CUSTOMER USE CASE

Process tool efficiency at a leading contract chip manufacturer had slipped, and they needed to find out why.

CHALLENGE

Increasing pressure to reach higher levels of yield across processing tools

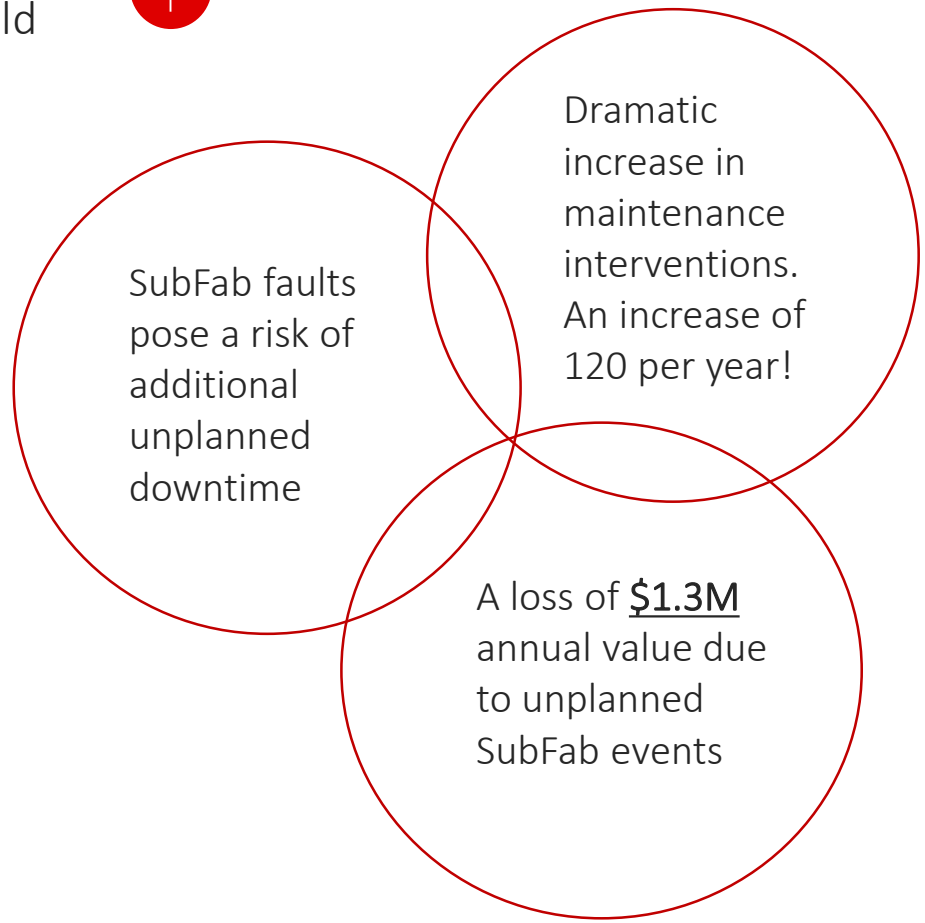
This foundry faces continual pressure to reduce time-to-money. Consumer demand to make latest innovations marketable as fast as possible is increasing. A new technology development that took two years to first silicon, now may only have a 3-6 month window to pay its development costs back. Process tools need to have 80%-90% yield as soon as possible.

Yield levels on several processing tools weren't achieving their target but repeat investigations didn't show a clear cause. On one process tool, the wafer throughput was at 10% of its peers. The process and equipment engineers needed to investigate further to find hidden variables that could be jeopardizing performance.

Eliminating the risk of a pump fault

Despite extensive automation across the Fab there were still many unconnected data areas. The SubFab with all its vacuum, abatement and chiller infrastructure was one of those unconnected areas. This disconnection became a growing concern across the Fab.

