CUSTOMER PRESENTATION BRIEF
As presented at the 2017 EMEA Users Conference

OSIsoft.

SUMMARY

PEM |
RWTH Aachen University

Industry

Transportation

Business Value

- Business Intelligence
- Operational Insight
- Performance Optimization
- Process Controls
- Quality Management

PI System™ Components

- PI Server™
  - Data Archive
  - Asset Framework (AF)
- PI Vision™[1]

Fully Charged: How Aachen is Using the PI System to Make Electric Vehicle Battery Production More Cost-effective

RWTH Aachen University, located in Germany, is one of the largest technical universities in Europe. Founded in 2014, the university's PEM (Production Engineering of E-Mobility Components) institute focuses on designing electric mobility solutions. To make electric vehicles more affordable for mass production, engine batteries must be produced in a cost-effective manner. With the help of the OSIsoft PI System, PEM Aachen used operational data to optimize the production process in order to:

- Predict battery quality during production to eliminate the cost and time associated with end of line testing
- Reduce overall production cost by as much as 20 percent
- Shrink battery scrap rates from 10 percent to two percent

The Significant Cost of EV Batteries

For internal combustion engines, 25 percent of the value of the vehicle is in the drive train. In electrical vehicles, that number is only 15 percent. However, for electric vehicles, the battery is a whopping 36 percent of production cost. "The battery is getting more expensive and the drive train, like the electrical engine, is getting less expensive," said Christoph Lienemann, Group Leader of Battery Production at PEM, during the 2017 OSIsoft Users Conference in London. "The price of the EV [electric vehicle] is really defined by the battery and also by the production of these battery cells. So, it's essential to really focus on production – make it more effective… increase the quality and also… reduce the cost in the end."

Battery Production: The Waiting Game

Battery production is a complex, broad process that involves a lot of testing between each step. The last step is electrical charging where the battery cell is activated. Batteries are charged and uncharged, and then left to rest for two-to-three weeks to allow the chemical process to take place. Battery quality can only be determined after the resting period, meaning a lot of working capital is sitting in stock for up to three weeks. Since faulty batteries can only be identified upon end of line testing, that working capital may ultimately end up in the scrap heap.

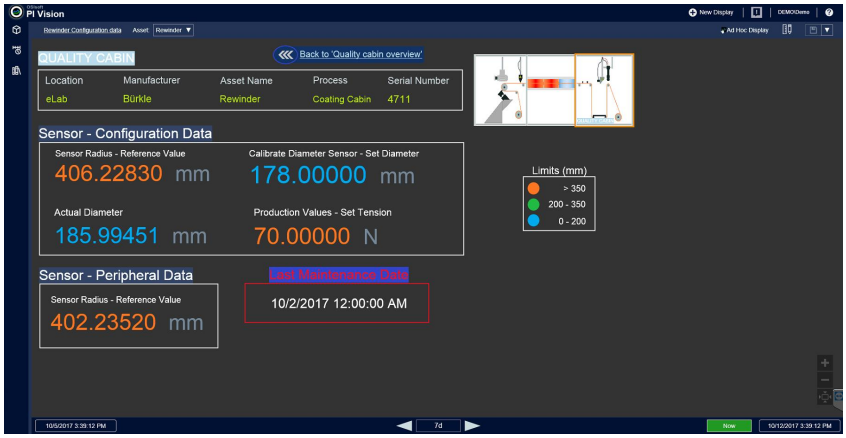
"One of the major challenges in battery production is that you have very broad processes, very different processes, a big variety, and a lot of… cause/effect relationships are not clear yet," noted Lienemann. With the goal of identifying those cause/effect relationships in production, PEM implemented a technology

consortium using the PI System to bring disparate data sources together with measurement and testing to predict battery quality and eliminate the end of line testing.

A PI System Consortium of Production Data

After choosing the right technology partners to form the consortium, PEM developed its I40 Maturity Index, which is a replicable four-step model that is used as a framework for production use cases. Based on visibility, transparency, predictability and adaptability using machine learning, PEM began leveraging a mixture of sensors and integrated cameras to collect data from its mixing, coating and drying machinery. In just six short weeks, PEM was able to use the PI System to extract production insights.

With this steady stream of data coming from a significant portion of its battery production line, PEM now has the right visibility to understand which production processes and equipment are working properly. In addition, with the help of augmented reality, PEM staff can use mobile devices to view inside of production equipment and analyze parameters to understand functionality. Using PI Vision, PEM can drill down into the dashboard details to quickly understand battery quality and identify any issues that would potentially land batteries in the scrap pile – all before the batteries come off the line.



Keeping a Pulse on Battery Quality: PI Vision allows Aachen to predict battery quality before the three-week resting period.

Battery Production Cost Reduction with the PI System

PEM Aachen has been implementing the PI System consortium across its entire production line with a targeted completion data of the end of 2017. Based on current use cases, upon full deployment, Aachen estimates that there will be an overall reduction in production costs of 20 percent. In addition, industry battery scrap rates hover around 10 percent but, with the help of the PI System, Aachen predicts that its scrap rate will be reduced to less than two percent. To learn more about Aachen and the PI System, watch the full presentation here.

> "...the idea is to use our findings to decrease the process costs for the industry so batteries will get cheaper and also electric mobility will get cheaper…"
>
> – Christoph Lienemann, Group Leader, PEM Battery Production

[1]PI Coresight was renamed to PI Vision in 2017.

Lienemann, Christoph. Digital Transformation to Reduce Testing Efforts in Battery Cell Production. OSIsoft.com. 18 October. 2017. Web. 19 November 2017. <https://www.osisoft.com/Presentations/Digital-Transformation-to-Reduce-Testing-Efforts-in-Battery-Cell-Production/>