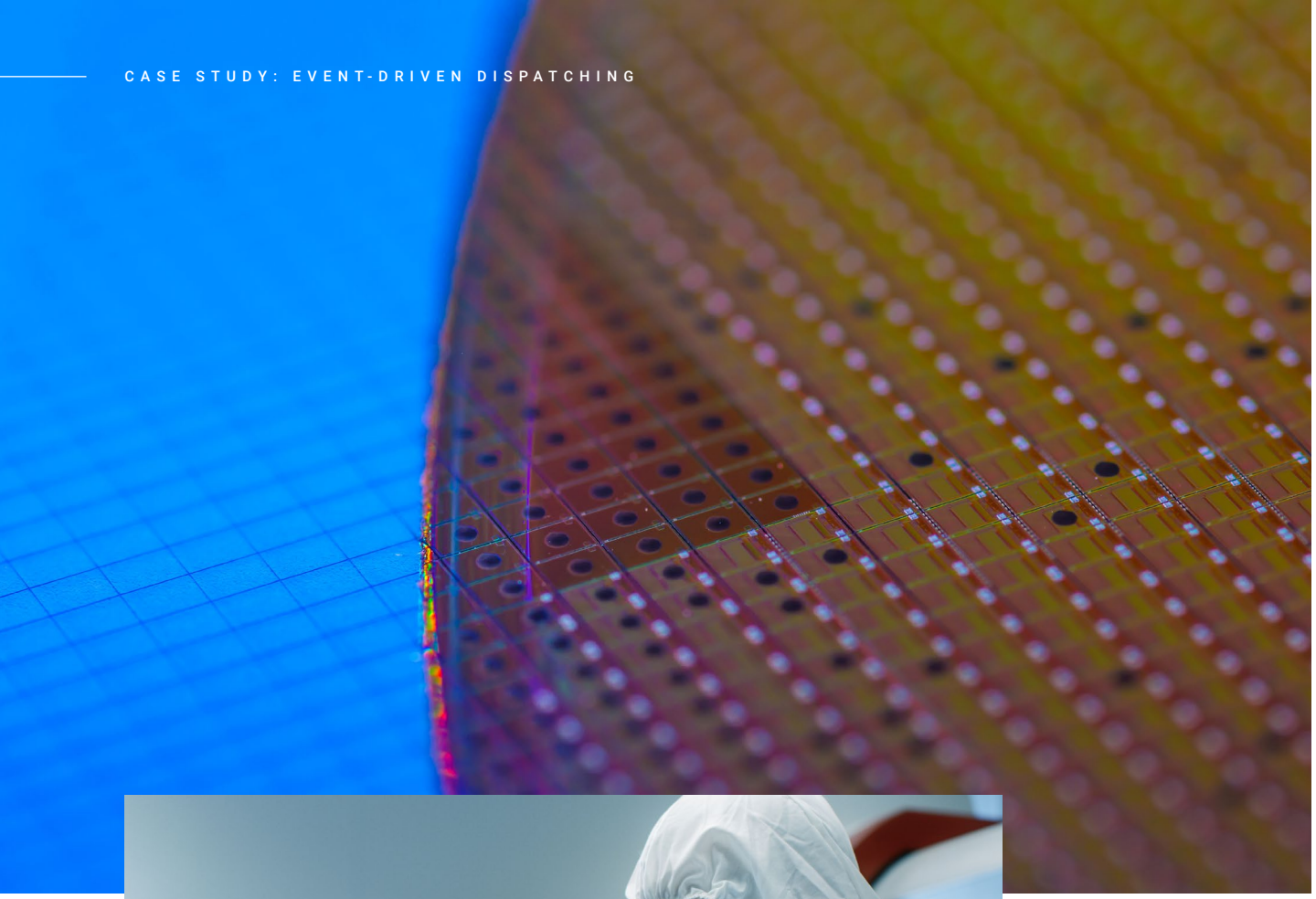
CASE STUDY

EVENT-DRIVEN DISPATCHING

A Winning Strategy: Integrate and Automate to Optimize and Visualize

A global leader in semiconductor component manufacturing was ready to take the next step in its quest to digitally transform its factory. Partnering with SYSTEMA, this manufacturer set its sights high – and integrated an automated, real-time dispatcher into its newly optimized production control system.

