THE HEURISTIC DISPATCHING METHOD OF AUTOMATIC MATERIAL HANDLING SYSTEM IN 300MM SEMICONDUCTOR FABRICATION

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ABSTRACT. Highly automated materials handling in 300mm semiconductor manufacturing is one of the biggest concerns to practitioners. Based on designs of the single rail, single movement way, and long time while overhead hoist transport (OHT) loading and unloading, the OHT traffic jams are happened frequently. This will cause the OHT traffic jam seriously, and influence so much to the product cycle time. Observing the empirical operations for carrying lots and considering the effect and limitations from OHT transportation, this study proposes a heuristic OHT dispatching rule to expedite the movement of lots for reducing job waiting times. The objective is to minimize the transport delay of lots handling service under the automatic material handling environment in 300mm wafer manufacturing. Numerical experiment results demonstrate that the heuristic dispatching method can effectively expedite the movements for lots delivery. The proposed method is very useful for shop floor control functions, such like scheduling and dispatching, in the 300mm fab-wide automated production environment.

Keywords: AMHS, OHT, Semiconductor manufacturing

1. Introduction. In recent years, the production of semiconductor manufacturing systems has been widely discussed. The automation of this system is complex due to complicated product mixes, flexible product routes, and long production cycle time. Compared with the operations in 200mm, 300mm fab demands highly automated operations in material transport to improve cost effectiveness and to prevent the possible ergonomics hurts due to heavy weights of 300mm wafers. Seamless collaboration is crucially needed between process tools and material transport systems to optimize equipment utilization and product cycle time [1,2].

Automatic material handling system (AMHS) is one of the major topics in the factory integration field and it significantly relates to the factory optimization and management, such as improvements of both throughput and cycle time, increasing customer expectation to meet on time delivery, and increasing improvement of factory effectiveness. An AMHS in a semiconductor manufacturing optimizes productivity, equipment utilization, ergonomics, and reducing vibration shock to the wafers. Furthermore, fewer operators are necessary. Nevertheless, the savings from modest staff reductions can be offset by the cost of equipment and systems, but automation can generate positive effects on overall equipment effectiveness (OEE), yields, development time, ramp time, and cycle time.

There are several solutions to AMHS in a semiconductor fab, including automatic guided vehicle (AGV), rail-guided vehicles (RGV), overhead shuttle (OHS), and overhead hoist transport (OHT), and so on. OHT is the most popular and is a promising technology to realize transportation automation in semiconductor manufacturing [3]. It is useful for