

REISHAUER GROUP



**REISHAUER**

Gear Grinding Technology

# **Verification and virtual commissioning of configurable handling systems**

Oliver Stamm

Design and Development Engineer

Reishauer AG

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**Adopt virtual commissioning:**

*Verify design and tailor your solution to customer's requirements in a cost-effective way*

**Increase efficiency:**

*Reuse existing data in one environment to get actionable results in days instead of weeks*

**Broaden the horizon:**

*Leverage the multi-domain simulation platform to address multiple business and technical challenges*

## FACTS & FIGURES I/II



1,100

1,100 employees worldwide

700 employees  
**Reishauer**



400 employees  
**Felsomat**



360 M

CHF 360 million consolidated net sales

**33% Asia**



**35% Americas**

**32% Europe**

## FACTS & FIGURES III/II



18 M

### Research and Development Expenditures

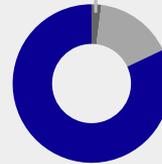
- CHF 18 millions p. a.
- 5 % of annual net sales



18 M

### Investments CHF 18 millions p. a.

**82 % Machines**

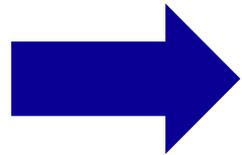


**2 % IT**

**16 % Real Estate**

1. **Verification:** Customer requirements such as cycle times are nearly impossible to calculate in advance
2. **Mathematics:** Traditional calculations of single components result in a fragmented validation with limited insights.
3. **Communication:** Better integration of multi-domain knowledge needs working together: software, electronics, mechanics.
4. **Resources:** “Is this necessary?”

1. **Workflow:** From customer's requirements to virtual commissioning
2. **Data:** Reusing of configurable CAD- model for customer-specific, dynamic simulations
3. **Technology:** Partially elastic multi-domain system models with variants



One platform: Using MathWork's Simulink



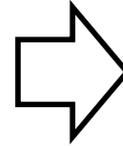
**Solution: Virtual machine**

Feasibility studies of customer's processes



Better pricing

Simulations with Simulink are fast and deliver more insights than traditional analytical models



