

Welcome to the ETA-Factory

Reaching a new level of energy efficiency performance in production by using interdisciplinary and cross-linked innovation strategies



TECHNISCHE
UNIVERSITÄT
DARMSTADT



Birmingham | June 14th & 15th 2017 | Ann-Christin Frensch, M. Sc.



Welcome to the ETA-Factory



Who is doing research at the ETA-Factory?

The ETA-Project

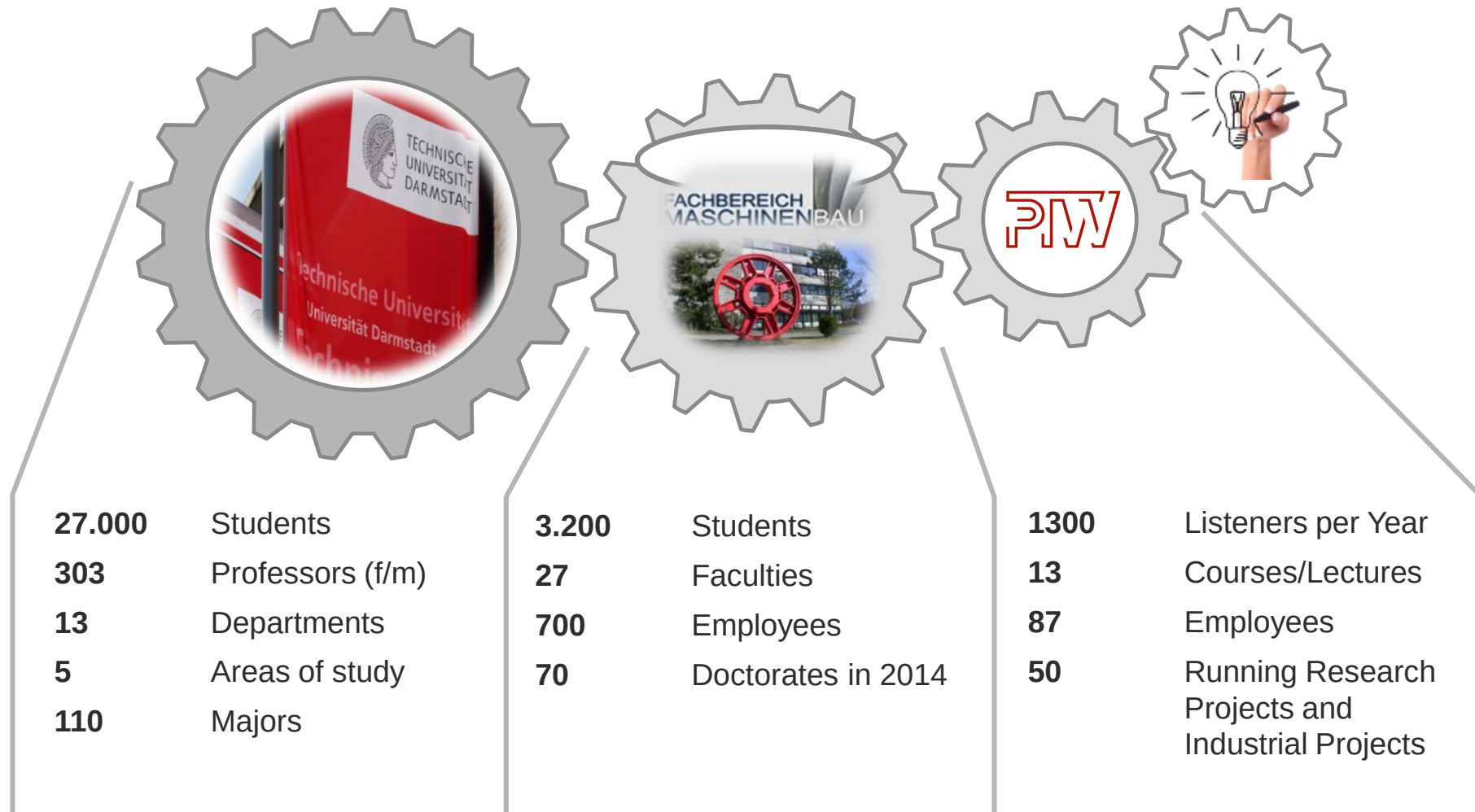
What's inside the ETA-Factory?

