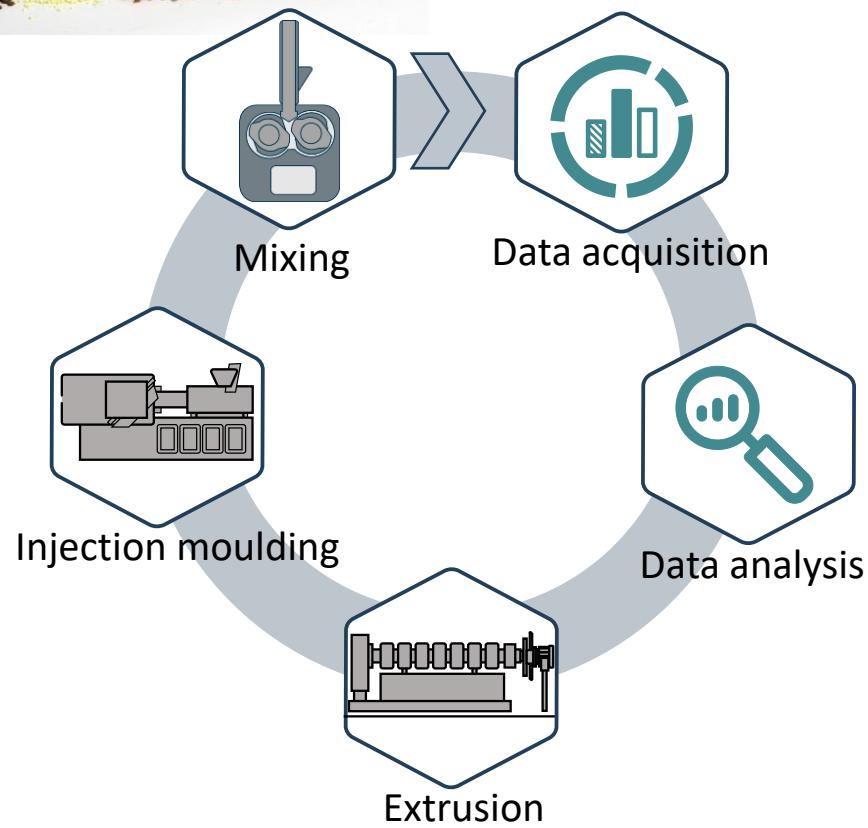


# Intelligent search engine for finding optimised rubber compounds (InSuKa)

Die Plattform für die Digitalisierung von Materialien

Ein Verbundprojekt von:





## Challenges in rubber compounding

- Iterative and knowledge based development of mixing instructions
- Often time-consuming and requires a high amount of materials and energy
- New materials cannot be integrated in the mixing process

## Goals

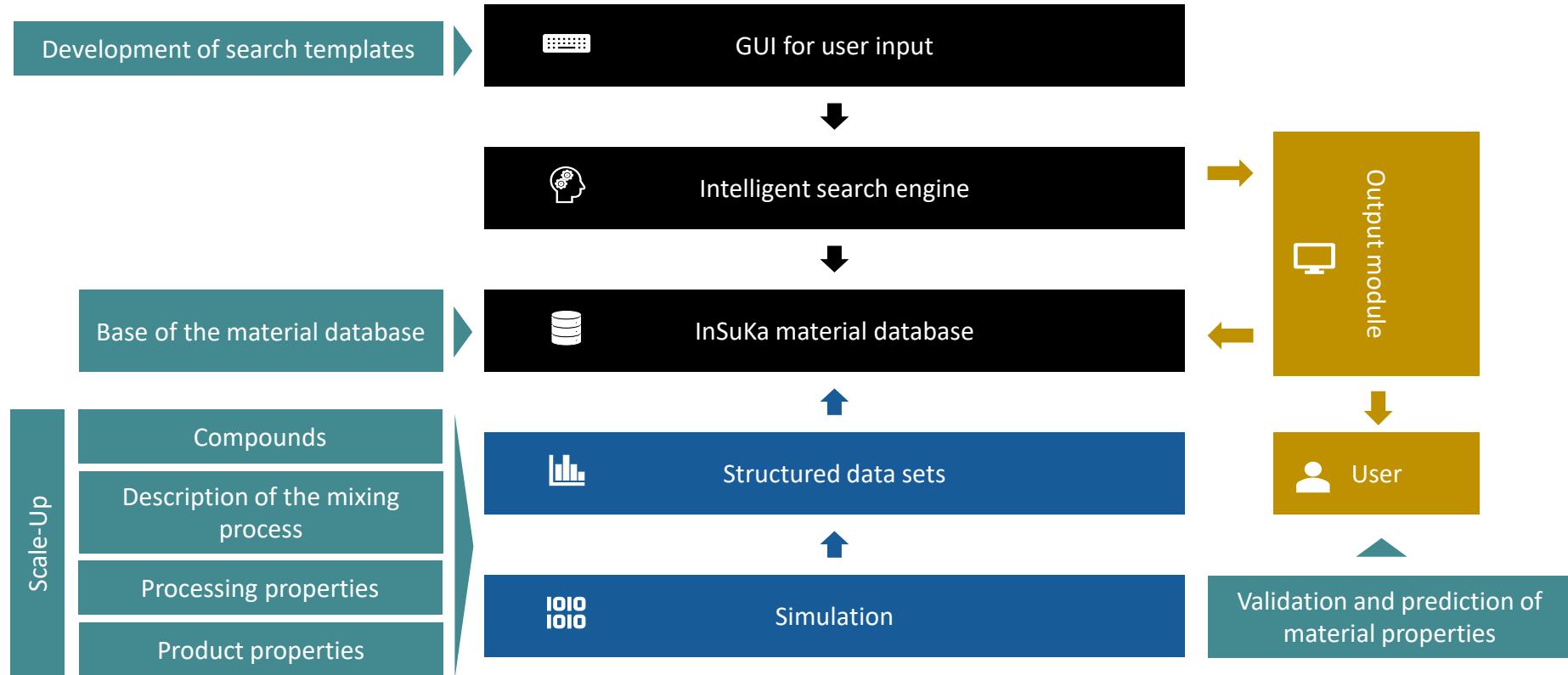
- Development of a rubber compound database
- Characterisation of the mixing process and general rubber processing
- Prediction of the mixing process based on material and process parameters
- Development of an intelligent search engine

