

Global Automotive Component Manufacturer Uses PMA to Speed Up Root Cause Analysis

PATHWAVE

Using PMA (PathWave Manufacturing Analytics) to speed up the RCA (Root Cause Analysis) process for functional test failures in real-time



Introduction

With the concurrent outbreak of the pandemic and chip shortage, time to market is extremely crucial in fulfilling the market demand. This accelerates the demand and adoption for all kinds of IOT devices and analytical tools that can help with manufacturing health monitoring and maintaining high FPY (First Pass Yield). Nevertheless, there's still a lot of opportunities to improve, especially in the functional test process. Root causing functional test failures can be difficult and complex.

As a real use case, we take a high volume global automotive component manufacturer that has decades of continuous improvements experience to their manufacturing lines and continues to strive to provide the best quality for their customers. Having functional test yields less than 90% is not acceptable to them and immediate RCA is required in such cases. In this case study we will elaborate on how PMA enabled near real-time RCA of the equipment fixture issues on the production floor that caused a low yield scenario.

The Challenge

The global automotive component manufacturer had set up a real-time monitoring display above each tester to monitor its performance. Furthermore, they had their own in-house analytical tool to do data analytics.

A production yield of <90% FPY brought to their immediate attention that there is an equipment issue somewhere within the production line. They busied themselves with aggregating all the data sets from each of the functional tester systems to try to figure out what was causing the low production yield. In total **they spent approximately 6 months trying to root cause the issue**, which turned out to be one of the fixture for



Organization:

- A Global Automotive Component Manufacturer

Challenges:

- Low FPY (First Pass Yield)
- Long RCA times

Solutions:

- PathWave Manufacturing Analytics (PMA)

Results:

- RCA process reduced from 6 months to 5 mins
- Improved FPY
- Daily Monitoring of fixture health



the product used by the functional test systems. Much of their time went into manual data aggregation and transformation. In the process of troubleshooting the issue, the production managers needed to shut down the production line to work on the problem. After much work, monitoring, and what seemed like a reasonable corrective action, they decided to perform monthly maintenance to all the fixtures on the Functional Tester lines to rectify the FPY loss.

The Solutions

After the initial introduction to PMA's features the company was very interested in the capabilities related to fixture comparisons, ranking of top failing tests, and top alert statistics. To prove out the benefits of using PMA it was decided to perform the demo using offline analytics. This is where the data from a possible problematic period is loaded into PMA for analysis, in this case the dataset that caused 6 months of effort to narrow down the root cause was used.

After the automated analysis of the historical data was completed by the PMA platform, it took a Keysight Field Engineer approximately 5 minutes to find the problematic fixture and the reason behind its issues. This process proved that PMA is able to save time by reducing this investigation from **6 months** to just **5 mins**.

Below we present the steps used to narrow down the problematic fixture, when using PMA, as well as the recommendation because of the analytics performed.

1. Predictive alert model – Detecting issues before they happen



Figure 1. Real-time alert sent early in the process on 18-Feb.



Figure 2. Corresponding measurement chart showing the eventual failures that affected the FPY as the volume of anomalies started to rise on 18-Feb and started to fail on 22-Feb (triangles show the retest passing boards).

From Figure 1, there was a degradation anomaly alert triggered for the fixture F-1234 B123. Looking at the detailed measurements across the week, it shows an eventual failing trend with many failures and retests happening on 22-Feb. The failures caused the sharp drop in the daily FPY as shown in Figure 3.



Figure 3. Daily FPY by project and corresponding worst tests for each project to help drive investigations into the failures.

The simple task of just viewing an alert and its corresponding measurement data allows investigators to eliminate the possibility of product failures in just a few clicks. This allows the user to focus on resolving their equipment or product issues rather than spending large amounts of time collecting data, analyzing, and debugging those issues.

2. Fixture comparison – Identifying the problematic fixture

To identify fixture to fixture variations there is a fixture comparison feature. It will facilitate the isolation of problematic fixtures by allowing the user to view all the test equipment and fixture combinations at glance.