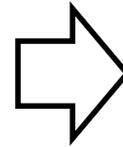
Faster development

Simulation results can be used for accurate dimensioning of components



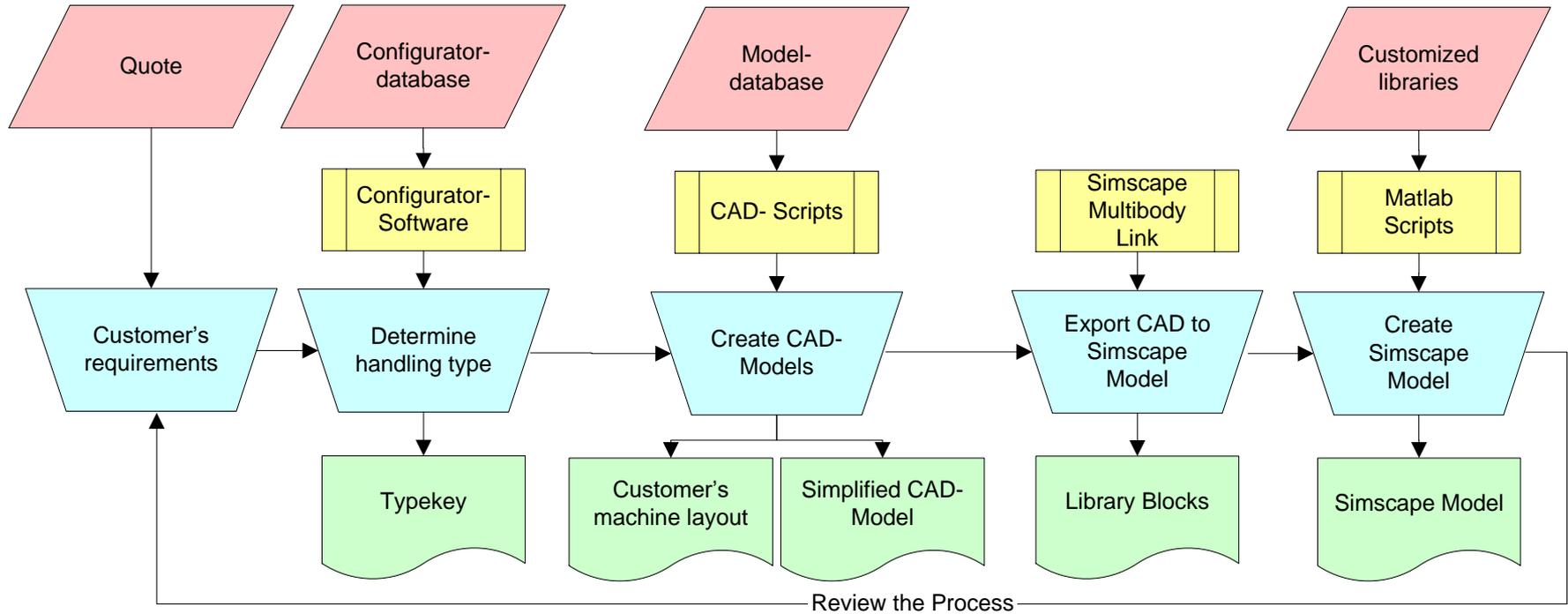
Lower costs

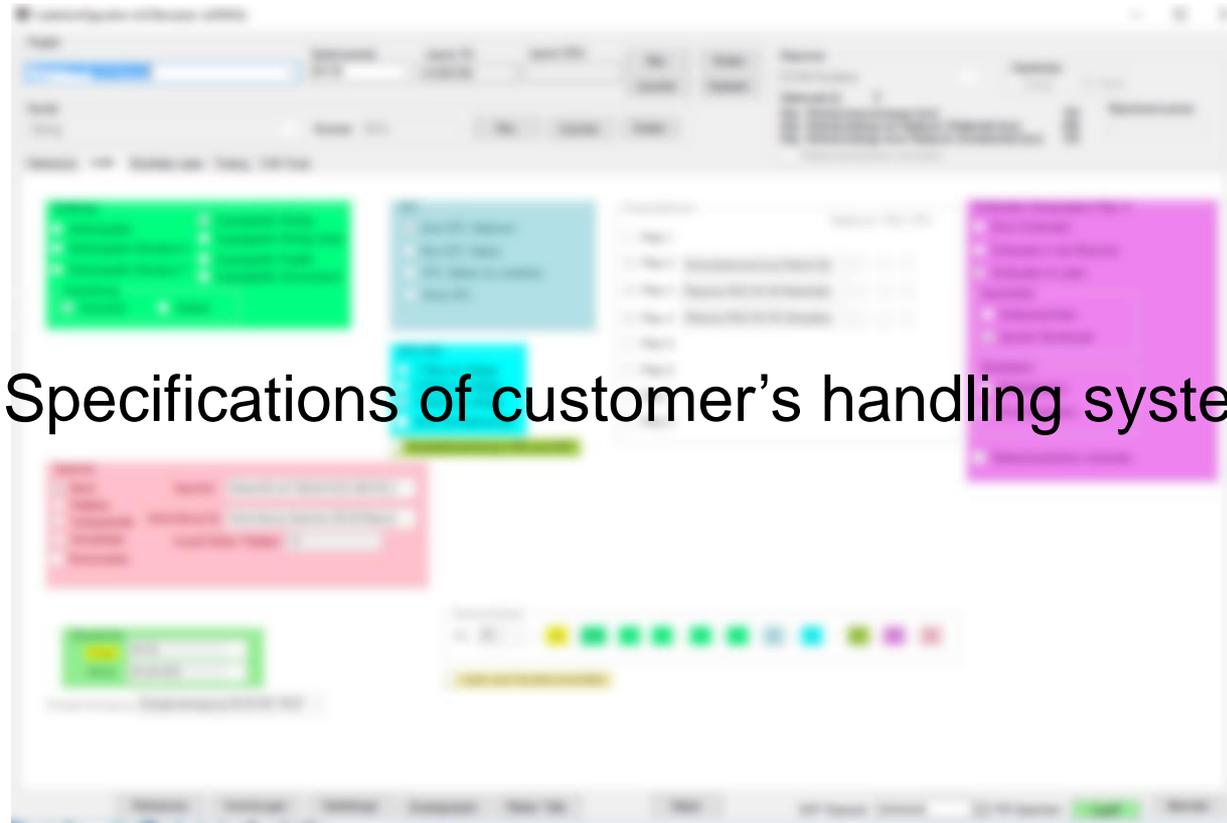
Calculate lifetime of linear guideways according to customers process to predict service intervals



