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SIMULATION OF STEEL PRODUCTION LOGISTICS SYSTEM BASED ON MULTI-AGENTS

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Abstract

To deal with the complex structure and difficulty in precise expression of the interaction between entities in the steel production logistics system, this paper uses complex network theory and multi-agent system engineering to simulate the complex steel production logistics system, and thereby calculate related parameters, gather statistics, and optimize the steel production logistics system. According to the analysis, the processing of logistics is low in efficiency because 19 pieces of equipment are involved from the beginning of the logistics subject processing to the final formation of steel, while only a few processes are required for about half of the auxiliary material or auxiliary process. The system logistics is not compact because most of the equipment used in steel production has only a single function and a limited service area, whereas a higher degree distribution indicates a higher importance in a piece of equipment in the network. This is a must to guarantee the normal operation of the equipment with a higher degree distribution. The simulation results are basically the same with the actual production results, and the error is within the acceptable range, which proves that the simulation system is correct and effective.

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Key Words: Production Logistics System, Complex Network, Multi-Agent System Engineering, Simulation, Steel Production

1. INTRODUCTION

Steel production is a unique process. Generally speaking, it is a complex system involving multiple production processes, numerous logistics links and a long running flow. Changing between the solid phase and the liquid phase, the logistics subject goes through a multi-stage, continuous physical and chemical transformation. The production logistics system of the steel industry has the characteristics of multi-stage production and multi-stage transportation. Thus, how to improve the production efficiency and orderliness has become a research topic of intense interest.

Previously, researchers mostly used complex system theories and methods to study and analyse the optimization of steel production logistics system [1, 2], but the optimization effect was quite limited due to the low efficiency of the theories and methods. With the development of computer technology, simulation modelling based on the steel production logistics system has become the mainstream approach of logistics system optimization, and the theoretical results provide some guidance to researchers. The modelling simulation of the production logistics system can visually reflect the whole production process, and identify the bottleneck equipment to optimize its operation. The system can be simulated with little or no investment, and the optimal plan can be obtained by constantly modifying the parameters. Therefore, simulation modelling is an effective way to handle the complex production process [3, 4]. Currently, simulation modelling methods for complex systems mainly include queuing network modelling [5], bottleneck shifting modelling of production logistics [6], influence net