SYSTEMA
Art of Automation



An Industry Challenge – Meeting Increased Demand and Production Complexity in a Mature, 24×7 Semiconductor Fab

Semiconductors are among the most complex devices manufactured today. Today's largest companies are manufacturing almost 100 billion devices annually while managing 10,000+ product types. With rapidly changing demand and innovation cycles, and an ever-increasing product mix, managing these complicated production processes within a highly dynamic environment presents significant challenges.

The long manufacturing history of many semiconductor industry leaders means that their factories have been in operation for decades – some over 50 years. In a mature facility, simply expanding a factory's footprint (more space, more tools, etc.) to meet increasing demand and production complexity can be problematic due to physical constraints. In these cases, automation is often the key to improving factory performance.

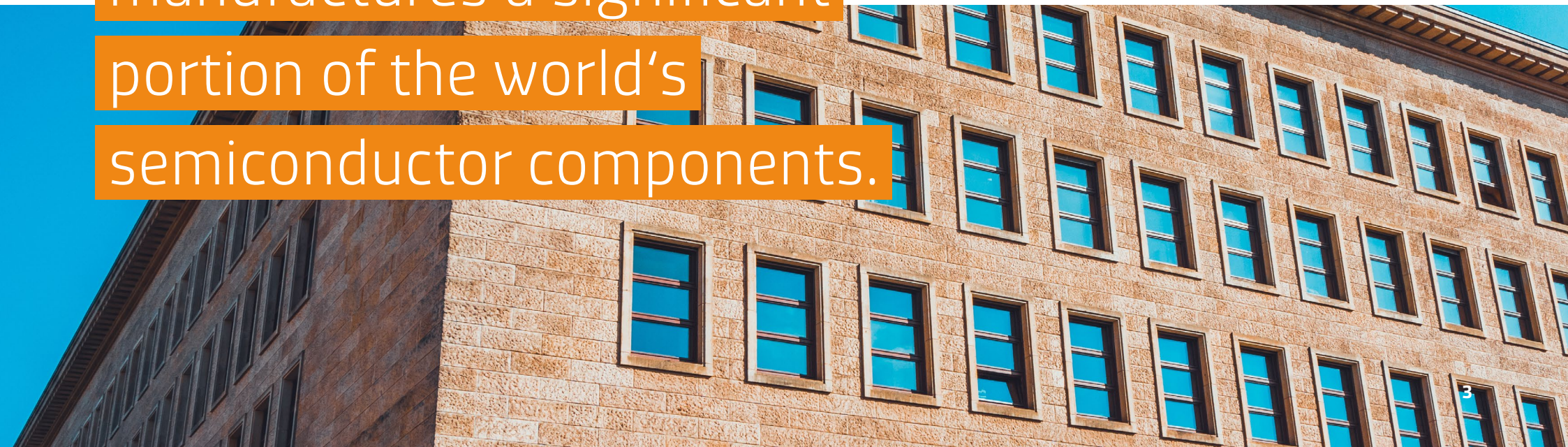
This was exactly the challenge SYSTEMA was tapped to overcome.

SYSTEMA's Challenge – How to Increase Utilization through Digital Transformation

Having grown organically over many decades, the manufacturer's factory faced both physical and technological challenges. Low ceilings and space constraints made realization of automated transport extremely complicated as well as adding additional tools costly and time-consuming.

Legacy IT systems and manufacturing staff separated across several buildings had led to locally optimized work areas and a fragmented system architecture. The existing manufacturing environment had been pushed to the limit. The manufacturer knew their production equipment still had capacity, but their IT systems were holding them back.