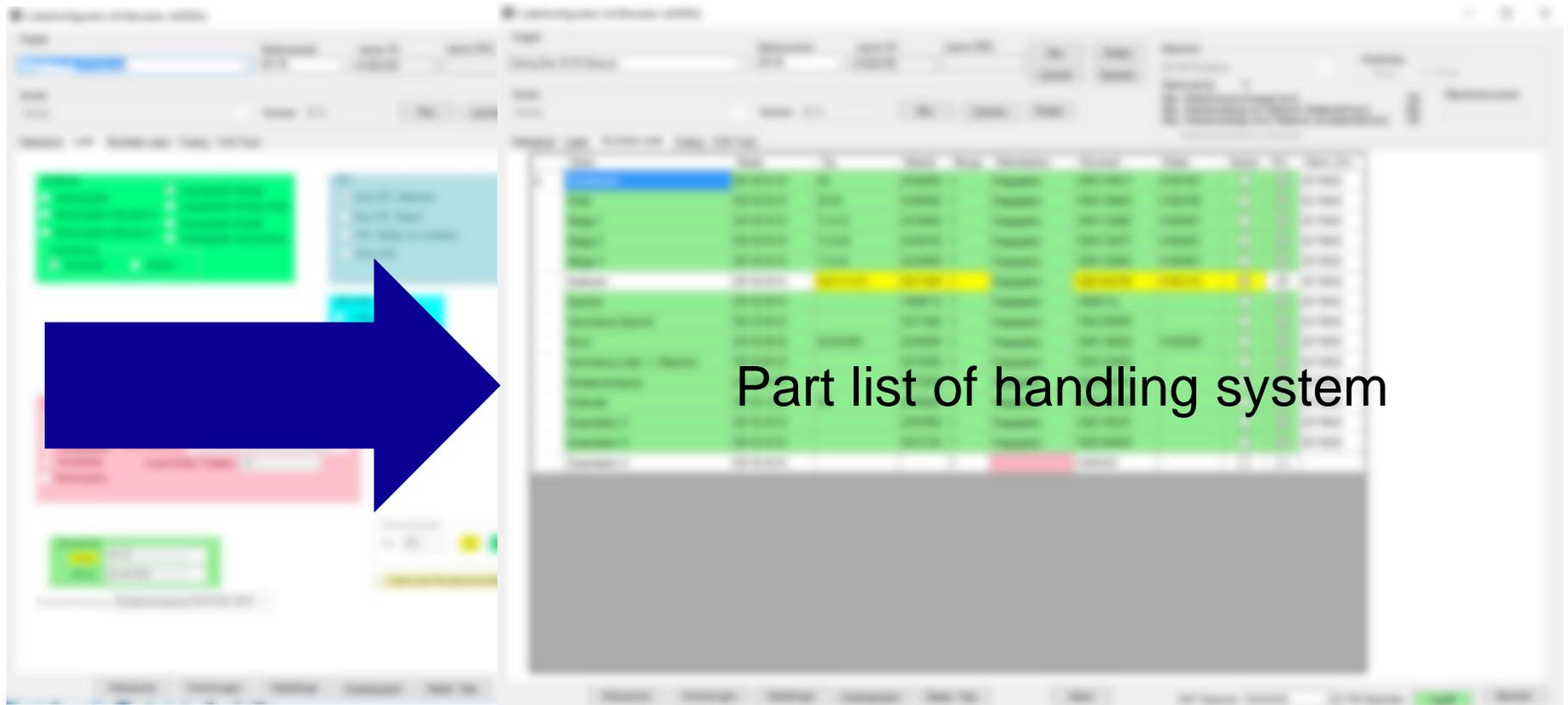
Industry 4.0



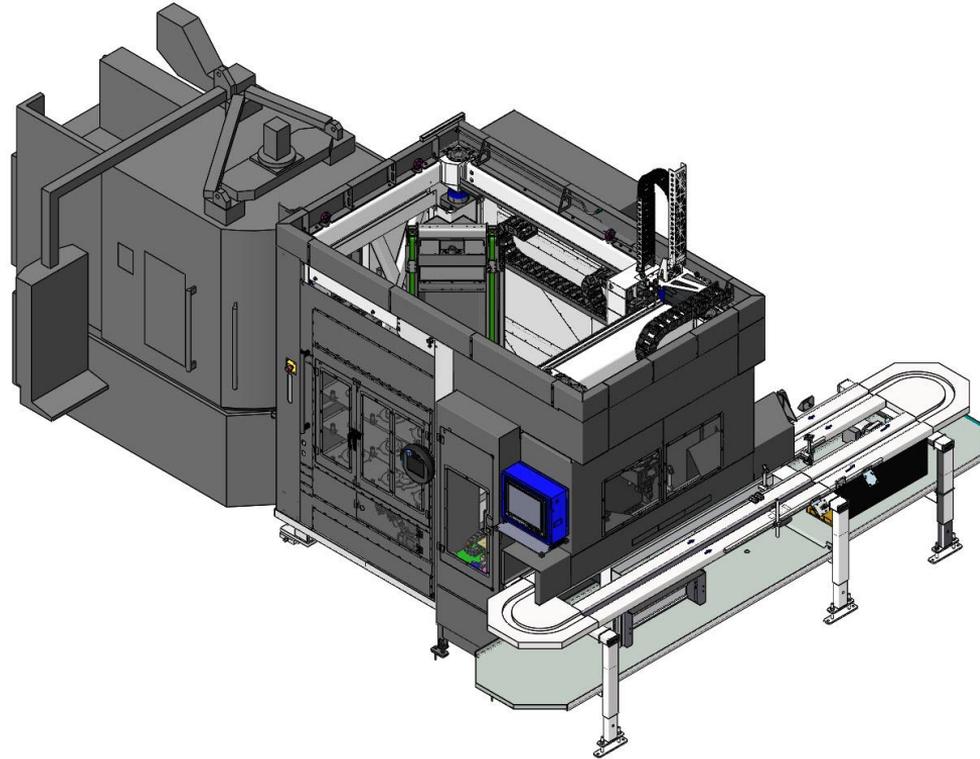
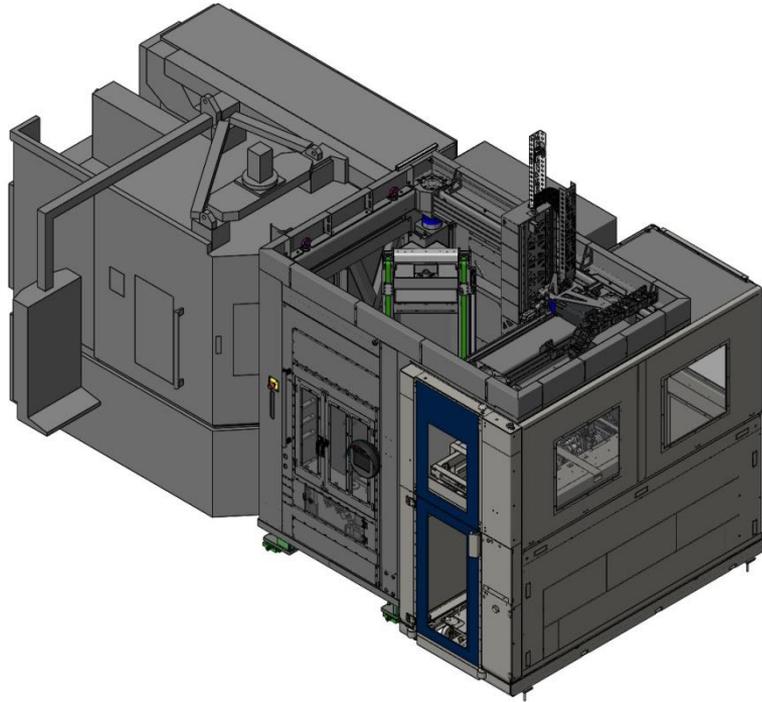