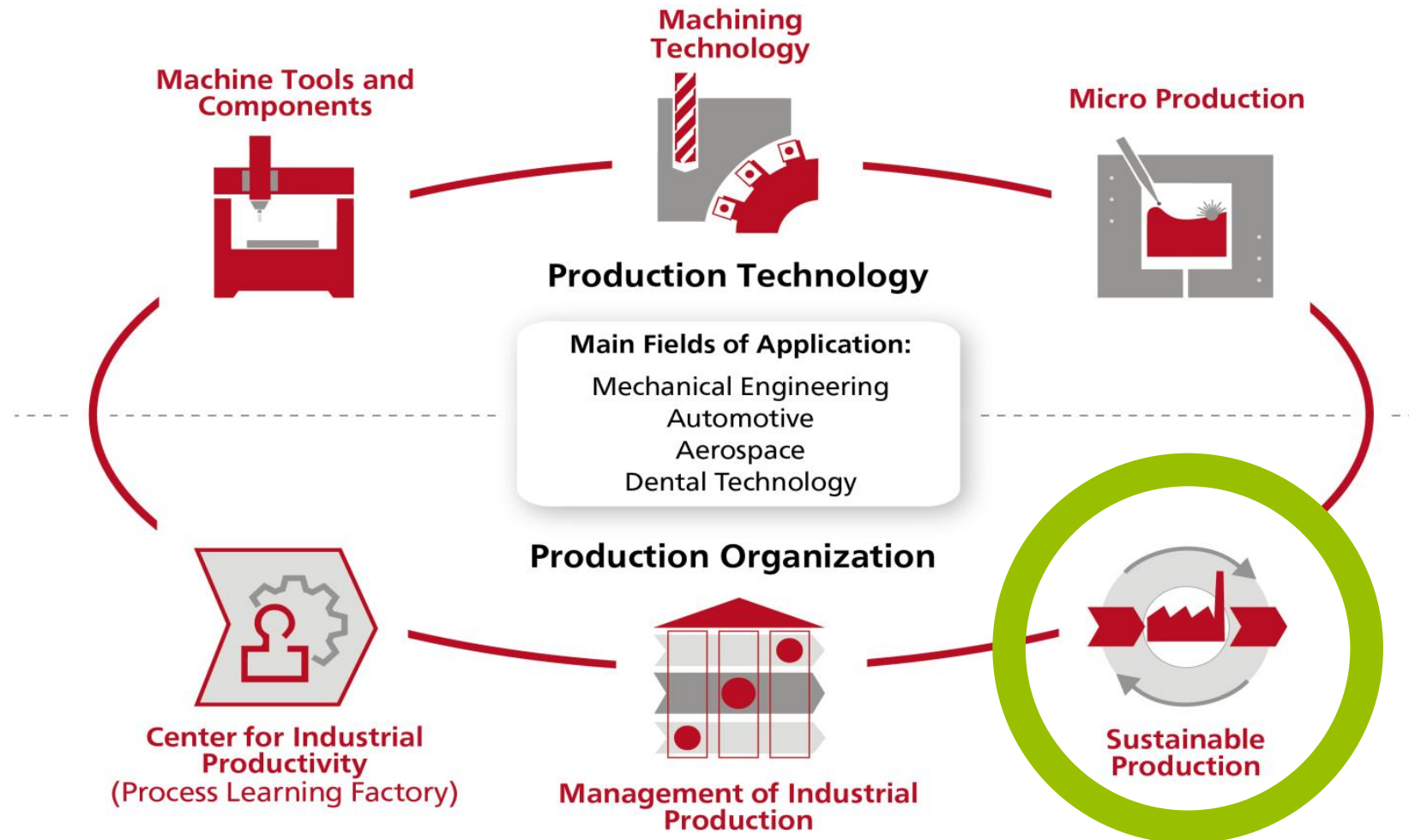
What's about transfer?



