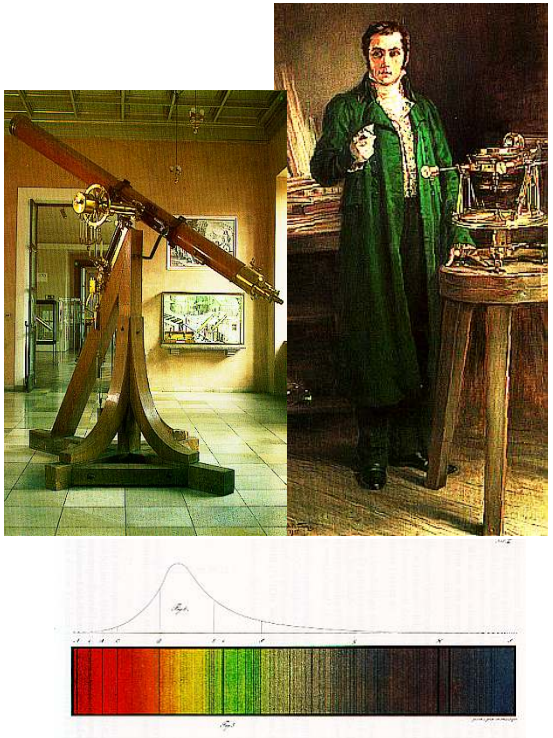
FhG

Fraunhofer Gesellschaft

(Fraunhofer Society for applied Research)

The Fraunhofer Organisation

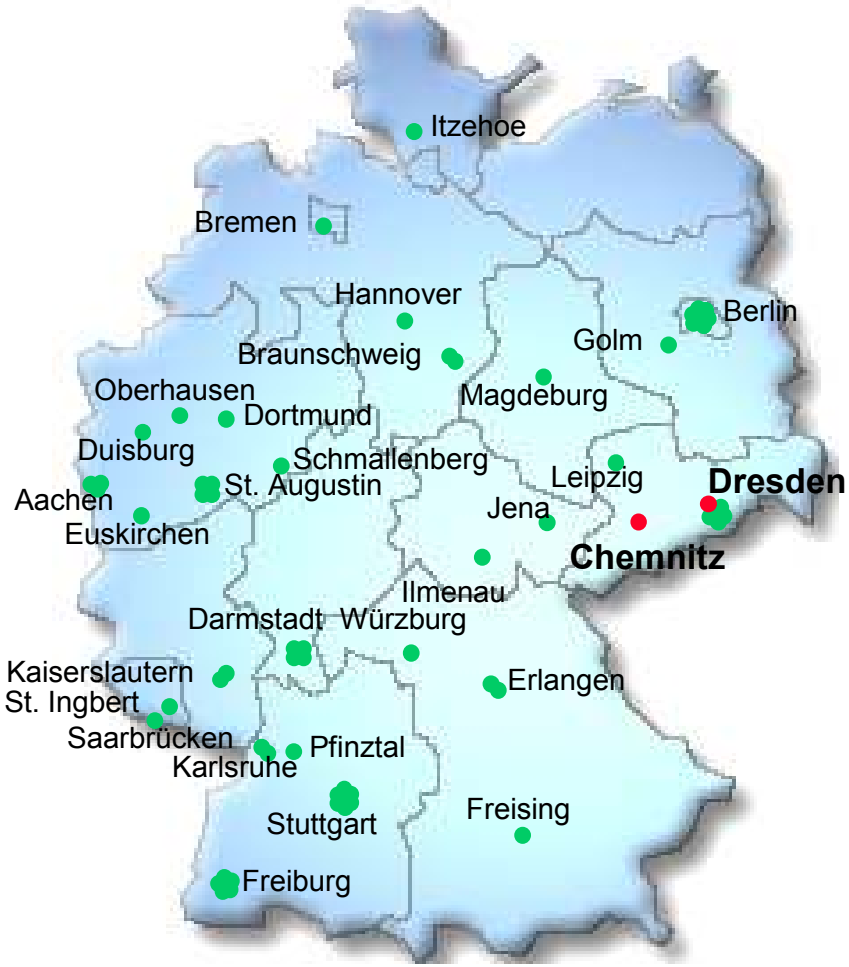


The organization takes its name from **Joseph von Fraunhofer (1787-1826)**, the illustrious Munich researcher, inventor and entrepreneur

