

Development of the Smart Metal Casting Processing Management System

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Abstract. In this paper, we describe the smart metal casting processing management system, in which we applied case-based reasoning on the window environment. The metal casting processing is complex and variable depending on a kind of metal casting products. Especially, the metal casting industry has a feature which produces small quantities but produces a lot of different types of metal casting products. And we developed the smart metal casting processing management system which could show the processing route depending on the product cases intelligently using the result of case-based reasoning. The experimental result shows that our smart metal casting processing management system schemes achieves more productivity than manual management schemes

Keywords: Metal Casting, Smart Processing Management System, Case-Based Reasoning,

1 Introduction

Metal casting is one of the most common casting processes. Metal patterns are more expensive but are more dimensionally stable and durable. Metallic patterns are used where repetitive production of castings is required in large quantities. Casting is a manufacturing process by which a liquid material is usually poured into a mold, which contains a hollow cavity of the desired shape, and then allowed to solidify. The solidified part is also known as a casting, which is ejected or broken out of the mold to complete the process. Casting materials are usually metals or various cold setting materials that cure after mixing two or more components together; examples are epoxy, concrete, plaster and clay. Casting is most often used for making complex shapes that would be difficult or uneconomical to make by other methods. Also, the metal casting processing has a complex and various processing route. At this point, the types of required shape are very various. Also, the required component properties are different. So, the casting processing management system supports the user in

component design, the determination of melting practice and casting methods to pattern and mold making, heat treatment, and finishing using case-based reasoning [1, 2, 3]. This saves costs along the entire casting manufacturing route. Also, this can reduce the error rate of products and a producer must increase the productivity. In this paper, we developed the smart metal processing management system using case based reasoning. The structure of this paper is as follows. Section 2 describes the smart metal processing management system and presents its results details. Finally, the conclusions are drawn and the future study is discussed in Section 3.

2 Smart Metal Casting Processing Management System

A. Smart System

In order to apply case-based reasoning, we need past cases, and we tried to collect the cases for such instances but we couldn't find them. And, we selected the representative past cases first hand. We expressed the collected cases, and stored them in a case base. After that, we retrieved relevant past cases from the case base, using a metal casting product ID in searching for the optimal processing management of the metal casting industry.

B. Results

We have implemented a smart casting processing management system with C# based on Windows. The window dialog control function can provide an easy and convenient method of operating the metal casting processing management system because the operator has much user experience with window dialog, through other window dialog. Figure 1 shows the order information to make the metal casting products. The operator inputs the information in the field such as an ID of product, a kind of materials, requirements of customer, a drawing of product, and etc.

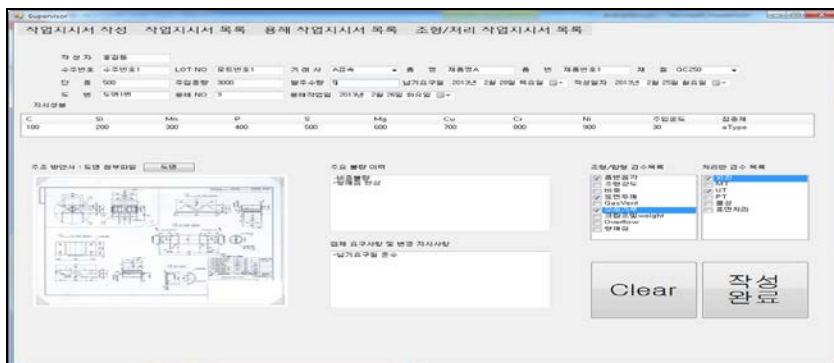


Fig. 1. Order window dialog

As Figure 2 shows, the smart metal casting processing management system presents the optimal manufacturing route depending on a type of the product based on the

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result of case-based reasoning. The red color buttons represent the processing steps of the given casting product route, but the grey color buttons represent the skipping steps.



Fig. 2. System result

3 Conclusions and Future Work

In this paper, we have implemented a smart metal casting processing management system using case-based reasoning with C# based on Windows. The window dialog control function can provide an easy and convenient method of operating the metal casting processing management system because the operator has much user experience with window dialog, through other window dialog. The experimental result shows that our smart metal casting processing management system schemes achieves more productivity than manual management schemes. In the future study, we are going to extend this research to apply broadly to traditional metal casting industry based on wireless communication.

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