

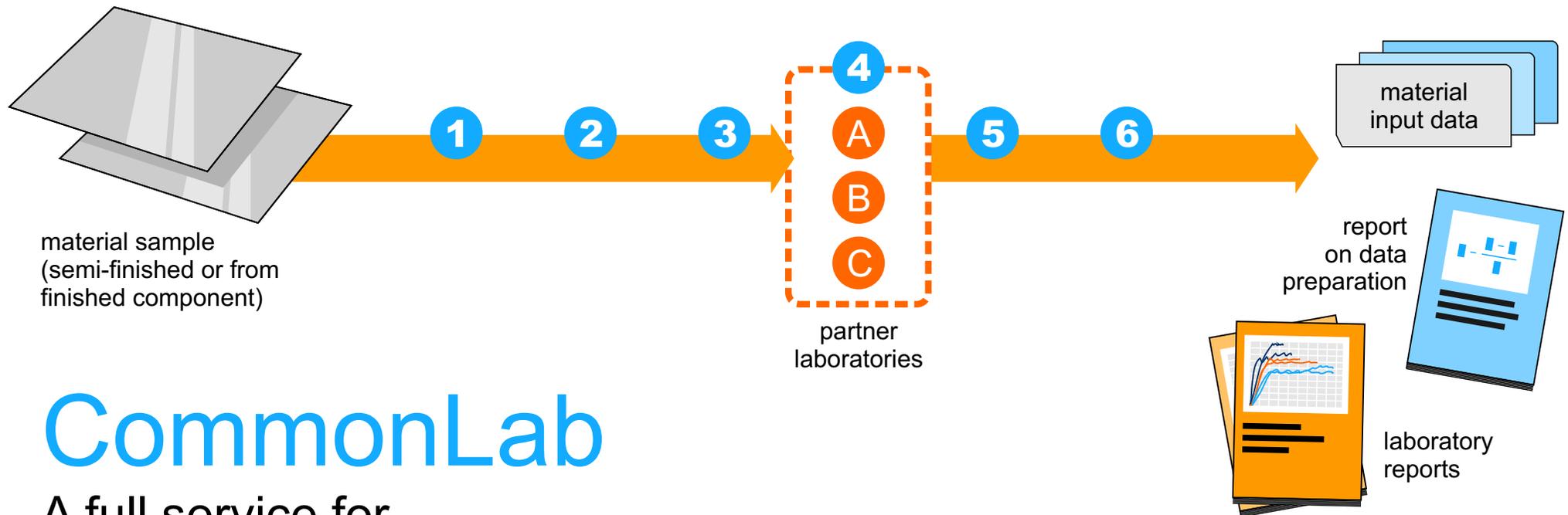
Finite element analyses with nonlinear material behaviour, e.g. forming or crash simulation, require a good description of the material behaviour. Obtaining reliable material parameters is not trivial. MATFEM can test your materials and derive material input data for your FEM analyses.

We cover a wide range of material models for various commercial explicit simulation codes.

We characterize your individual material and do not offer data from a general material database.

The service is fully transparent to our customers. We provide all lab data, lab reports, a theoretical report on the parameter identification process and a comparison of the identified model data with the original lab data at the end of the project.

The customer holds the rights to all lab data and identified parameters.