KEY PROBLEMS



As technology nodes were introduced, process chemistries were becoming harsher on pumps and forcing the SubFab team to shorten pump maintenance intervals dramatically. Within a year, frequency of pump maintenance schedules went from 2-3 years to twice a week. Not only did the Fab suffer increased costs associated with maintenance and pump swaps, but the process tools lost 4-8 hours production time at each event. Frustratingly increased maintenance wasn't enough to eliminate the risk of an unexpected pump fault which often resulted in expensive downtime and wafer loss.

After experiencing a pump failure just a few weeks after a maintenance cycle, the SubFab team approached our team for help.

These assumptions illustrate the significant value that can be created by reducing unplanned down events.

MAINTENANCE AND DOWNTIME ESTIMATION

REDUCED MAINTENANCE COSTS	VALUE OF CHAMBER UPTIME	REDUCED WAFER SCRAP VALUE
$444,960	$412,000	$494,400

TOTAL ANNUAL VALUE

$1,351,360

SOLUTION

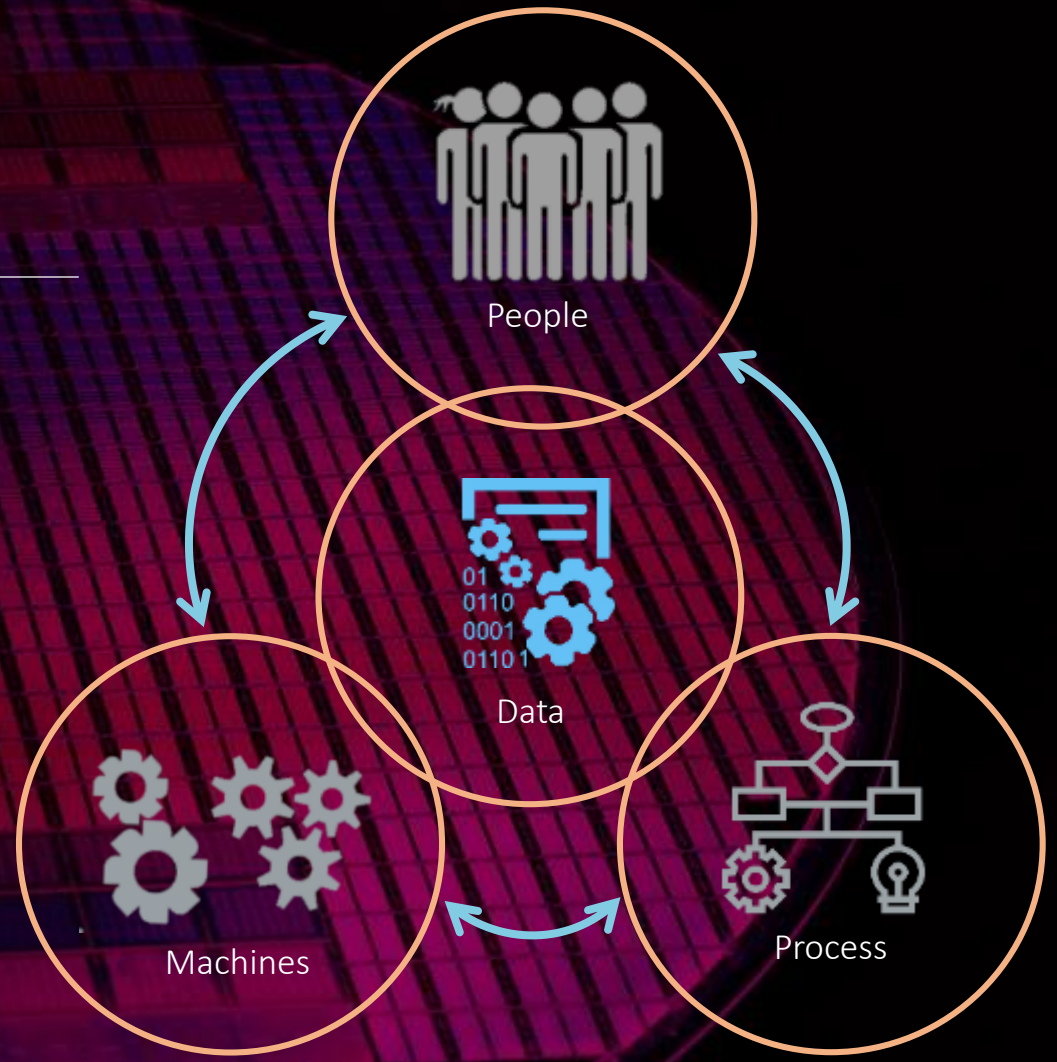
Uncovering the root cause of unplanned downtime