## Tools and software

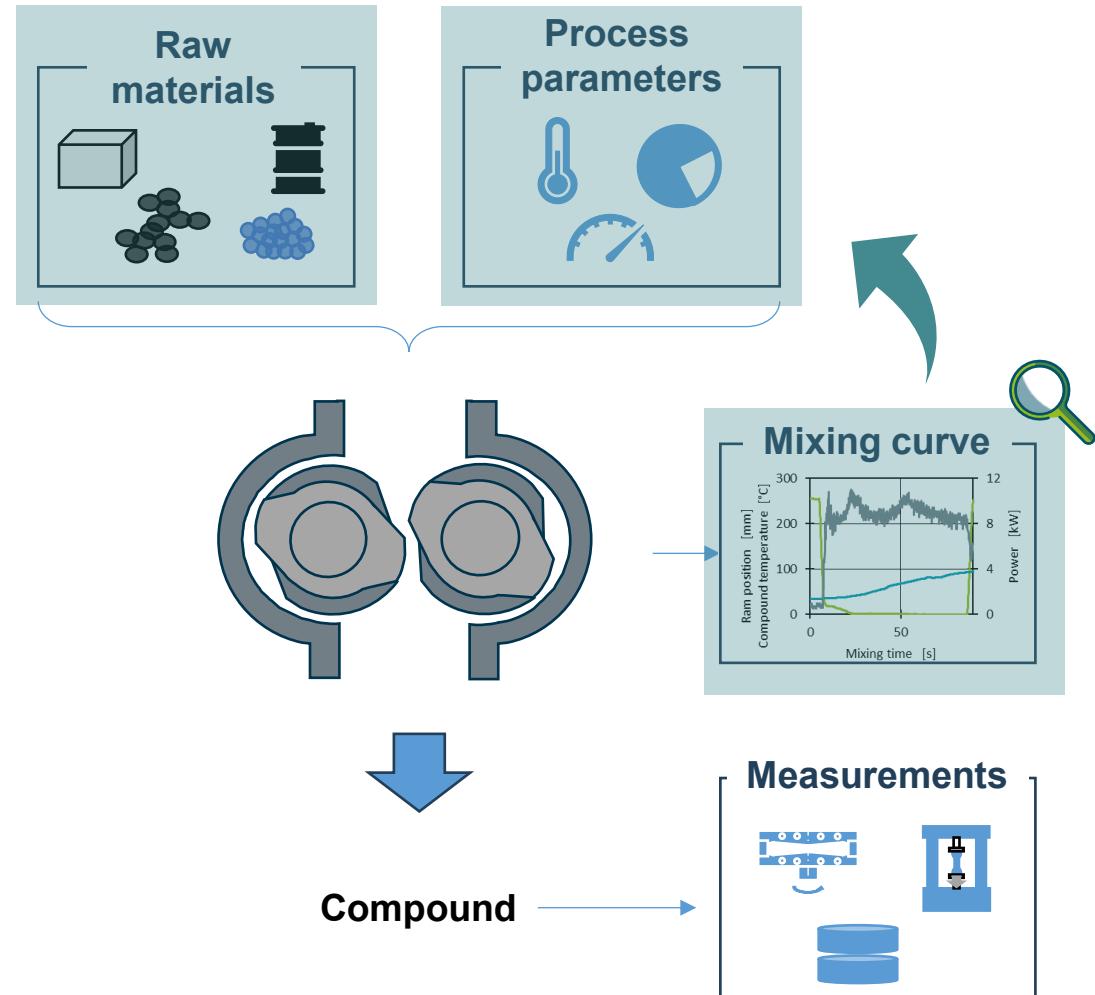
- PMD Core ontology
- Material-AI (MAT-AI) as a base for the search engine