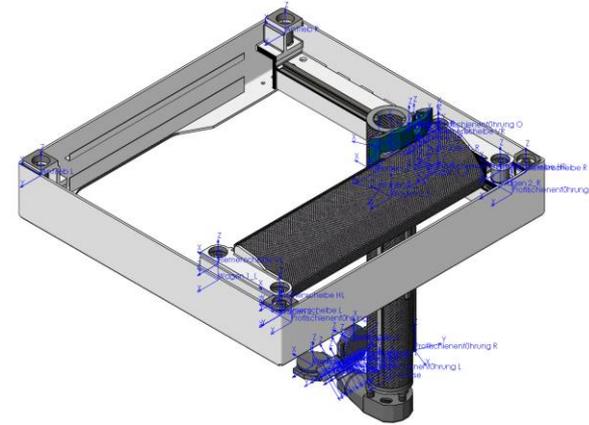
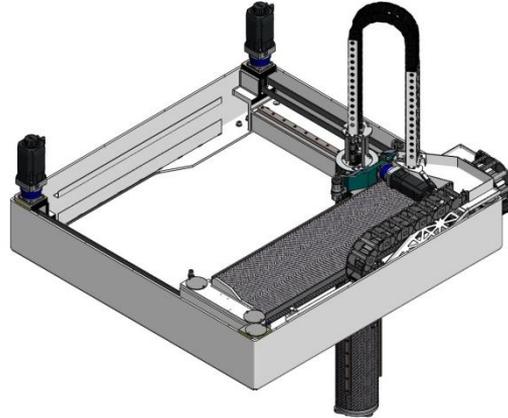
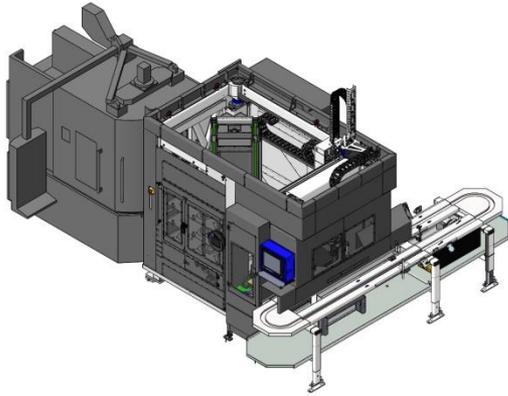
Specifications of customer's handling system



