

# MODELLING AND SIMULATION FOR PRODUCTION LOGISTICS SYSTEM IN INDUSTRIAL ENTERPRISES BASED ON HYBRID NETWORK

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## Abstract

Modern industrial production logistics systems in a modern are very complicated, which generally includes many continuous variables and discrete events. For these complicated industrial production logistics systems, this paper has set up a new hybrid Petri network model based on the common hybrid Petri network and with a combination of differential Petri net and controlled Petri net. This paper made simulation calculation with Java language and studied the modelling object through an industrial DFM solvent recovery process, which has revealed that this model is suitable for the modelling and simulation of hybrid production logistics system in industrial enterprises and can unify the simulation and analysis under the framework of one model. Targeted control strategies can be proposed based on simulation results, which is of great significance in instructing and improving production efficiency. (Received, processed and accepted by the Chinese Representative Office.)

**Key Words:** Hybrid Petri Net, Production Logistics, Modelling, Simulation

## 1. INTRODUCTION

Industrial enterprises have been the important basic industries of our economic development, which include chemical industry, metallurgy, petroleum, steel, energy, paper and food production, etc., while these enterprises are also important in our energy consumption and environmental pollution emissions. Therefore, how to decrease energy consumption and decrease the pollution of these enterprises has been a major focus in industrial field research. Each industrial enterprise has its own production logistics system, which is the basis for maintaining continuity of the production process [1] and is an essential process in manufacturing. Characteristics of each process of production logistics system in industrial enterprises have been studied, including material conversion and the migration rule etc., in order to make optimization based on its characteristics, which is an effective measure of improving resource utilization rate, production efficiency and environmental improvement.

Production logistics system of industrial enterprises involve numerous and complicated factors with mutual effects. Many systems in the industrial field are generated with interaction between the dynamic system of continuous variables and the dynamic system of discrete events, which is the so-called hybrid system. The traditional method cannot make analysis and simulation for the hybrid system accurately and clearly. In recent years, hybrid Petri net (HPN) technology developed from the traditional Petri net and has more image, objective and flexible characteristics, which is an obvious advantage and significant for hybrid industrial production logistics system [2]. Furthermore, it can describe a discrete event and continuous event at the same time. Fabio et al. have proposed the first order hybrid Petri net for optimization and control of the hybrid system [3]. Flaus and Ollagnon have proposed the hybrid flow network (HFN) for simulation of industrial production logistics with a combination of Petri net and continuous process net [4]. Paper [5] combines speed controlled Petri net and controlled timed Petri net to establish the hybrid controlled Petri net model and applies it to the industrial evaporation process. Zhao et al. [6, 7] have made a series of