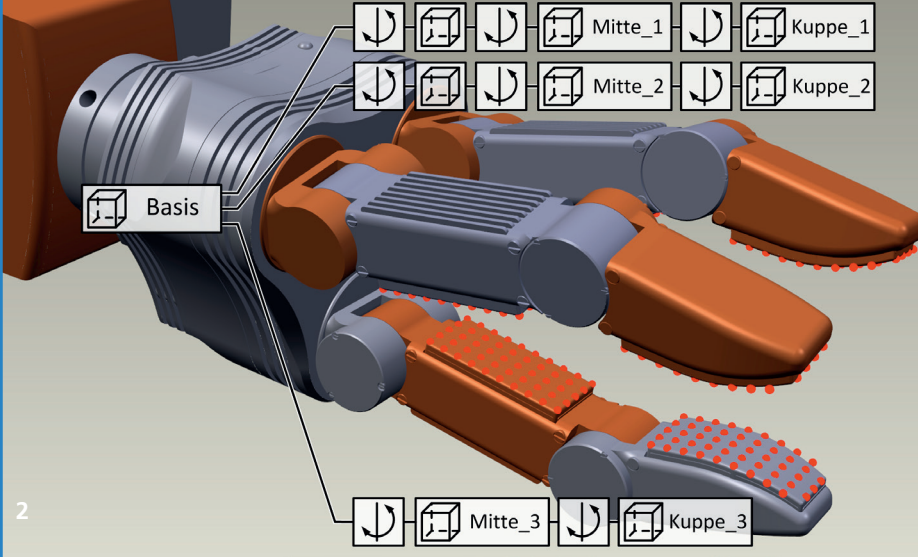


PUTTING IDEAS INTO OPERATION FASTER: DIGITAL ENGINEERING IN MACHINERY MANUFACTURING





SIMULTANEOUS AND RELIABLE PRODUCT AND MA

The crucial criterion for machinery and plant manufacturers' competitiveness is the capability to develop technically sophisticated and high-risk projects in shorter and shorter time with minimal costs and high quality.

A mechatronic view of products and integration in development are the keys to success.

The Fraunhofer IFF delivers custom solutions for you to develop your products based on state-of-the-art methods of digital engineering. Upon request, we will develop your custom machinery, from the idea to the start

of production, or provide software tools that enable you to engineer efficiently.

Developing Your Custom Machinery

As your technology partner, we will use digital engineering to rapidly develop validated automated solutions:

- We will develop solution concepts that match your own manufacturing and handling tasks,
- validate the concepts with simulations,
- train your operators and service technicians on a virtual model at an early stage and

- provide service, support and further development throughout the entire life cycle of your system.

Customized Solutions for Product Development

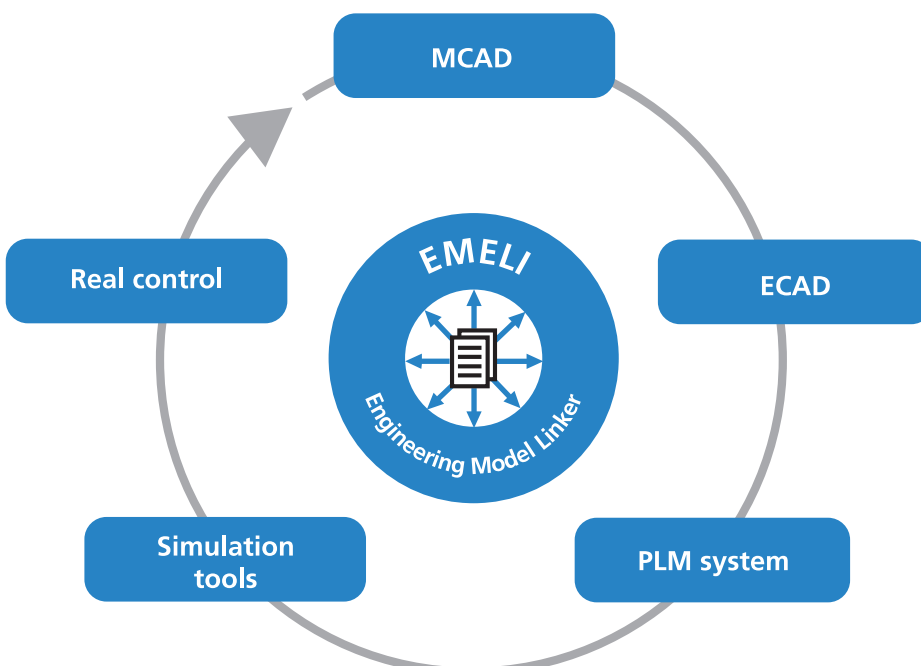
- We will analyze your development workflows, tools and data systems,
- identify gaps and media failures in your development workflows,
- develop custom concepts for an integrated development environment together with you and
- implement these concepts and support their introduction in your company.

You will profit from shorter development times and products with validated and optimized features.

Consulting for the Introduction of Virtual Design Processes

Do you still have little or no experience with the use of digital design tools? We would be glad to provide you vendor-neutral consulting. Our extensive landscape of commercial and proprietary digital engineering tools and our specialists are at your disposal to develop and progressively introduce the optimal concept for your company. Take advantage of our experience with research and development for your company's future.

CROSS-TOOL BASE OF DATA FOR INTEGRATED ENGINEERING





MANUFACTURING DEVELOPMENT

Integrated Digital Engineering

Methods and tools of digital engineering make it possible to integrate digital specifications, modeling, simulation and optimization of a product throughout its entire life cycle – from its design to its development and manufacturing and even its use.