- **Was founded in 1949 and is recognized as a non-profit organisation**
- **The leading organisation of applied research in Germany**
- **58 research institutes in Germany**
- **About 12,000 employees, about the half of them scientists and engineers**
- **Annual research budget >1 billion €**
- **Affiliated research centres and representative offices in Europe, the USA and Asia**
- **Headquarter of the Fraunhofer-Gesellschaft is in Munich**

The Fraunhofer-Gesellschaft in Germany

58	**Institutes at 40 Locations**
~ 12 000	**Employees**
~ 1 Billion €	**Budget per Year**



Fraunhofer Institut Werkzeugmaschinen und Umformtechnik

The Profile of the Fraunhofer-Gesellschaft

7 Alliances

- Micro Electronics
- Production
- Information and Communication
- Material and Components
- Life Sciences
- Surface Technology and Photonics
- Defence and Security

Alliance Production
(founded 1998)

- IPT Aachen
- IPK Berlin
- IWU Chemnitz
- IML Dortmund
- IWU Dresden
- IFF Magdeburg
- IUSE Oberhausen
- IPA Stuttgart
- TEG Stuttgart

Fraunhofer Institut Werkzeugmaschinen und Umformtechnik

Fraunhofer Institute
for Machine Tools and Forming Technology

Fraunhofer Institut Werkzeugmaschinen und Umformtechnik

Fraunhofer-Institute for Machine Tools and Forming Technology

In Numbers:

- 170 researchers and engineers
- 130 students and trainees
- 16 Mio. € budget

Focus:

- Machine Tools
- Mechatronics
- Forming Technologies
- Precision Engineering

in Chemnitz und Dresden

Networks:

- Fraunhofer-Gesellschaft (58 institutes of applied research)
- Universities in Saxony, Germany and worldwide
- Automotive industry (OEMs) and suppliers
- German and European Machine Tool Producers

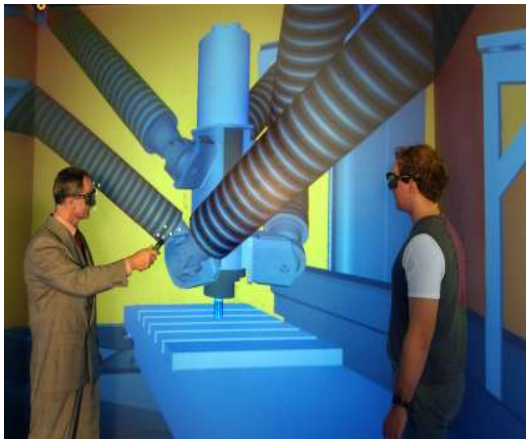
Fraunhofer IWU Institut Werkzeugmaschinen und Umformtechnik

Core Competences

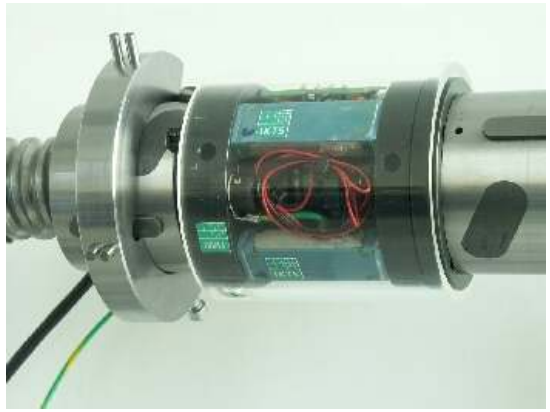
Technologies for Automotive Components

Machines and Components

Precision in Micro und Macro



Integration of IC Technologies into Production Engineering



Mechatronics

Organizational Structure and Regional Networks

TECHNISCHE UNIVERSITÄT CHEMNITZ

IWP INSTITUT WERKZEUGMASCHINEN UND PRODUKTIONSPROZESSE

Prozessketten der SFB 283 Massivumformung

DFG-Transfer-bereich 50

SFB 457 Regional Production Networks

KMC Kompetenzzentrum Maschinenbau Chemnitz

INDUSTRIEVEREIN SACHSEN 1828

ARBEITSKREIS WERKZEUGMASCHINEN IN SACHSEN/THÜRINGEN e.V.