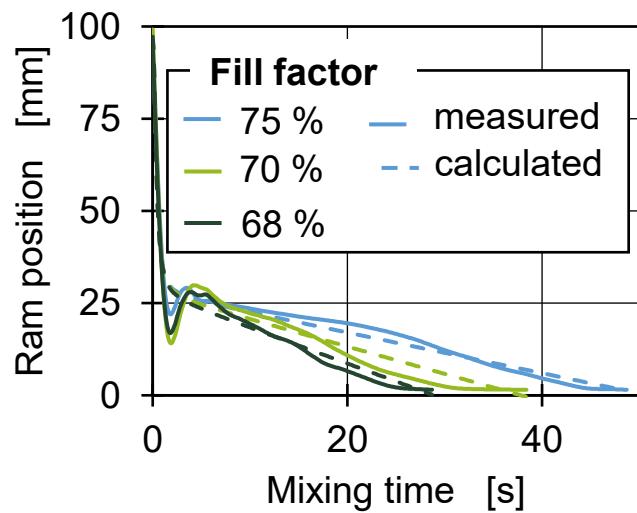
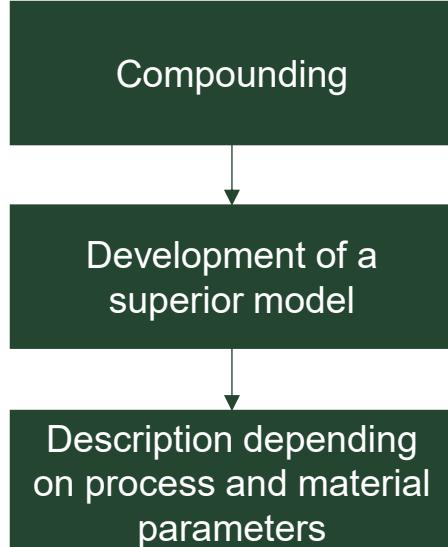
# Project structure