## Examples of configured CAD Models



## Different grades of details and simplification

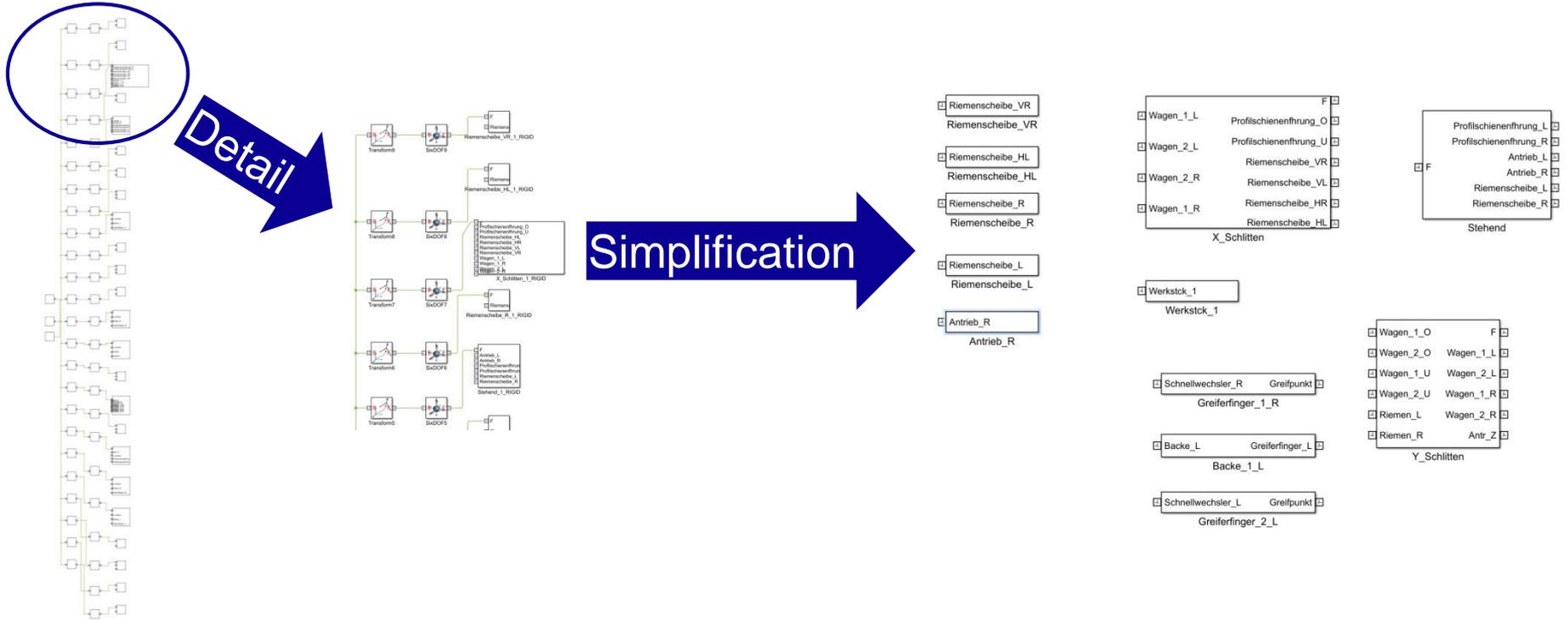


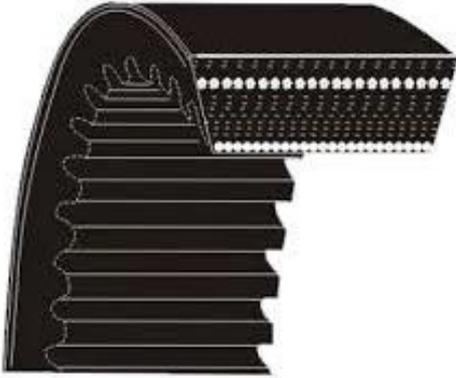
- 10'000+ Bodies
- Simscape-Model too complex
- Not enough RAM for loading

- 1'000+ Bodies
- Very slow graphics update
- Long calculation times

- 24 Bodies
- Only moving elements
- Simple model to work with

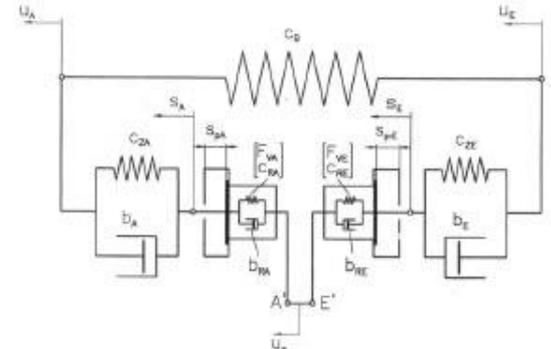
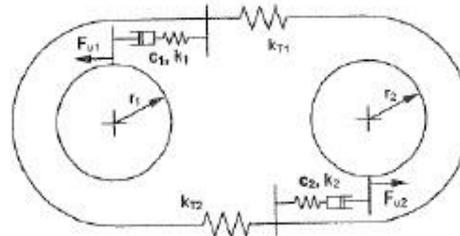
## Simulink-models: Imported and conditioned for the library





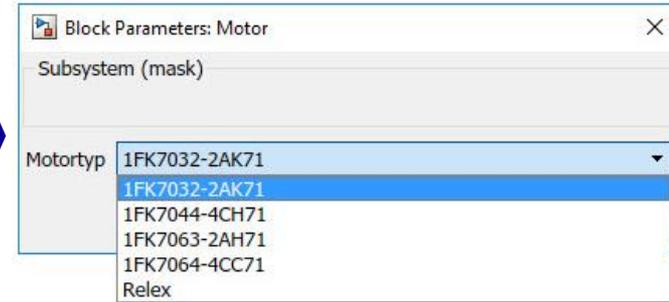
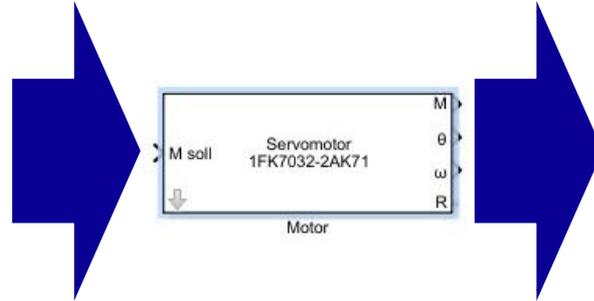
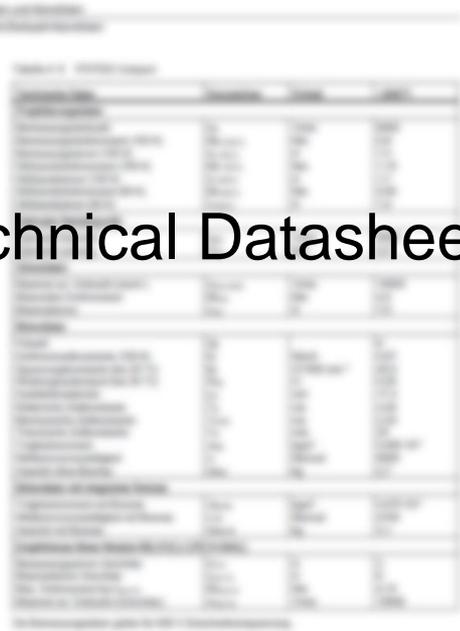
- What output do I need?
- What input data do I have?
- How detailed are the physical models?