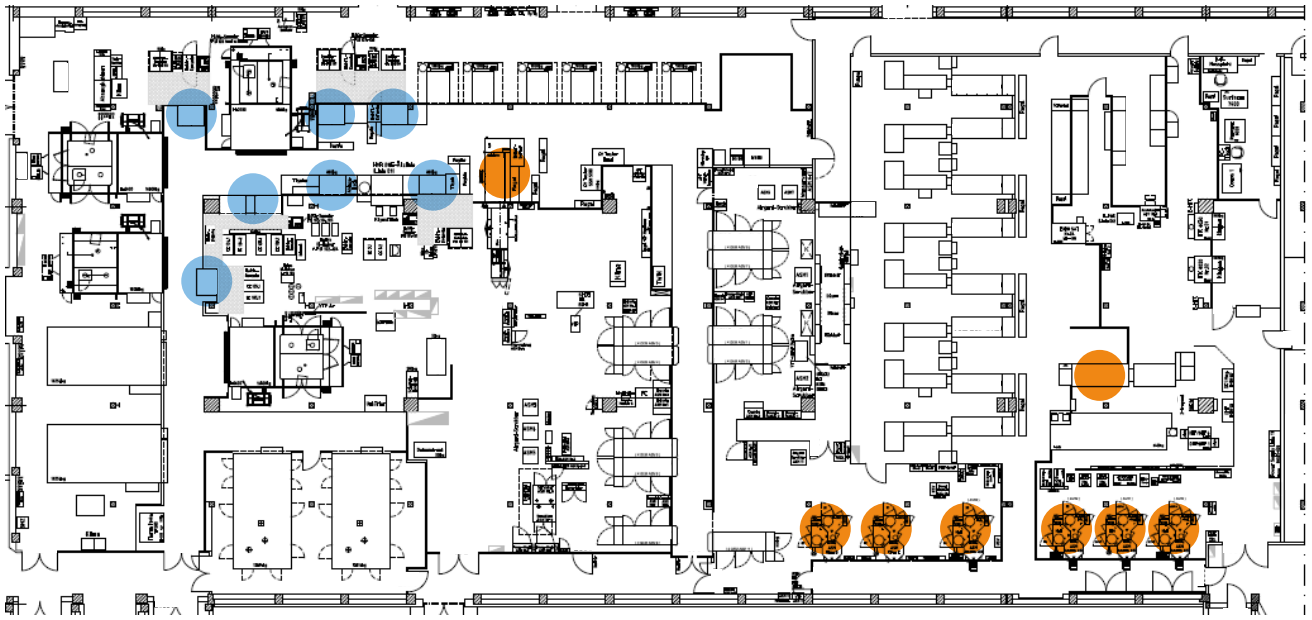
This 24×7 factory manufactures a significant portion of the world's semiconductor components.



The Game Plan – Collaborate to Integrate and Automate

This industry leader knew that a successful digital transformation meant change for people as well as processes and systems. So their first step was to find a partner with both the necessary automation expertise and a long history of managing complex requirements and organizational change. The search led to SYSTEMA and its proven event-driven dispatching solution (EDDi).

Once the right partner was found, a game plan rapidly developed into an exciting, no-holds-barred project to increase utilization by optimizing material flow through the deployment of a real-time, automated dispatcher. Given the fab's long history, its homegrown MES would have to be adapted to meet the requirements of a flexible, dynamic dispatching system, and other paper-based processes and institutional knowledge would have to be dissected and automated along the way.



The location and suboptimal lot-processing order of pre-Furnace cleaning tools (light blue) often caused timing delays and starvation in the Furnace work area (orange).

For phase one, SYSTEMA and the manufacturer decided to optimize material flow for batch processing in the Furnace production area. Once proven successful, the team would move systematically through other work areas.

Furnace is one of the fab's most critical production area. It requires a long run-time, and the right quantities of material must be available to optimize its batch runs and avoid bottlenecks.

Furnace often experienced timer issues (for oxidation prevention) while waiting to complete batches and resorted to processing single lots at a time to get hot lots quickly through the work area. This was largely due to issues in the pre-Furnace cleaning work area.

