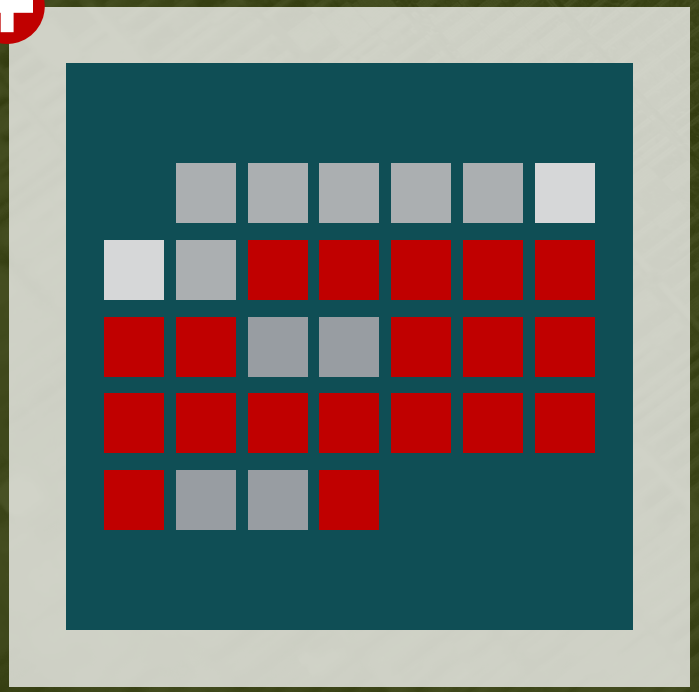
Cost Comparison of Maintenance Regimes

Reactive, Preventative and Predictive Maintenance

Erik Collart
Global Product Manager
SCADA Semiconductor Service

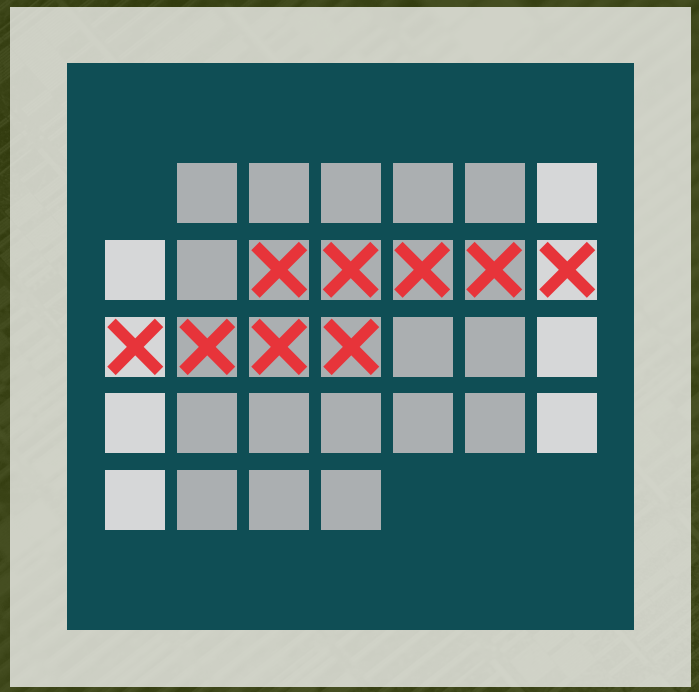
The three maintenance options

Reactive



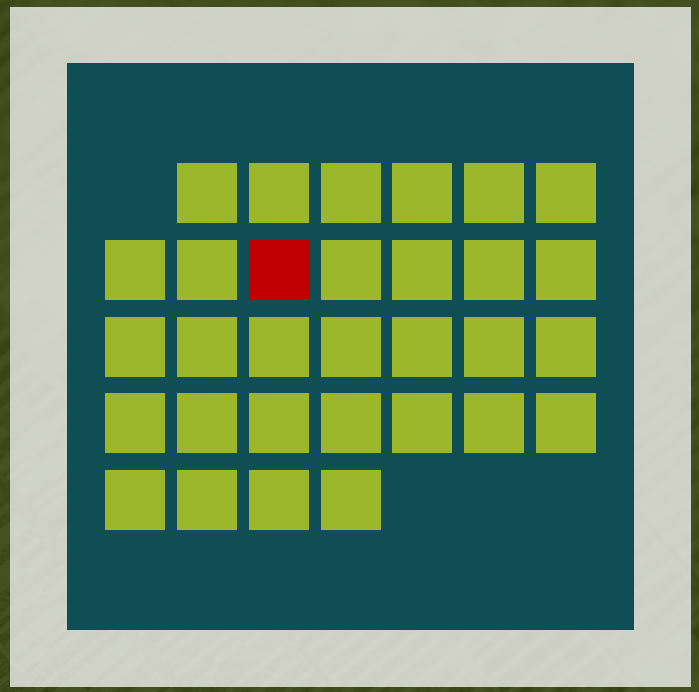
Wait until it breaks

Preventative



Scheduled downtime,
whether it's needed or not

Predictive



Targeted repairs
only when needed

The four cost categories

Our predictive maintenance system uses data from the largest global install base to deliver intelligent service options across four cost categories

Spare parts and labour

