Unified Platform for detecting faults governed by Process Controls - Vishali Ragam

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Motivation:

Process controls have been used in an independent fashion when it comes to identifying the root cause of an anomaly. The role of process control is seen as notifying end user when unexpected behavior surfaces. From there, a manual or semi manual disposition process begins to pinpoint the troubled areas. This can be cumbersome and time consuming since semiconductor's have seen steady increase in the number of sensors and the processes that impacts the product. A method for bringing Fault detection, Advanced Process Control (APC) and Statistical Process Control (SPC) into a singular platform is presented in this paper. This facilitates identifying sudden changes in chambers' trace data which impacts the line. This platform also facilitates an understanding for mis-compensations coming from APC. Traditional Process Control which is viewed as a reaction mechanism is now equipped as a detection mechanism with this integration.

Approach:

Factory key performance indicators (KPIs) are a direct measure of combined influences from both process and measurement tools. Hence, identifying process controls for these tools and processes which are interdependent is crucial. The proposal here is a platform which can then access all data sets which influence factory KPIs. For example, information used for creating a process specific inline measurement charts are the fundamental components that impact and navigate with the product. Integrated functions are then developed between these different data structures to map respective process and metrology runs. This facilitates structured data to be used in real-time and at run-time. This function offers the ability to connect data based on the information relevant for the technology. The design not only provides integration and connectivity of data but also supports data model. This is done by facilitating dynamic evaluation of process performance from its inception in a single platform.

Results:

Unified Process Control is instrumental in identifying and reducing both systemic and random failures. We are now able to monitor the quality of the process, as the manufacturing process is no more a black box. The nature of process and equipment are well understood over time. The integration leads to speed and quality of decision thereby reducing human factors. The platform is a solution for understanding failures due to interdependencies and lack of available measures. The interface provides process and equipment insights for better decisions, a 1% reduction in random failures and 3% reduction in systemic failures is achieved.

Conclusion:

Early detection is one of key benefits seen with this platform. It seen that decision quality is improved there minimizing exposed material. This brings down costs per event and material management. The concept of unified platform can be extended to RMS (Recipe Management systems) as well to YMS (Yield management) and DMS (Defect Management systems) thereby developing a Unified Fleet Control. Such a level of automation is envisioned as a fundamental architecture to bring us into Prescriptive and Predictive territory using Artificial Intelligence.