



Renewable Energy Corporation ASA (REC) is one of the leading players in the solar energy industry with presence across the solar value chain. The company is based in Norway, employing more than 3,900 in locations through Europe, Asia and the United States.

DEPLOYMENT SUMMARY

TIBCO Spotfire® visual analytics enables REC to perform root cause analysis tasks much more quickly because users no longer have to focus on the data extraction process and limitations of previous analytical tools. New analyses such as defect mapping can be created in the Spotfire dashboard in a day, as compared to months working with IT and external suppliers.

“Other data visualization tools were difficult to learn and I couldn’t find a lot of support to help me overcome hurdles. Spotfire is very user friendly. I got up and running quickly without a lot of preparation to just get started, as I found with the other tools.”

Eddy Tan, REC Technologist

REC Looks to TIBCO Spotfire Visual Analytics to Improve Silicon Wafer Production Yields

REC is a multi-billion dollar company and among the world’s largest producers of polysilicon and wafers for solar applications, and a rapidly growing manufacturer of solar cells and modules.

REC continuously looks to improve silicon wafer production yield effectiveness by reducing the number of defects due to machine failures or impurities. The best way to do this is to invest in technologies that can help improve production yield.

CHALLENGE

In its Norway facility, REC produces thousands of silicon blocks per week, which are sliced into millions of wafers. This generates multiple levels of data with millions of rows that are recorded and stored in a data warehouse. Using traditional analytical tools such as Excel and SQL queries, REC had difficulty analyzing wafer level information because of the large volume of data. In addition, the company has a distributed data storage system, making it difficult to combine all data sources together in a single interface for quick analysis, particularly if the end user lacks the knowledge needed to perform certain types of queries.

REC technologist Eddy Tan and his group spent a lot of time inspecting the data before it could even be analyzed. As a result, REC became quite dependent on IT and external suppliers for building the analytical tools that could handle such robust analysis needs. The external suppliers generated pre-made reports, but it took months to get them and if any changes were required it could take months more – at great expense – to get them.



Spotfire's heat map visualization is used to identify the wafer position with the most defects. Drill down capability enables users to find out when the problem causing the defects began.

SOLUTION

While the company uses some other BI software package for distributing its ERP information between locations, the tool was judged to be insufficient for REC's huge production data analysis needs. Eddy Tan began looking for a more flexible and scalable data visualization solution and discovered TIBCO Spotfire. He found it to be the most suitable for REC's hierarchical data structure, easy to use, and superior for ad-hoc analysis. Spotfire provides the ability to view data on demand and quickly drill down into huge volumes of data to provide insight into the unknown to uncover trends, patterns and unexpected insights.

"Other data visualization tools were difficult to learn and I couldn't find a lot of support to help me overcome hurdles," says Eddy Tan. "Spotfire is very user friendly. I got up and running quickly without a lot of preparation to just get started, as I found with the other tools."

Spotfire aligns well with REC's existing IT infrastructure and because the data is cached on the Spotfire server, it doesn't put a lot of strain on internal systems. "This made it possible to begin using Spotfire right away instead of

needing to build a data extraction infrastructure, enabling hourly queries to be performed," notes Knut Erik Ballestad, MES Manager of REC.

A team of Spotfire superusers were assembled and they created initial dashboards to show off the capabilities of Spotfire. From there, end users conceived of ways to improve the dashboards themselves through Spotfire's self-service discovery capability, lowering reliance on IT for data preparation and new report configuration. The dashboards in use today reflect that input. When they see what is possible in Spotfire, it spurs them to think of other ways Spotfire can help them do their jobs.

Washline Performance

The Spotfire team created a tab on the Spotfire analysis dashboard with data from multiple sources to compare the performance of washlines to each other. If a washline appears to be underperforming, the user can click on that bar and instantly drill down from run level data to block level data to immediately see which blocks are producing a high level of dirt.



This Spotfire visualization enables REC to perform instant root cause analysis of its washlines. Transitioning so quickly between run level and block level data makes it easy to spot problems and take remedial action.