Technical Datasheet



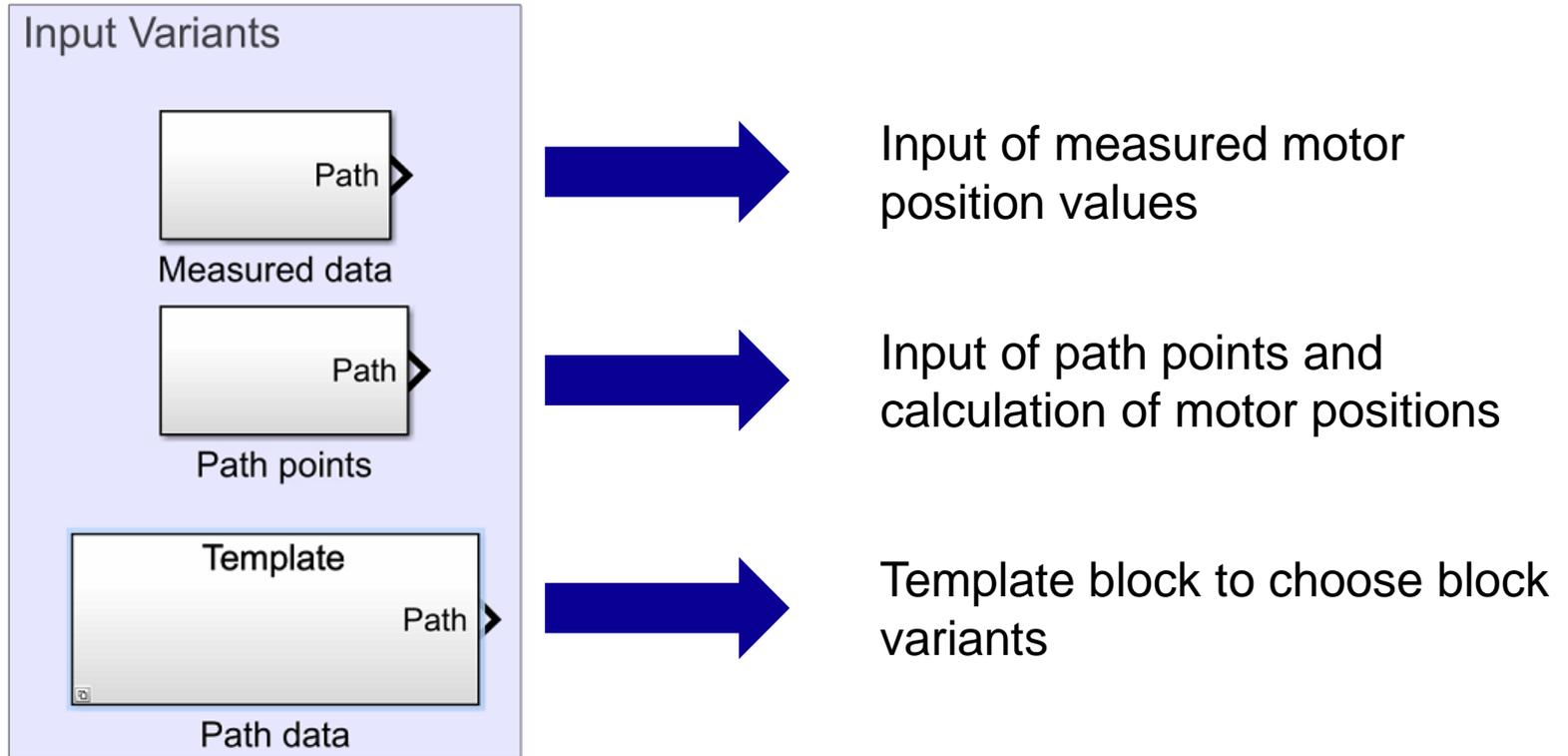
Library with variants of motor models:

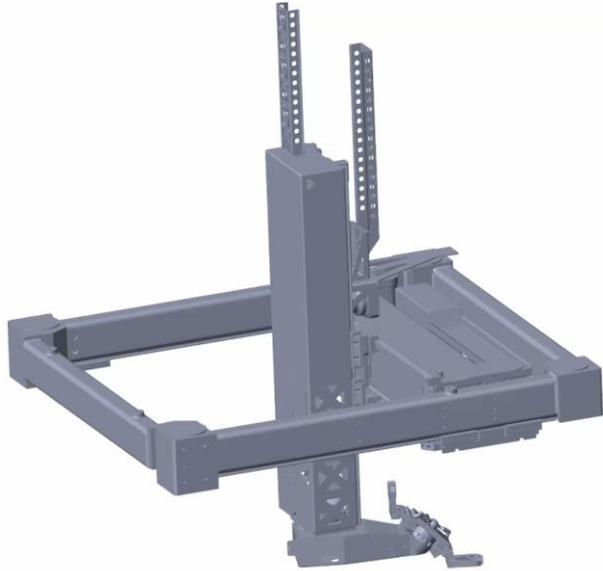
Technical Datasheet



Proof-of-Concept with MathWorks support







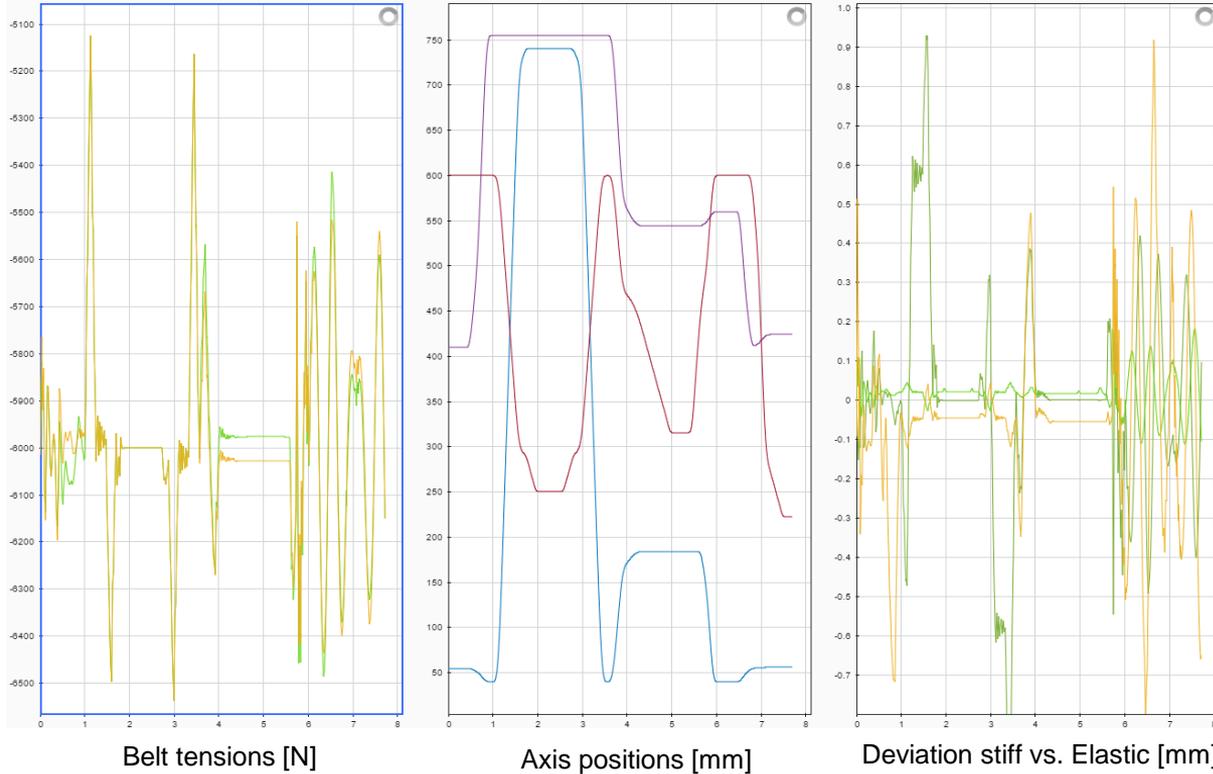
Current system



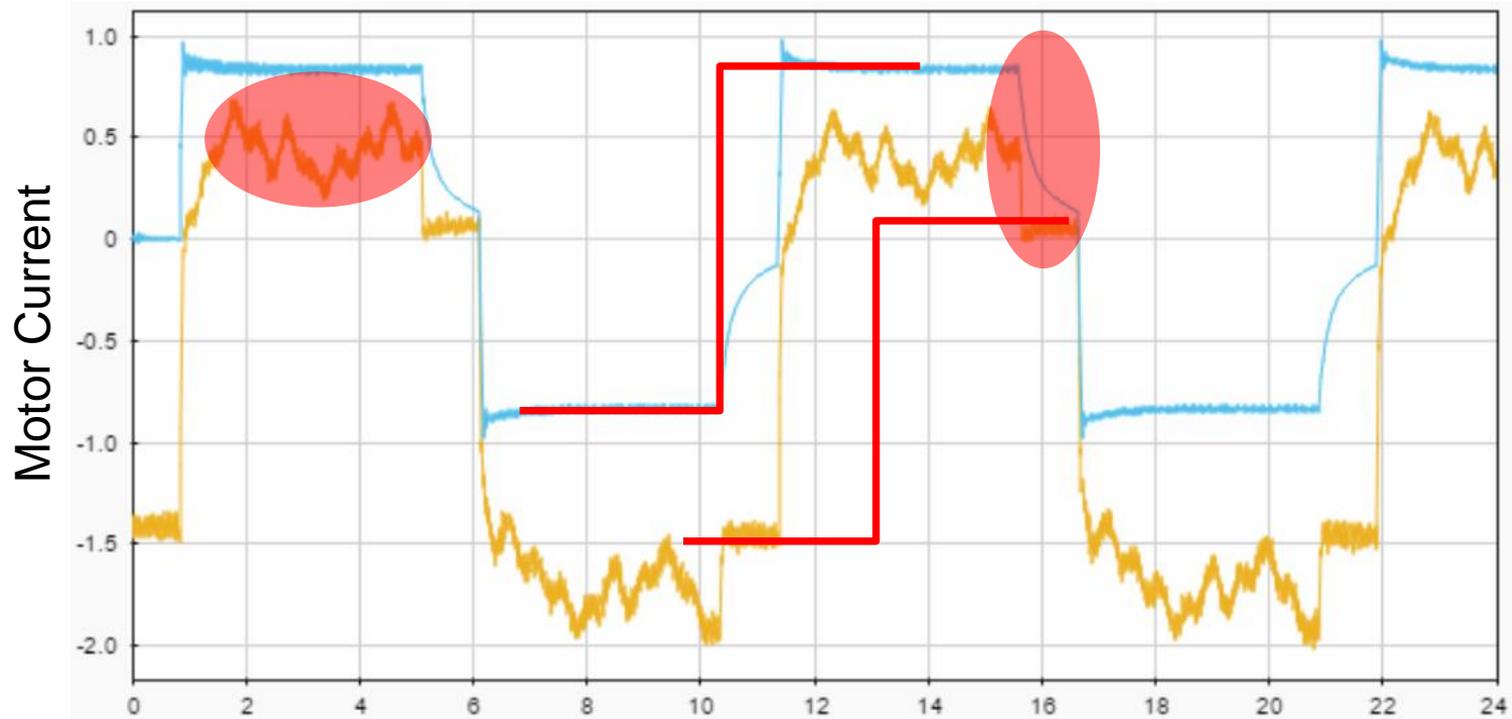
Virtual prototype: better trajectories, faster, less moving mass, cheaper