TU Darmstadt and the PTW

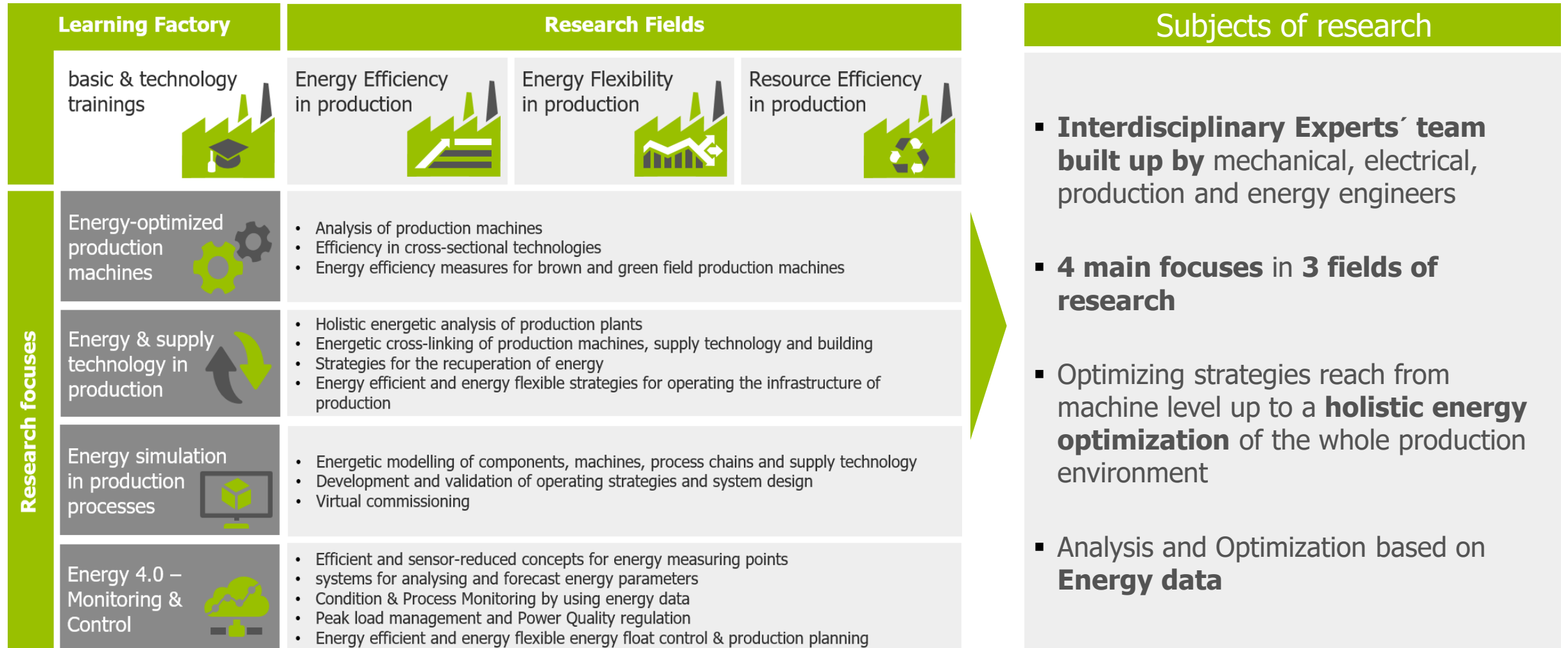
An Engine for Innovation





The research group *Sustainable Production*

Gaining knowledge by using the benefits of interdisciplinarity



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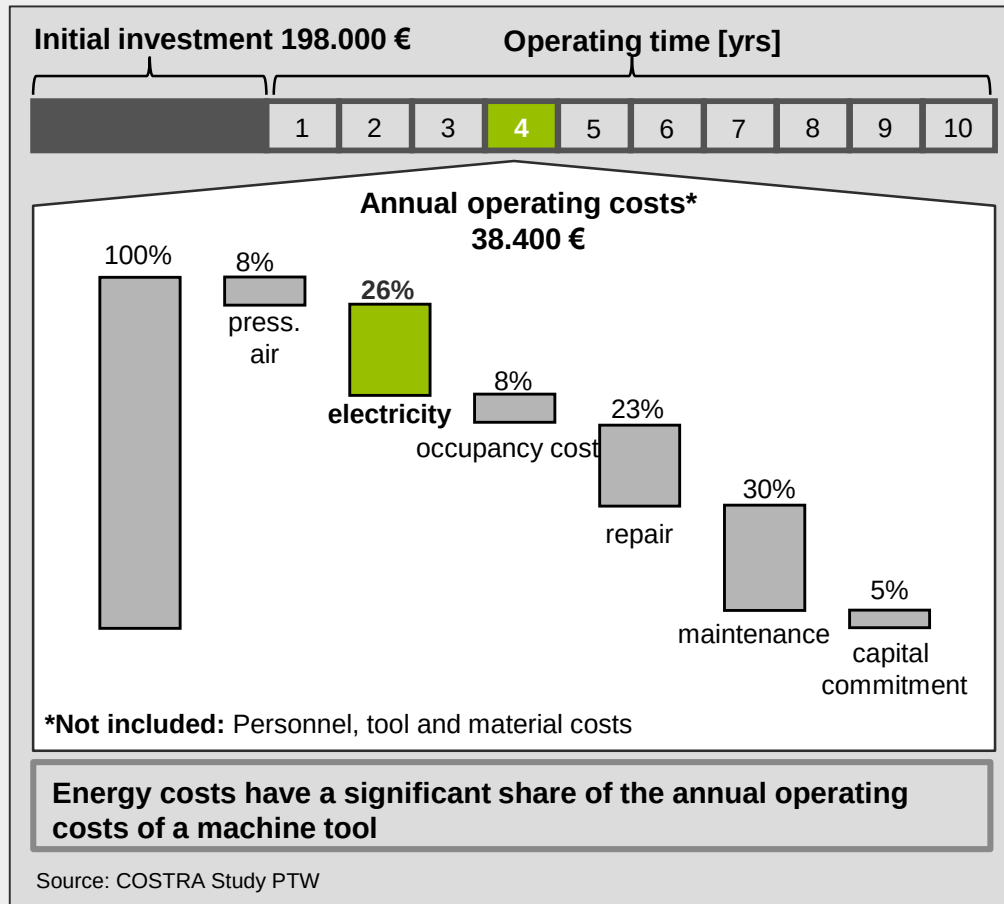
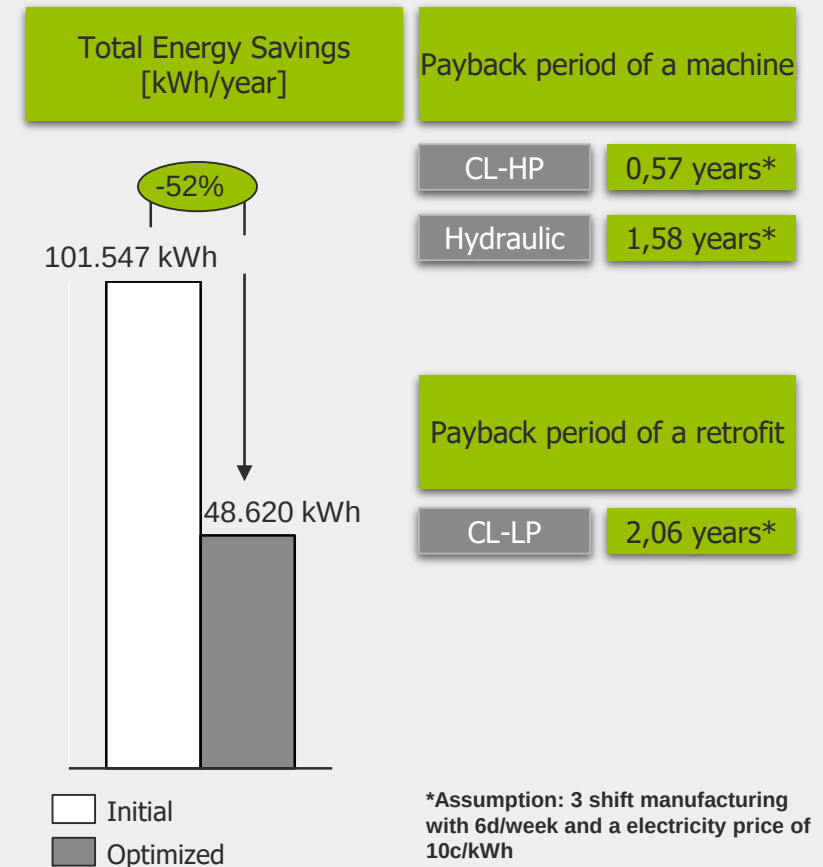


