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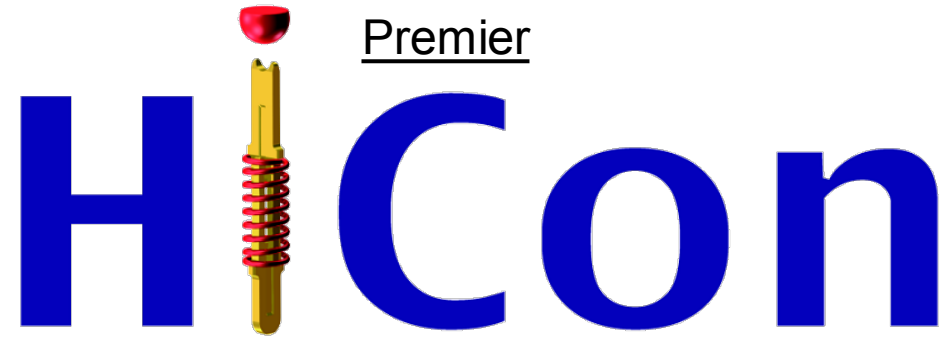
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Analysis of Test Socket Performance and Overall Equipment Effectiveness

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Analysis of Test Socket Performance and Overall Equipment Effectiveness

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Perfect OEE

- Overall Equipment Effectiveness (OEE) is a metric that identifies the percentage of planned production time that is truly productive.
- An OEE score of 100% represents perfect production:
 - Testing only good parts
 - Testing as fast as possible
 - Testing with no down time



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Focused Improvement Goals and Activities

- In our world of test, we are always conscious of productivity, efficiency, and cost.
 - we have become very aware of the importance of measurement.
- This presentation introduces the basic concepts in measuring and improving both productivity and efficiency.
 - The metrics we have identified are for improving overall equipment effectiveness (OEE).



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Overall Equipment Effectiveness

- OEE (Overall Equipment Effectiveness) is a “best practices” metric that identifies the percentage of planned production time that is truly productive.
 - An OEE score of 100% represents perfect production: manufacturing only good parts, as fast as possible, with no downtime.
- OEE is useful as both a benchmark and a baseline:
 - As a benchmark, OEE can be used to compare the performance of a given test cell to similar in-house assets, or to results for different shifts working on the same asset.
 - As a baseline, OEE can be used to track progress for in eliminating waste.



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Manual Measurement

- Start with Manual Measurement
 - Performing manual OEE calculations reinforces underlying concepts and provides a richer understanding
 - It's also relatively easy
 - $\text{Availability} = \text{Run Time} / \text{Planned Production Time}$
 - $\text{Performance} = (\text{Ideal Cycle Time} \times \text{Total Pieces}) / \text{Run Time}$
 - $\text{Quality} = \text{Good Pieces} / \text{Total Pieces}$



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OEE is Calculated Using Three Factors

- Each of the three factors represents a different perspective of how close your testing process is to perfect production.

OEE Factor	Perfect Production
Availability	An Availability score of 100% means the process is always running during planned production time (it's never down).
Performance	A Performance score of 100% means when the process is running it is running as fast as possible (at the theoretical maximum speed; each part at the Ideal Cycle Time).
Quality	A Quality score of 100% means there are no defects (only good parts are produced).



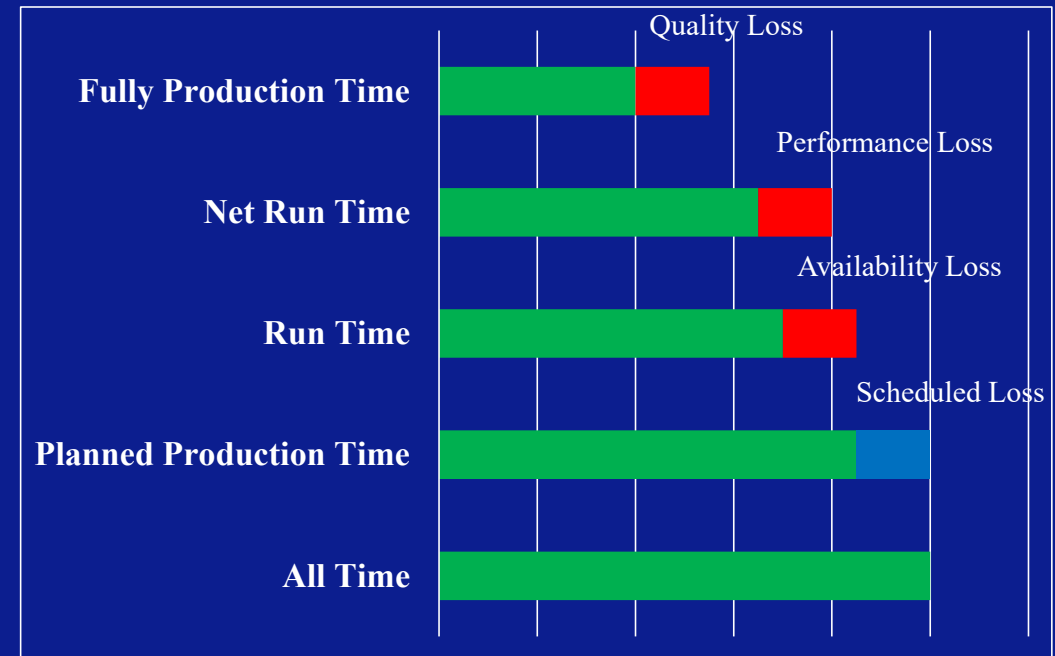
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OEE Losses