VEMAS VERBUNDINITIATIVE MASCHINENBAU SACHSEN

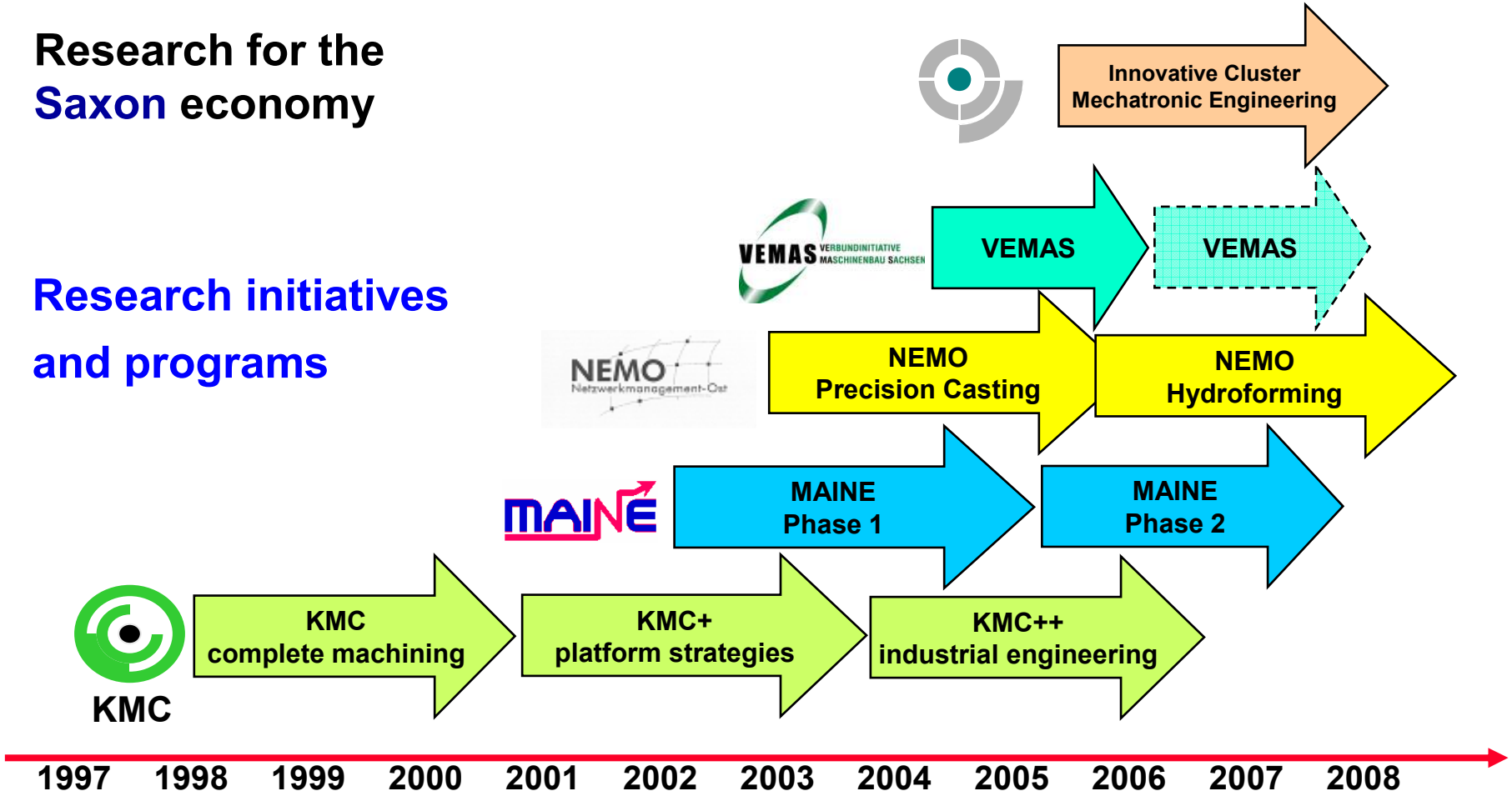
Fraunhofer Institute Machine Tools and Forming Technology (IWU)

