent support and they reply very quickly on the rare occasion that there are any issues. We enjoy using the system and working with the team.

"yieldHUB is great value for money based on both the power of the tools it provides as well as the service from the support team."

What's the best thing about yieldHUB for product engineers?

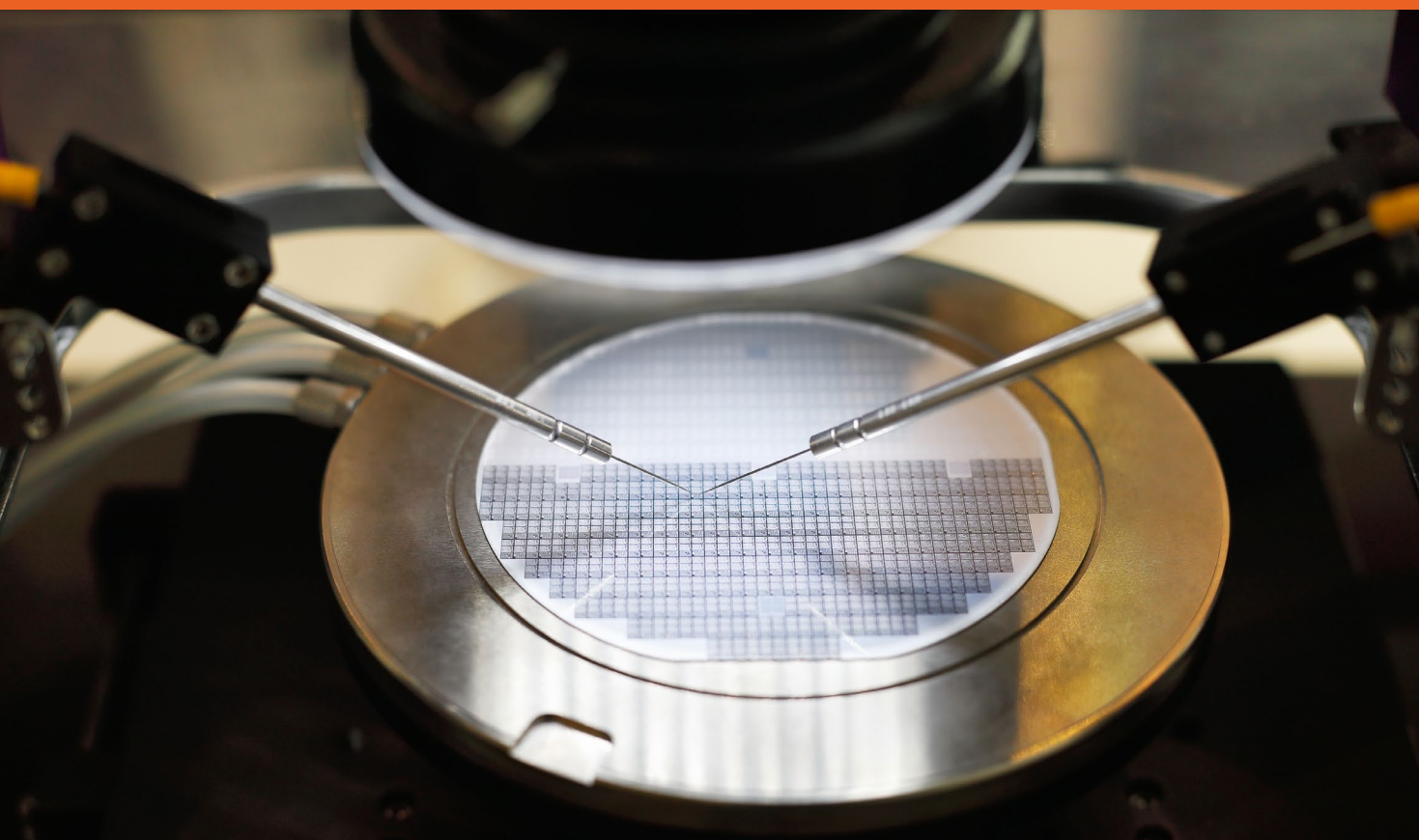
Most features product engineers need are readily available. When we have an idea or need customisation, we inform yieldHUB. They work with us to develop the idea and help us solve the problem. Sometimes it's straightforward. Other times they come up with innovative solutions that we wouldn't have thought of. They often have new features and upgrades which makes the system even better and easier to use. We have found yieldHUB to be reasonable in negotiating any special requests we might have from time to time.

What new feature are you looking forward to?

We're looking forward to Extra High Risk Die inking around the Bad Die area. This will save us a lot of time spent on wafer yield mapping for the assembly house compared to doing this manually.