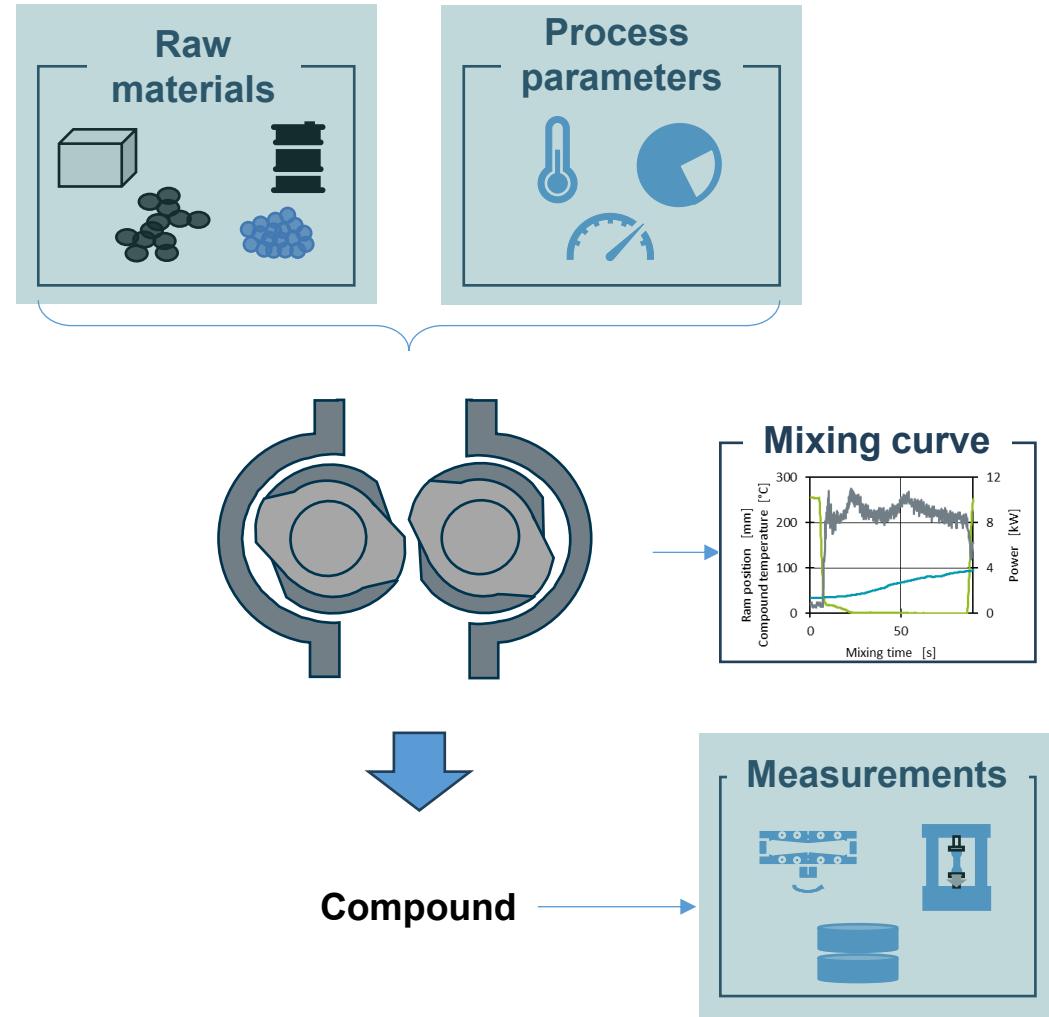


# Simulation of the mixing process

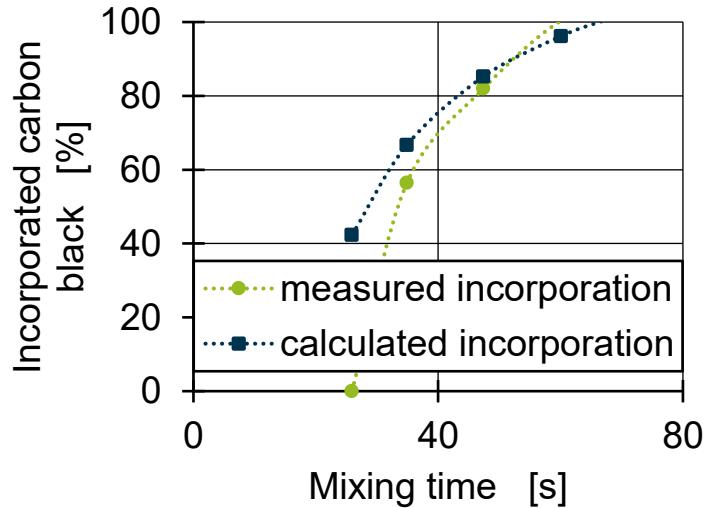
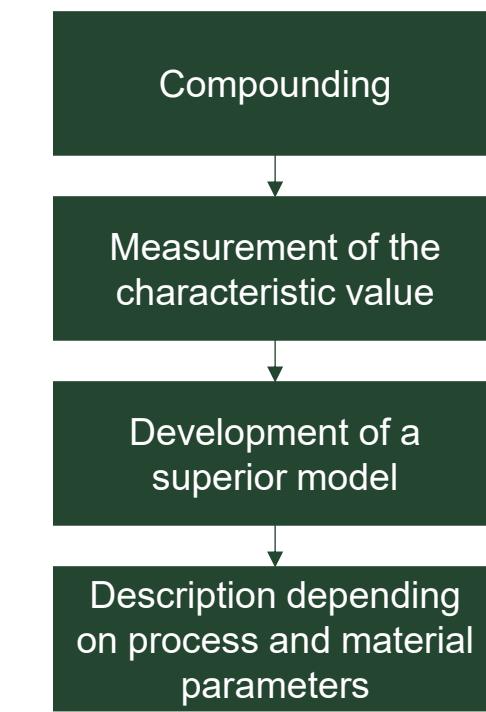


To establish a correlation between the process parameters, the recipe components, and the mixing process, models are developed that describe, for example, the incorporation of fillers or the temperature development of the compound.