This cost category includes the expenses associated with purchasing and storing spare parts needed for equipment repair, as well as the labour costs of maintenance personnel.

High volume manufacturing requalification

This cost category refers to the expenses associated with requalifying equipment for use after maintenance or repair, as well as the costs of metrology (measurement and analysis) required to ensure equipment is operating within acceptable parameters.

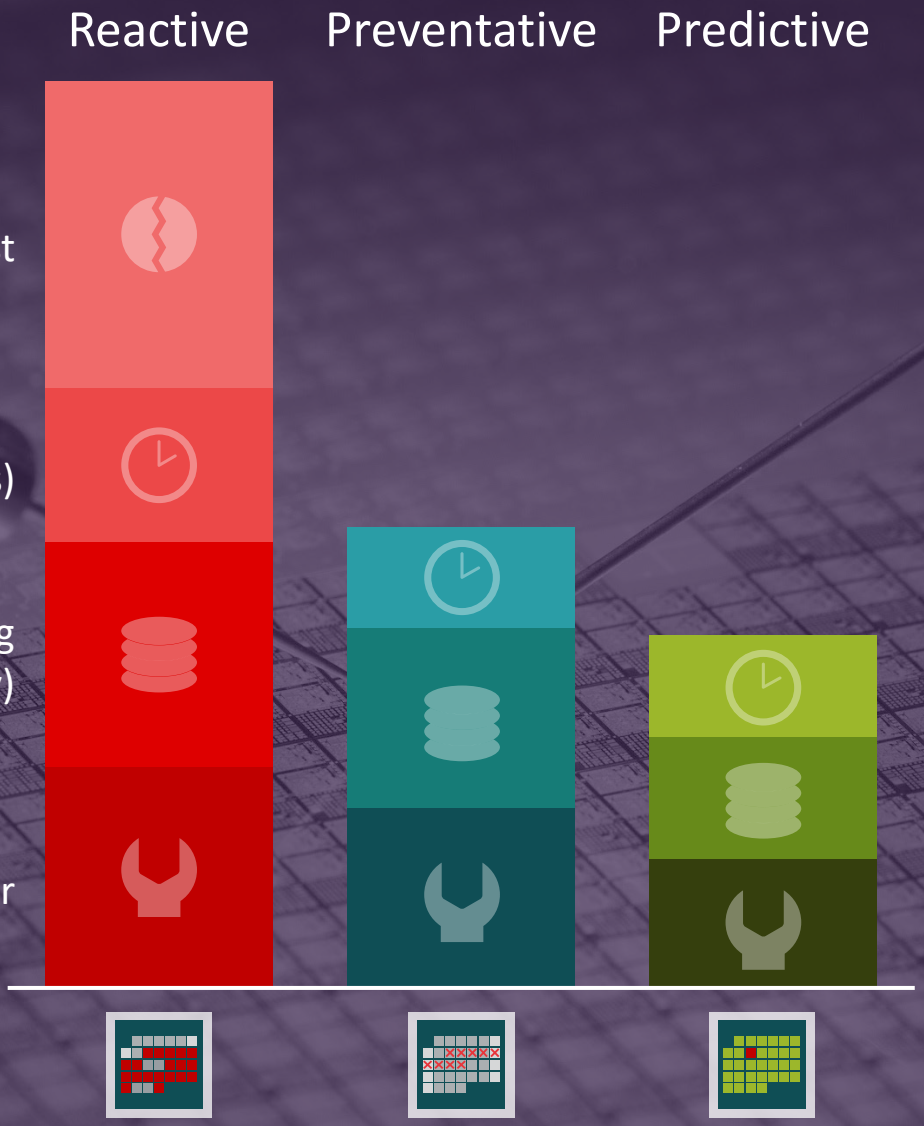
Throughput or Uptime loss

This refers to the decrease in productivity that occurs when equipment is down for maintenance or repair. Uptime loss is a related concept, representing the amount of time a piece of equipment is unavailable for use.