What kinds of people should use yieldHUB?

Any product and test engineers in chip design houses, Si foundries or chip test houses, who need to analyse the data from wafer electrical test, chip probe, final test will benefit from yieldHUB. It's useful for engineering managers to oversee their teams and what's happening in the factories. It's ideal for anyone who wants a cost-effective yield management system.



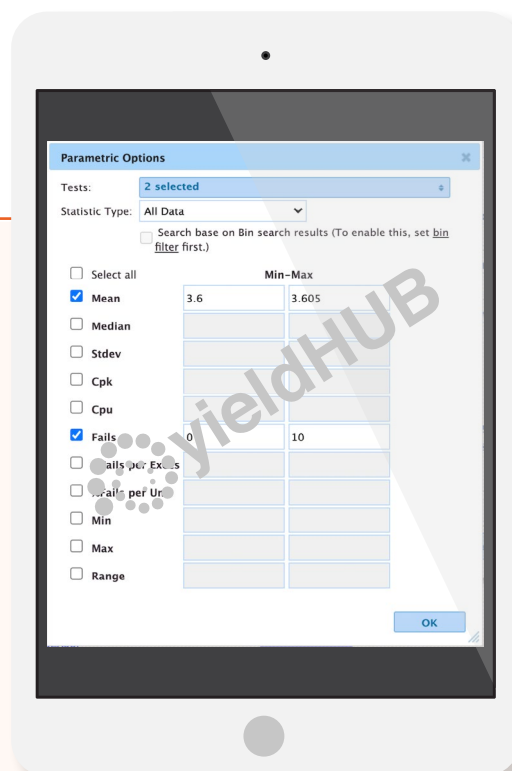
Fast visualisation:

The bluetooth low energy test is key to keeping yields under control for one of our products. Knowing the distribution of yield across sites is extremely important and we can do this for any given lot or across hundreds of lots if needed. If we see a deviation we can do some work to fix the offset and yields go back up.

The visualisation in the charts and the breakdown in the stats tables for parameters such as this gives us valuable information which we can share with our manufacturing partners as needed to help us optimise our yields. I can safely say that this type of volume monitoring of such a parameter is not possible using traditional desk-top analysis tools and spreadsheets. It's right in front of you in seconds using yieldHUB!

Fast Search:

When there is an issue with a wafer or a lot, it's important to be able to find wafers that behaved similarly in the past and compare that group of wafers with more normally behaving wafers. yieldHUB has fantastic customisable search and analysis capabilities to enable all of this. Our volumes are now multiples of what they were even two years ago. The ability of the yieldHUB software to search and analyse so quickly even at such massive scale is hugely impressive.



For example, with hundreds of thousands of wafers in the database already, it can find in seconds wafers that have a particular bin or parametric behavior. Those wafers could have been tested at various points over the past four years! The common feature of those wafers might be a particular attribute of a fab parameter and that can be found with ANOVA and similar tools.

Again, this takes seconds and is faster now than ever with the new server technology yieldHUB invested in a few months ago. The image above shows how simple the interface is to search the entire database for wafers from a test program that has a specified parametric behavior. You can even do this parametric search for units that have specified bins.

Composite bin pattern chart:

We find that there are many useful tools in yieldHUB for quickly determining the true source of a yield issue. Such yield issues can sometimes be caused by the wafer foundry which is beyond our control, of course, being a fabless company. The issue can also be because of something intrinsic in the design of a product or the performance of the test fixture or tester. In all cases, we have found yieldHUB to be extremely useful in helping us find the real source of the yield issue. The tools are visual and tabular and excellent for collaboration with our foundry.

For example, we had a serious yield issue where the isolated bins 9 and 10 as having distinct patterns across the affected wafers. yieldHUB software allows you to stack wafers (even hundreds if needed) quickly and with very powerful visualisation.

The output from yieldHUB helped to convince the Fab to run commonality across their tools. Commonality is a method for checking the difference between good and bad wafers in terms of which tools were used in manufacturing the good and bad wafers. Often it identifies that one tool had a different setting or there was a different tool at a given step in fab used to manufacture the bad wafers. This analysis allowed the fab to adjust and put in finer control, a key tool which affected the wafer performance. Often the foundry will not know such effects without feedback from their customers and yieldHUB's capabilities are ideal for such feedback.

The tool within the foundry was fixed and the wafer yield went back to normal. Without the speed and visualisation of yieldHUB, we have no doubt that the yield would not have been rectified in such a short time.