Motivation for ETA-Project: MAXIEM

Tooling machine MAG XS 211



Reducing total energy consumption by optimizing on machine level



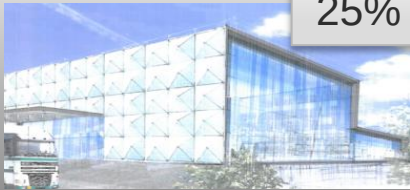
The Challenge

Holistic increase of the Energy Efficiency



Today: Isolated optimization of different sub-systems of a factory

Building



25%

Quelle: Prof. Dipl.-Ing. J. Eisele

Process chain



20%

Machine



30%



Savings
< 30 %

Our vision: Holistic factory optimization including all sub-systems



Interaction of:

- Machines
- Process chains
- Buildings

Synergies by energy controlling and recovery measures



Potential
~ 40 %

Involved Partners



The ETA-Project

Gefördert durch:

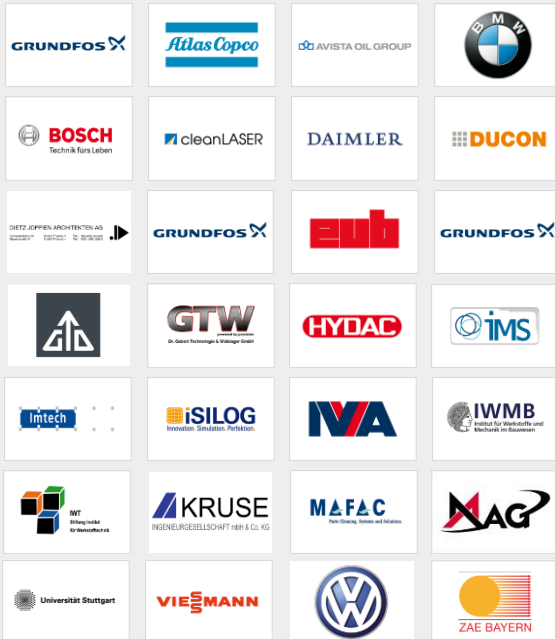
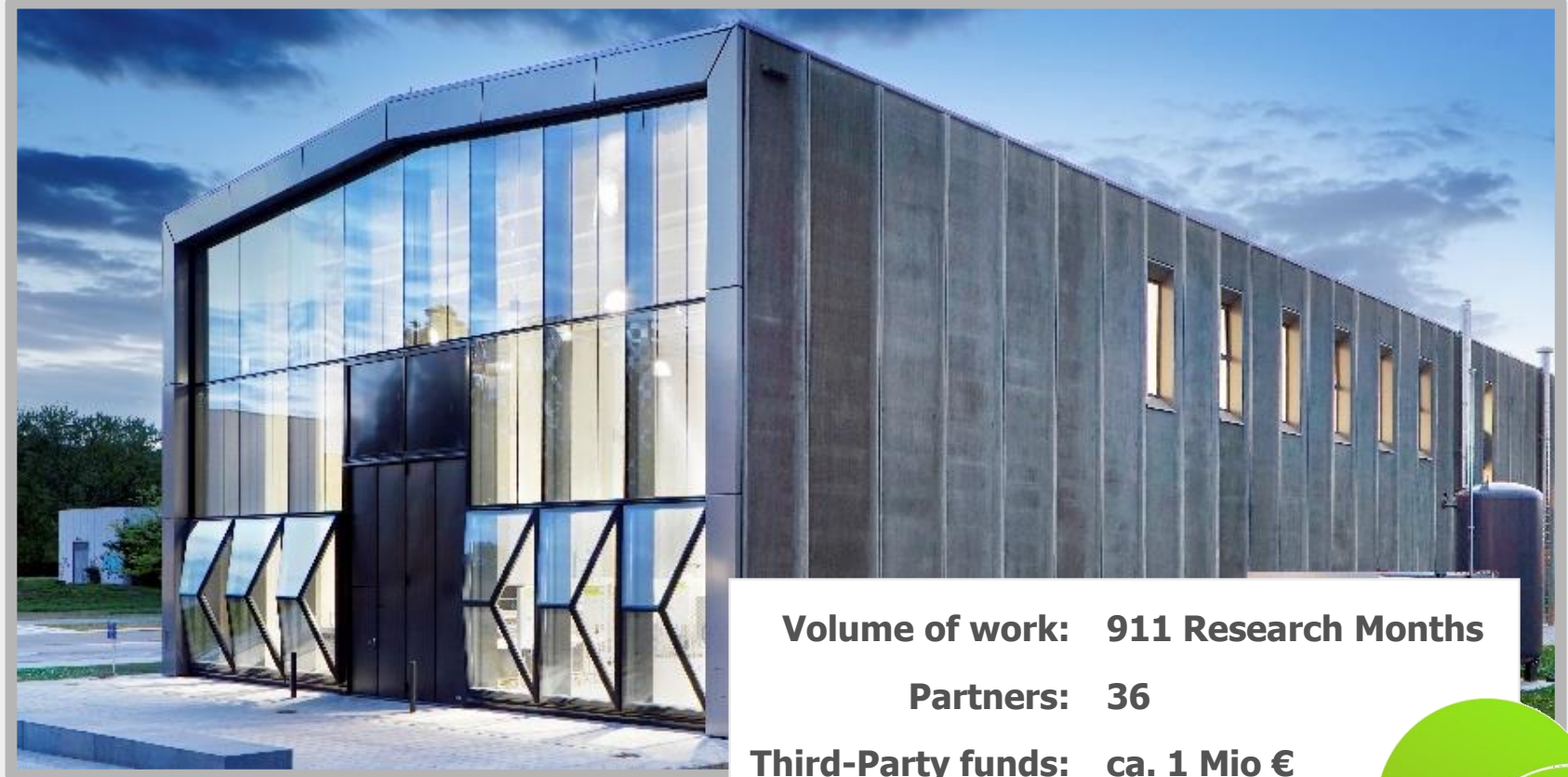