- A way to look at the three factors in terms of loss:
- **Quality Loss** includes productivity lost from testing parts that do not meet quality standards after the first pass (the concept of first pass yield).
- **Performance Loss** includes all factors that cause the process to operate at less than the maximum possible speed when running (including both slow cycles and small stops). Examples include contact wear, substandard materials, and misfeeds.
- **Availability Loss** includes all events that stop planned production for an appreciable amount of time (usually several minutes). Examples include equipment failures, unplanned maintenance, material shortages, and changeovers.



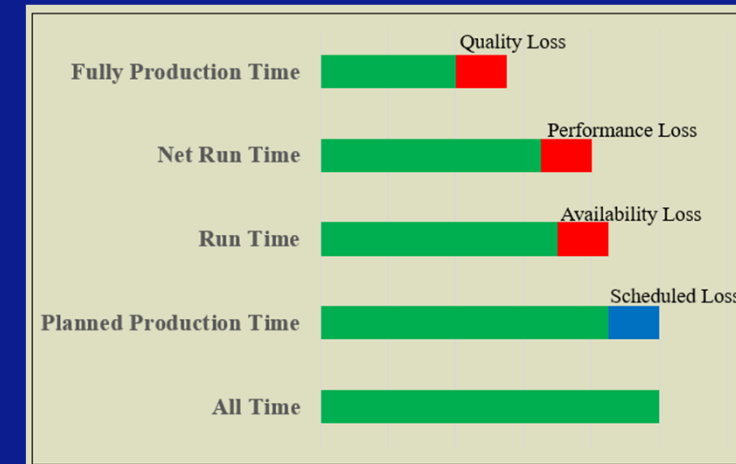
OEE measures the percentage of planned production time that is truly productive (the ratio of Fully Productive Time to Planned Production Time), and organizes all losses into intuitive, actionable categories.



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Focus on Loss

- Measuring OEE is only the beginning (the foundation) of an OEE program
 - The real power and value of OEE comes from understanding and acting on the underlying losses
 - (Availability Loss, Performance Loss, and Quality Loss)
 - Take effective action to reduce losses and your OEE score will improve



The Six Big Losses

- The three OEE factors, Availability, Performance, and Quality, are associated with six losses common in back-end test and test socket performance

OEE Factor	Six Big Losses
Availability	<ul style="list-style-type: none"> Breakdowns (e.g., equipment failure, tooling failure, unplanned maintenance) Setup and Adjustments (e.g., changeover, material shortage, warm-up time)
Performance	<ul style="list-style-type: none"> Reduced Speed (e.g., rough running, equipment wear, operator inefficiency, incorrect settings) Small Stops (e.g., obstructed flow, jam, misfeed, sensor blocked, cleaning, checking)
Quality	<ul style="list-style-type: none"> Startup Rejects (scrap, rework, in process damage, incorrect assembly) Production Rejects (same as above; but during steady-state production)

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OEE Calculation Model

Shift structure :	
No of days	5
Tot hr./shift	8
No of shift (ex : day, evening = 2)	2

Total production hr. 80

Planned Downtimes (h/ week)	
Cleaning	2
C/O	2
Breaks n Lunches	1
Total Planned DT	5
Available production opening time (hr.)	75

Unplanned Downtimes (h/week)	
Breakdowns	2
Missing product	1
Missing employees	0
Adjustments	2
Others	0
Total Unplanned DT	5
Actual Run Time	70

Availability % 93.3% 7%

Efficiency	
Test Cell Standard Throughput (theoretical max) (u/min)	120
Actual Throughput (u/min)	119

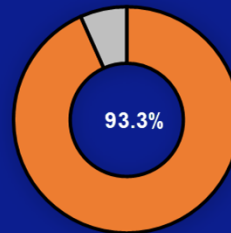
Performance % 99% 1%

Quality %	
Total Parts Tested	8330
Total Parts Tested Good	8163

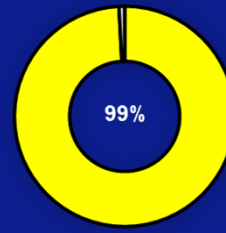
Quality 98.0% 2%

OEE 90.7% 9%

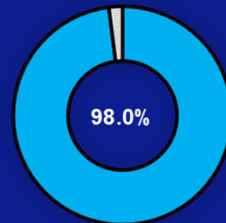
Loss Column



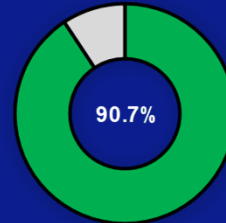
Availability



Performance



Quality



OEE

$$OEE = Availability \times Performance \times Quality$$

$$Availability = \frac{Actual\ Test\ Cell\ Run\ Time}{Planned\ Test\ Cell\ Run\ Time}$$

