Research on the Production Scheduling Method of a Semiconductor Packaging Test Based With the Clustering Method

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ABSTRACT
In this article, the scheduling of modern industrial production is studied. The research on scheduling of semiconductor packaging and testing is put forward. A new solution of packaging and test scheduling based on dynamic optimization is proposed. The decomposition strategy is used to solve the problem of the encapsulation test scheduling problem. The complexity of the problem is reduced to ensure the consistency of optimization. In the method, an AP clustering algorithm is used to optimize the matching relationship between job and resource. The neural network method is used to solve the problem. The research of this project will fully combine the characteristics of packaging and testing production. In view of the existing production scheduling theory, there is a big gap to a semiconductor packaging and testing enterprises for the actual research background. This simulation experiments show that the method can be used on packaged production scheduling to provide a viable, effective method support.

KEYWORDS
Clustering Method, Method of Semiconductor Packaging Test, Rule Learn, Scheduling

INTRODUCTION
The current scheduling methods include the following: 1) based on operational research methods, such as mixed integer linear programming (Méndez et al., 2001), dynamic programming methods. Tsinghua University, Xiao Jing and others using mixed integer programming method is only for ATM two-stage mixed flow scheduling problem (Xiao et al., 2010), has a very good optimization effect. 2) Intelligent search method, such as genetic algorithm (Pesch et al., 2009), differential evolution algorithm, particle swarm algorithm, ant colony algorithm (Misneok et al., 2008) and so on, which has a good global optimization ability, for solving multi-objective optimization problem is significant. 3) The optimization method based on heuristic rules is the earliest proposed approximation optimization method (Jackson et al., 1955), which uses certain optimization rules to achieve a specific optimization method (Smith et al., 1956), the computational complexity is low, easy to implement, in practice Has been widely used (Lu et al., 1991). Lu et al. are the first to study heuristic rules to optimize production (Lu et al., 1994), and had studied the effective rules that could reduce the production cycle in semiconductor production and achieved good results. But the heuristic-based optimization

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method does not have the characteristics of global optimization. 4) Based on the method of constraint satisfaction technology, it is necessary to instantiate the processing time variable of each process under the constraint condition of non-violation of the problem, and use constrained check and constraint propagation technique to optimize the constraint solution in a given time (Oliveira et al., 2001). 5) Aims to develop a novel genetic algorithm of multi-subpopulation parameters with hybrid estimation of distribution (MSPHEDA) (Wang et al., 2015) to solve the present problem effectively and efficiently. Zhu, et al studies the challenging problem of scheduling single-arm multi-cluster tools with wafer residency time constraints. They have a linear topology and their bottleneck tool is process-bound. This work finds an optimal one-wafer cyclic schedule (Zhu et al., 2015). A simulation optimization approach for a hybrid flow shop scheduling problem in a real-world semiconductor back-end assembly facility is presented (Lin et al., 2015). Cluster tools are automated robotic manufacturing systems containing multiple computer-controlled process modules (Pan et al., 2018). A novel fruit fly optimization algorithm (nFOA) is proposed to solve the semiconductor final testing scheduling problem (SFTSP). (Zheng et al., 2014). A hybrid approach integrating a particle swarm optimization algorithm with a Cauchy distribution and genetic operators (HPSO+GA) (Jamrus et al., 2018) for solving an FJSP by finding a job sequence that minimizes the makespan with uncertain processing time is developed. The photolithography workshop (Bitar et al., 2016) is often a bottleneck and improving scheduling decisions in this workshop can help to improve indicators of the whole plant. Two optimization criteria are separately considered: the weighted flow time (to minimize) and the number of products that are processed (to maximize). Semiconductor fabrication line (Kim et al., 2016) runs with several hundreds of steps on several hundreds of equipment in the type of re-entrant flow process. The hierarchical planning decisions are made in a way that the production planning is determined on the integrated models at first, and the scheduling operations are then performed. The most complexity comes from the difficulties of synchronization of the production planning and scheduling. An iterative approach to achieve the synchronization is suggested to coordinate the input and output quantity of the production plan when generating a schedule. 6) Affinity scheduling (Squillante, 2011) is the allocation, or scheduling, of computing tasks on the computing nodes where they will be executed more efficiently. Such affinity of a task for a node can be based on any aspects of the computing node or computing task that make execution more efficient, and it is most often related to different speeds or overheads associated with the resources of the computing node that are required by the computing task. Combined scheduling method, which uses a variety of approximate algorithms to solve the scheduling optimization problem, make up for the shortcomings of the respective algorithms, play their respective advantages, such as differential evolution algorithm (DA) (Mendes et al., 2005) and artificial bee colony algorithm (ABC) (Bao et al., 2009).

In the process of mining the matching relationship between production and equipment resources, a suitable clustering algorithm is needed to deal with the large-scale and high-dimensional data on the semiconductor packaging line. The matching relationship between the production operation and the equipment resources can be supported. Affinity Propagation (AP) clustering is a new clustering algorithm recently proposed by Frey et al. In Science magazine. AP clustering does not need to specify K (classic K-Means) or other parameters that describe the number of clusters (the network structure and size in the SOM). The results of AP clustering algorithm are free from random components and are suitable for high dimensional clustering. It is one of the best clustering methods. AP clustering algorithm appears and is rapidly applied in the field of face image clustering, handwriting recognition and other fields (Frey et al., 2007). AP clustering method has not been applied to the field of semiconductor packaging test production scheduling, through that the use of AP clustering method to obtain a definite matching relationship results, reduce the impact of manual participation is necessary.

This paper will focus on the research of production and scheduling based on job and resource dynamic matching semiconductor package test, and propose a new research plan and solution based on the operation and resource dynamic optimization matching package test production scheduling, and use the decomposition strategy to solve the package test scheduling problem. The research of
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