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Equipment Selection Knowledge Base System for Industrial Styrene Process☆

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Abstract: Equipment selection for industrial process usually requires the extensive participation of industrial experts and technologists, which causes a serious waste of resources. This work presents an equipment selection knowledge base system for industrial styrene process (S-ESKBS) based on the ontology technology. This structure includes a low-level knowledge base and a top-level interactive application. As the core part of the S-ESKBS, the low-level knowledge base consists of the equipment selection ontology library, equipment selection rule set and Pellet inference engine. The top-level interactive application is implemented using S-ESKBS, including the parsing storage layer, inference query layer and client application layer. Case studies for the industrial styrene process equipment selection of an analytical column and an alkylation reactor are demonstrated to show the characteristics and implementability of the S-ESKBS.

Keywords: Equipment selection, Ontology technology, Knowledge base system, Styrene process

1. Introduction

With the continuous development of intelligent information technology, the smart factory has received extensive attention. Smart factory uses the Internet of things technologies for highly integrated manufacturing, and employs the intelligent systems to simulate the experts to analyze, infer, judge, think and make decisions for the practical problems of industrial process[1]. Purpose of Smart factory is to change the way of human-centered problem-solving in traditional industrial processes and transforming human intelligent activities to information systems' intelligent activities[2].

Knowledge base system is an important part of smart factory, also known as artificial intelligence database system 3. As a combination of artificial intelligence technology and traditional database technology, the knowledge based system uses knowledge representation to save, infer and reuse the domain-related theoretical knowledge, factual data, and heuristic knowledge effectively 4.

Ontology is widely used to build domain models in the development of knowledge base system, since it provides the basic vocabularies needed for modeling and explains the relationship among them 5. As ontology model can provide powerful knowledge inference, good knowledge expression and convenient knowledge acquisition ability 8, it has become the research focus of knowledge base system that is based on knowledge discovery 8.

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