Machine Tools and Production Systems	Mechatronics	Cutting Techniques	Forming Technology
Production Systems	System Techniques	Cutting Technologies	Sheet Metal Forming
Machine Tools	Adaptronic Applications	High-Precision and Micro Fabrication	Bulk Metal Forming
			Prototypes / Joining

Innovation Platforms of the Fraunhofer IWU

Research for the Saxon economy

Research initiatives and programs



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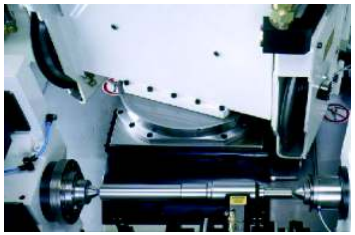
The Saxon Machine Tool Industry Alliance Chemnitz - KMC



Research projects

Project phase 1
09/1998 till 12/2000

„Process combination and complete machining“
six joint projects with more than 30 participating companies and R&D institutions
total volume: 21,5 million €
>> circa **84** million € sales increase
>> 16 patents

Project phase 2
03/2001 till 12/2003

„Platform concepts for mechanical engineering“
five joint projects with more than 30 participating companies and R&D institutions
total volume: 20,5 million €
>> ca. **77 million** € sales increase
>> **15** patents

Project phase 3
starting 2004/2005

„Technologies in mechanical engineering for industrial engineering, construction and infrastructure“

Fraunhofer Institut Werkzeugmaschinen und Umformtechnik

KMC Kompetenzzentrum Maschinenbau Chemnitz

Freistaat Sachsen

Project partners

Leaded by the Volkswagen Sachsen GmbH and coordinated by the Fraunhofer IWU more than twenty companies (Suppliers to automotive industry and machine tool builders) were involved in the collaborative project with a total budget of about 28 Mio. €.

Phase I: 2002 – 2005, supported by Saxon Ministry of Economy

Fraunhofer Institut Werkzeugmaschinen und Umformtechnik

Innovative platform for mechanical and automotive engineering

Mechanical Engineering Initiative Next Economy MAINE – Phase I

“Residue-free engine manufacturing”

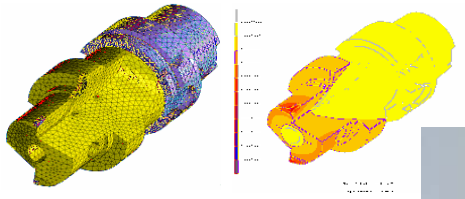
“Fully automated laser welded car body manufacturing”

I burr- and chip-free manufacturing of engine components

II original and forming technologies for avoidance of residues

III optimized deep drawing parts made of forming and joining methods

IV Laser process in car body manufacturing

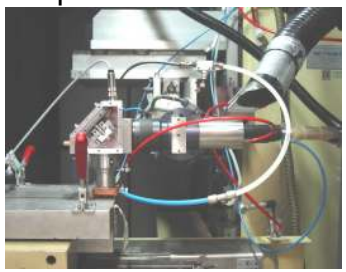


New boring tools
with optimal chip formation,
decuple lifetime increase
resulting from coatings

