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Chapter V

STEP-NC to Complete Product Development Chain

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Abstract

This chapter addresses the issue of product development chain from the perspective of data modeling and streamlining. The focus is on an emerging ISO standard, informally known as STEP-NC, and how it may close the gap between design and manufacturing for a complete, integrated product development environment. This new standard defines a new generation of NC programming language and is fully compliant with STEP. There is a whole suite of implementation methods one may utilize for development purposes. STEP-NC brings richer information to the numerically-controlled machine tools; hence, intelligent machining and control are made possible. Its Web-enabled feature gives an additional dimension in that e-manufacturing can be readily supported. A case study toward the end demonstrates a STEP compliant, Web-enabled manufacturing system.

Introduction

In the manufacturing domain, there are two types of traditional product development models, *centralized model* and *collaborative model*. In a centralized model, manufacturing activities occur within a single manufacturer or a few manufacturers that have similar information infrastructures. In this model, proprietary data formats are commonly used. In a collaborative model, a middle tier is added using a neutral data exchange format. As such, collaborative activities in the manufacturing environment become easier. Figure 1 illustrates the data flows in these two models.

In Model A, both CAD and CAM systems use the same proprietary data format. Over the years, CAD/CAM system vendors have developed different data formats to support their systems throughout the design and manufacturing processes. The benefits of this model are obvious. CAD and CAM systems are unified by the same data format so that data incompatibilities between CAD and CAM systems are eliminated. Furthermore, since there is no data-transferring barrier, system vendors have more freedom to model more information. In addition to pure geometry, integrated CAD/CAM systems can cater for all the activities ranging from design to NC programming. Some of such systems include Pro/ENGINEER (with Pro/NC), CATIA and UGS. However, these systems are not without problems. They assume that data exchange during a product life cycle only occurs within one manufacturer or among a few manufacturers that implement the same CAD/CAM system. When more manufacturers are involved in the product life cycle, it is hard, if not impossible, to unify those manufacturers with a specific proprietary data format. Therefore, the structure represented by Model A is deemed unfit for collaborative manufacturing due to data incompatibility.

Model B aims to solve this problem by using exchangeable neutral data formats such as IGES (Initial Graphics Exchange Specification). Neutral data formats provide a middle tier to connect CAD and CAM systems. With the help of neutral data formats, Model B creates a collaborative manufacturing environment and makes design data exchange possible for large projects at the international level. Yet, some problems still exist:

- IGES was designed to exchange geometrical information only, so additional design or manufacturing information (such as feature information) within a proprietary model is ignored.