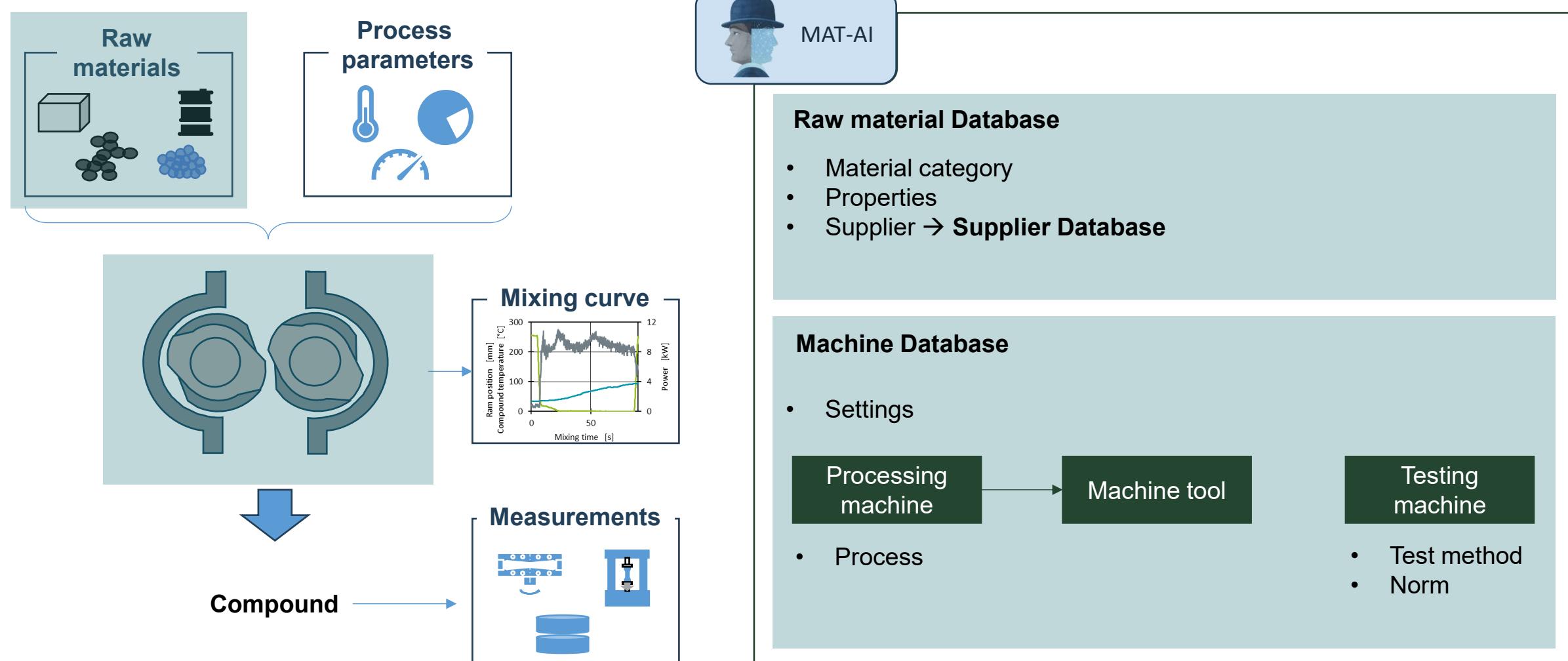




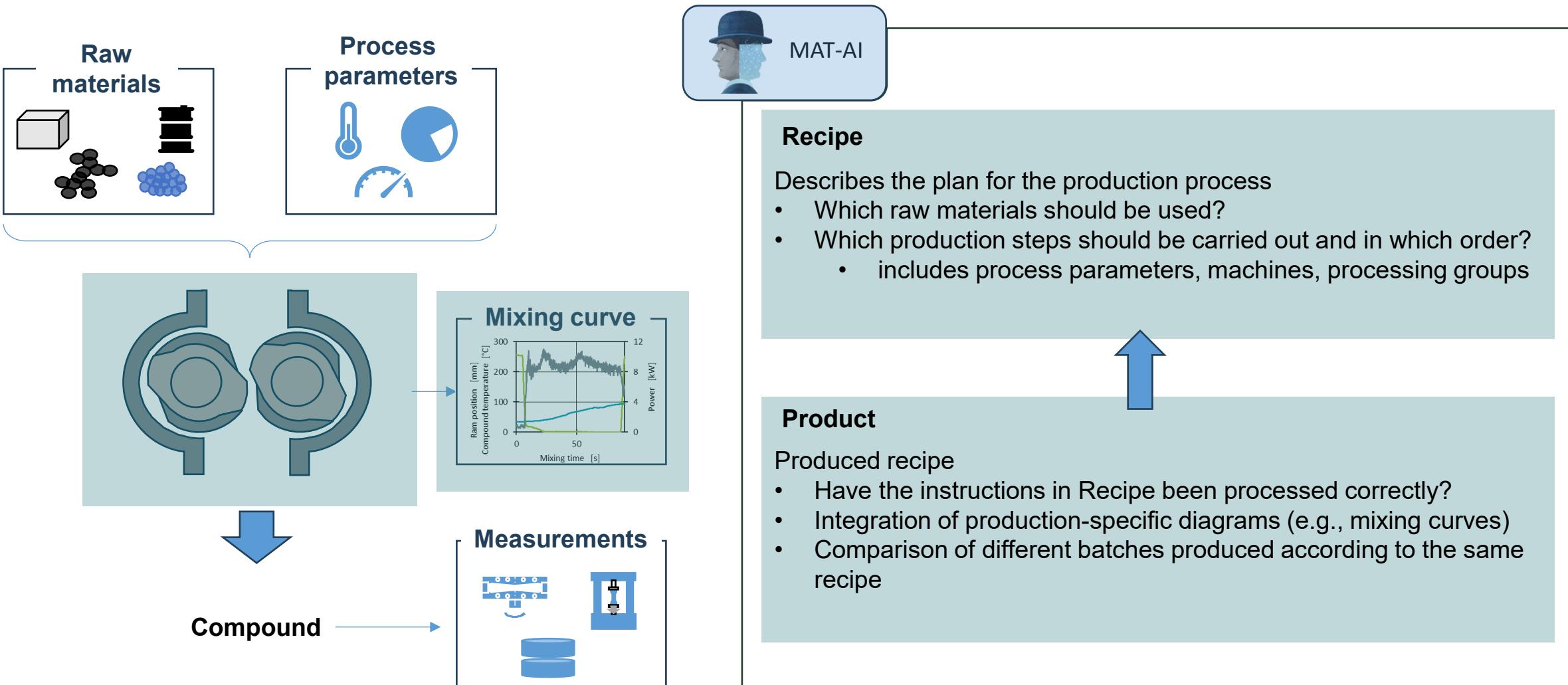
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