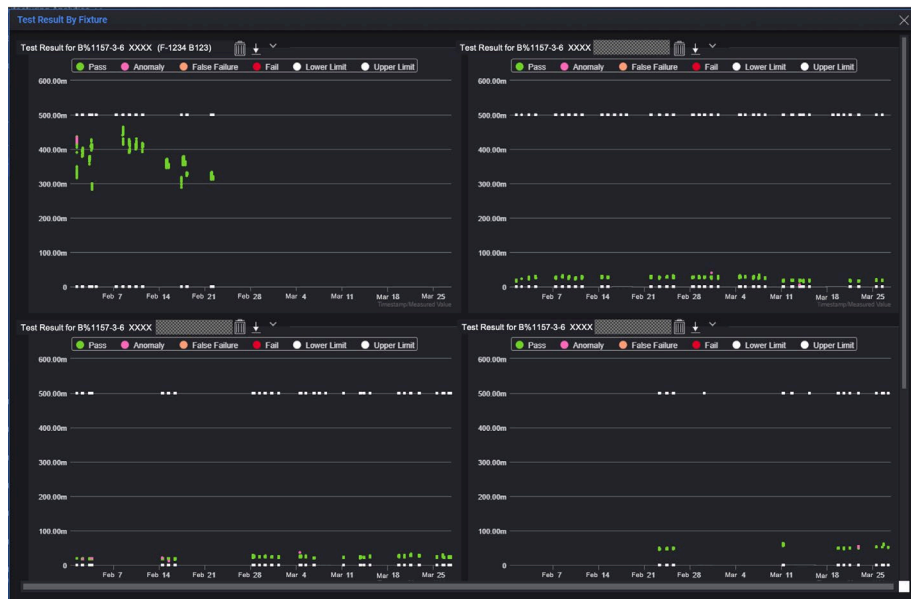


Figure 4. Compare by equipment and fixture showing fixtures with stable measurements vs a fixture with unstable measurements.

By using the “Compare by Fixture” feature it was immediately apparent that there is a fixture with unstable measurements that contributed to most of the problem with the FPY. After isolating the root cause of the dip in the FPY, being due to the fixture, the technician or engineer will then need to report this issue to the production team. Taking a snapshot or downloading the image of the chart is effortless and can also be added into the report generating tool in PMA.

3. Report generation tool – Configurable reports

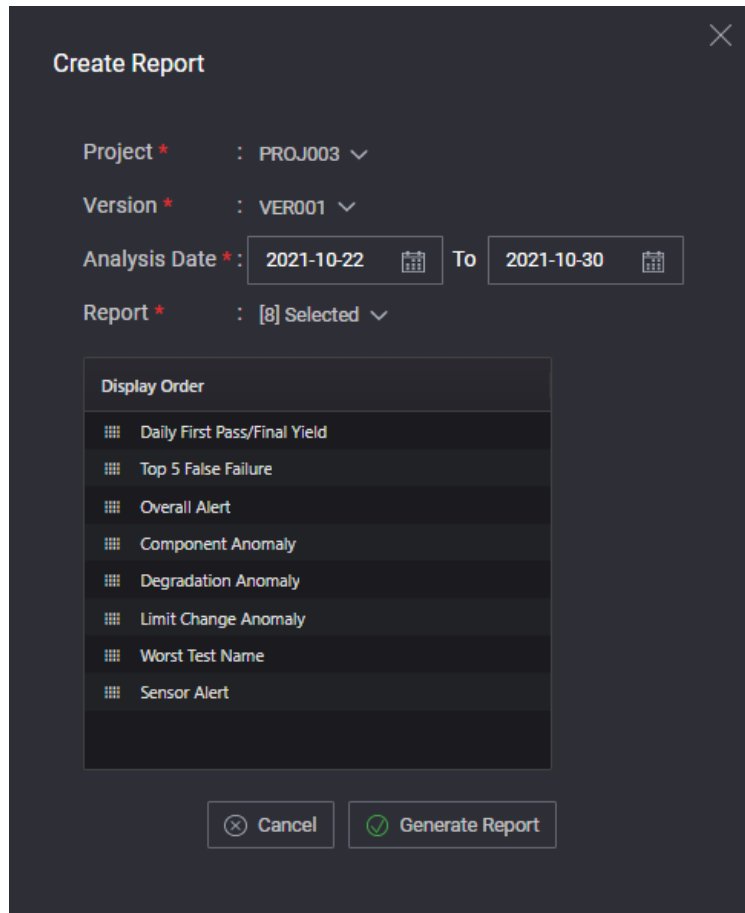


Figure 5. Configurable report generation tool

PMA has a customizable report generation tool that allows the user to generate a report based on their preferences. The static reports generated, of interesting time ranges, can then be downloaded in PDF format for easy sharing and tracking. The user can share the relevant charts of exactly what the production line was experiencing for any issues or just for the tracking purposes of a particular project.

Conclusion

By utilizing and reviewing the data from just 3 features within PathWave Manufacturing Analytics, the Predictive Alerts, the Fixture Comparisons, and the Report Generation Tool, the root cause and corrective action process mentioned in this case study became almost effortless. The continued use of the software later contributed to further improvements in production lines.

PathWave Manufacturing Analytics helps to speed up the investigative process and reduce the downtime experienced in production by providing clear visibility to just the right amount of the test equipment's measurement data at a glance while also allowing the user to easily capture and report it with little effort. Consequently, the production line can get back on track or even improve its capabilities with this analytics software.

For more information

To find out the latest on PathWave Manufacturing Analytics, go to

www.keysight.com/find/pathwaveanalytics

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