



CUSTOMER SUCCESS

Fab recovers more than 1,400 hours of lost process tool time per year





CHALLENGES

Valuable process tool time is impacted by SubFab maintenance

The value of a single leading-edge semiconductor wafer is estimated at \$17,000*. Downtime on one process tool alone can interrupt production and rapidly cause setbacks in wafer output, yield and cycle time. Maximum process tool uptime is critical to profitability.

With limited insight into the performance of the vacuum and abatement system, and its impact on process tool availability, this Fab had to operate under a time-based maintenance approach.

Determined only by the age and run time of SubFab equipment, time-based maintenance couldn't completely eliminate the risk of a down event. Large inventory of spare parts had to be readily available, putting additional pressure on supply chains. Also, unexpected demands were made on maintenance teams to provide additional service support.

Corrective maintenance takes more time

In an event where the vacuum and abatement system shuts down unexpectedly, the cleaning, recovery, re-qualification of the process tool was estimated to be at least 500 hours of tool time each year. This figure was calculated across 75 process tools; each requiring 6-7 hours of additional maintenance per unexpected stop.

*Source: Centre for Security and Technology (CSET) REPORT, 2020
<https://www.techspot.com/news/86813-analysts-believe-single-tsmc-5nm-wafer-costs-17000.html>



KEY PROBLEMS

Concerns over **wafer loss** caused from down events in the vacuum and abatement system.

At least 500 hours of **process tool time lost** per year, due to corrective SubFab maintenance

Under pressure to meet rigorous growth targets to **double production** of new products

Managing the risk of downtime

Time based maintenance wasn't enough, if the Fab wanted to meet growth and performance targets. Unexpected downtime needed to be avoided at all costs but without enough insight to quickly identify root causes of system issues, increased routine maintenance was the only option.

The Fab was challenged to deploy the right technical expertise in the SubFab, and as a result frustration between the Cleanroom and SubFab teams grew, leading to inconsistent communication and a lack of data sharing.

In search of a more effective and accurate method to eliminate the risk of down events, this facility enlisted our help.