Understanding SubFab uncertainty was the priority. The SubFab team already had our equipment monitoring processes in place, where the data was collected and ready to analyse in order to understand how and where faults were developing.

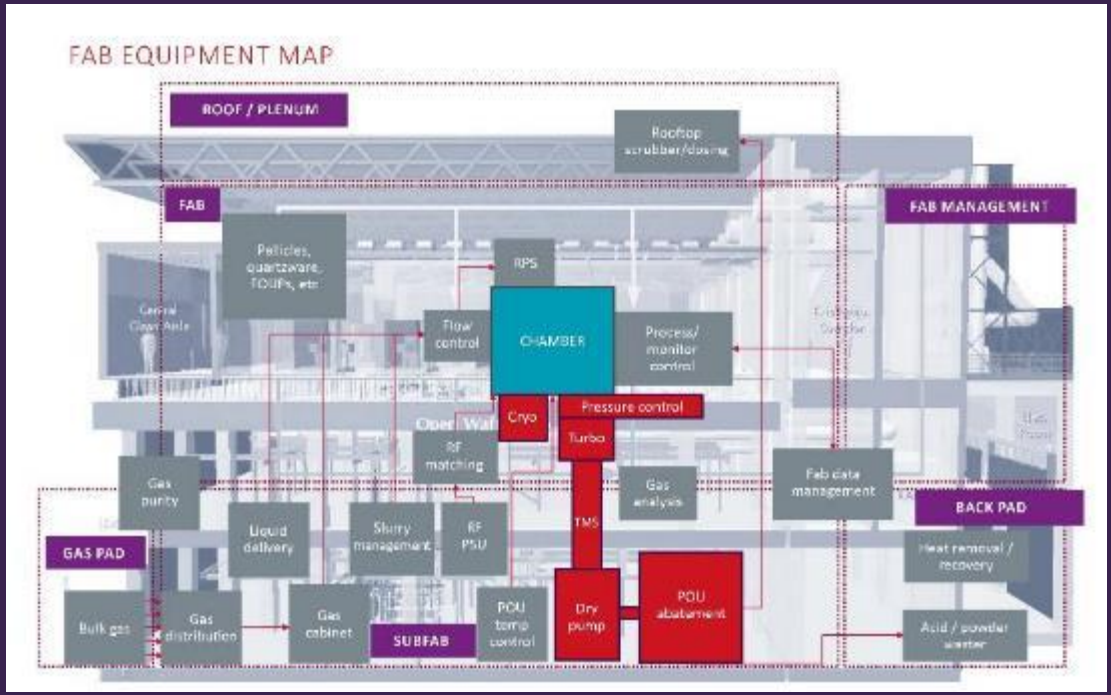
In collaboration with our Operational Excellence team, the SubFab team leveraged our domain knowledge and data analytics tools to accurately predict the future equipment state and required maintenance intervals.

The SubFab team now had comprehensive data to take to the process team. Both the process team and the SubFab team were now in a perfect position to work together to tackle root causes of reduced performance.

Both teams were relieved to move away from the disruptive, short-term fix of increased maintenance cycles.



A LEAK IDENTIFIED BETWEEN THE CHAMBER AND THE VACUUM SYSTEM



Prescriptive maintenance in action

This Operational Excellence approach rapidly solved the mystery of under-performing process tools and revealed future opportunities to improve performance.