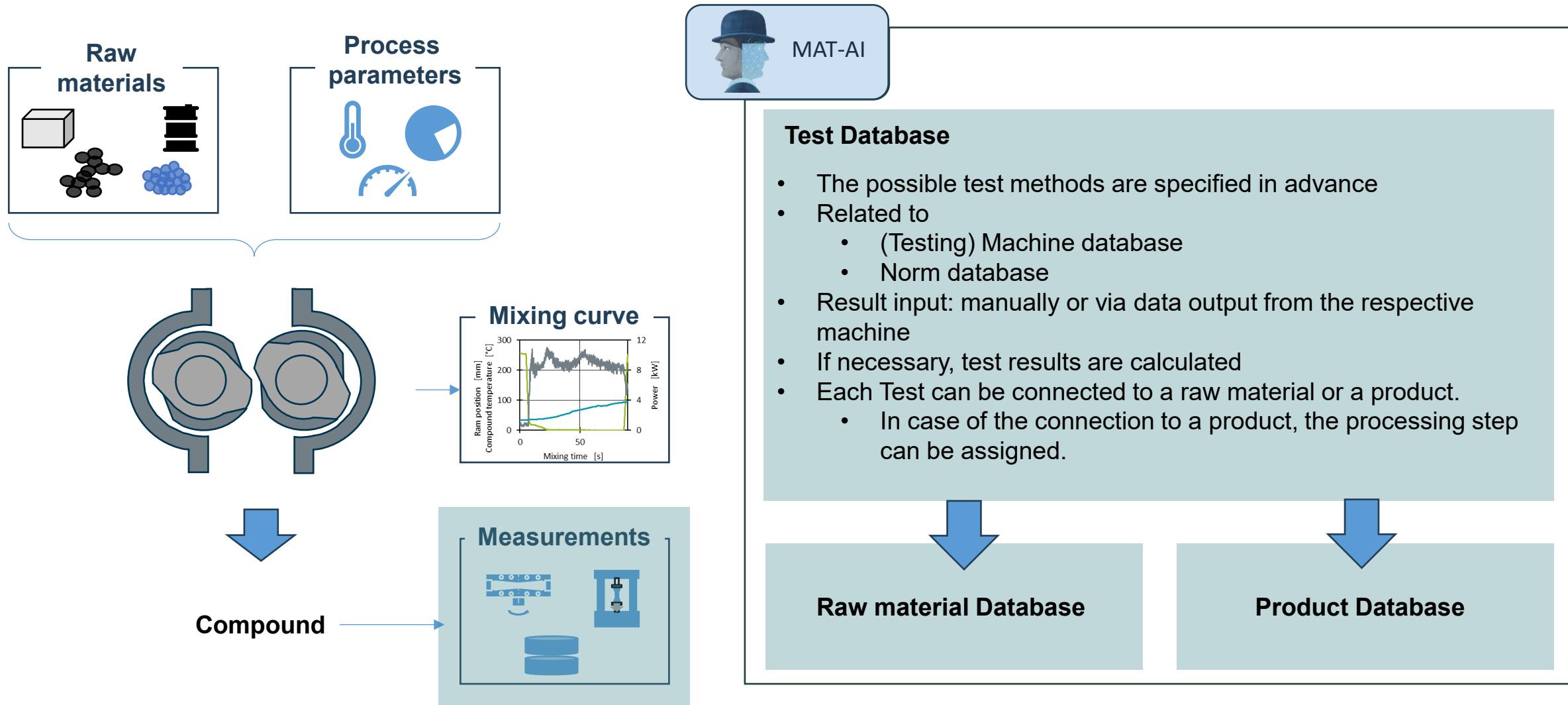
# Structure of the database – raw materials and machines