aufgrund eines Beschlusses
des Deutschen Bundestages

Betreut vom:



Unterstützt durch:



Volume of work: 911 Research Months

Partners: 36

Third-Party funds: ca. 1 Mio €

Own Funds: ca. 3,7 Mio €

Total Volume: ca. 15 Mio €



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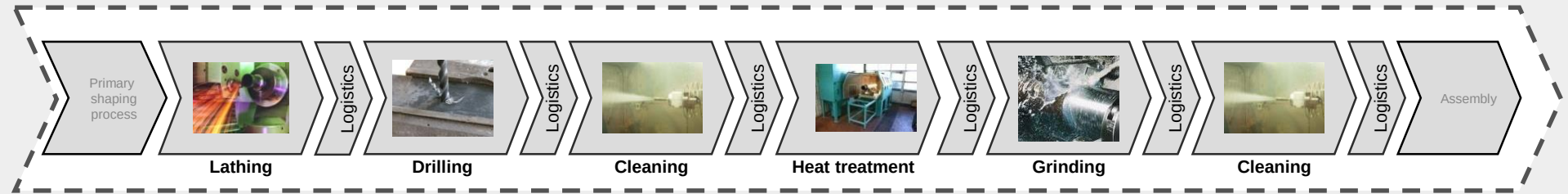


ETA – The energy efficient model factory

Reduction of energy in production processes



Building up an energy efficiency optimized production process with our ETA-Partners



Energy efficiency research based on a realistic production chain in an innovative factory building

- Original process is used for the demands on **quality and functionality**
- **Energy efficiency** research based on a **realistic production chain** in a **innovative factory building**
- **Interdisciplinarity for reducing the energy need in industrial companies**

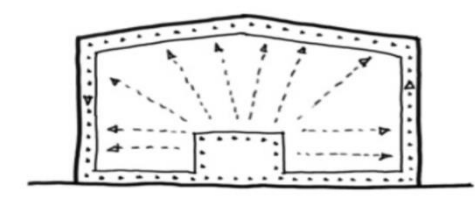
Key Innovations in the ETA Factory

Energy Efficiency is increased by interdisciplinarity

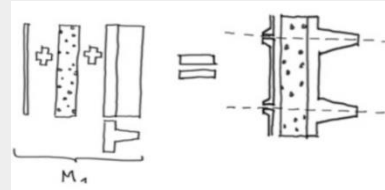


An Overview

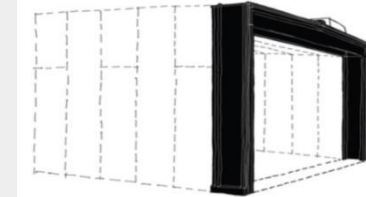
Energetic interaction



One material: concrete

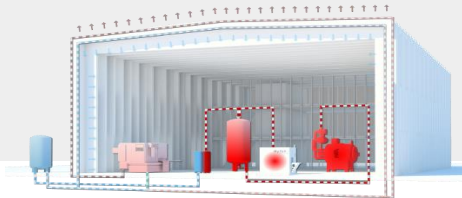


Modular structure



Civil Engineering

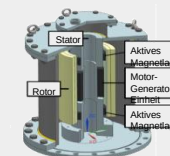
Energetic combination of machines, building services & building