assembled
crank shaft

Demonstrator part
„B-pillar Golf 5“
3 manufacturing concepts

Online-control of the
laser process for an
optimal welded seam



Improvement | **Quantum jump** | **Quantum jump** | **Improvement**

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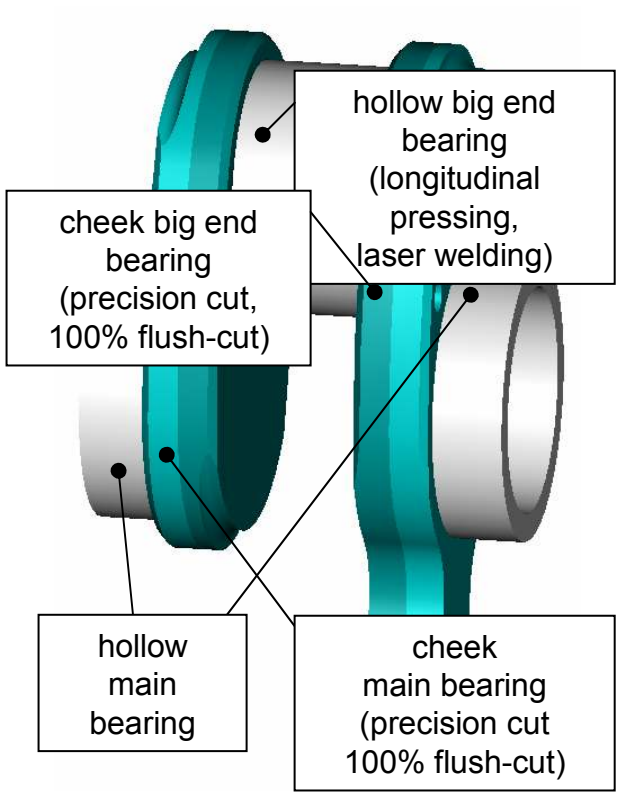
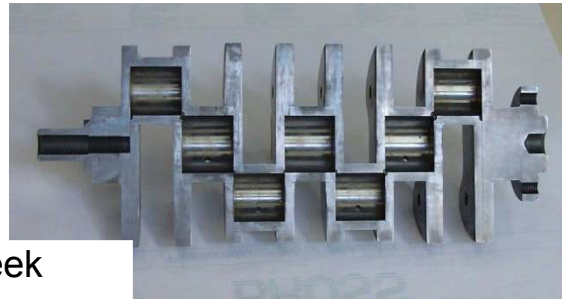
MAINE

Freistaat Sachsen

Crank Shafts



Construction of a crank
of the manufactured crank-shaft



Process Chain:

- force fitting / welding bearing
- surface grinding of cheek
- joining complete shaft with cheek-cheek
- grinding complete shaft

Advantages:

- approx. 25 % **weight savings** against serial shaft
- high flexibility by **modular assembly**
- extension of constructive possibilities (**material versions**, location and construction of **oil well**)

Project Results:

- test of first **prototypes in „lighted“ motor** as well as in the vehicle have been done successfully
- testing of prototypes on the vibration test rig (bending and torsion) and further **optimization of fatigue strength**