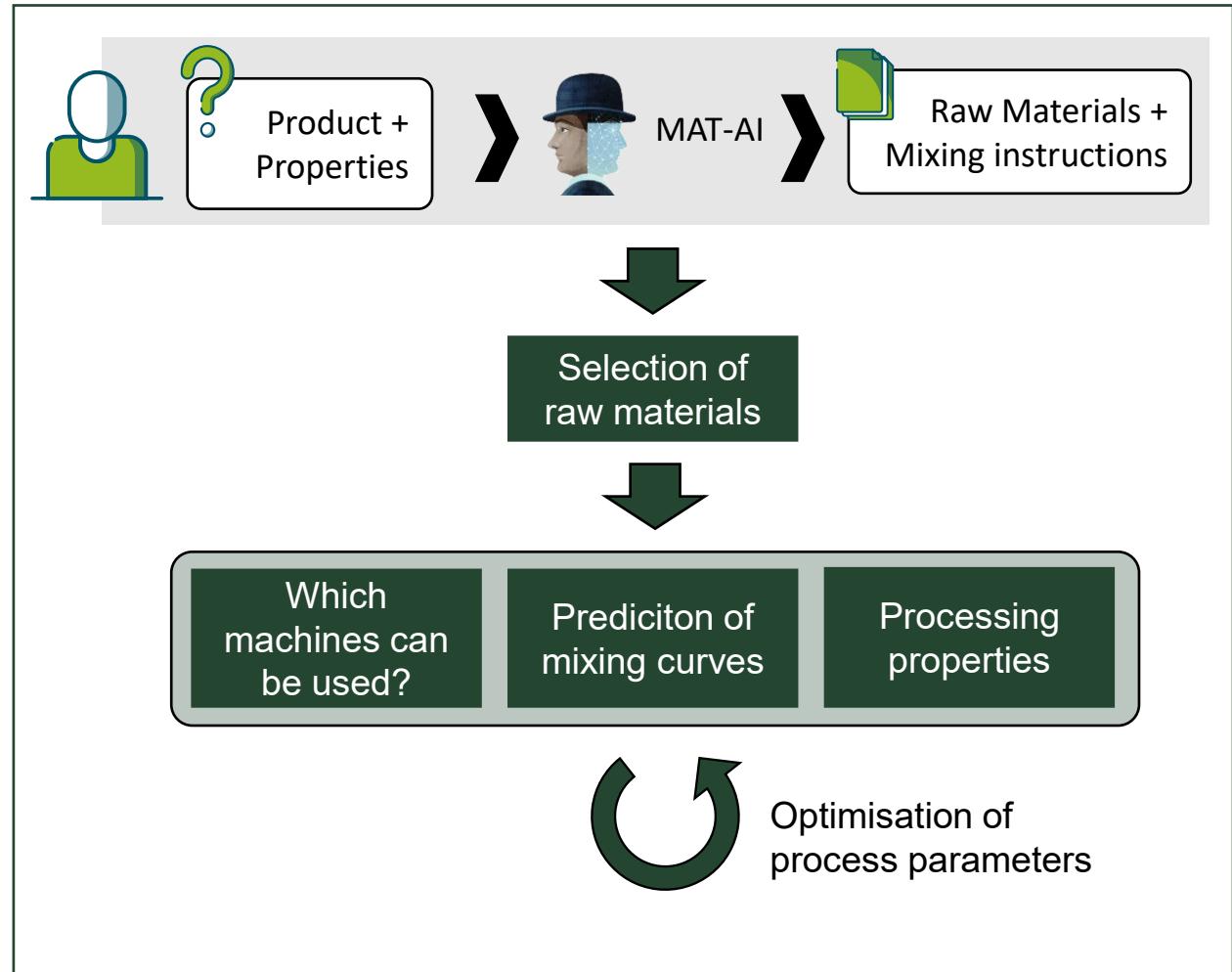
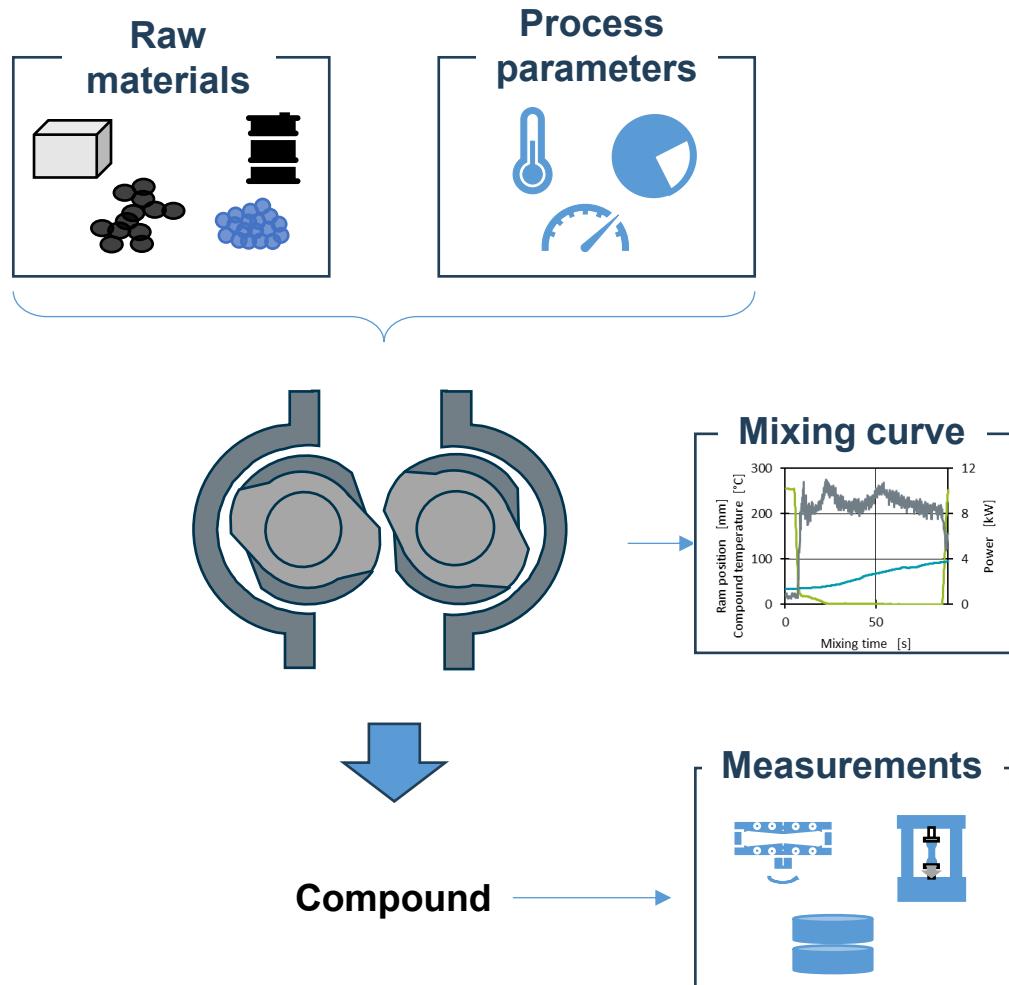
# Structure of the database – recipe and product



