

IAV Kasai and Online-DoE

Real-time model-based calibration

Design of Experiments (DoE) is a method that permits efficient calibration of engine control units. It is based on mathematical models and considerably reduces the calibration effort.

We have been making successful use of DoE for many years in various projects. The IAV Kasai software has resulted from the information gained by our engineers and their accumulated experience. IAV Kasai makes the DoE process easily understandable and accessible without having to forego special expert settings. A complete DoE can be carried out very simply using the software, which on the other hand also offers extended settings for making specific changes.

Online DoE is an additional feature that offers the user an automated process from test planning through to modeling. Adaptive test planning also boosts measurement efficiency. IAV Kasai can be used together with a test bench automation system such as ORION to cover the entire DoE process. From test planning via modeling through to optimization, the software takes you through all necessary steps. It processes the underlying data in graphic form for swift capture of all the important DoE points. Every step is supported by an interactive workflow for jumping back and forth in the process. The scope of functions is rounded off by integrated interfaces such as model export to Matlab.

Functionalities:

- *Workflow-based, simple user guidance*
- *Preconfigured DoE process*
- *Test planning in blocks*
- *Automatic selection from various model approaches*
- *Automatic outlier detection*
- *Fully integrated Matlab interface for model export*
- *Graphic model evaluation*
- *Map-optimized OptiMap*

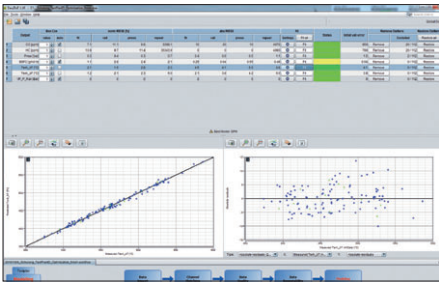
Advantages in the engineering process:

- *Easily accessible use of DoE*
- *Reduced test bench time*
- *Utilization of existing know-how and prevailing stipulations*
- *Wide-ranging optimization possibilities*
- *Efficient control configuration*
- *Tested over many years; on-going further development*

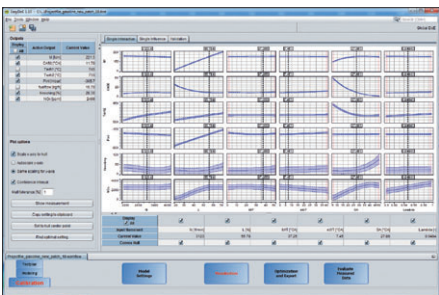


Product by IAV

Step-by-Step to the Optimum



Modeling



Model evaluation

Using prior knowledge

IAV Kasai goes through all the steps of DoE. Preconfigured settings provide a good basis to obtain optimum results quickly. It begins by defining the inputs of the engine together with the variation limits. Varied definition of the limits is possible, for example on the basis of already known maps, thus permitting individual subdivision of the test space. The settings are used to generate a test plan for measuring the engine at the test bench.

Automatic model comparison

Once the measured data are available, models are trained accordingly in IAV Kasai. The software automatically looks for the best model approach, choosing between polynomial models, RBF networks and Gaussian process models. Model quality can then be assessed for selecting the optimization models. The software allows for graphic evaluation based on various interactive diagrams as well as model export via the integrated Matlab interface for other optimization programs.

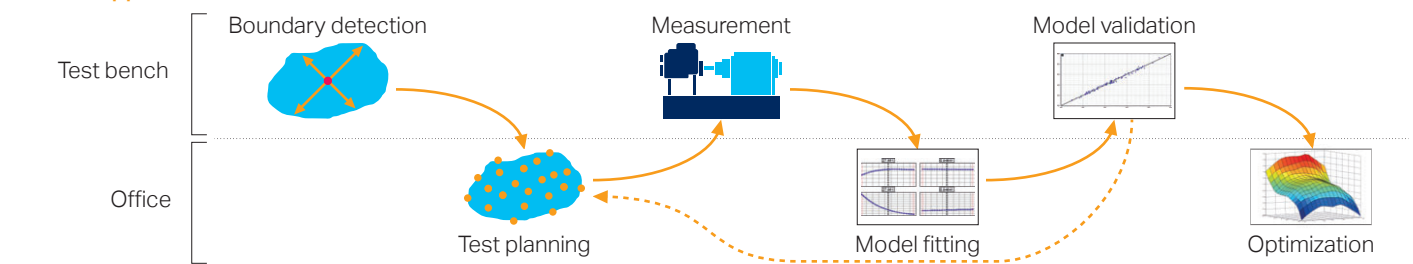
Integrated optimization

The plug-in OptiMap in IAV Kasai is an integrated solution for complete map optimization, with a workflow for adjusting all optimization settings. The plug-in defines several optimization sequences that can be repeated. Every operating point in the map area can be given a defined optimization target.

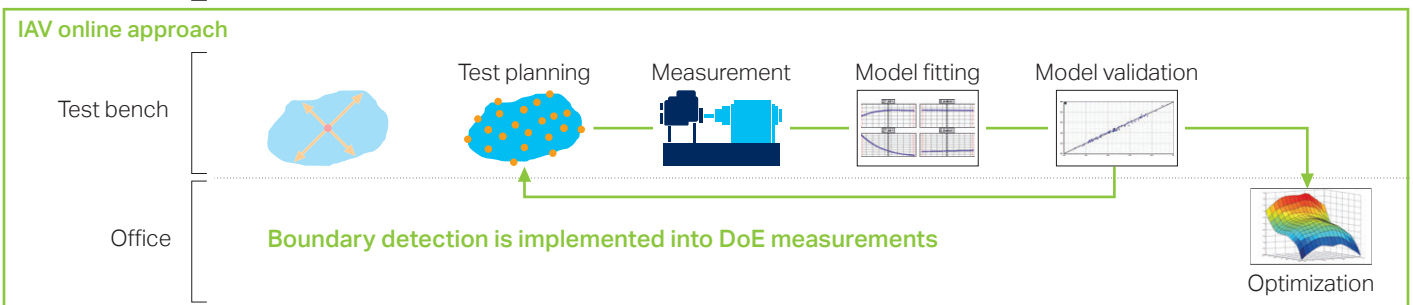
Online DoE gives the user the option of real-time modeling, with iterative tests for considerably enhanced calibration efficiency.

Interested? We will gladly provide support in dealing with your questions or interest in our product or bespoke solutions!

Classic approach



IAV online approach



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