Goal, Challenges, and Results

The aim of this project was the development of a prototype for the automatic generation of work planning seamlessly within the current integrated product development process (see Figure 1). Preparatory steps for the work planning generation include CAD feature and product data extraction as well as checking for compliance with internal rules and standards. The final aim is the full digital integration of CAD/PDM/ CAPP/ERP applications and models where geometric machining features (such as welding edges) information are transferred from CAD and PDM applications to CAPP for the automatic generation of work planning. Finally, work planning can consistently and automatically be integrated into the ERP system data base.

The outcomes of this project are:

- A developed CAD add-on for the extraction of the relevant CAD machining features and the integration of additional product data form the PDM data base;
- A PDM add-on for automatic technical compliance checking of CAD models;
- A knowledge-based CAPP application prototype permitting the automatic generation of work planning and their integration into the ERP data base via a developed interoperable web-service.

Fig. 1: Simplified product development process

Development of a CAPP Prototype

The CAD parameters and machining features are automatically extracted and stored into a neutral XML document through the development of a CAD add-on in Creo (CAD System at LWN). To fully automate this part of the process, a CAD model compliance checker (PDM add-on) has also been developed. The XML document is then automatically enriched with configuration
product data coming from the PDM data base. A knowledge base was developed to determine the appropriate processing steps from the extracted model parameters and features, to calculate the processing times for each operation, and to define the corresponding processing sequence. An inference engine then interprets the planning rules in order to compute the corresponding work planning. The architecture and the workflow of the solution prototype are illustrated on the Figure 2.

**Fig. 2: Architecture and workflow of the prototype**

The integration of the add-ons has been first achieved by an externally attached script, which facilitates the connection between these applications. Finally, standardised web services have been implemented in order to automatically and consistently import the generated work plans into the ERP database (see Figure 3).

**Impact and Effects**

The components currently considered include welding plates. It is also planned to automate the generation of work planning for other types of components and topologies, such as pipes.

It is also envisaged to apply such methods and tools for the generation of work planning at Hans Künz GmbH.

These methods and tools have permitted to demonstrate the feasibility to automate three interrelated time-consuming and partly redundant tasks:

1. The standard compliance checking of the CAD models and product data;
2. The extraction of CAD machining features and related master data;
3. The computation of work planning for sheet metal parts.

With regard to the impact on the business processes, such a generative CAPP application enhances:

- Process rationalization and standardization;
- Increased productivity of work planners;
- Reduced lead time for work planning;
- Increased quality of work plans.

**Contact and information**

K-Project AEDA
V-Research – Industrial Research and Development
Stadtstraße 33, 6850 Dornbirn, Austria
T +43 5572 394159
E office@v-research.at, http://www.v-research.at/

**Project coordinator**
Dr. Vaheh Khachatouri

**Project partners**

<table>
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<tr>
<td>Liebherr-Werk Nenzing GmbH</td>
<td>Austria</td>
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