Being able to transition so quickly between run level and block level data makes it easy to spot problems, trace them back to the process unit that may have caused the problem, and take remedial action. "Root cause analysis is much faster in the Spotfire interface because of Details-on-Demand and the links between the different data levels," notes Eddy Tan.

In Excel it was very difficult to download the data from each data source, bring all the data together manually and drill down to determine root cause analysis. As a result, it took longer before a problem was spotted with a machine or washline; Spotfire has made analysis much faster and easier. In addition, some of the analyses performed in Spotfire would have been impossible with Excel because of how much time it would have taken – hours in Excel versus minutes using Spotfire. Achieving actionable insight more quickly enables process engineers to investigate patterns for which they had previously lacked the time.

Based on feedback from one user, he used to spend three hours per week making a weekly report which monitors the performance of one process area. This report is sent to all the engineers and stakeholders of that process

area. With Spotfire, he has converted the weekly report into a dashboard and thus no time is spent to make the report. The report is much better than before because instead of a static report covering only what is happening in the previous week, the users can now use the Spotfire dashboard as and when they need it, to get the most current status of the process area.

Wafer Defects

Spotfire's visualizations enable the production team to easily identify the position of defects on wafers, the type and amount of defects in a selected time period. The user can easily determine that certain positions on the wafer generate the most defects of a particular type. Further drill down indicates when the defect occurred. Spotfire handles this type of analysis very well, despite the large amount of data and the fact that the multiple data sources are stored in several different places. Using Spotfire's Information Links, the distributed data is combined in a single interface. "So we're able to not just find out which process unit is causing the defect, we can also find out where on the wafer the defect has occurred," says Eddy Tan. "This has helped a lot with root cause analysis."

RESULTS

While it's difficult to determine the production yield percentage increase attributable to Spotfire, the analytical tool enables REC to more easily and quickly find the root causes of production problems and take the needed action to rectify. Spotfire has been received by users at REC very enthusiastically. They're no longer limited by the boundaries of their analytical tool. If they envision something they'd like to see on the dashboard, it can be implemented that day, as compared to the months it used to take waiting for the external supplier to modify a report.

Performing analyses has also become much easier for end users because they no longer have to perform data extractions and do the plotting themselves. They are now quite reliant on the Spotfire dashboards to do the data extraction and query for them, freeing them to focus on the visualizations and look for patterns. "Previously

we had all this data but we weren't really using it" says Eddy Tan. "With Spotfire we are finally using the data we are collecting." Already some of these patterns newly discovered with Spotfire have spawned several projects targeted at understanding the root cause of these patterns, potentially improving the production yield significantly.

Future plans for Spotfire include connecting it to new data sources, including a time series database, which is a significant data source for all of the process units. It stores values every second; Spotfire could be very handy for trending the processes.

"Speed of insight has been the most dramatic benefit of Spotfire," says Eddy Tan. "If there any inconsistencies or missing data, we can spot them immediately. In the past we would have to wait for a problem to occur. Now we catch inconsistencies much faster than before."

The Spotfire team has created three different categories of Spotfire dashboards for REC report consumers:

1. **Production** – Used to visualize data at a high level by production leaders, team leaders and operators to look at trends and check the recent performance of specific process units.
2. **Analysis** – Used by the REC R&D department and process engineers to perform test verification and statistical analysis. Several dashboards allow comparison of two different test groups to see whether or not there is improvement with a test. Spotfire's drill down capabilities enable process engineers to trace a problem in production back to a specific process unit.
3. **Data extraction** – This Spotfire dashboard makes it easy to perform data extraction without any knowledge of SQL queries, which is very important to dashboard creators and power users.



TIBCO Software Inc. (NASDAQ: TIBX) is a leading independent business integration software company and a leading enabler of real-time business, helping companies become more cost-effective, more agile and more efficient. TIBCO has delivered the value of real-time business, what TIBCO calls The Power of Now®, to thousands of customers around the world and in a wide variety of industries.

<http://spotfire.tibco.com>

TIBCO Spotfire
TIBCO Software Inc.
212 Elm Street
Somerville, MA 02144

Tel: +1 617 702 1600
+1 800 245 4211
Fax: +1 617 702 1700