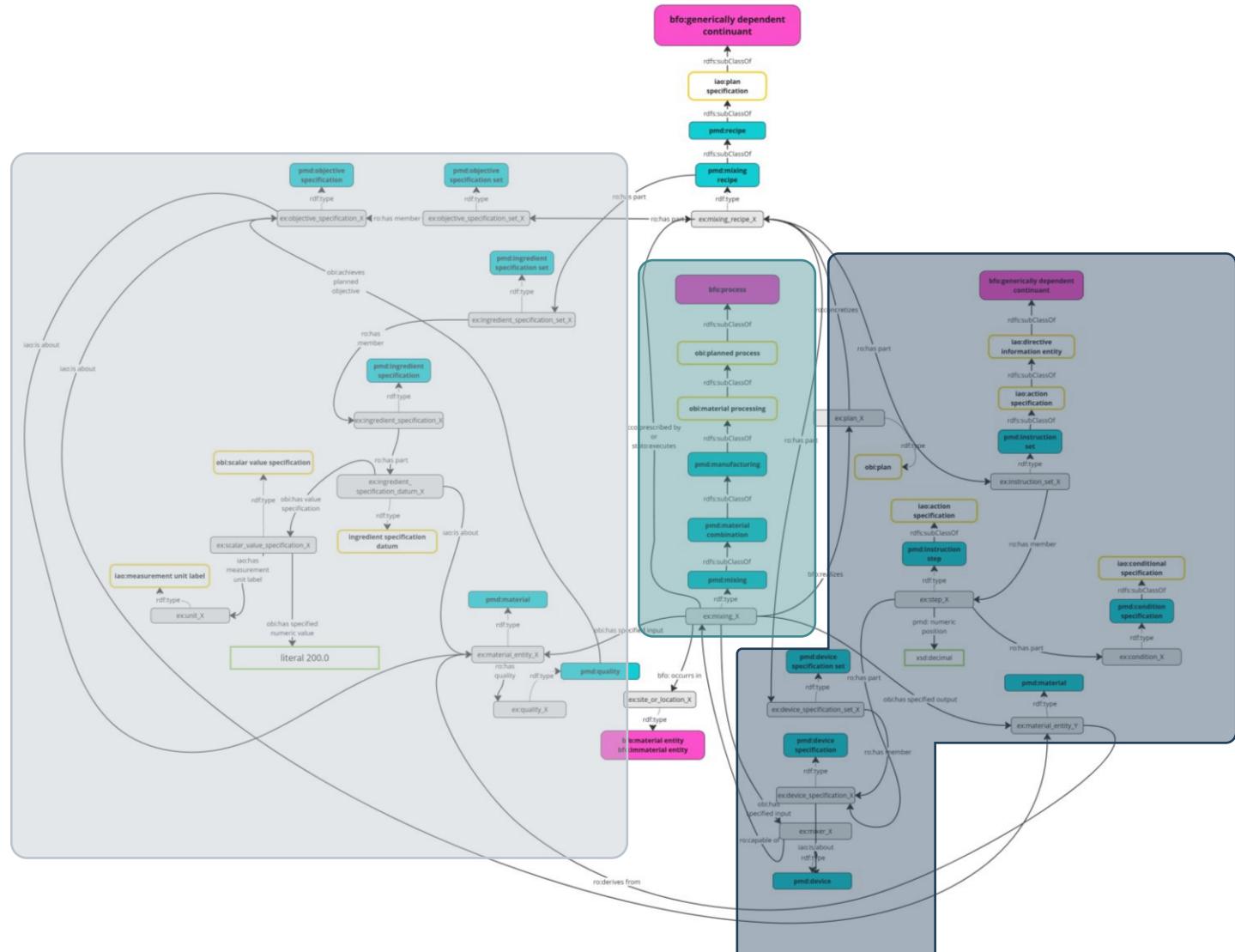
# Structure of the database – test



# Search engine to find optimised rubber compounds



# Ontology describing the mixing process



The mixing process pattern is part of the ontology for the complete process including further pattern for example the measurement.

## General points for the mixing process

## Specification of raw materials

- What materials are used?
- What properties do these materials have?
- Unit for each property

## Specification of the mixing instructions

- Subdivision of the process into mixing steps, including setting the switchover criteria and process parameters
- Assignment to a device

# Our Consortium



- Polymer synthesis
- Polymer processing
- Polymer applications



- Rubber mixing
- Rubber processing
- Raw material characterisation



- Material science
- Polymer science
- Process-structure-property relations



- Rubber mixer manufacturer
- Mixing room concepts



INSTITUT FÜR  
KUNSTSTOFF  
VERARBEITUNG  
in Industrie und Handwerk  
an der RWTH Aachen

- Polymer processing
- Rubber processing
- Mixing, extrusion, injection moulding



- Digital exchange of information
- Ontologies
- Knowledge Graphs



- Digital transformation
- Database „MAT-AI“

