

The Troubleshooting Toolkit for Semiconductor Manufacturers

INDUSTRY

Semiconductor Manufacturing

SOLUTION

PowerInsight by Advanced Energy™

EQUIPMENT

Paramount®, Navigator®, Pinnacle®

CHALLENGE

At a semiconductor fabrication site, a tool owner noticed that one of the twelve RF generators on their tool suddenly jumped to its maximum rated output. At the same time, there was a temperature rise in the cooling water of the tool. The tool was two years old and its performance critical as it operates at a high utilization rate. This fab also serves the automotive industry which is known for its stringent quality standards. Therefore, although the issue didn't immediately cause production loss, the customer was highly motivated to investigate any and all anomalies in the tool parameters, locate the root cause, and implement solutions quickly to avoid any unwanted downtime or wafer scrap.

Since the sudden rise in generator output power and tool temperature happened simultaneously, the tool owner hypothesized that the generator itself was the cause of the issue. They contacted the OEM for support and were told to swap the positions of the generator experiencing abnormal output power increases (Generator 11) with another identical generator on the same tool. However, the output power rise did not move with the generator and was still observed on the new generator now installed in the Generator 11 position on the tool. The temperature rise anomaly was still present after the generator swap as well. At this point, the tool owner determined that they needed deeper support from experts in power delivery to identify the root cause.

SOLUTION

Advanced Energy Field Service Engineers visited the customer's site to troubleshoot the issue. After the preliminary examination, they decided to use PowerInsight by Advanced Energy™ to gather more data and identify the root cause.

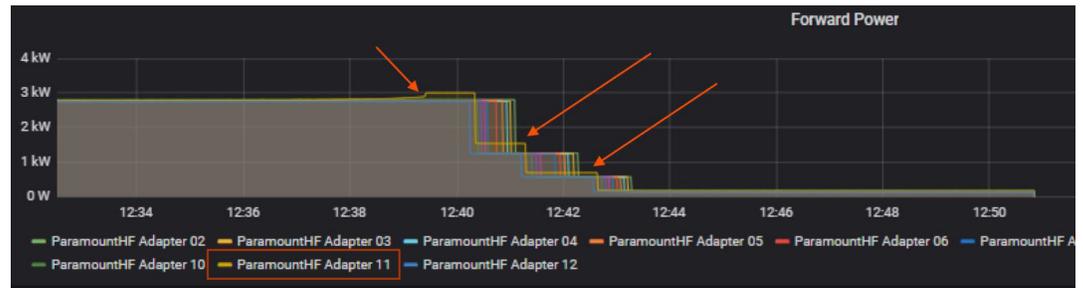
PowerInsight by Advanced Energy™ is AE's new Industrial Internet of Things (IIoT) solution. It has an integrated edge computer that can collect, store, and analyze data from all connected devices. As data is being collected, the interactive

dashboard enables users to apply sorting, filtering, and mathematical functions as well as set up triggers to send alerts to custom process variables when anomalies are detected.

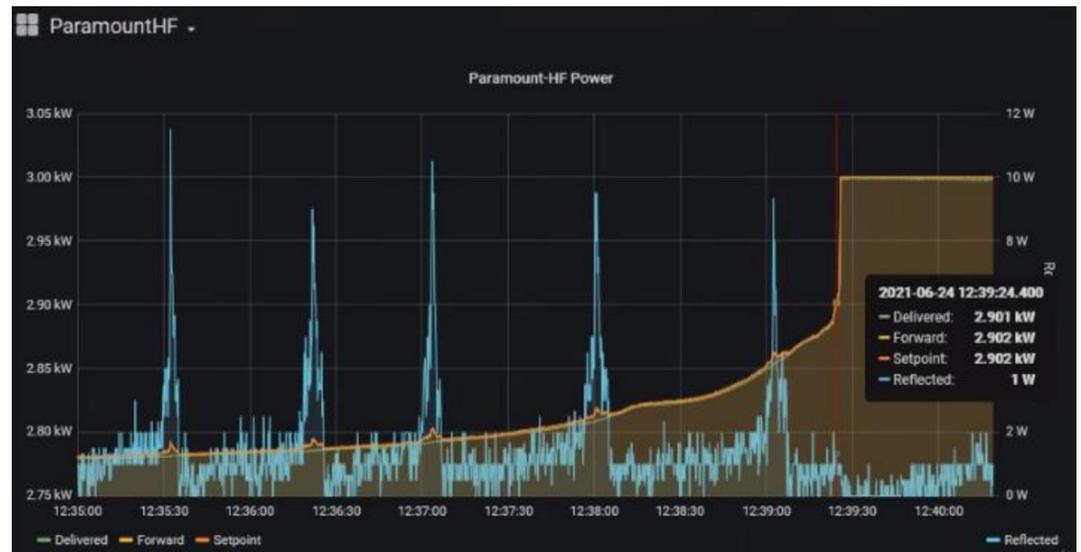
PowerInsight allows immediate data visualization for all connected devices simultaneously, enabling real-time comparison across equipment and toolsets, making it the perfect troubleshooting tool for any semiconductor fab.

RESULT

AE Field Service Engineers connected all twelve AE generators on the tool to PowerInsight and began monitoring the data while the unwanted generator power rise was reproduced. By plotting generator forward power on the PowerInsight dashboard, it was clear that the output power of Generator 11 was offset from the other generators (shown below). This helped to narrow down the scope of the root cause investigation.



AE Field Service Engineers then applied further analytics on Generator 11. The PowerInsight dashboard below shows that Generator 11 was outputting a higher power than the other generators due to a change in setpoint applied to the generator at the time. The generator was reacting correctly to the setpoint but the change in setpoint was unintentional.



To verify that what caused the generator forward power offset on Generator 11 was an unintentional change in setpoint, AE Field Service Engineers measured the voltage being applied to the setpoint pin on the generator's analog user port. When the issue occurred, the voltage on the setpoint pin exceeded the maximum voltage setting of 10 V, which caused the output power of the generator to jump to its rated maximum. Working with the tool owners, AE Field Service Engineers were able to identify the root cause of the issue as a defective control board on the resonator, which is responsible for giving setpoint commands to the generator.

CONCLUSION

Semiconductor fabrications are under increasing pressure to improve quality and yield, while reducing costs, year after year. Fast and accurate troubleshooting is necessary to quickly identify problems and implement solutions to keep production running smoothly.

With PowerInsight by Advanced Energy™, tool owners can collect extensive datasets and easily monitor critical process variables across their equipment and whole tools. Plus, with the help of PowerInsight's data scientist team, they can develop custom algorithms to set triggers and send alerts when process abnormalities are detected, before they can adversely impact quality or production.



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PRECISION | POWER | PERFORMANCE

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