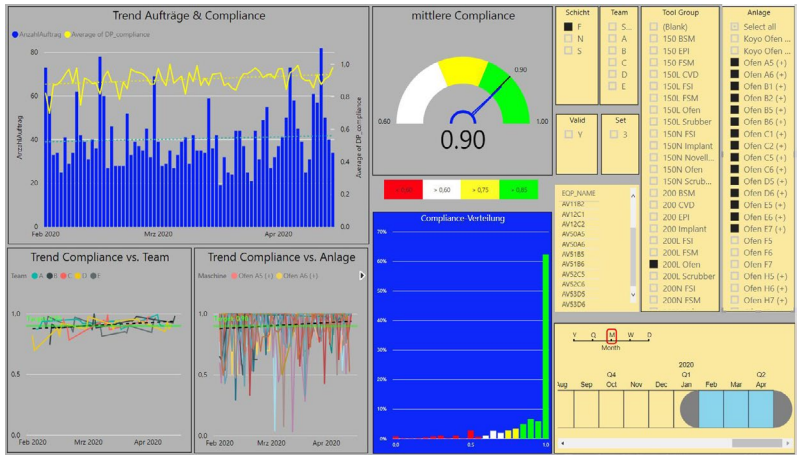
Processing incomplete batches in Furnace was impacting capacity utilization throughout the fab.

> “Talent wins games, but teamwork and intelligence win championships.”
>
> – MICHAEL JORDAN

The Solution – Playing the Long Game Instead of Chasing the Quick Win

The manufacturer hoped that deploying a new material dispatch system would be a quick win to increase fab utilization. They had long outgrown their internally developed system and needed capabilities it couldn’t provide such as real-time updates, sophisticated rules-based material routing and instantly updated dispatch lists in the hands of their operators. SYSTEMA’s EDDi was a star player in the ultimate solution, but it was a focus on the long game that made this project such a success.

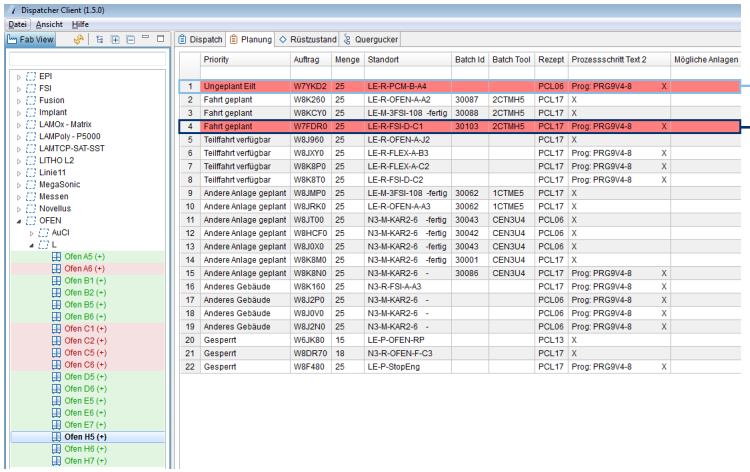
SYSTEMA helped this industry leader step back, deep dive, and envision a new, automated way of running the factory – one that optimized overall material flow throughout the entire fab. This focus on the long game meant that sometimes plans were challenged and changed. Instead of driving down WIP, shelves were installed in bottleneck areas so that tools could run 24×7 without idling. To better track WIP, fab infrastructure upgrades, including a centralized wafer-box tracking system, were deployed. The long game meant data were integrated and architecture simplified instead of adding new systems or silos. The long game meant deeply engaging with operators and production staff to eliminate “hidden factory” operations and continuously refine material-routing rules.



EDDi compliance monitoring allowed identification and resolution of “hidden factory” issues that helped optimize fab material flow. Non-compliance at bottleneck tools, such as Furnace, was often elevated due to pressure on operators to deliver hot lots.

