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BAYESIAN DIGITAL MANUFACTURING MODEL ANALYTICS

VIDEO TRANSCRIPT

[0:00:01] Today, all companies are facing enormous challenges. And Accenture has researched these challenges specifically for the semiconductor manufacturing industry.

[0:00:12] Every 18 to 24 months there is a major technology node change increasing both the process complexity as well as manufacturing turnaround time.

[0:00:23] By 2030, the manufacturing cost per wafer, in the most aggressive transistor scaling, will cost 3 times more than 2020.The increased complexity, having more data than ever and trying to do more with it creates a need for big data analytics.

[0:00:43] This soaring wafer cost caused by increased process steps and longer turnaround time which in turn means longer time to get yield -test results.

[0:00:55] We all know that yield and machine performance improvement have a significant impact on wafer cost.

[0:01:02] And that longer turnaround time requires early anomaly detection in the manufacturing process.

[0:01:09] Today, newer chips utilize 3D technology, and this can increase the cost of yield failure. This poses an even greater challenge due to complex chipset and assembly package techniques.

[0:01:24] All these factors together create the need for big data analytics which provides the insight from data at scale that an organization otherwise can't extract value from.

[0:01:36] Advanced process control techniques like Feed Forward/Feed Back are needed. Process window confirmation for high aspect ratio fabrication is another important issue to consider.

[0:01:50] Accenture understands cost savings is the driver. Machine availability and yield improvement are suitable for data analytics targets because they are immediately measurable in many cases, providing high client value in terms of manufacturing cost savings.

[0:02:09] It’s clear that overall equipment efficiency improvement is a common issue in many semiconductor manufacturing plants worldwide. Our offering introduces examples of solutions that utilize sensor and in process quality control data from equipment.

[0:02:27] Research shows the proven solution is the Bayesian approach and why it works. Its value is in predictive maintenance, root cause analysis, quality control skip, yield process optimization, advanced process control and anomaly water detection.

[0:02:46] It’s difficult to specify the kinds of equipment engineering system data because higher data requirements equal a longer time to get insight which in turn equals a more affected product.

[0:02:59] Generally Artificial Intelligence and Deep Learning need a large amount of data. And most users depend on analytics at the early stage of production using a limited data amount.

[0:03:12] Deep Learning cannot show an obvious interpretation, so engineers hesitate to take action to follow the analytics results. And Bayesian modeling creates value through confidence with engineering stakeholders, not just in the analytics itself.

[0:03:29] We know that the Bayesian modeling provides high robustness prediction combining equipment engineering system and sampling quality control data. Correct plural chamber equipment engineering system data offset automatically and extract engineering equipment data which has high correlation with yield -easily. This enables parameter optimization using small amounts of data based on the Kernel function constructed by engineering knowledge.

[0:04:00] Our solution consists of three key components: mathematical modeling, domain knowledge and computation. Traditional methods are not appropriate for high-dimensional complex data since they rely heavily on over-simplified assumptions such as linearity and normality.

[0:04:19] We understand that Bayesian modeling can easily incorporate physical knowledge, moves to recommendation faster, offers more flexibility, and is highly explainable and capable of robust prediction.

[0:04:30] That being said, Accenture recognizes that Bayesian modeling is the proven answer for today and the future of semi-conductor manufacturing globally.