6-7 HOURS OF ADDITIONAL
MAINTENANCE PER DOWN EVENT

TYPICAL TOOL DOWNTIME FOR MAINTENANCE



CORRECTIVE
18 HOURS

PLANNED
11.5 HOURS



Illustration on a typical batch processing tool



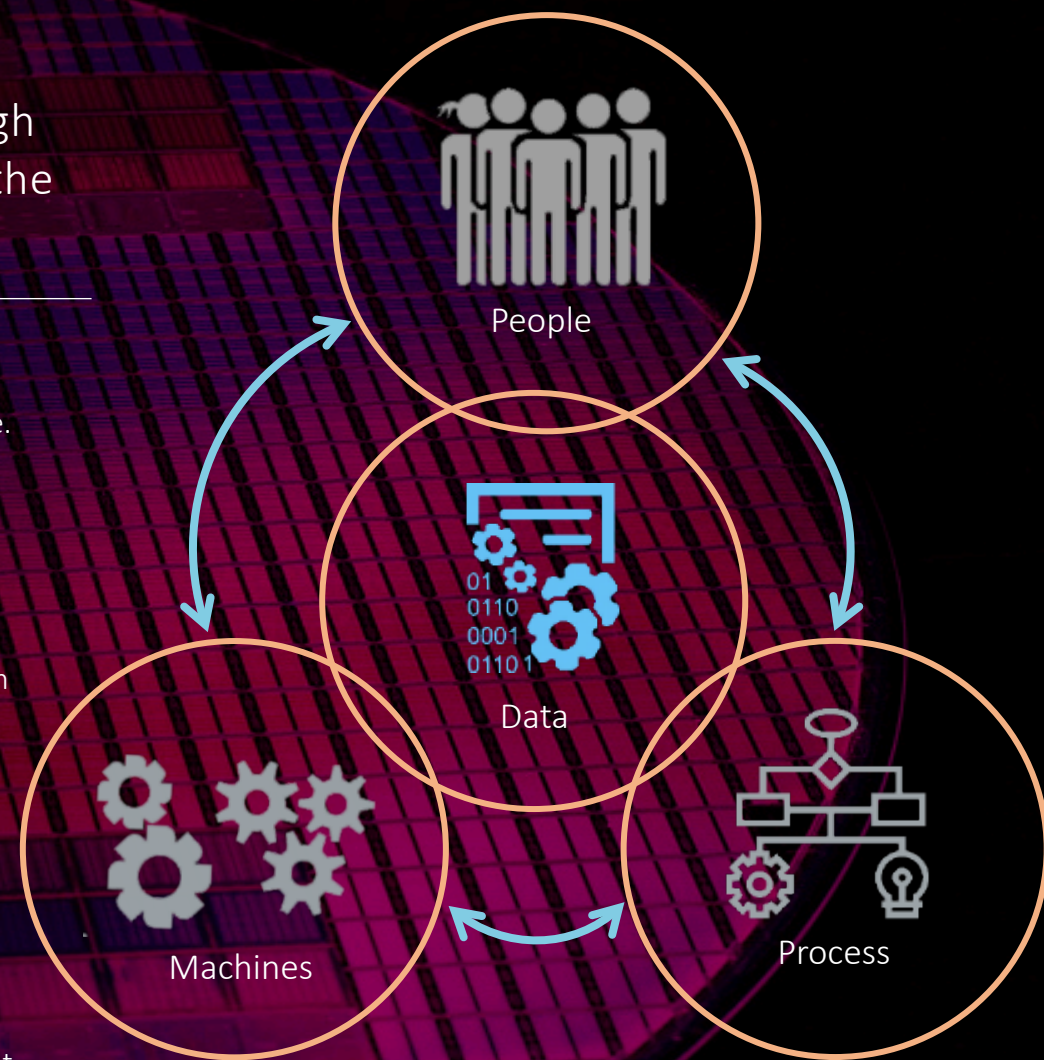
SOLUTION

Increasing process tool efficiency through collaboration between the SubFab and the Cleanroom

The first step was to align teams on the potential value of changing the approach to SubFab operations and maintenance. The management team could quickly see the gains in process time, wafer scrap and associated maintenance if they were better equipped to optimise operations.

The next step involved understanding the exact performance implications on process tool efficiency. By bringing the vacuum and abatement system under an Operational Excellence programme, both the Fab and the SubFab team could collaborate to detect faults and causes of inefficiencies.

To understand and make the required improvements, the SubFab team needed the specific domain knowledge on how vacuum and abatement can optimise process tool efficiency. Edwards' Operational Excellence team worked closely with engineers onsite to collect data and bring their technical insight right to the front line, where decisions can be actioned in real-time and deliver the best outcome.



Minimising the maintenance effort

The vacuum and abatement system across 75 process tools was monitored under the Service Management application (SMA) platform, where immediately the Fab team could see that increased preventive maintenance was restricting manufacturing efficiency. With this insight, the Fab team could make well informed changes to improve performance and minimise the maintenance effort.