$$Performance = \frac{Actual\ Test\ Cell\ Throughput}{Planned\ Test\ Cell\ Throughput}$$

$$Quality = \frac{Parts\ Tested\ Good}{Total\ Parts\ Tested}$$

$$OEE = Availability \times Performance \times Quality$$



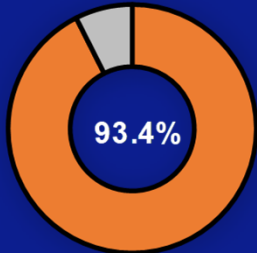
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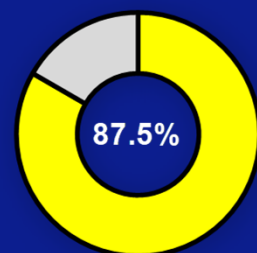
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Availability and Performance

Shift structure :	
No of days	5
Tot hr./shift	8
No of shift (ex : day, evening = 2)	2
Total Production Hours	80
Planned Downtimes (h/ week)	
Cleaning	2
C/O	2
Total Planned DT	4
Available production opening time (hr.)	76
Unplanned Downtimes (h/week)	
Breakdowns	2
Missing product	1
Missing employees	0
Adjustments	2
Others	0
Total Unplanned DT	5
Actual Run Time	71
Availability %	93.4% 7%
Performance %	
Test Cell Standard Throughput (theoretical max) (u/min)	80
Actual Throughput (u/min)	70
Performance %	87.5% 13%



Availability



Performance

OEE= Availability X Performance Quality

$$Availability = \frac{Actual\ Test\ Cell\ Run\ Time}{Planned\ Test\ Cell\ Run\ Time}$$

$$Performance = \frac{Actual\ Test\ Cell\ Throughput}{Planned\ Test\ Cell\ Throughput}$$



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OEE Calculation Model Revisited

Shift structure :	
No of days	5
Tot hr./shift	8
No of shift (ex : day, evening = 2)	2

Total production hr. 80

Planned Downtimes (h/ week)	
Cleaning	2
C/O	2
Breaks n Lunches	1
Total Planned DT	5
Available production opening time (hr.)	75

Unplanned Downtimes (h/week)	
Breakdowns	2
Missing product	1
Missing employees	0
Adjustments	2
Others	0
Total Unplanned DT	5
Actual Run Time	70

Availability % 93.3% 7%

Efficiency	
Test Cell Standard Throughput (theoretical max) (u/min)	120
Actual Throughput (u/min)	119

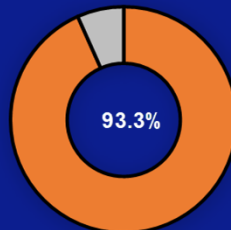
Performance % 99% 1%

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Total Parts Tested	8330
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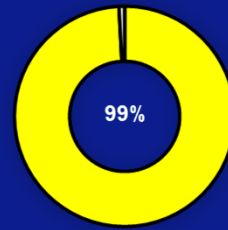
Quality 98.0% 2%

OEE 90.7% 9%

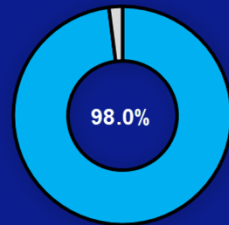
Loss Column



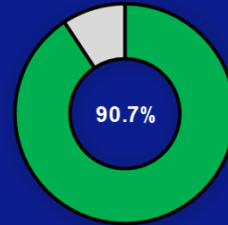
Availability



Performance



Quality



OEE

$$OEE = Availability \times Performance \times Quality$$

$$Availability = \frac{Actual\ Test\ Cell\ Run\ Time}{Planned\ Test\ Cell\ Run\ Time}$$

$$Performance = \frac{Actual\ Test\ Cell\ Throughput}{Planned\ Test\ Cell\ Throughput}$$

$$Quality = \frac{Parts\ Tested\ Good}{Total\ Parts\ Tested}$$

$$OEE = Availability \times Performance \times Quality$$



Summary

- OEE is only a measure, its benefits will be lost if the shortfalls identified are not acted on
 - OEE is a total measure of performance, but the data used to produce it must be used to priorities improvement tasks.
 - The purpose is to:
 - Identify losses
 - Remove waste
 - Drive improvements
- OEE% = Availability X Performance X Quality**
- Shows test cell or plant output as a percentage of maximum capacity
 - World Class = 85% (= 95% X 95% X 95%)
It is not uncommon to > 90%!



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Conclusion

- OEE is a hierarchy of metrics that focus on how effectively a test cell is being utilized.
- In essence:
 - OEE is a measure that identifies equipment potential.
 - OEE identifies and tracks loss.
 - OEE identifies windows of opportunity

The main objective of OEE is to:

- Increase productivity
- Decrease cost
- Increase awareness of the need of machine productivity
- Increase equipment life

The results of these objectives of OEE are to:

- Increase profits
- Attain (or maintain) a competitive edge



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