

CAE/CAD/CAM 的一贯化整合作业如何运用在新产品开发的模具设计与制造

INTEGRATION OF CAD/CAM/CAE IN MOLD DESIGN AND MANUFACTURING

H. H. Tseng, F. S. Lai

Department of Plastics Engineering University of Massachusetts Lowell, MA01854
and

Tonson. Peng

Keymold Enterprise & Engineering Co. Wu-Ku Industrial Park, Taipei, Taiwan

In 52nd Annual Technical Conf. ANTEC Part 1, 6–9 June 1994, pp. 1100–1103.

Introduction

During the past decade, the technology of the computer aided design and manufacturing has been rapidly improved. Many of the mold manufactures have adopted this technology in their production process. Mold design has gradually changed from the draft board to the 2-D computer aided design. Mold manufacturing has changed from duplicating machine to CNC machine in the recent years, the software and hardware of CAD, CAM and CAE have brought the moldmaking a new change. Since most of product designs have used 3-D model, the mold designs have been gradually pushed from 2-D to 3-D design. With the advantage of the 3-D modeling, the CAM and CAE can be implemented more efficiently. The development of computer technology has improved some degrees of productivity in the toolmaking industries. The maximum benefit of the CAD/CAM/CAE is heavily depended on the integration of software and hardware system. In the present moldmaking industry, many of the computer systems have been introduced variously. In most of the cases, the CAD is one system, CAM is another system, and CAE is the other system. Although the data files can be transferred with different translation package, the results are confusing and incompleteness in many cases. The incompleteness of the file translation will cost profit and delay the production time. If the CAD, CAM and CAE systems are incompatible, the recreating geometry model in each system stage is necessary. The objective of this study is to investigate the integration of the CAD, CAM and CAE

system in the mold design and manufacturing. The investigation includes the concept of integration and comparison of 2-D and 3-D system. In order to understand the performance of the CAD and CAM integration, a back cover of a computer monitor was used as a case study.

Current Engineering In Mold making

Conventional tool design and manufacturing is a sequential process. This type of manufacturing process is very difficult to survive in today's global competition. Most of the conventional tool designers use two dimensional drawings as the main tool to communicate with part designer and tool shop. Tool designers have to design the 3-D parts into 2-D drawings. Then, the engineers in tool shop need to figure 2-D mold design drawings into 3-D tool making. This iterative process costs the manpower and production time. Although the drawing is implemented by the CAD system, the operation of each process is individual. Frequent reworks and modifications become inevitable for most conventional processes.

Current CAD/CAM/CAE system can be implemented by 2-D and 3-D model. A simplified schematic diagram is shown in the Figure 1. In part design and mold design, designer may use the same or different CAD system, if each process uses different CAD system, the geometric model needs to be transferred by the translation software. To implement CAD and CAM, the geometric model also needs to be translated. Geometric model translation is an obstacle to improve the productivity of moldmaking. There is no standard for the exchange of geometric data at the present time. Most of the CAD, CAM and CAE in most of the engineering industries.

Proposed Engineering In Mold making

A single geometric data system is important for moldmaking. To reduce the waste of rework and modification, a single geometric data base is needed. The proposed system is shown in the Figure 2. Since every product development is start from concept drawing. It is important to develop other application systems based on the original CAD system. With a single geometric data, all the design information can

be communicated with digital format. Since each application software is developed based on the same geometry file, the translation of geometric data is no need. With the single geometric data, the product geometry is very easy to access by the CAM and CAE system. Any modifications of the product can be rapidly transferred to every process.

Except the concept of the single data base, team approach and early involvement are also the main factors for the cost reduction and the lead time shortening. To organize a task force team involved by the toolmaker and molder is very important. Moldmaking process in the product development takes majority of time. The early involvement of the moldmaker can reduce many of the mold reworks and the product developing times.

Case Study

A CAD system with the feature of single geometric data base was used. The system also includes mold base and CNC programming package. The plastic product used for this study was a monitor back cover (Figure 3). The figure shows the solid model of the product. Figure 4 shows the flow chart of the mold design process. Since all the processes share the same geometric model, the CAE and CAM can be implemented easily. Once the part geometry was created, the EDM model and mold design job were started at the same time. Since the CAD system has mold base data bank, the selection and modification of the mold base become easier.