APPLIED SMARTFACTORY PLANNING, SCHEDULING AND DISPATCHING SOLUTIONS FOR SEMICONDUCTOR MANUFACTURING

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ABSTRACT

Semiconductor manufacturing facilities have historically considered operations as straight forward decision-making processes and relied on the traditional ERP systems and excel spreadsheets for their Planning and Scheduling processes. However, with increasing complexity and demand changes, the inaccuracy and run time of these processes have increased steeply leading to customer dissatisfaction. Similar was the case with a large backend Assembly and Test (AT) manufacturing company who were experiencing long planning commit cycles (1 week) and inaccurate scheduling sequence leading to a drop in On Time Delivery percentage. Existing ERP and advanced planning systems failed to comprehend the complexity making them inaccurate, unstable and cumbersome. Applied Materials, deployed a proof of concept at this AT facility using $2/3^{rd}$ of the production volume to generate a fast and accurate Commit plan with a detailed lot level Scheduling sequence and dispatch list. The following use case will present the solutions, performance, benefits and results.

1. INTRODUCTION

The company is a large semiconductor Assembly and Test site producing more than 50 million parts per month across nearly 125 different products. The complexity included different form factors, multiple levels of subparts, generic resources, raw materials and alternate steps with varying parameters. Each process area in the company also operated in different verticals acting as discrete entities tied together which limited the information flow between the areas. Complexities and interdependencies of this degree caused the size of the planning model to be very big, making it difficult to generate a weekly commit plan using their existing ERP and Planning systems. The company needed a fast and automated solution that could comprehend all the complexities and provide an optimized plan with a detailed lot to equipment level scheduling sequence. This capability was provided using the Applied Smartfactory Productivity solutions with Engineered works.

2. MODEL DESCRIPTION

The overall solution architecture was designed to provide an optimized plan combined with simulation to improve the accuracy of the commit plan and scheduling. Planning solution used a fast and sophisticated mathematical solver that optimizes the plan based on the objective functions defined. The output of the planning is fed into the Scheduling Solution that uses the Applied AutoSched-based Simulation to generate a detailed lot to equipment level sequence which is finally used to generate the dispatching list. The overall view of the model is shown in Figure 1 below.
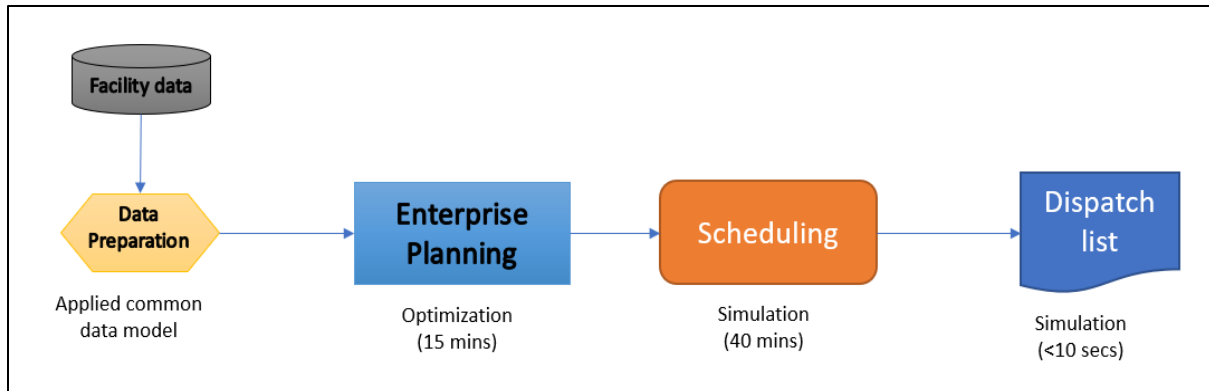
Figure 1: Applied smartfactory productivity solutions architecture.

3. OUTPUT

The output from the solution was helpful in quickly identifying the bottlenecks and material shortages. The simulation model helped in planning the equipment setups in advance and predict the future bottlenecks and inefficiencies by visualizing the flow in solution UI. The planners were able to run multiple what-if scenarios and were able to see those plans executed quickly at the shop floor level.

4. CONCLUSION

The solutions were well integrated and very stable with an overall run time of 1 hour which included 15 minutes for the optimized Planning solution, 40 minutes for the Scheduling Solution and less than 10 seconds for the dispatching list for each tool. By implementing these solutions, the productivity of the planners was expected to improve by more than 35% and decrease the overall planning duration by more than 75%.