Fab Process Yield Improvement through Infrastructure Development and Teamwork Optimization

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Abstract

IBM's 200mm production Fabricator located in Burlington, VT is in the process of transforming its primary focus from new technology enablement to the delivery of a diverse mix of low cost, high performance logic technologies. Leveraging a strong technology base, its new mission includes offering differentiating features such as eDRAM and CMOS image sensors. In the early stages of this transformation, Process Yield, which includes both Manufacturing and In-Line Test losses, was determined to be a key competitive opportunity. The goal was set to achieve best of breed performance. Burlington's diverse mix of technologies (CMOS, BiCMOS and SiGe, .25 to .13u nodes) provided an inherent challenge in analyzing losses and driving feedback and corrective actions. A comprehensive methodology which included infrastructure development was required for improvement.

Zero sum accounting was used to drive any wafer loss to one of 23 established Teams. Tech Centers Teams (9) were organized by like tool types and responsible for all aspects of manufacturing performance. Process Modules Teams (14) were organized by process flow and responsible for all aspects of product performance. Test losses originated from a wide array of different technologies, device types, process features and reliability requirements. Infrastructure development included a central database for all scrap related parameters. Easy menu options allowed for tracking, analyzing and quickly assigning scrap to correct Teams. An automated web based reporting system summarized information for all Teams, real-time. Test engineering developed an improved product disposition engine which utilized "registered parameter names". This improved fail clarity by reducing the raw number of fail types by almost 10X. The new system, referred to as ILETS DB, migrated all critical fail information from stand-a-alone "spaghetti code" to a structured, web based application which provided security, approval and history files. It also greatly simplified test/analysis/debug and improved data reliability. Also incorporated was a new fail convention, referred to as DNA, which allowed for rapid detection of all basic fail types. Appropriate data speed, transparency and accuracy enabled individual Teams to understand losses and rapidly engage corrective measures.

In addition, proactive Fab wide initiatives were undertaken and focused on engaging the entire operations, equipment, engineering and management teams. A standardized communication package was shared with all teams and highlighted challenges and goals while emphasizing within sector controls. Special Teams were initiated in critical areas to assess risk using FMEA (Failure Mode and Effects Analysis). The overall Burlington effort, which focused on Team work, infrastructure development and operational excellence, resulted in a significant and sustained process yield improvement. It reduced the overall scrap rate by >60% and positioned the Fab for migration to a LEAN enterprise.