In-house Development Of Lithography Metrology Tools Recipe Validation System To Ensure Recipe Integrity And Data Feedforward To Process APC Systems

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ABSTRACT

A challenge for 200mm Metrology Tools is Recipe Integrity of Measurement Job-files. Being Legacy tools, tool suppliers do not have readily available solution to preserve the Recipe Integrity of Metrology Job-files, and hence the measured data. When job-file content is accidentally changed by user, incorrect data will be feedforward to Processing Tools without detection. Primary tools of interest are Lithography Overlay and DICD Metrology tools, henceforth affecting Lithography APC Systems. This paper discusses the inaugural low-cost in-house Development and Implementation of Lithography Metrology Tools Recipe Validation System (RVS) to include Recipe Management System (RMS) & Single-Logic Database (SLDB) functionality for Overlay and DICID Metrology tools, equivalent to more advanced Processing Tools capability.

INTRODUCTION

The in-house Recipe Validation System rides upon the existing Computer Integrated Manufacturing (CIM) infrastructure in Globalfoundries. The key is to develop a low cost and self-sustaining system for Legacy tools whereby suppliers no longer support Continued Improvement Projects (CIPs). Globalfoundries CIM Team works closely with Metrology Engineering to understand the Metrology Recipe structure & decode the format. The team collaborated with Software Expert to internally develop coding to implement RVS features listed:

- User Access Management (segregate privilege)
- Upload Recipes from physical tools & Golden the Uploaded Recipes
- Recipe Audit Function (comparing golden vs tool)
- Generate Audit Trails/ Recipe Golden & Upload list/ Reporting of Recipe for Engineering Record
- Integrate with existing CIM for Lot Run interlock

Figure 1 illustrates the RVS Logical Design that used the existing Gateway Bay Service (GBSsrv) to bridge transactions between CIM Equipment Manager/ Systems (EM/ ES) and the developed Recipe Validation System (RVS). The concept is similar to existing application server for Processing Tools for ease of maintenance by the same CIM team.

Existing EM/ ES is customized to enable Recipe Data storage in CIM SLDB Table for validation functions as per Metrology Process Engineering definition. Being a foundry, there are different models of Overlay and DICD Metrology tools in the 200mm facilities. Coding is developed to cater to all models recipe contents validation, with the flexibility to select critical parameters of comparison as per user definition. With the connection through GBSSrv, full comparison transactions could be done in a matter of minutes, without impeding Metrology tools cycle-time. Once Recipe Validate failed, the system rejects running the lot, with auto-trigger of Metrology Process Team to do Recipe Content Validation.

RESULTS & DISCUSSION

With the developed RVS, when a Production lot is loaded on the Metrology Tool, RVS will compare the physical Recipe Content in the Tool with the Golden Recipe pre-uploaded by Metrology Engineer in RVS Database. When the 2 contents matched, CIM issues the command for the Metrology Tool to proceed with measurement. If the 2 mismatched, CIM issues a reject command to disallow Metrology tool to proceed. The EM will display the alarm message to trigger Metrology Process Engineering to validate the Recipe content. This will apprehend and correct undesired Recipe changes. Figure 2 illustrates the RVS modus operandi. The team has customized the RVS coding for 4 Overlay and 2 DICD Tool Models.

CONCLUSION

The team has successfully developed and implemented a low-cost in-house Metrology Tool RVS for Overlay and DICD Metrology Tools to achieve Metrology Recipes Integrity Check. The low cost, self-sustaining system has brought about Cost Avoidance related to undetected Job-file content changes, leading to Scraps & Near Miss.
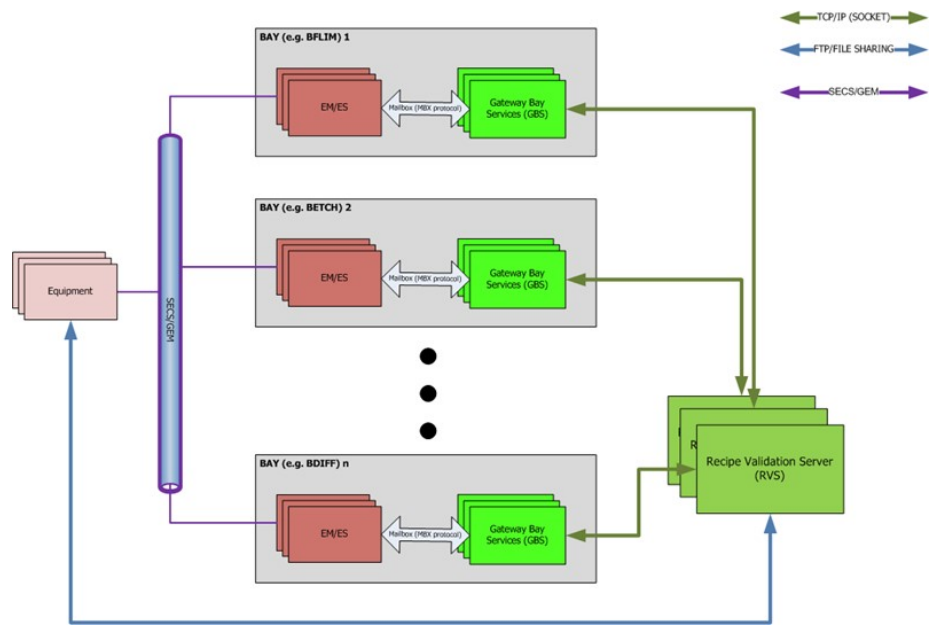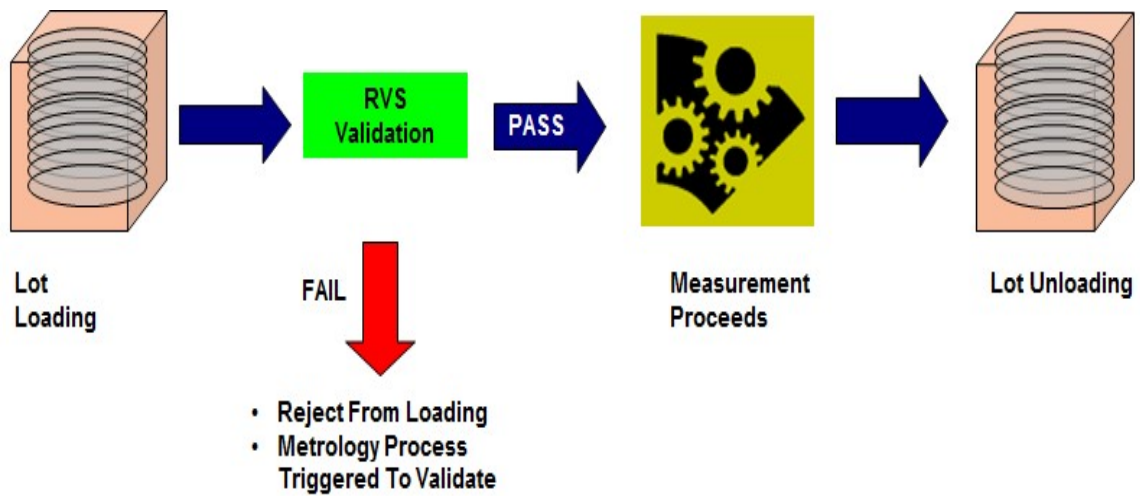
Figure 1 RVS Logical Design

Figure 2 RVS Modus Operandi