Holistic energy controlling

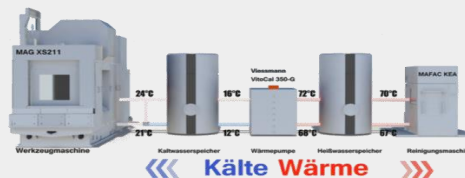


Smoothing of load peaks by means of kinetic energy storage

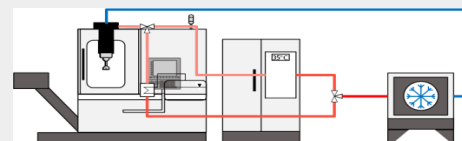


Energy- and Electrical Engineering

Energetic combination of machines control



Energetic machine improvement



Smoothing of load peaks by means of innovative control concepts



Mechanical and Process Engineering

Key Innovations in the ETA Factory

Energy Efficiency is increased by interdisciplinarity



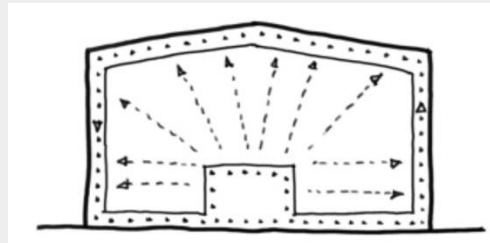
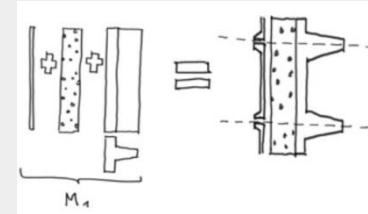
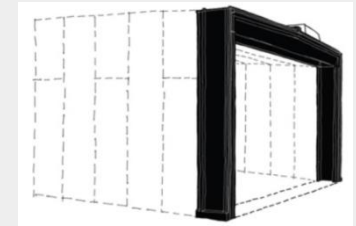
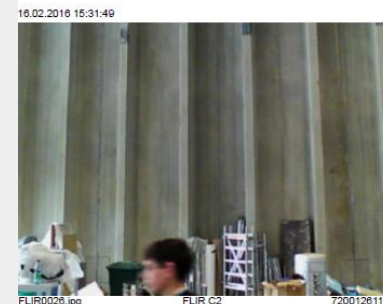
Innovative factory building