Time saving on each processing tool

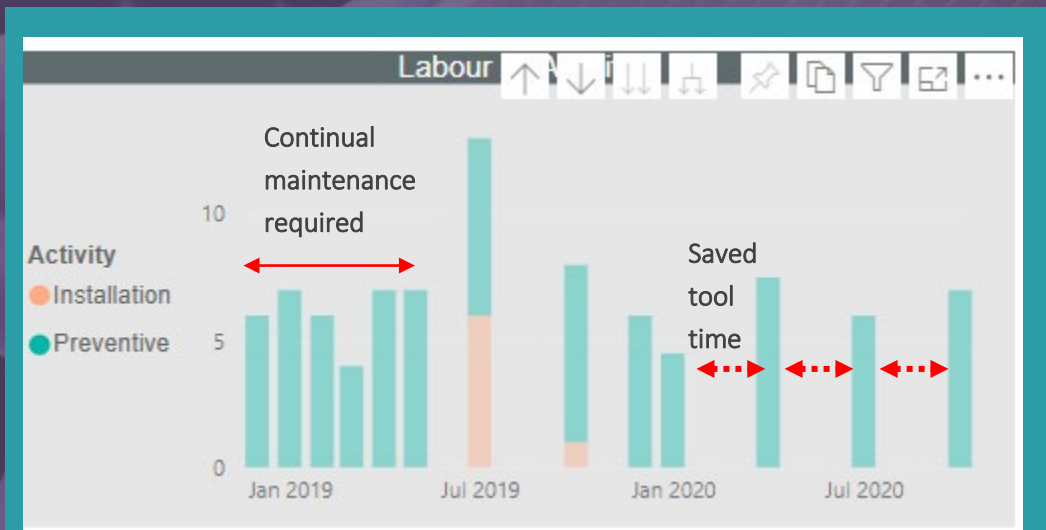


Figure 1: Maintenance hours on 1 process tool

Increasing tool availability across the Fab

The success was evident in the downtime metrics compared across this Fab with another Fab in the same region; that has just started their Operational Excellence journey. The difference in downtime hours, demonstrated the value of the customer's approach to Operational Excellence.



14% decrease in maintenance

2019

10,002 hrs



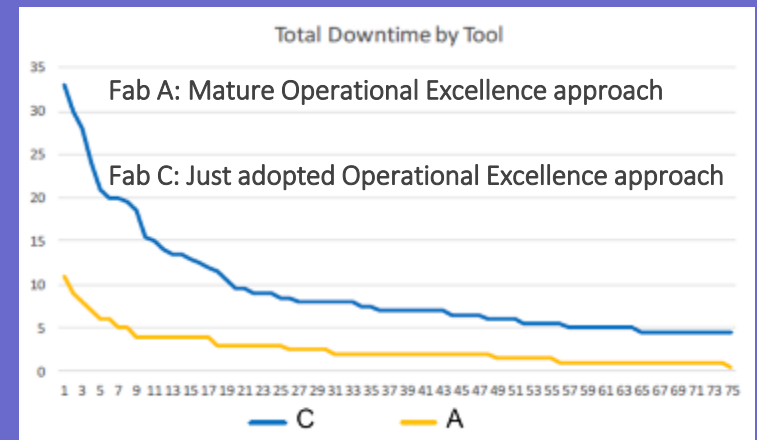
2020

8,565 hrs

1,437 hours of addition tool time



Tool downtime across 2 Fabs





OUTCOME

An annual saving of 1,437 hours of tool time

Freeing up 1,437 hours of tool time without the risk of wafer loss was an excellent result for the first year. By monitoring the equipment service cycle, the SubFab Operational Excellence team were able to understand the root causes of faults and work with the Cleanroom team to uncover more efficient ways of working. This led to collaboration on how to synchronise the maintenance of the vacuum and abatement system with valuable bottleneck tools, where there is no capacity for the tool to be down.

After the first year, the Fab is in a good position to achieve growth targets with this Operational Excellence approach now rolled out across two Fabs. The customer now looks to expand their manufacturing footprint with another two new Fabs, including their assembly and test facility at the heart of their operations.

The SubFab is aligned to support manufacturing goals

The ongoing investment of technical expertise specific to the vacuum and abatement system paid off in under a year with the increased throughput and reduced cycle time. The increased manufacturing efficiency puts the Fab in a strong position to make that next technology breakthrough and further cement their position as a market leader.



FEEDBACK

“This customer had a strategy to accelerate manufacturing efficiency. By engaging internal stakeholders to transfer the technical expertise on-site, the SubFab is ready to significantly contribute towards achieving this goal.”



CONSULTANT,
OPERATIONAL EXCELLENCE TEAM
EDWARDS

NEXT STEPS?



READY TO REVEAL THE POTENTIAL VALUE
IN YOUR SUBFAB?

[Learn more with the Value Calculator](#)

VALUE CALCULATOR

Please tell us about your operation

Process type
Single Wafer Process

Number unplanned events per year
150

Causing scraps
Chamber downtime hrs, unplanned
12

Chamber downtime hrs, planned
4

Your potential annual value
\$2,856,000
created through improved wafer throughput and chamber availability

Reduced maintenance costs	Additional throughput for improved chamber availability	Additional throughput for scrap avoidance
\$696,000	\$1,200,000	\$960,000

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