Closing Data Gaps

Specialized software tools, which support engineering effectively and efficiently, are commercially available for different development tasks. The Engineering Model Linker (EMELI) developed at the Fraunhofer IFF combines your engineering tools. The consolidation of application-specific data produces a functional view of an entire machine.

Automatic Modeling

Developed at the Fraunhofer IFF, the tool VINCENT automatically imports design data from every common CAD tool. The addition of kinematics produces a virtual model of your machine.

Advantages of Digital Engineering

- Coordinated and parallel engineering from the start of a project
- Validation and optimization of functions on a virtual model already before prototyping
- Consistent reuse of data generated once
- Faster and less expensive creation of automated solutions that meet your needs

Simulation Validates Engineering

Different simulation tools are interfaced to validate your engineering. They range from numerical and analytical simulation tools to physical simulation and real-time collision detection.

Automatic Control Code Generation

Automatic control code generation enables control engineers to develop validated control systems at an early stage. Motion sequences are specified on a virtual model and automatically transposed into executable control code together with the engineering data enhanced from EMELI.

Controller Testing in Real-Time Simulations

Real-time interfacing with any common control system enables you to test any machine controller you develop on a virtual model. The real machine then starts with validated software.

References

Membrane filter factory designed and ready for operation in record time for LANXESS Deutschland GmbH

- Simultaneous development and planning of the product, manufacturing and factory on virtual models

Solution:

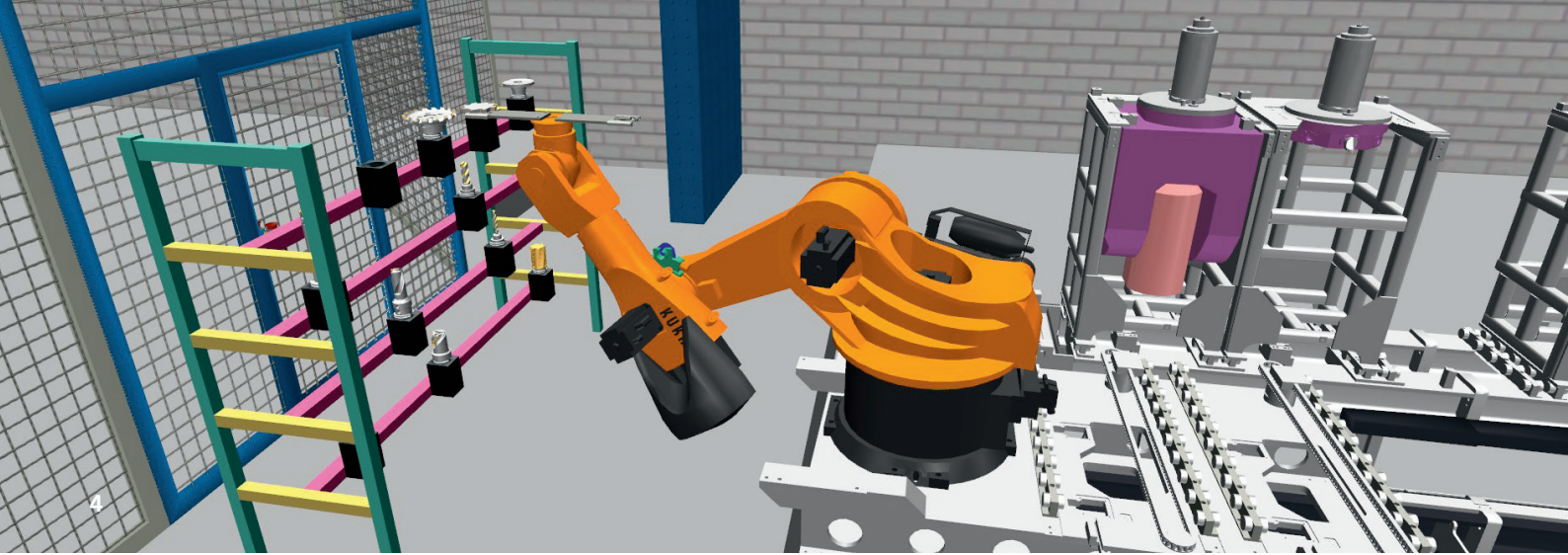
- Optimization of product features with numerical and analytical simulations
- Design of the manufacturing line in virtual reality
- Validation and optimization of critical manufacturing steps with simulations
- Detailed development of manufacturing
- Control programming and testing with a real controller on the model
- Ten months from award of the contract to commissioning

Programming time of a custom machine SM Calvörde GmbH minimized

- Automatic, model-based creation of a 32-axis double gantry welding system's machining programs reduced time by ninety percent

Solution:

- Direct importation of machine and welded part data from MCAD
- Graphic specification of approximately 10,000 welding points
- Automatic calculation of a collision-free path
- Automatic code generation for four numerical control units, including synchronization mechanisms



1, 3 Machine development from the design to the start of production.

Photos: Dirk Mahler, Fraunhofer IFF

2 VINCENT: Automatic modeling.

Image: Fraunhofer IFF

4 Simulation validates

engineering. Image: Fraunhofer IFF

**Fraunhofer Institute for
Factory Operation and
Automation IFF**

Prof. Michael Schenk

Sandtorstrasse 22
39106 Magdeburg
Germany

Contact
Virtual Engineering

Prof. Ulrich Schmucker
Phone +49 391 4090-201
ulrich.schmucker@iff.fraunhofer.de

www.iff.fraunhofer.de/en