Civil Engineering

Energetic interaction

One material: concrete

Modular structure



Key Innovations in the ETA Factory

Energy Efficiency is increased by interdisciplinarity

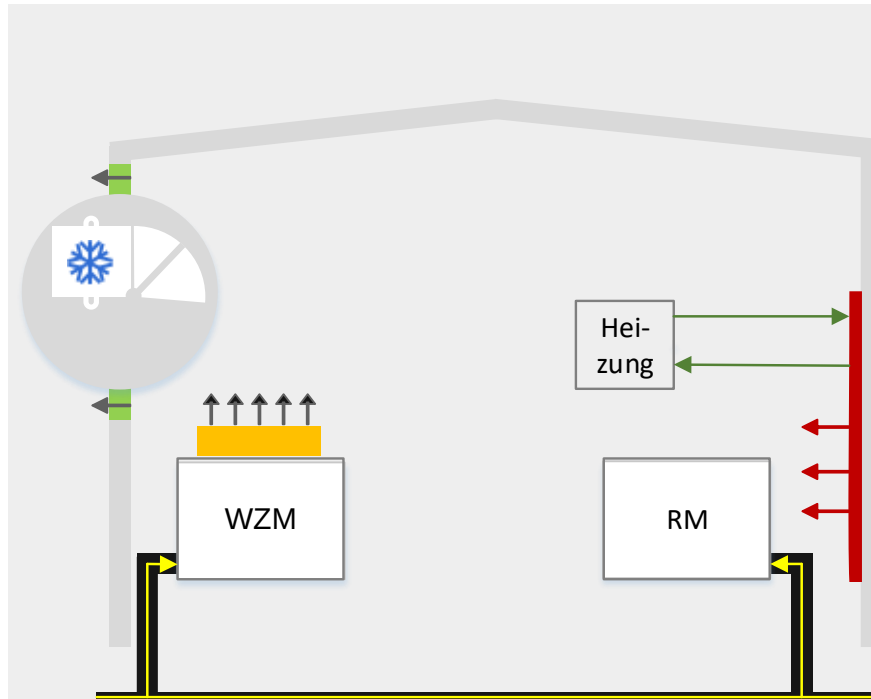


Holistic view on energy efficiency in production processes

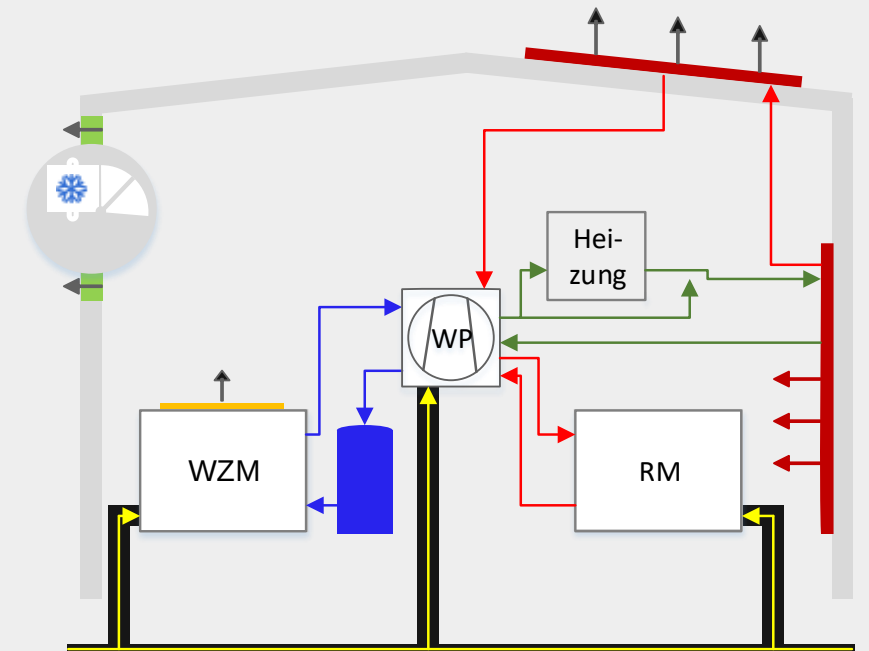
Energy- and Electrical Engineering

Thermal cross-linking

Energy Controlling



Business-as-Usual-Scenario



Energy-Efficiency-Scenario

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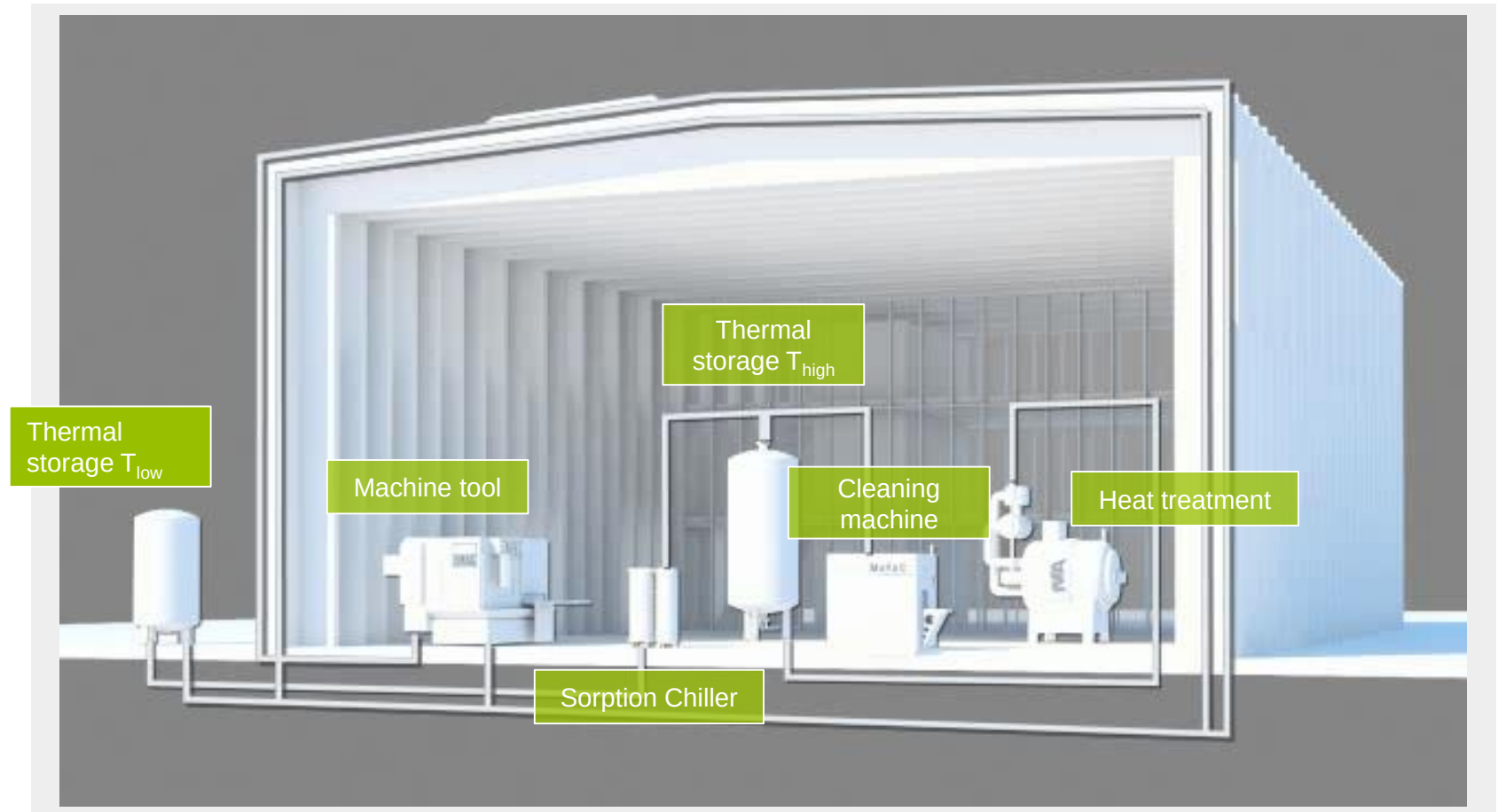