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MAINE

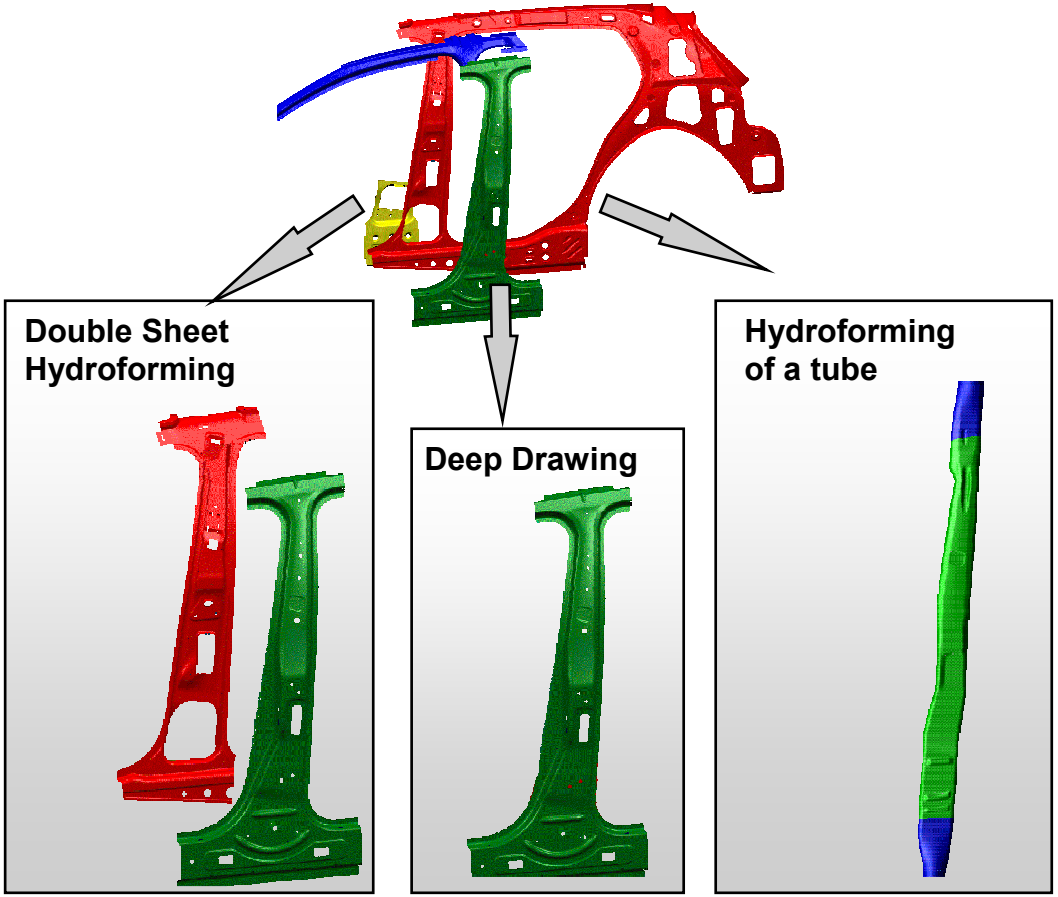
Benchmarking of three strategies for the production of a B-pillar

Criterions

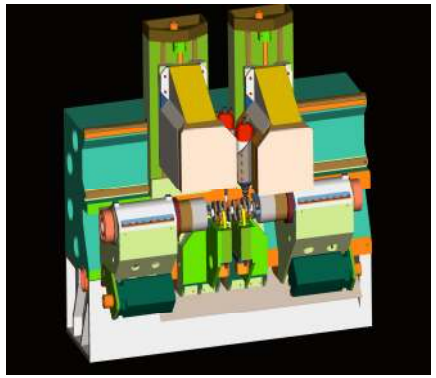
- Production
  - Costs for equipment and tools
  - Material
  - Cycle time
- Component Properties (especially stiffness)

Technological Variants

- Conventional deep drawing
- Double Sheet Hydroforming (inner and outer part of the B-pillar)
- Hydroforming of a tube

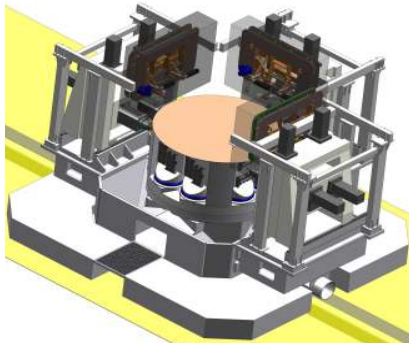


Machine System Design and Process Development



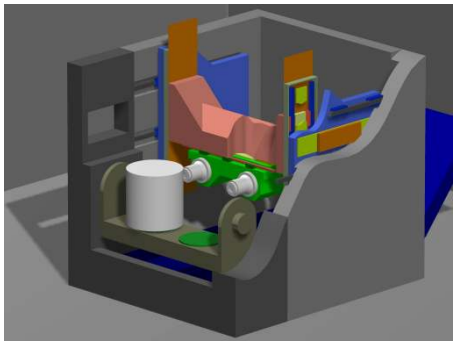
StarragHeckert
machine concept 2-spindles-machine
with linear motors for dry machining

New Machine Systems



WEMA Vogtland
Application of the demonstrator modules to the **dry machining at a "round step machine"**

NILES-Simmons
machine concept for the **ortogonal turn milling** of hardened crank-shafts



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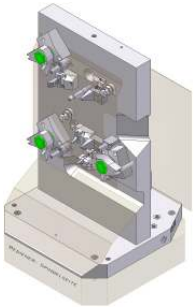

HOHENSTEIN
Intelligent clamping device

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MAINE