Xaar: Extending STDF capabilities

Here in yieldHUB, we work with customers to solve problems in new ways, as well as providing software to help yield management. Xaar, one of our customers in the UK, needed to extend the capability of STDF to avoid changing software on the test floor. We work with STDF a lot. We were happy to help them with the challenge. It turned out to be rather interesting, so we thought we'd share it with you here.

What is STDF?

Standard Test Data Format (STDF) is a file format for semiconductor test information. It was developed by Teradyne. It is now a de facto standard widely used throughout the semiconductor industry. It is a commonly used format produced by automatic test equipment (ATE) platforms from companies such as LTX-Credence, Roos Instruments, Teradyne, Advantest and others.

It is the preferred file format for semiconductor test information. It is very useful for bringing together many results or data-points in semiconductor or electronics testing. Having a standard means that all vendors can work to that standard but it also means that not all needs are catered for.

The challenge

We've seen a number of customers who want to view results in a different way. They want to see the relative physical location, of the parts of the chip, where the results come from. The simple case is the pins on a device. STDF has pin records. It stores pin numbers, pin names, and results per pin. However, there is no facility to record the physical location of each pin. As it isn't in the standard, it is not easy to add it into the test data at source. So we have added the option to include this into the data analysis tool, yieldHUB. While pins on a device is the most common need for this, some of our customers

have more complex and interesting examples. One of these is Xaar.

The customer

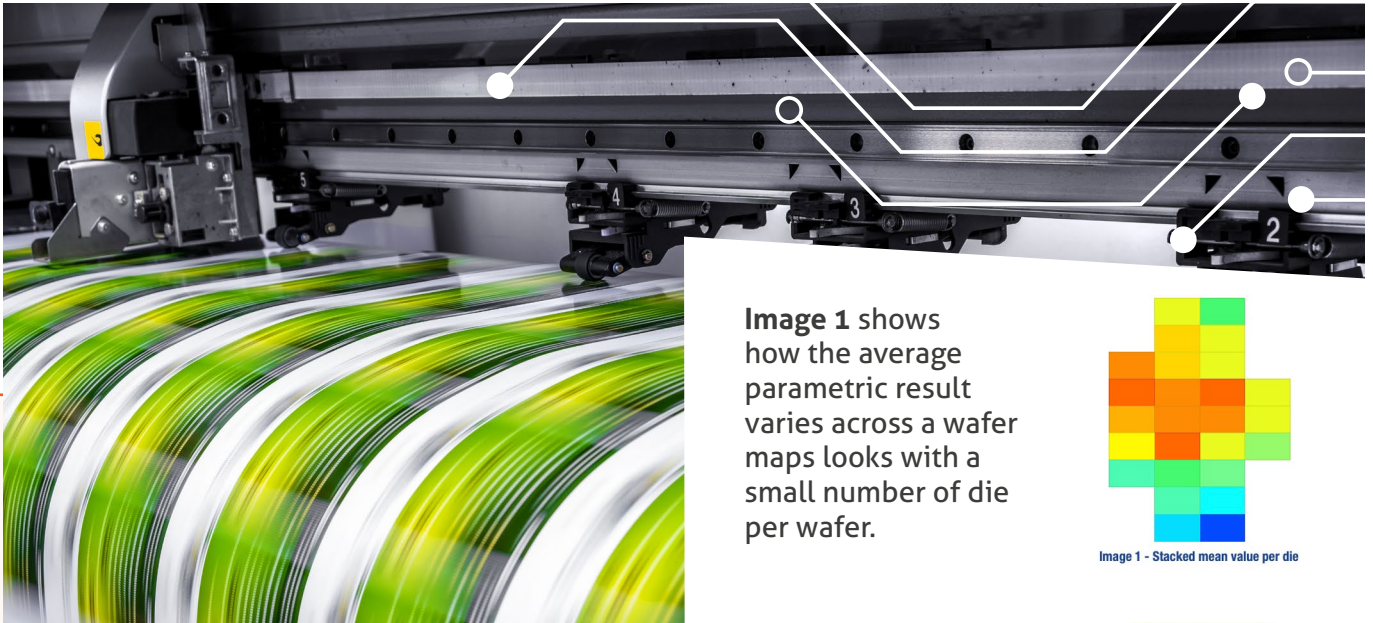
Xaar is a world leader in industrial inkjet technology. They are a large fabless company and we've been working together for a few years.

Xaar's unique challenge

Xaar designs and manufactures inkjet printheads. The nozzles on the printhead are tested a number of times during manufacturing. The physical location of any variation in performance is very useful to assess. Using yieldHUB, Xaar engineers are able to see map images of where the tens of thousands of nozzles are across a silicon wafer and how these differ. This means that variation from the wafer fab can be identified and improved when necessary.