CommonLab

A full service for
FEM material input decks

Reliable material data in six steps

1 Discuss the simulation problem

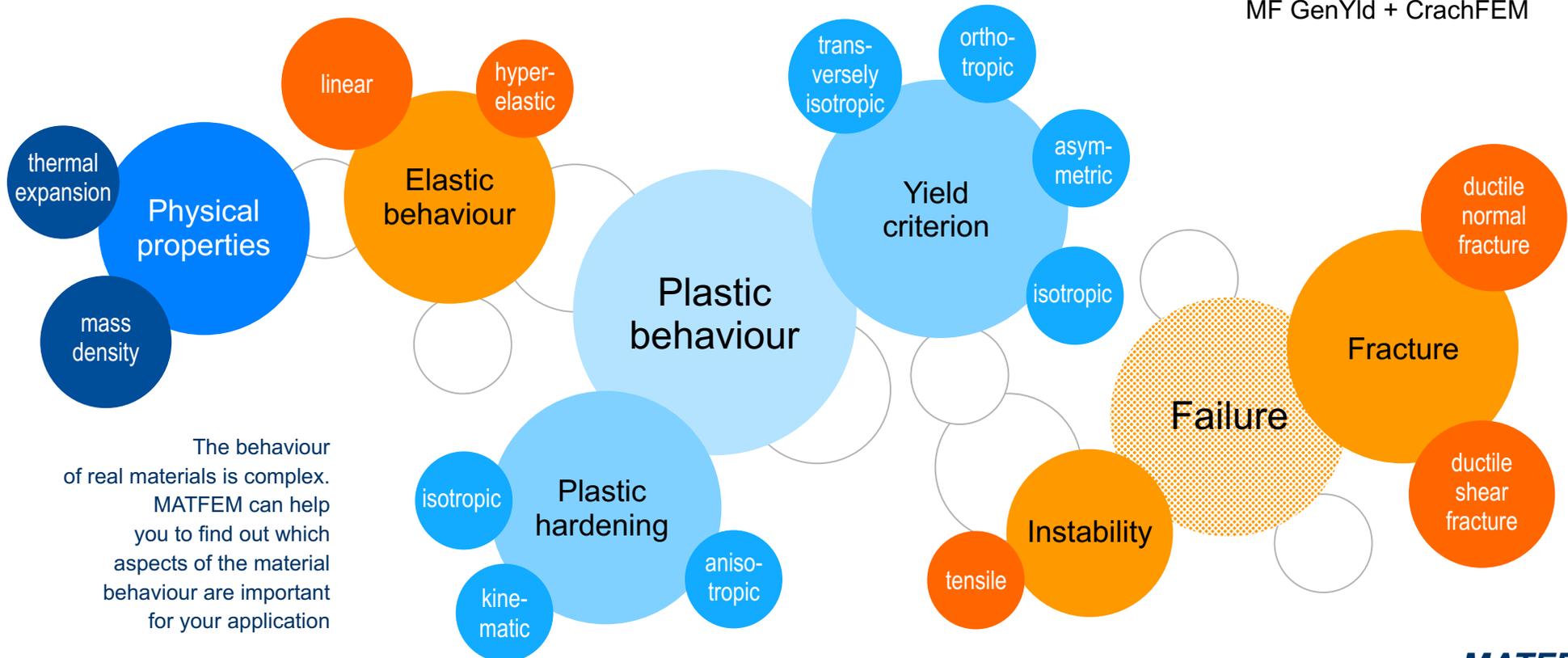
The first step is to assess the simulation problem at hand and to identify the important physical effects that should be considered in the material model.

Material modelling comprises a vast range of aspects. For one application, only a subset of this range is important. We can help you to find out which aspects of the material behaviour are worth modelling in detail and which aspects can be neglected.

2 Select the proper material model

The commercial finite element codes provide various material models. Depending on the problem, we can help you to choose an appropriate model, for which we will prepare the data.

We also provide material data for MATFEM's material model MF GenYld + CrachFEM



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3 Define an experimental programme

We define a cost-effective test programme which takes into account the special properties of your material and the application field of the simulation.

For example, fracture tests are carried out only for materials with low ductility. Tests with load reversal may not be needed for some simulations, but recommended for others.

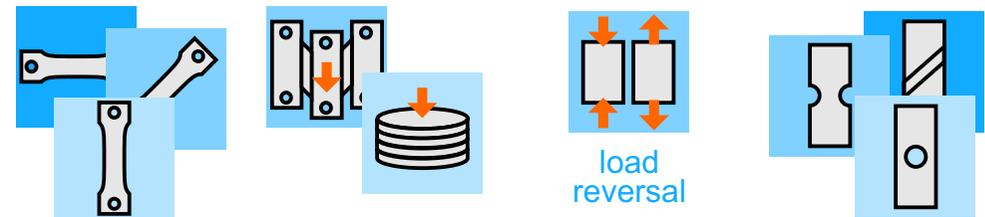
The experimental programme is discussed with the customer and also considers the project's time frame, data available from customer facilities and the required quality.