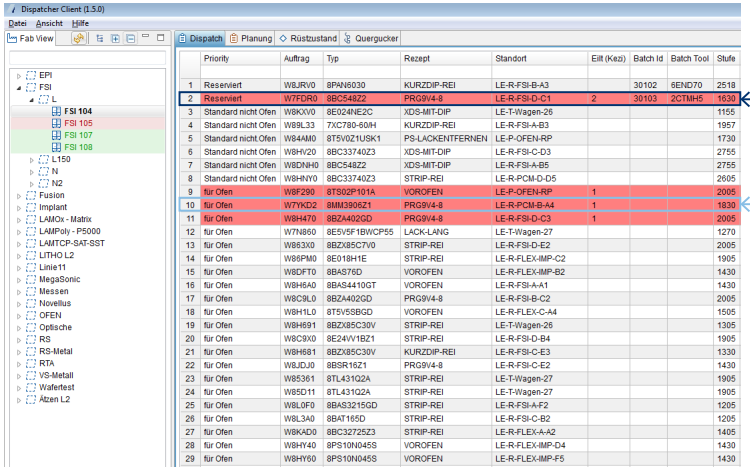
Planning list Furnace & FSI

FURNACE



reservation

FSI CLEAN

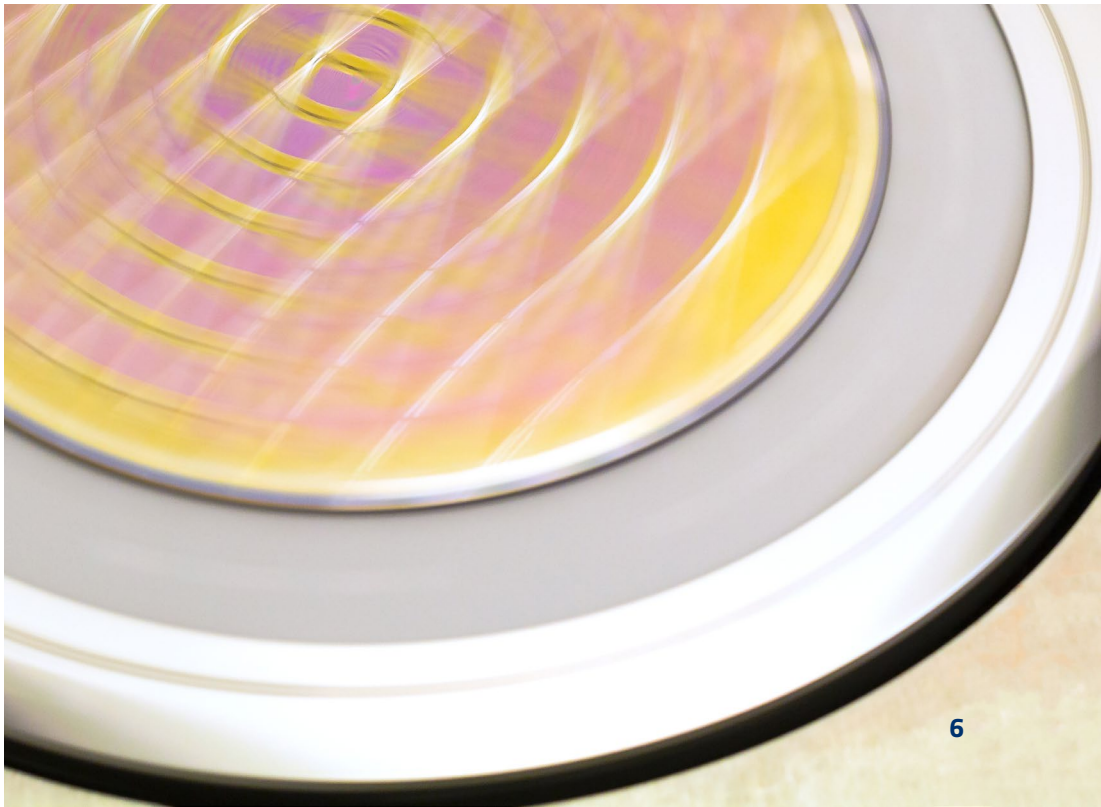


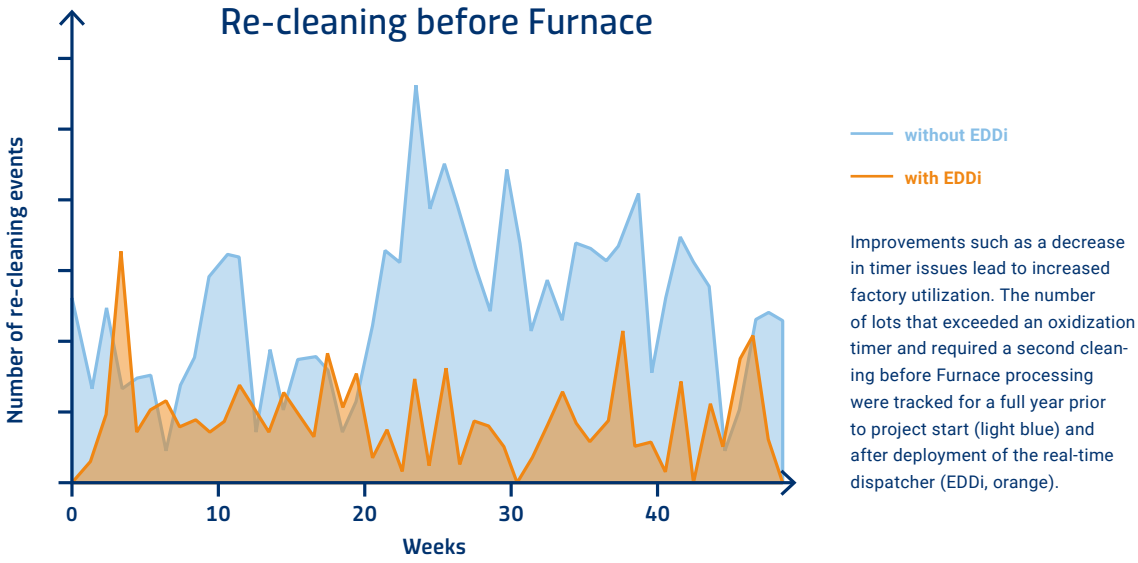
For the win: Lot dispatch order for pre-processing cleaning area (below) is now based on the priorities and requirements (e.g. batching) of downstream work areas like Furnace (above) as well as other areas.

For the Win – A Fab-Wide Automated Production Control System

In the end, the team created a fully automated production control solution able to manage all the new and modified processing rules and capabilities the fab needed to optimize material process flow. They deployed a fab-wide dispatching system providing rules-driven, real-time dispatch lists, and fully integrated it with the manufacturer's updated MES now able to handle a flexible, dynamic production environment; its new operator GUI; and its upgraded fab infrastructure.

A win that substantially changed how one industry leader runs its entire fab.





Improvements such as a decrease in timer issues lead to increased factory utilization. The number of lots that exceeded an oxidization timer and required a second cleaning before Furnace processing were tracked for a full year prior to project start (light blue) and after deployment of the real-time dispatcher (EDDi, orange).

Final Stats – Optimization and Visualization Deliver Digital Transformation

Together, SYSTEMA adapted and optimized how the manufacturer operates its factory. Substantial gains in capacity utilization were made both within the Furnace area and throughout the fab. Along the way, employee engagement and workload were also transformed, eliminating common questions such as *"What should I run next?"* or *"Where is my material?"* Now operators and production staff have the tools they need to proactively and quickly resolve shop-floor delays, freeing up time to work on more value-added activities – like continuing to drive the digital transformation of their 20th century factory.