Wafer scrap cost

This cost category is specific to the semiconductor industry and represents the financial losses incurred when wafers (the thin slices of semiconductor material used to create integrated circuits) are damaged or rendered unusable during equipment downtime.

Overview of costs for the three maintenance regimes

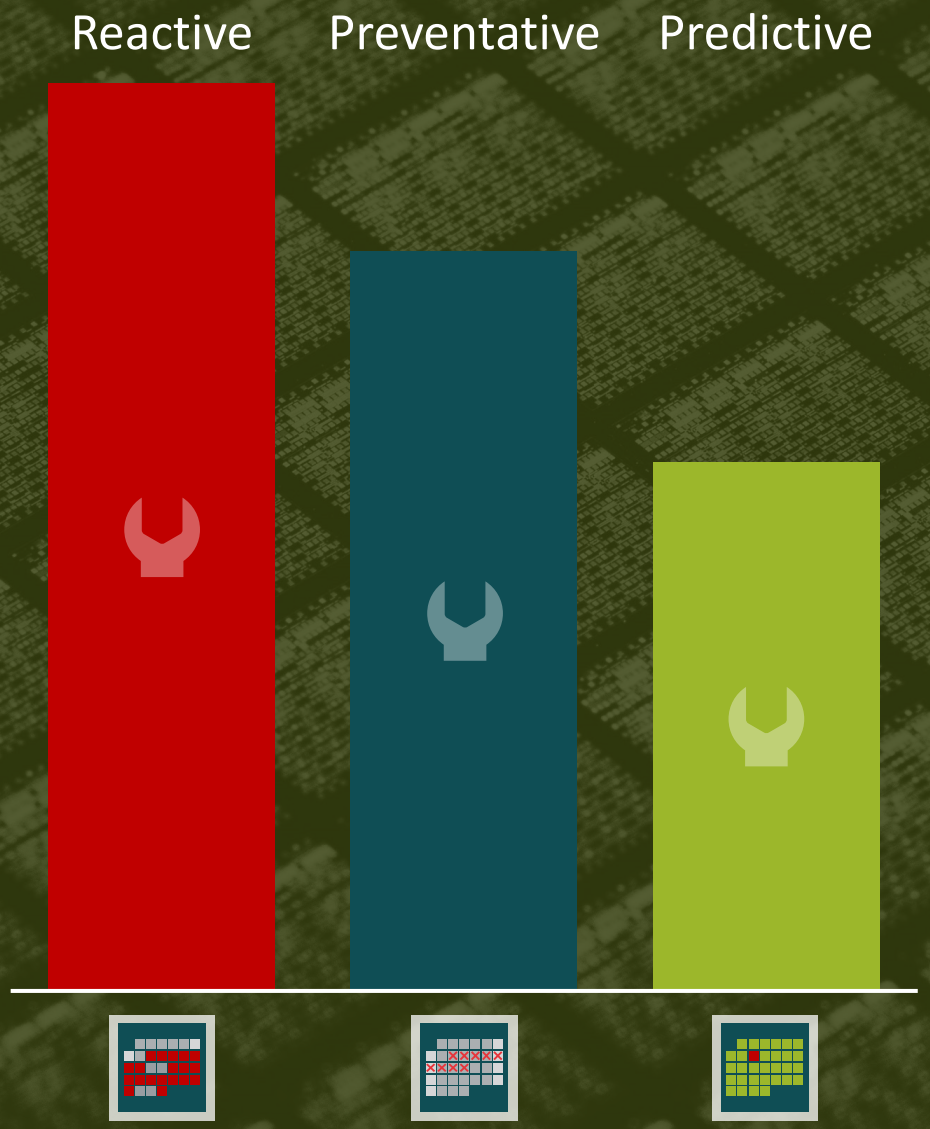


The following slides break down these costs in more detail

1. Spare parts and labour

Reactive maintenance typically has the **highest costs** in this category, as unexpected equipment failures can lead to more extensive damage and require more parts and labour for repair.

