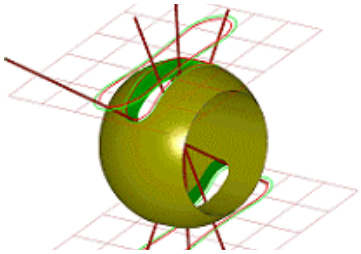
# STEP-NC
# STEP-compliant Data Interface for Numerical
**IMS Project No. 01009**

- Extended an existing data model for turning and milling processes
- A prototype for a turning CNC was developed
- Tested and implemented new measuring equipment



The project IMS STEP-NC was started as an extension of the ESPRIT project STEP-NC with the major goals of widening the STEP-NC technologies, extending the exchangeability between shop floor and design, strengthening function and tools, and spreading the new data model worldwide.

New technologies which were developed are understood as new process chains between CAD and a turning or an measuring machine. Therefore the existing data model for milling was extended. A prototype for a turning CNC was developed and adopted at a Boehringer machine tool. The public demonstration of the full process chain took place at the ISW symposium at Stuttgart in June 2003.

The second new technology which was also implemented and tested was “measuring” with a measuring machine from Zeiss. Measuring is based on a very new process chain in the environment of STEP (ISO 10303 ). The basic requirements for this process chain are not fully included into the PDM-data (Product data management). CAD systems do not support the data for tolerancing combined with features in a sufficient manner. So the development of the data model was on the top edge of the STEP development. For the realization of a scenario it was necessary to implement a kind of CAM for measuring and the adoption of an available measuring machine and software from Zeiss. Due to the short time for realization the demonstration was concentrated on the feature round-hole. The result of measuring was fed back into the data model for the further use in manufacturing environment.

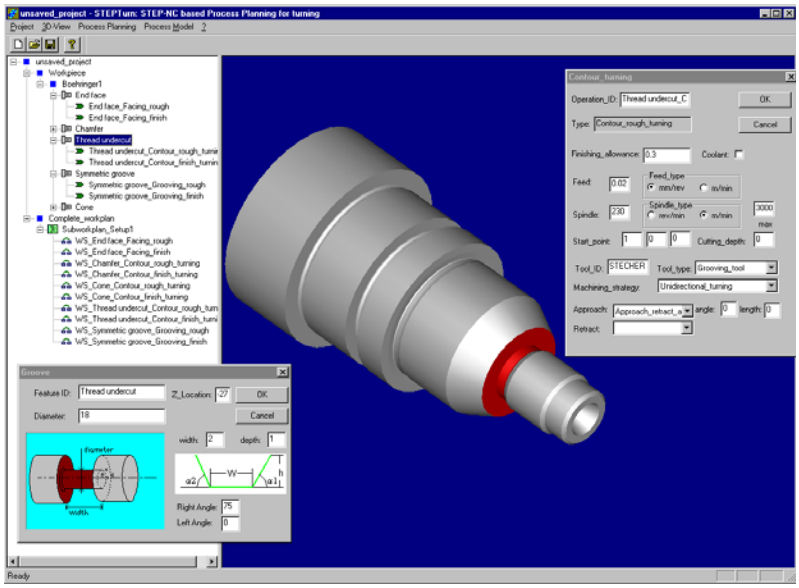
The exchangeability of code was demonstrated in combination with an expert system for contouring of wood and a wire EDM process chain with a four axes Charmille machine which can compensate wire offset for ruled surfaces as enhanced feature. The new wire EDM function is a very new application which was never demonstrated before.

The wood cutting contouring application demonstrated the use of an expert system which could be updated for the avoidance of burning. This can happen if the cutting data are not optimized. After a learning phase the expert system can supply hints for the programmer to avoid the use of critical cutting situations.

For the better dissemination of the new process chains the project was launched as part of an IMS project. There were sixteen (16) partners from Switzerland, USA, Korea and EU (France, Italy, Sweden and Germany). Switzerland that developed the EDM scenario.

The EU partners concentrated on the scenarios for turning, measuring and contour cutting. The Korean partners worked on Rapid Prototyping and scenarios for turning and milling. The US partner realized an implementation which was based on the “Application Interpreted Model” (AIM) of the “Application Resource Model” (ARM) which was directly used from the other partners.

Cross checks demonstrated several difficulties in interpretation of the exchanged code. Intensive work on this problem resulted in two proposals which will be helpful to avoid such problems in the future. Europe proposed a set of manufacturing resources as add-on for the integrated resources which will simplify the mapping.




The US partner proposed the use of a XML model data exchange which can include ARM, AIM and additional functionality. Both proposals are under discussion in the STEP community (ISO TC 184 SC4). The whole work of the project is based of the development of the data models. For the availability of the models the output was documented as a standard ISO 14649. The milling documents are available as International Standard, turning is in DIS voting and wire EDM is on CD stage. The model for measuring is a working draft due to the absolutely new content.