Chapter XI
Integration Based on STEP Standards

ABSTRACT

The integration model (Model B) as discussed in the previous chapter makes use of exchangeable neutral data formats such as IGES (1980). Neutral data formats provide a middle tier to connect CAD and CAM systems. Thus, Model B can create a collaborative manufacturing environment and make the design data exchange possible for large projects at the international level. Yet, some problems still remain. IGES was designed to exchange geometrical information only, so additional design or manufacturing information (such as feature information) within a proprietary model is ignored. During data exchange, some information may become astray during data transfer; geometry stitching or model repair is often needed. Plus, IGES is not an international standard.

As previously discussed, there are also problems common to both Models A and B (Figure 10.1). Different data formats (e.g. IGES and ISO 6983-1, 1982) are used in the design-to-manufacturing chain. Data loss occurs in the transaction from design to manufacturing because only low-level, step-by-step sequential machining commands are passed onto the CNC controllers, leaving the complete product model behind.

Of particular significance has been the endeavour made by the International Organization for Standardization to introduce the STEP Standard (i.e. ISO 10303-1 [1994]). Major aerospace and automotive companies have proven the value of STEP through production implementations resulting in savings of US $150 million per year (Gallaher, O’Connor & Phelps, 2002, PDES, Inc. 2006). Moreover, STEP has recently been extended to cater to manufacturing data modelling and execution with an aim to fill the information gap between CAD/CAPP/CAM and CNC. The standard is informally known as STEP-compliant Numerical Control, or otherwise STEP-NC for short. It was given an ISO name of “ISO
14649: Data model for Computerized Numerical Controllers (ISO 14649-1, 2003)”, which defines the STEP-NC Application Reference Model. With STEP being extended to model manufacturing information, a new paradigm of integrated CAD/CAPP/CAM/CNC is emerging. This is illustrated in Figure 11.1. The key to this paradigm is that no data conversion is required and the data throughout the design and manufacturing chain are preserved.

This chapter focuses on the use of STEP standards to support data exchange between CAD systems as well as facilitate data flow between CAD, CAPP, CAM, and CNC systems. Also discussed are the specific integration issues between CAD and CAPP, CAPP and CAM, and CAM and CNC using STEP standards. STEP-NC data model is a relatively new member in the STEP family, but it completes the entire suite of STEP standards from design to NC machining. Both Physical File Implementation Method (ISO 10303-21, 1994) and XML Implementation Method (ISO/TS 10303-18, 2004) are presented as the two popular ways of implementing STEP and STEP-NC.

**DATA EXCHANGE USING STEP AND STEP-NC**

STEP has been briefly introduced in Chapter II. This section discusses the standard from the perspective of being a useful tool to support data exchange and integration. The keys

*Figure 11.1. Integrating CAD/CAPP/CAM/CNC*
Related Content

Simulation of Grinding by Means of the Finite Element Method and Artificial Neural Networks
[www.igi-global.com/chapter/simulation-grinding-means-finite-element/63340?camid=4v1a](www.igi-global.com/chapter/simulation-grinding-means-finite-element/63340?camid=4v1a)

Mathematical Optimization Models for the Maintenance Policies in Production Systems
[www.igi-global.com/chapter/mathematical-optimization-models-for-the-maintenance-policies-in-production-systems/191781?camid=4v1a](www.igi-global.com/chapter/mathematical-optimization-models-for-the-maintenance-policies-in-production-systems/191781?camid=4v1a)
An Empirical Study to Evaluate the Impact of Demographic Variables to Complaint Behavior of Customers in a Dine-In Restaurant Industry: A Case of Graduate Students

Standardized Dynamic Reconfiguration of Control Applications in Industrial Systems
Thomas Strasser, Martijn Rooker, Gerhard Ebenhofer and Alois Zoitl (2014). *International Journal of Applied Industrial Engineering (pp. 57-73).*
www.igi-global.com/article/standardized-dynamic-reconfiguration-of-control-applications-in-industrial-systems/105486?camid=4v1a