Preventative maintenance has **lower costs**, as parts and labour are typically needed only for scheduled maintenance tasks.

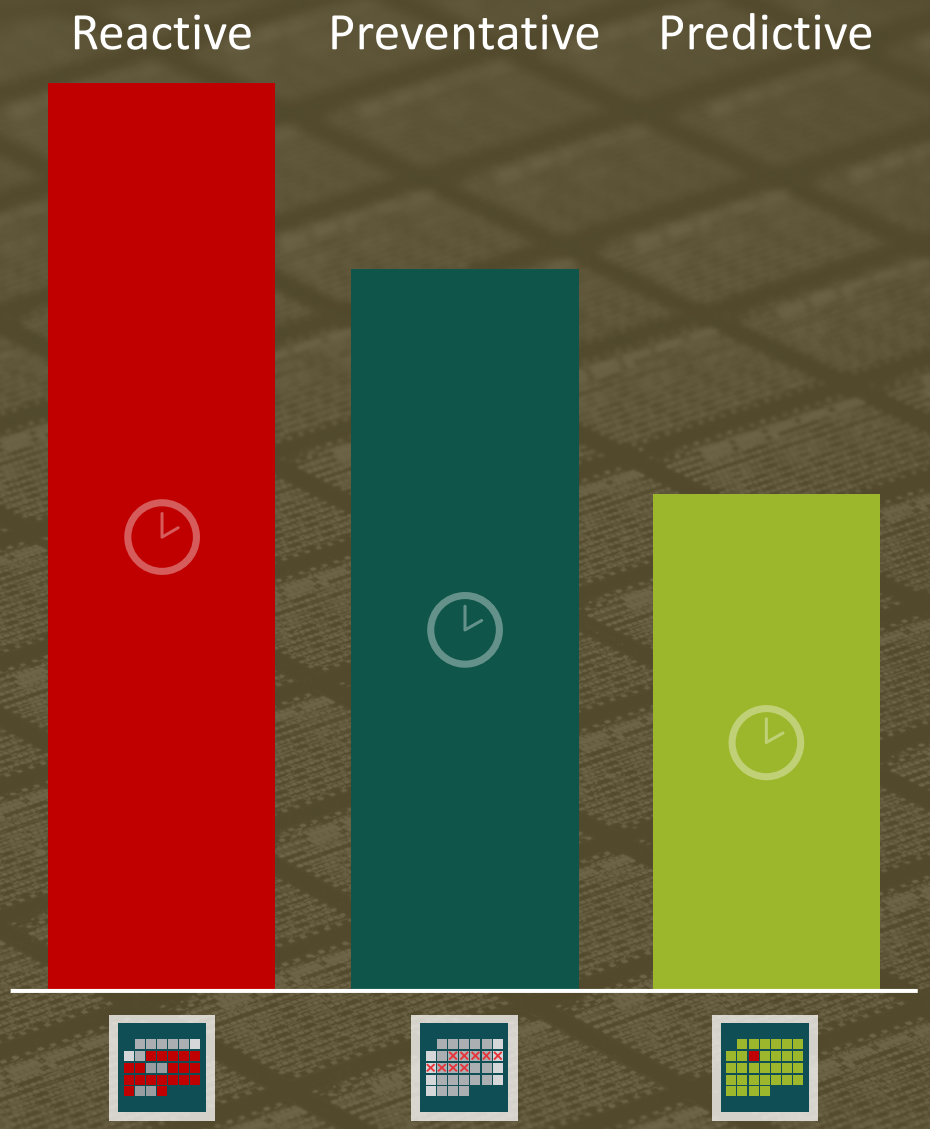


Predictive maintenance has the **lowest costs**, as it uses real-time data to determine when maintenance is needed, minimizing the number of parts and labour required.