The outcome

The solution worked seamlessly for Xaar. Leading the work within Xaar is Principal Product Engineer, Alan Morgan. Alan says *"With the addition of MPR XY Mapping in yieldHUB, I am able to do extremely detailed analysis very quickly. This helps me to understand silicon variation and how it can affect the performance of critical components in the printhead. At Xaar, we pride ourselves*



on delivering the highest quality and performance to our customers. We're excited to extend analysis capabilities beyond standard formats such as STDF without needing to change any software on the test floor."

Kevin Robinson, Director of Customer Success in yieldHUB had this to say about delivering new capabilities to customers, *"This project is a great example of what we deliver to our customers. We work closely with them to understand their needs and then bring real value and unique insights to our customers. Providing new capabilities that unlock new insights for our customers into their manufacturing is both exciting and satisfying."*

The images opposite are taken from yieldHUB to show some of the capability.

Image 1 shows how the average parametric result varies across a wafer maps looks with a small number of die per wafer.

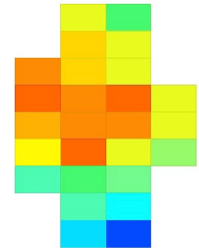


Image 1 - Stacked mean value per die

Image 2 shows the MPR XY mapping with data from thousands of nozzles (could be pins, pixels, repeated design blocks) mapped across the die and wafer.

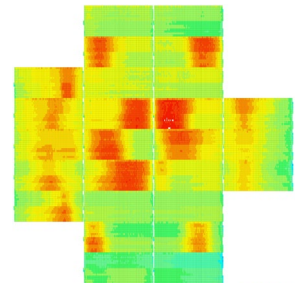


Image 2 - STDF MPR XY across a wafer

yieldHUB

Image 3 is a gallery of a 25 wafer lot. Here you can see the variation wafer to wafer in the patterns. yieldHUB also supports stacking thousands of wafers for even deeper analysis.

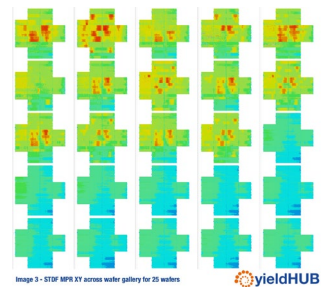


Image 3 - STDF MPR XY across wafer gallery for 25 wafers

yieldHUB

Why is this important?

Like many companies, Xaar had a unique challenge. By working together, we were able to come up with an interesting solution. It is easy to see challenges as insurmountable, but the old adage "Ask and you shall receive" holds true. When you work with your suppliers, they may have seen your challenge many times. They will undoubtedly have a different perspective on the situation and might come up with a novel solution for you. If you work for a fabless company, IDM or OSAT and have a challenge that you think is unique, contact us. The solution might be a lot easier than you think.



About Xaar PLC

Xaar is a world leader in the development of digital inkjet technology. Xaar's technology drives the conversion of analogue printing and manufacturing methods to digital inkjet which is more efficient, more economical and more productive than the traditional methods which have been in use for years.

The company designs and manufactures printheads as well as systems for product decoration and industrial 3D Printing which use its inkjet technology.

"I am able to do extremely detailed analysis very quickly. This helps me to understand silicon variation and how it can affect the performance of critical components in the printhead."

Alan Morgan, Principal Product Engineer, Xaar



yieldHUB is a multinational company specializing in Yield Management Solutions for the semiconductor industry. For companies who need to optimize yields, yieldHUB software provides them with a complete understanding of yields in manufacturing. Advanced offerings include specialist software for aerospace, automotive and AI chips.

www.yieldhub.com

Why customers use yieldHUB



Yield Optimisation

yieldHUB helps you to increase yield and reduce scrap. It tracks what's happening on the factory floor and recognises anomalies. Engineers spend less time gathering the data and more time solving problems. All of this combines to increase yield margins and reduce scrap.



Scalability

The database design is massively scalable from a few gigabytes of data to terabytes. As your company grows, you won't have to worry about changing software. As your company ramps up production, you won't need to worry about storage issues slowing you down.



Quality & Reliability

Features specific to improving quality and reliability of both test programs and your products are part of the yieldHUB offerings. So you will achieve higher quality testing as well as higher quality products that last in the field.



Traceability

yieldHUB translates the unique ID companies often encode in fuses on each die to a searchable field in the database. Returns are quickly found in yieldHUB and you can see quickly how they performed relative to other dice.



Collaboration

yieldHUB helps make communication and collaboration seamless. You can add and send comments through the system itself. Share reports and send data at the touch of a button. yieldHUB enables you to communicate with your global supply chain worldwide.



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