One tool issued multiple advisories on poor vacuum performance and warnings over a period of months, despite frequent maintenance. Our own analytics on the pump and abatement showed normal operation. Our analytics also indicated the approximate location of an issue in the wider vacuum system to be the likely source of the problem. The SubFab team now knew where to search for a fault to uncover the root cause.

Working together the SubFab and process team identified a recurring leak in an area between the vacuum equipment and connected process tool.

OUTCOME

More than $1.3M of value released across the Fab in tool uptime and reduced maintenance

After fixing the leak, the distressed pump returned to a stable condition, maintenance intervals returned to normal with reliable fault predictions. The process tool matched the yield and output of its peers.

Required **maintenance** interventions **fell** from **120 per year** to just **17**. With each maintenance interval taking at least 8 hours, this saved over **820 hours** of tool **processing time** per year on this tool alone. The potential value created through the reduction of maintenance costs and the additional throughput coming from improved chamber availability was well over **a million US dollars.**

Checking procedures improved

A leak falling in this area could easily be missed under current checking procedures. Now working under a model of Operational Excellence, system checking protocols have been improved to further optimize the maintenance of the SubFab and the wider vacuum system.

As Operational excellence in the SubFab continues to pay off across the wider fab. The foundry now looks to uncover even more value by synchronising specific maintenance schedules between process tools and SubFab equipment.

TEAM FEEDBACK

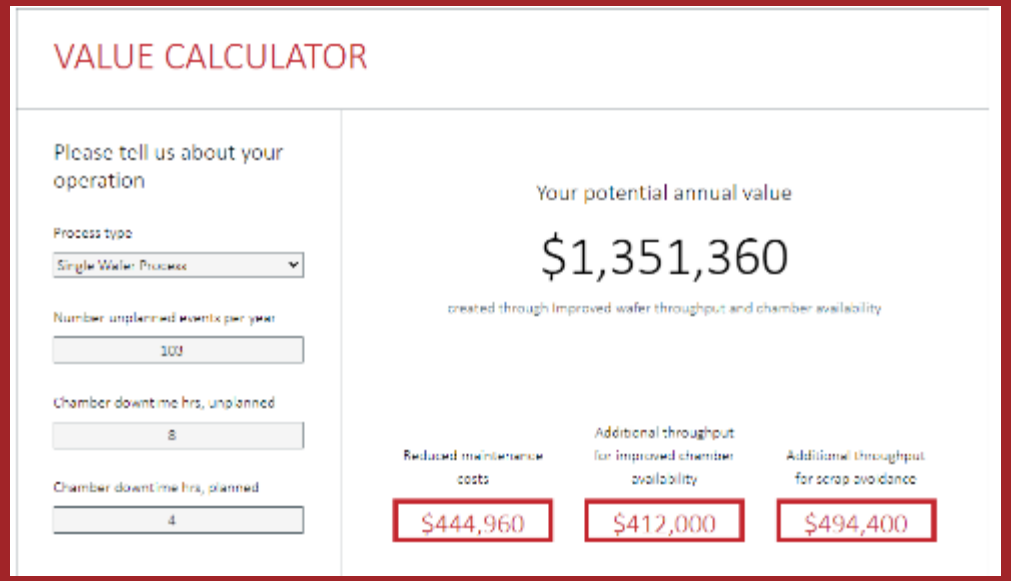
> “Putting in place additional monitoring in the SubFab quickly paid off in value across the Fab. Now, the customer has a long-term strategy to pinpoint and address root causes of process tool inefficiency. This is a great example of Operational Excellence in the SubFab.

CONSULTANT,
OPERATIONAL EXCELLENCE TEAM
EDWARDS

NEXT STEPS?

READY TO REVEAL THE POTENTIAL VALUE IN YOUR SUBFAB?

Learn more with the Value Calculator



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