2. Throughput loss (or Uptime loss)

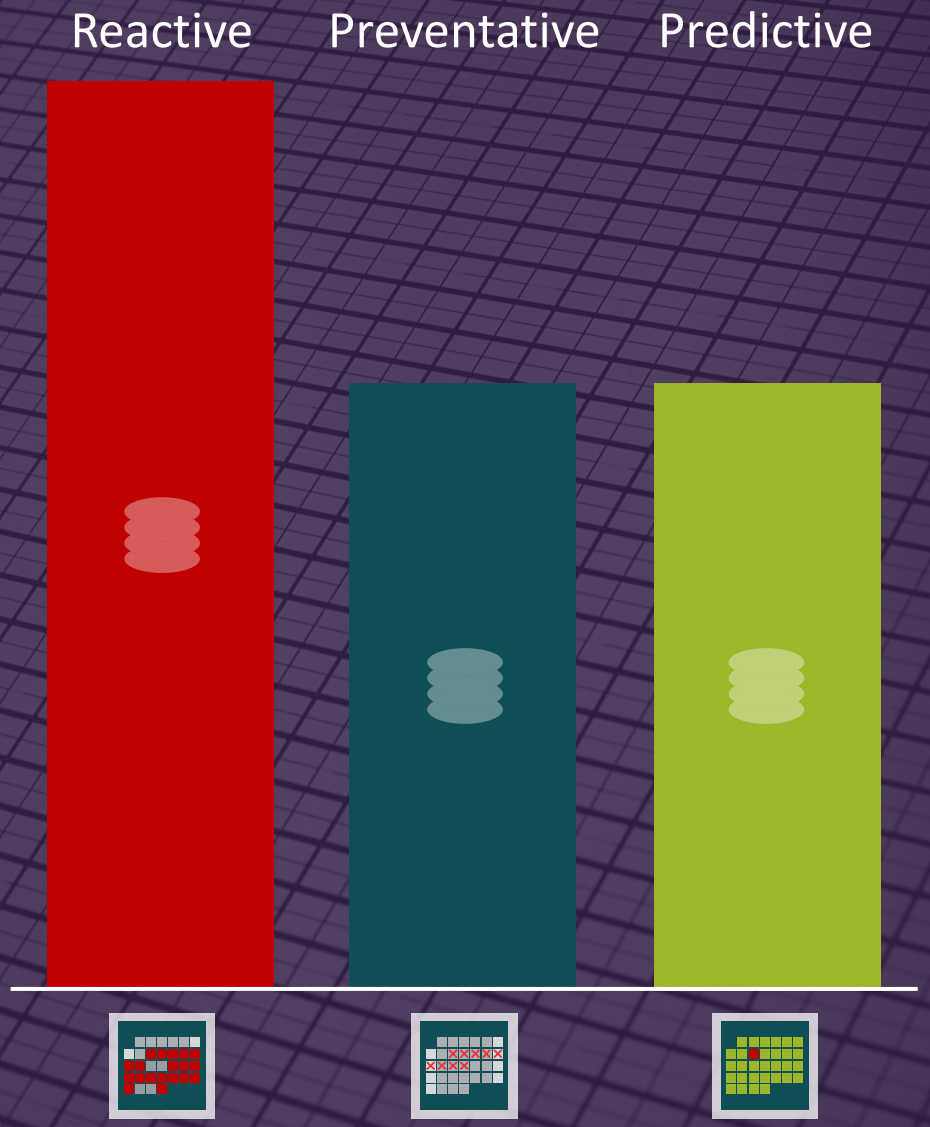
Reactive maintenance has **the highest throughput and uptime losses**, as unplanned downtime can take longer to resolve.

Preventative maintenance has **lower losses**, as scheduled maintenance tasks can be planned around production schedules.



Predictive maintenance has **the lowest losses**, as it uses data to optimize maintenance scheduling and minimize downtime.

3. High volume manufacturing requalification costs (including metrology)



Reactive maintenance generally has **the highest costs** in this category, as equipment may be more severely damaged and require additional cleaning, calibration, and measurement cycles.

Both preventative and predictive maintenance have **lower and typically similar requalification costs**, as there is less potential for significant contamination or damage to the equipment.