The ETA: A thermally linked System

Energy- and Electrical
Engineering

Thermal cross-linking

Energy Controlling



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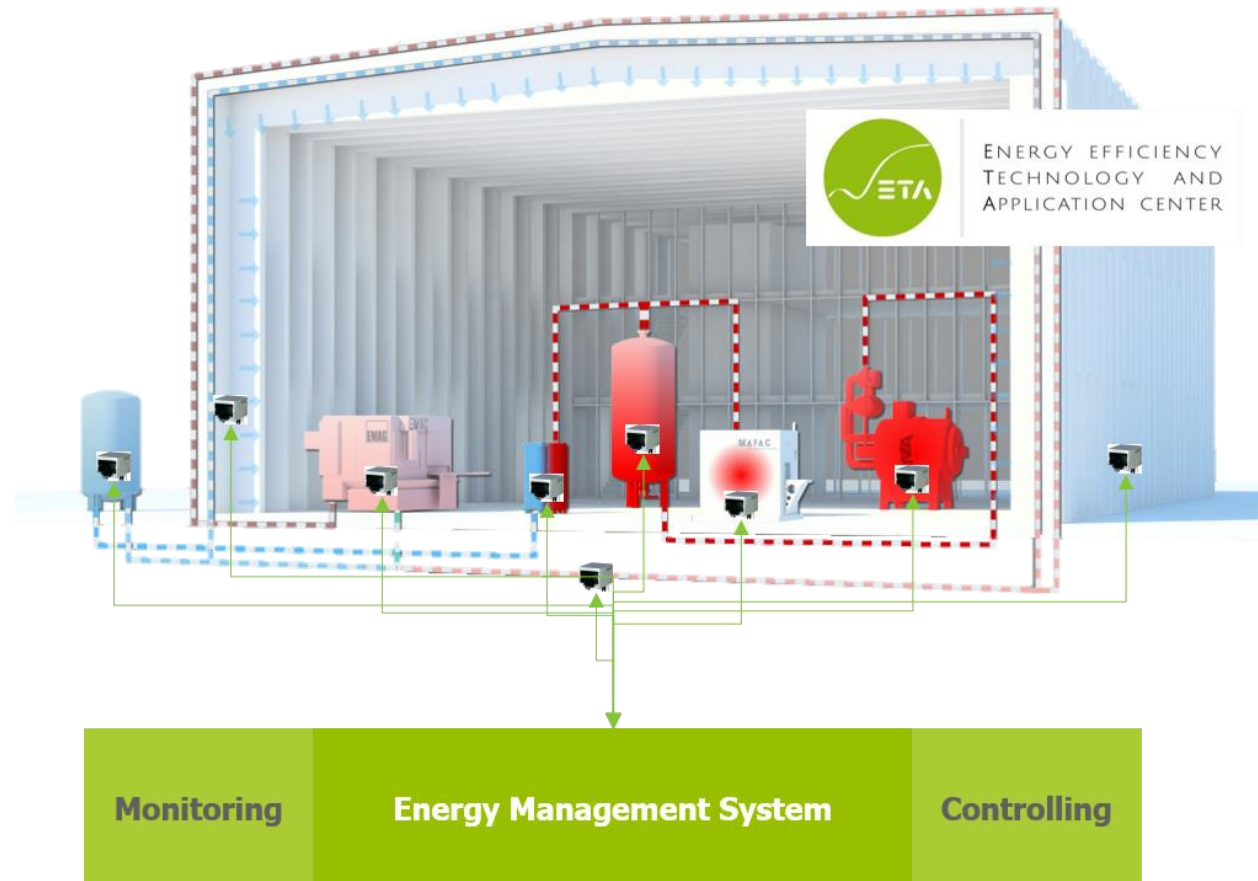


From Big Data to Smart Data

Energy- and Electrical Engineering

Thermal cross-linking

Energy Controlling



ICT cross-linkage of



Sensors
(e.g. Temp., Pressure, Power, ...)



Actuators
(e.g. Pumps, Valves, Drives, ...)



PLC controls

in



Production Machines



Building Services Equipment



Building

>1000
Real-Time Data Points

Key Innovations in the ETA Factory

Energy Efficiency is increased by interdisciplinarity



Energy efficiency in Production machines

Mechanical and Process Engineering

Tooling Machines

Cleaning Machines

Nitriding furnace



- Demand-based control of pumps and compressors
- single component load transfer
- Minimizing of leakage
- ...



- individual cleaning program for each component
- Insulation
- Recuperation of Energy
- ...



- Recuperation burner
- Insulation
- Using lightweight construction
- Optimizing process
- Recuperation of waste heat
- ...

Key Innovations in the ETA Factory

Energy Efficiency is increased by interdisciplinarity



Thermal linking of tooling and cleaning machine

Mechanical and Process Engineering

Tooling Machines

Cleaning Machines

Nitriding furnace



Energy Efficiency due to thermally linked system



Tooling machine

- **Cooling system** of tooling machine has more than **20%** of total energy consumption
- waste heat is spread to surrounding without recuperation

Cleaning machine

- **16 %** of the average energy consumption is used by the **electrical bath heating**
- Cleaning bath is heated up electrically

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A step further

Sensitization for energy efficiency

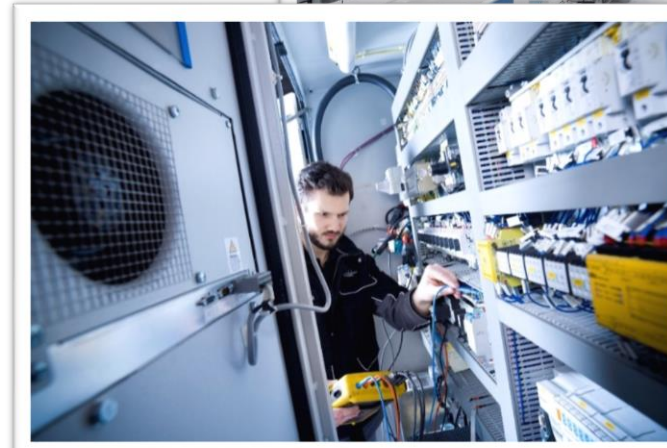


Energy Efficiency for Everybody...

- **Energy-Workshops** for skilled workers from industry
- Courses and theses for **students**
- **Visit of the ETA-factory** for people from universities, industry, politics etc. (~ 1000 visitors during the last year)

Future researches in the ETA...

- Further **energy efficiency projects** in the several research fields of ETA
- Special projects for **transferring** the ETA-outcomes into industry
- **Energy flexibility**



Thank you for your interest!

For further questions we are happy to be at your disposal.



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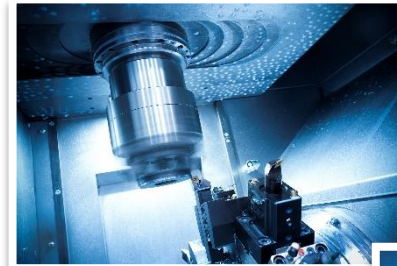


www.eta-fabrik.de

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