100%
Increase in Furnace runs at maximum capacity

64%
Reduction in on-hold wafers in Furnace

>90%
Operator compliance in Furnace

17%
Increase in overall factory capacity utilization (wafers per run)

2
Project length in years

Future Game Plan – Continue to Integrate and Automate for the Next Digital-Transformation Win

Industry leaders understand that they must continuously innovate and improve operations to stay ahead of the competition and that digitization delivers a strong ROI.

Together with SYSTEMA, the fab continues to focus on increasing capacity utilization and operational efficiency through extending its production control system. Roll-out of an RFID tracking system is currently underway.

What's next for this industry leader? Under consideration are plans for introducing scheduling algorithms that will further optimize material flow as well as real-time reporting and analytics to the shop floor. All of that already designed for being used also on handhelds and tablets in the future.

Once again, the Furnace production work area will pilot solutions, bringing this digitization story full circle – this time with a team that has already honed its knowledge and experience in the automation game. The odds of another win are definitely in their favor!

> "Looking forward, we expect automation to be a key factor to our continued industry leadership."
>
> – FAB OPERATIONS MANAGER

Questions about SYSTEMA Dispatching Solutions?
Please feel free to ask a specialist at contact@systema.com
or visit us on the web at:

systema.com/event-driven-dispatching

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