4. Wafer scrap cost

Reactive Preventative Predictive

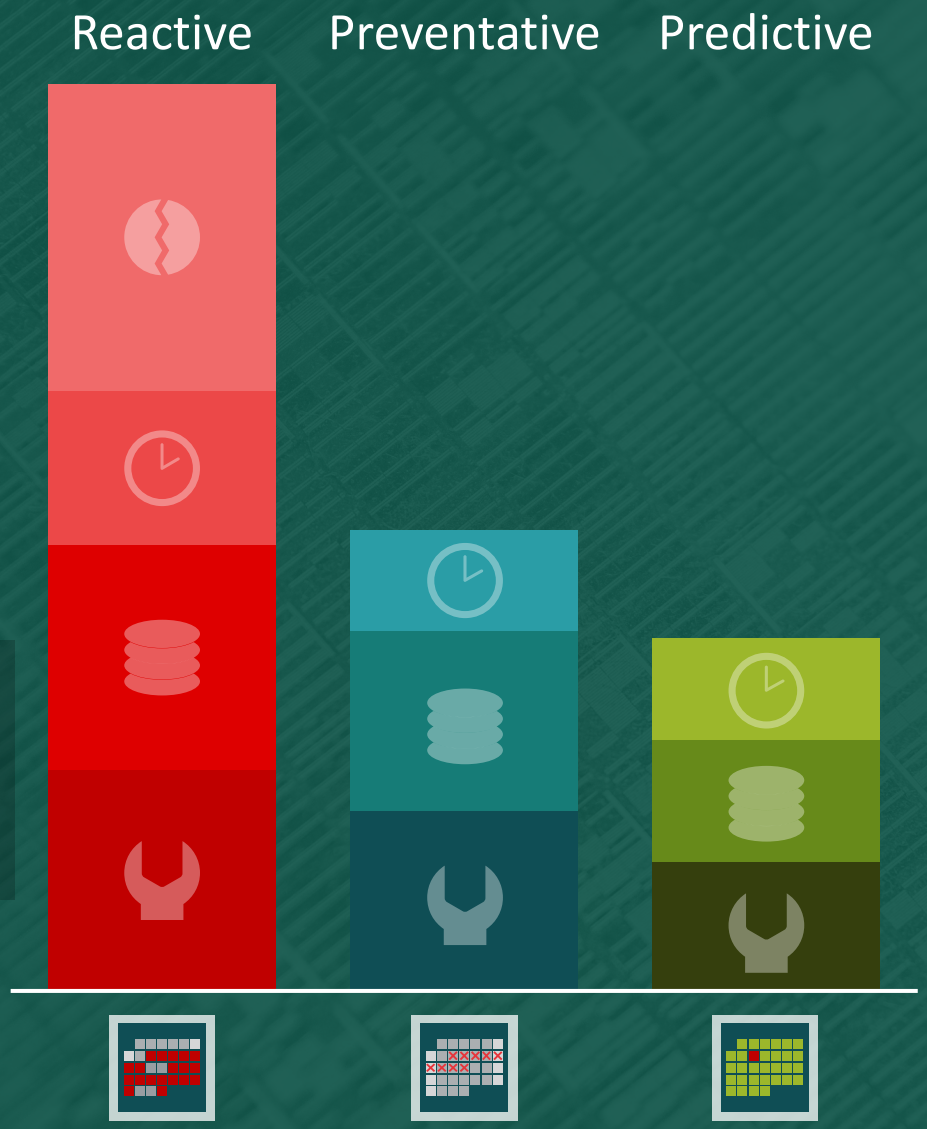
This cost is **only applicable to reactive maintenance**, as wafers are not typically in the process of being manufactured during preventative or predictive maintenance tasks.

Wafer scrap **cost can be extremely high**, particularly for leading-edge semiconductor technologies where each wafer can have a value of thousands of dollars.

Conclusion

Returning to the original chart comparing the three options, we have four generic cost categories: Spare Parts and Labor, Throughput Loss (or Uptime Loss), High Volume Manufacturing Requalification Costs (including metrology), and Wafer Scrap Cost.

Stacking these different cost categories on top of each other, we find that **predictive maintenance has the lowest overall cost** compared to both preventative and reactive maintenance regimes.



While the relative size of these cost categories may vary, this general picture is consistently observed across different scenarios. This analysis suggests that **implementing a predictive maintenance regime can lead to cost savings and improved efficiency for organizations**.

To discuss your approach to maintenance,
request a consultation with our team

consultation@edwardsvacuum.com

ing