**Solution: Virtual machine of different Systems**

# Simulation Data Inspector: View of results during one cycle



## Comparison of measurements and model:



Feasibility studies of customer's processes



Better pricing

Simulations with Simulink are fast and deliver more insights than traditional analytical models



Faster development

Simulation results can be used for accurate dimensioning of components



Lower costs

Calculate lifetime of linear guideways according to customer's process to predict service intervals and



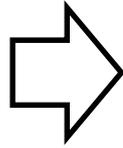
Industry 4.0

**Conclusion: The idea has become reality**

# Benefit for BOTH: Customer and Company

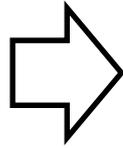
**Conclusion: The idea has become reality**

Better pricing



Optimal quote for customer, less risk for company

Faster development



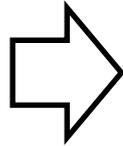
Virtual commissioning leads to less failures in process

Lower costs



-30% drive size for same performance

Industry 4.0



Calculate total cost of ownership possible

**Conclusion: The idea has become reality**

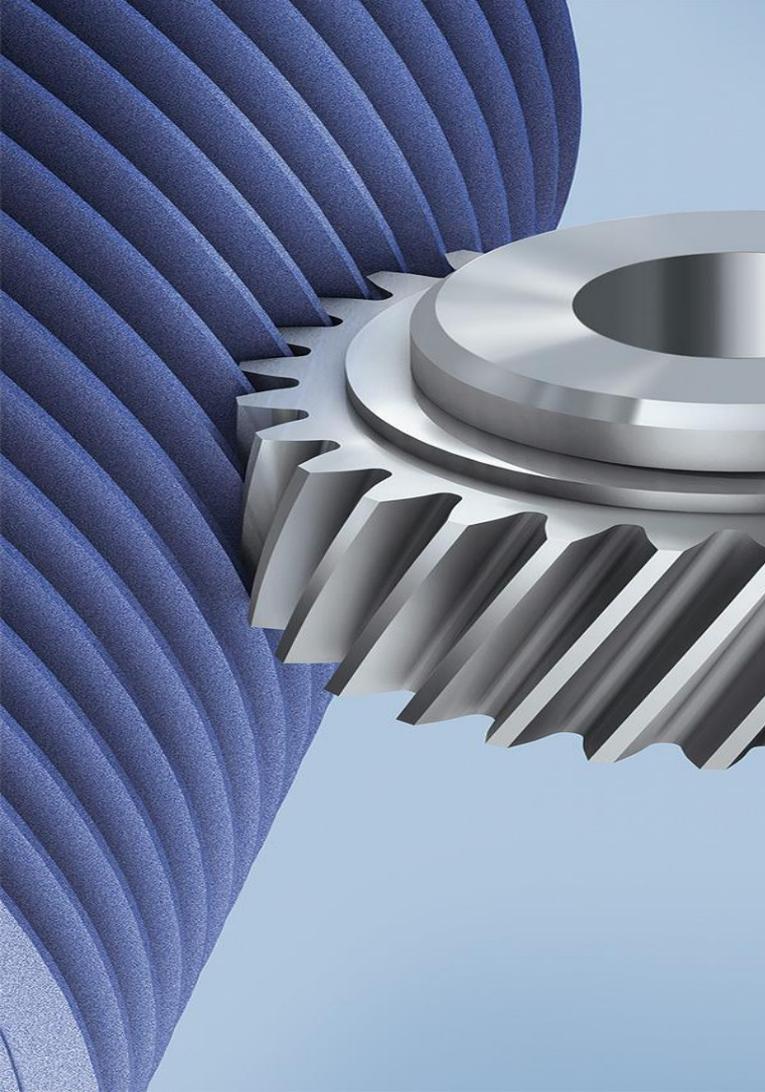
## Next steps:

- Integration of workflow in everyday use for other engineers
- Optimization of:
  - Hardware
  - Software
  - Trajectories

## Future tasks:

- Integration of machine logic: State machine
- Code generation of model
- Downgrade from NC to PLC
- Integration: Hardware in the loop for parameter estimation and error handling





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 FELSOMAT®

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“Not trying” is like  
failing before starting