The programme is modular. Costs are assigned to each module such that individual modules may be skipped or postponed.

4 Carry out experiments

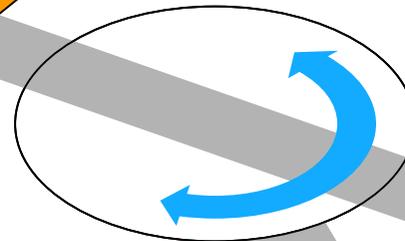
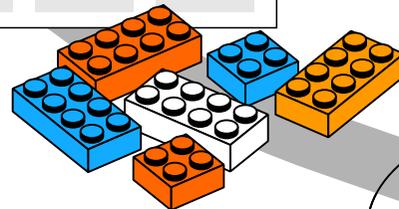
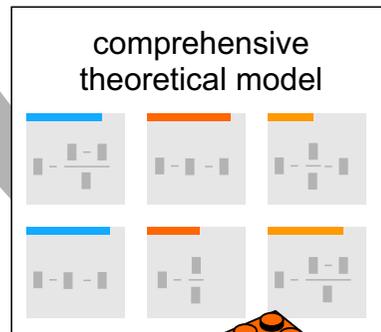
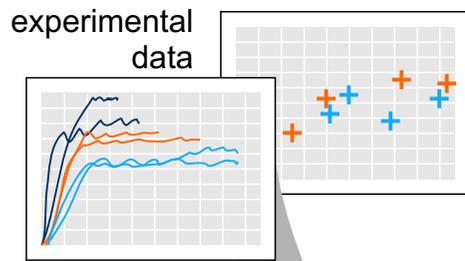
MATFEM has a network of specialized partner labs at universities, research institutes and private companies from Germany and other countries. In cooperation with our partner labs, new tests and specimens are developed.

We select the most appropriate partner labs for each project. If the customer can provide their own test results, those results can be included in the process.



Various classes of experiments describe different phenomena of the material behaviour. MATFEM can help you to define your test programme

elastic properties	✓		
yield criterion	✓	✓	
plastic hardening	✓	✓	✓
forming limit	✓		
fracture			✓



By fitting clearly described basic load cases well, the material model should be able to describe the material behaviour for arbitrary loads.

Inverse iterative procedures usually yield parameters that are valid only for limited load cases. Therefore, such procedures are kept to a minimum.

6 Prepare and test material cards

After parameter identification we create the material input for the chosen models.

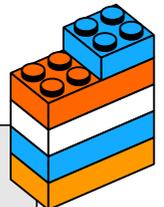
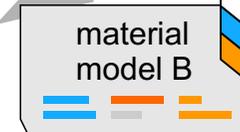
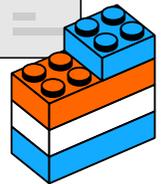
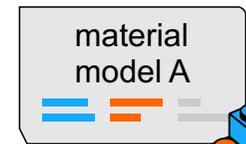
We also simulate test cases with the selected FEM software to validate the material card.

Reliable material data in six steps

5 Identify material data

We use in-house software to derive all material parameters for a theoretical phenomenological material model from basic tests. This theoretical model is independent of the finite-element solver.

The experimental data serves to feed a comprehensive theoretical model from which individual implementations may be distilled.



MATFEM

Which type of materials do MATFEM characterize?

Mainly, we characterize metallic materials for forming and crash simulations and polymers for crash simulations.

Metals:

- steel and Al sheets
- extrusions
- cast alloys

Polymers:

- without reinforcement
- short-fibre reinforced
- polymeric foams

For which FEM codes can MATFEM provide material data?

We can provide data for the following commercial FEM codes:

- ABAQUS
- Autoform
- LS-DYNA
- PAM-Stamp
- PAM-Crash
- RADIOSS

Who are our customers?

MATFEM has gained wide experience in material characterization from more than 500 projects for customers of various industries such as the automotive, aerospace and biomedical industries.

Get in touch!

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